ARKANSAS SOYBEAN PROMOTION BOARD MEETING—DAY 1
Zoom Option

Minutes

March 12, 2026
9:00 a.m.

Members Present in Person:	Josh Cureton, Brad Doyle, West Higginbothom, Matthew Roberson, Patrick Matt Smith, John Freeman
Members Present via Zoom:	BJ Royce Rogers II, Boyce Johnson
Members Absent:	Donald Morton Jr.

CALL TO ORDER
Chairman Doyle commenced the promotion board meeting at 9:00 a.m. and welcomed all members and guests. Members and staff introduced themselves and a quorum was confirmed by the Arkansas Department of Agriculture (department).

ADMINISTRATIVE MATTERS
Inoussa Zaki, Chief Financial Officer for the department provided the board's financial update report for the period July 1, 2025, through February 28, 2026. **ATTACHMENT 1**

Zaki stated that the board started the 2026 calendar year with a balance of $9.8 Million. Gross collections for this reporting period totaled $5.7 Million.

Zaki stated that for this reporting period, the board netted $2.7 Million, with $549,691 in total expenses, which leaves the board with $10,118,195 to fund future research or promotion projects.

Zaki briefly addressed the board's estimated budget for the upcoming year, determined from USDA National Agricultural Statistics Service (NASS) reports.

Member Smith asked Zaki if the excess funds were kept in a non-interest-bearing account. Zaki said yes, explaining that the funds are considered special revenue and that they must be kept in a non-interest-bearing account

Another member asked if there was any way to move the money into an account that does earn interest. Zaki said they might be able to convert the funds into a cash fund, which would earn interest. He said he would investigate options.

Motion to approve the board's November 6, 2025, meeting minutes; moved by West Higginbothom, seconded by Patrick Matt Smith. Motion carried.

Motion to approve all board travel for 2026; moved by Patrick Matt Smith, seconded by Matthew Roberson. Motion carried.

Motion to approve the board's latest financial report prepared by the department; moved by Josh Cureton, seconded by Patrick Matt Smith.

Motion to clarify that the position of the Arkansas Soybean Promotion Board is to not support any collaboration with, or funding of, soybean breeding or research connected to foreign soybean-producing competitor entities in countries such as Brazil, Argentina, or China; moved by Brad Doyle. Discussion on the motion ensued. Seconded by Patrick Matt Smith. Motion carried.

UNITED SOYBEAN BOARD (USB) UPDATE
Robert Petter, USB Member, provided the board with an update on the United Soybean Board (USB). **ATTACHMENT 2**

Petter addressed and provided updates on USB's structure, budget, and various program initiatives, including work on exports, sustainability, and industrial uses of soybeans.

THE COMMUNICATIONS GROUP UPDATE
Jacquelynn LaBeff and Hannah Philips with the Communications Group provided an overview of their marketing efforts, including website traffic increases, social media growth, the high-open rate of bean brief emails, and their recent public relations achievements. **ATTACHMENT 3**

The Communications Group also highlighted an opportunity to create a soybean-themed mural in the state through a grant offered by the USB. The group asked the board for $25,000 up front to implement the project, to be refunded back to the board by USB once the project is complete.

Motion to formally approve the grant application submitted by The Communications Group on behalf of the AR Soybean Promotion Board to the United Soybean Board for a mural. Moved by Patrick Matt Smith, seconded by John Freeman. Motion carried.

Motion to approve funding $25,000 in upfront operating costs for the USB mural grant. Moved by Josh Cureton, seconded by Matthew Roberson. Motion carried.

PROMOTION PROJECT PRESENTATIONS
Members were provided a "Day 1" binder detailing all submitted projects with supporting paperwork for the day's meeting. **ATTACHMENT 4**

The American Soybean Association (ASA) requested a total funding amount of $42,450 for the following initial promotion projects:

- 2027 Arkansas Biomass-Based Diesel Initiative (BBDI) Funding Proposal for $5,000 (Year 1 of 1).
- 2027 ASA Action Partnership (ASAAP) Membership Proposal for $6,000 (Year 1 of 1).

ASA also provided presentations on the following recompeting promotion projects:

- 2027 ASA Awards Celebration Sponsorship Proposal for $6,000 (Year 3 of 1).
- 2027 Innovation to Market (I2M) Work Group Membership Proposal for $7,500 (Year 3 of 1).
- 2027 Soybean Leadership Academy Proposal for $3,000 (Year 3 of 1).
- 2027 Young Leaders Program Proposal for $9,200 (Year 3 of 1).
- 2027 SoyStats Funding Proposal for $750 (Year 3 of 1).
- 2027 ASA Economic Analysis and Support Proposal for $5,000 (Year 3 of 1).

ATTACHMENT 5

Member Smith asked for clarification on ASA's role in the Farmers Fueling America proposal from the Iowa Soybean Association. The presenter explained that ASA is connected to the initiative, but Matt Herman with the Iowa Soybean Association is managing those proposals.

The Clean Fuels Alliance America requested $20,000 for the initial promotion project "State Market and Environment Support (Year 1 of 1)."
They also requested an additional $20,000 for the recompeting promotion project "Market Expansion Drive (Year 3 of 1)." **ATTACHMENT 6**

Members asked several questions prompting discussion.

The World Initiative for Soy in Human Health (WISHH) program requested $50,000 for the recompeting promotion project "WISHH Markets: Building Demand for US Soy Trade Together (Year 3 of 1)." **ATTACHMENT 7**

U.S. Meat Export Federation (USMEF) requested funding for $8,600 for the initial promotion project "USMEF Membership: A U.S. Pork Promotion Partnership (Year 1 of 1)." **ATTACHMENT 8**

Chairman Doyle asked about the practice of exporting meat in frozen containers. The presenter explained that it varies by situation and destination country.

The Arkansas Soybean Association requested funding for $206,900 for the recompeting promotion project "Grow for the Green Contest (Year 16 of 1)." **ATTACHMENT 9**

Member Smith asked if the peak in yield has been reached. The presenter indicated that it has not.

Arkansas State University at Newport (ASUN) requested funding for $11,000 for the initial promotion project "Soy to Soil – Community Agriculture Day at ASUN (Year 1 of 1)." **ATTACHMENT 10**

Chairman Doyle asked if this was the county's first Ag Day and the presenters indicated that it would be.

The University of Arkansas Division of Agriculture (UADA) requested a total funding amount of $110,088 for the following promotional projects:

- Poinsett County Agriculture Day for $8,070 (Recompete; Year 2 of 1).
- The Arkansas Irrigation Yield Contest for $10,000 (Recompete; Year 9 of 1).
- Soybean Science Challenge for $87,018 (Active; Year 3 of 3).
- Arkansas Future Agriculture Leaders Tour for $5,000 (Active; Year 2 of 3).

ATTACHMENT 11

A member asked about the curriculum that the Future Ag Leaders Tour covers. The presenter indicated that the curriculum is available on the UADA website.

The Arkansas Future Farmers of America (FFA) Foundation requested a total funding amount of $115,000 for the following promotional projects:

- Investment in the future of Arkansas Agriculture – Agricultural Education, Career Success, and FFA for $100,000 (Initial; Year 1 of 1).
- Joint funding proposal for Promotion of Education on Corn, Sorghum, and Soybeans in Arkansas 4-H and FFA Youth at Commodity Classic 2027 for $15,000 (Recompete; Year 3 of 1).

ATTACHMENT 12

Chairman Doyle then called for a lunch break at 12:10pm.
Meeting resumed at 12:40pm.

Three County Fair & Rodeo requested funding for $13,840 for the initial promotion project "All Things Soybeans (Year 1 of 1)." **ATTACHMENT 13**

Cross County Farm Bureau Women's Leadership Committee requested funding for $10,000 for the initial promotion project "Cross County Youth Ag Day (Year 1 of 1)." **ATTACHMENT 14**

Ozark Botanical Garden of the Ozarks requested funding for $6,500 for the initial promotion project "Chefs in the Garden (Year 1 of 1)." **ATTACHMENT 15**

Member Cureton asked if the event was ticketed. The presenter answered in the affirmative, further mentioning that proceeds act as a fundraiser for the garden and supports the Northwest Arkansas Food Bank.

Four States Fair & Rodeo requested funding for $10,000 for the recompeting promotion project "Ag Learning Center (Year 2 of 1)." **ATTACHMENT 16**

Soy Aquaculture Alliance (SAA) requested funding for $25,000 for the initial promotion project "SAA Qualified State Soybean Board (QSSB) Membership (Year 1 of 1)." **ATTACHMENT 17**

PRIVATE RESEARCH PROJECT PRESENTATIONS

Iowa Soybean Association requested funding for $15,000 for the initial research project "Farmers Fueling the Future (Year 1 of 1)." **ATTACHMENT 18**

National Aeronautics and Space Administration (NASA) Acres & University of Maryland requested funding for $97,547 for the initial research project "Collaborative AgMet Graphics for Within-Season Crop Conditions & Progress Tracking (Year 1 of 1)." **ATTACHMENT 19**

Members asked several questions from the presenter, prompting discussion.

Chicot Insights LLC requested a total funding amount of $210,352.60 for the initial research projects:

- Utilization of Precision Agricultural Technology Along with Machine Learning to Optimize Fertility Applications while Improving Soybean Productivity and Profitability at the Field Scale for $38,320.60 (Year 1 of 3).
- Developing Overhead Irrigation Recommendations for Arkansas Soybean Production for $41,020 (Year 1 of 3).
- Automated Irrigation Technologies that Improve Soybean Productivity, Profitability, and Aquifer Stability for $60,992 (Year 1 of 3).
- Structural Irrigation Strategies that Improve Soybean Productivity, Profitability, and Aquifer Stability for $70,020 (Year 1 of 3).

ATTACHMENT 20

Mid-South Soybean Board requested a total funding amount of $155,916.75 for the following research projects:

- Beating the Rot: Improving Soybean Resistance to Phytophthora Root and Stem Root in the Mid-South for $3,750 (Initial; Year 1 of 3).
- Novel Genetic Resources to Improve Soybean Seed Quality for $8,454 (Initial; Year 1 of 3).
- Spray application of double stranded RNA for simultaneous management of multiple soybean fungal and insect diseases for $11,956 (Initial; Year 1 of 1).
- Evaluating early soybean for productivity and herbicide efficacy for $3,015.50 (Initial; Year 1 of 1).
- Unlocking novel genetic pathways involved in syncytia development for durable soybean cyst nematode resistance for $13,544 (Initial; Year 1 of 3).
- Modernizing phosphorus and potassium recommendations and improving return on investment for climate-smart corn – cover crop – soybean cropping system for $10,000 (Initial; Year 1 of 3).
- Porous soy proteins for the delivery of vitamins for $5,500 (Initial; Year 1 of 3).

- Characterizing soybean genotypes for phosphorus efficiency for $14,253 (Initial; Year 1 of 3).
- Screening elite soybean lines for drought tolerance and developing high-throughput drought screening methodologies for the Mid-South for $16,250 (Initial; Year 1 of 3).
- Initiative of a Soybean mutation breeding pipeline: creation of superior traits towards quick releasing improved soybean varieties for $3,750 (Initial; Year 1 of 3).
- Foliar boron application to minimize flowers abortion and improve yield in soybean under drought/rainfed conditions for $7,500 (Initial; Year 1 of 1).
- Genetic approaches for enhancing salt tolerance in soybean for $10,000 (Initial; Year 1 of 1).
- Expanding potential market demand for and access to whole soy foods through nutrition education for $7,500 (Active; Year 2 of 3).
- Leveraging photosynthetic efficiency traits for improving soybean productivity in the Mid-South for $7,500 (Active; Year 2 of 3).
- Enhanced synthetic microbiome communities to manage sudden death for $6,277.25 (Active; Year 2 of 2).
- Breeding maturity group 4 soybean with enhanced resistance to southern root-knot nematode by reducing galling and nematode reproduction for $26,667 (Active; Year 2 of 3).

ATTACHMENT 21

UADA "ACTIVE" RESEARCH PROJECTS DISCUSSION

Members were provided an "Active" UADA research binder detailing all active projects with supporting paperwork. **ATTACHMENT 22**

Due to time limitations the active UADA research projects were discussed without formal presentations. UADA investigators were available to answer member questions regarding the active UADA research projects.

Member Higginbothom asked for an update from Dr. Bluhm about his biologicals project. Dr. Bluhm answered that the first year focused on developing novel biologicals, including a promising myco-herbicide targeting hemp sesbania. He further mentioned that next season's work will include screening additional commercial products, conducting field evaluations, and continuing development of new biological solutions.

Chairman Doyle asked for an update from Dr. Justin Chlapecka on the growth regulator study. Chlapecka answered that the first-year trials at two sites showed no statistical yield differences across treatments, though some chemicals affected plant height branching. He added that since no negative yield impacts were observed, the plan for next season is to double application rates to evaluate whether greater benefits can be achieved.

Chairman Doyle asked for an update from Ben Thrash on any emerging entomology concerns. Thrash answered that there were no concerns for soybeans, though cotton, rice, and Bermuda grass do have emerging insects of concern that he will be monitoring.

Chairman Doyle asked Dr. Jeremy Ross for an update on his variable seeding rate study. Dr. Ross stated that they obtained good data from the study with the help of two farm participants. Discussion ensued regarding variable seeding rates and the potential to find a prescription recommendation.

Chairman Doyle asked Mike Daniels to identify the most significant issue contributing to runoff in row-crop systems. Daniels answered that findings show relatively low nitrogen and phosphorus losses, though potassium losses are substantially higher and may warrant adjustments to soil test recommendations. He went on to say that cover crops reduce nutrient concentrations in runoff, but high runoff volumes limit measurable mass-loss reductions, highlighting the need to improve rainfall infiltration to reduce runoff and enhance irrigation efficiency.

OTHER BUSINESS

Dr. Shane Gadberry (UADA) requested approval for a budget revision required under their MOU with the board, explaining that staffing changes and leave requests have created unused personnel funds.

He requested to reallocate those personnel salary funds to an external support category to complete coding and backend development for the flow-meter project, noting that technical questions could be addressed by Dr. Henry at the following day's meeting.

RECESS

Meeting recessed at 3:30pm.

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Brad Doyle, Chairman

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RECESS

Meeting recessed at 3:30pm.

Brad Doyle

Brad Doyle, Chairman

ARKANSAS SOYBEAN PROMOTION BOARD MEETING—DAY 2
Zoom Option

Minutes

March 13, 2026
8:00 a.m.

Members Present in Person:	Josh Cureton, Brad Doyle, West Higginbothom, Matthew Roberson, Patrick Matt Smith, Boyce Johnson, John Freeman
Members Present via Zoom:	BJ Royce Rogers II
Members Absent:	Donald Morton Jr.

CALL TO ORDER
Chairman Doyle commenced the promotion board meeting at 8:00 a.m. and welcomed all members and guests. A quorum was confirmed by the Arkansas Department of Agriculture (department).

Members were provided a "Day 2" binder detailing all submitted projects with supporting paperwork for the day's meeting. **ATTACHMENT 23**

USSEC PROMOTION PRESENTATION
The United States Soybean Export Council (USSEC) requested a total funding amount of $95,000 for the following promotion projects:

- 2026 Soy Connext Sponsorship for $5,000 (Initial; Year 1 of 1).
- Japan Soy Foods Support for $15,000 (Initial; Year 1 of 1).
- Support of Soy Excellence Centers for $15,000 (Initial; Year 1 of 1).
- Utilization of U.S. Soy in the Americas for $25,000 (Initial; Year 1 of 1).
- 2026 USEC Membership for $10,000 (Recompete; Year 3 of 1).
- US Soy Promotion in Europe for $25,000 (Recompete; Year 1 of 1).

ATTACHMENT 24

UADA RESEARCH PROJECT PRESENTATIONS
The University of Arkansas Division of Agriculture (UADA) provided presentation slides as part of their research projects. **ATTACHMENT 25**

UADA requested funding for $38,240 for the research project "Quantifying potential gaseous N losses and soil health implications from non-nodulating soybean (Initial; Year 1 of 1)."

UADA requested funding for $40,000 for the research project "Temporary flooding effects on soil respiration in tolerant and susceptible soybean varieties in the greenhouse (Initial; Year 1 of 1)."

UADA requested funding for $54,255 for the research project "Soybean potential yield map and yield gap analysis for Arkansas (Initial; Year 1 of 1)."

UADA requested funding for $44,829 for the research project "Insect frass for plant growth promotion and enhanced soybean yields (Initial; Year 1 of 3)."

Chairman Doyle inquired about the inclusion of poultry litter in the project, as well as the sourcing of frass and the associated cost per acre. The presenter indicated that poultry litter was included in other studies, with results indicating frass could behave the same or better than poultry litter, and that they are working with an economics professor to determine the best frass application rate. They further mentioned frass could be sourced in Arkansas from Tyson.

UADA requested funding for $74,712 for the research project "Role of the soil microbiome in conferring flooding tolerance in soybean (Initial; Year 1 of 2)."

UADA requested funding for $18,980 for the research project "Establishing a long-term rotational study (Initial; Year 1 of 3)."

UADA requested funding for $30,767 for the research project "Developing a Screening pipeline and candidate gene pool for nematode resistance in soybean (Initial; Year 1 of 3)."

UADA requested funding for $49,036 for the research project "Assessment of soybean arthropod community dynamics across Arkansas for Integrated Pest Management (IPM) (Initial; Year 1 of 3)."

Member Smith asked when UADA last updated the IPM plan. The presenter stated that it has been approximately eight or nine years.

UADA requested funding for $48,868 for the research project "Valorizing Soy by-products into mycoprotein via acid/alkaline/enzymatic treatment and biomass fermentation (Initial; Year 1 of 3)."

UADA requested funding for $64,083 for the research project "Field Variability, Harvest moisture and advanced storage monitoring to improve Arkansas soybean quality (Initial; Year 1 of 3)."

UADA requested funding for $73,796 for the research project "Integrated strategies for safe, efficient, and profitable rewetting of over-dried soybeans using advanced bin aeration systems (Initial; Year 1 of 3)."

Chairman Doyle then called for a short break.
Meeting resumed.

UADA requested funding for $36,250 for the research project "Effects on carcass characteristics, meat quality, and consumer acceptability of inclusion of raw whole soybeans in growing and finishing diets for farm finished beef (Initial; Year 1 of 2)."

UADA requested funding for $30,000 for the research project "Transforming Arkansas soybean hulls into high-value probiotic silage: improved digestibility and reduced post-weaning diarrhea in piglets (Initial; Year 1 of 1)."

UADA requested funding for $41,788 for the research project "Immunomodulatory effects of isoflavones from soybean meal in broilers challenged with coccidiosis (Initial; Year 1 of 1)."

UADA requested funding for $79,880 for the research project "Development of highly digestible protein cultivars with reduced antinutritional factors (Initial; Year 1 of 3)."

UADA requested funding for $28,520 for the research project "Increasing adoption of elevation data and irrigation scheduling on furrow-irrigated soybeans (Initial; Year 1 of 3)."

UADA requested funding for $239,487 for the research project "Water management advancements for irrigated soybeans (Initial; Year 1 of 3)."

UADA requested funding for $45,000 for the research project "Field testing and optimization of biocontrol products targeting Palmer amaranth (pigweed) (Recompete; Year 1 of 3)."

UADA requested funding for $50,108 for the research project "Improving grain yield stability in Arkansas soybean (Initial; Year 1 of 3)."

UADA requested funding for $199,526 for the research project "Development of High-Yielding soybean cultivars with broad resilience to stressors (Recompete; Year 1 of 3)."

Discussion ensued regarding genetics and varietal development.

UADA requested funding for $104,180 for the research project "Genomic prediction and biological insight to enhance the efficiency of soybean breeding (Recompete; Year 1 of 3)."

UADA requested funding for $104,180 for the research project "Soybean germplasm enhancement using genetic diversity (Recompete; Year 1 of 3)."

UADA requested funding for $35,000 for the research project "Evaluating the influence of high-fiber grain coproducts on slowing the growth of gilts during the development period: impacts on iron status, microbiome, and reproductive efficiency (Initial; Year 1 of 3)."

UADA requested funding for $60,000 for the research project "Use of gossypol to inhibit reproduction as a model for feral swine control (Recompete; Year 1 of 3)."

Chairman Doyle asked about the sourcing of soybean oil used to feed the feral hogs. The presenter explained that the oil is imported from overseas, noting she had attempted to source domestic product, but large-scale US production methods made it extremely difficult.

Chairman Doyle then called for a lunch break at 12:00pm.
Meeting resumed at 12:30pm.

UADA requested funding for $62,000 for the research project "Determining the value of fungicide application using on-farm trials (Recompete; Year 1 of 3)."

UADA requested funding for $40,154 for the research project "Understanding taproot decline, septoria brown spot, and orange leaf spot; soybean diseases of increasing importance in Arkansas (Recompete; Year 1 of 3)."

UADA requested funding for $232,136 for the research project "Investigating emerging production recommendations for sustainable soybean production (Recompete; Year 1 of 3)."

UADA requested funding for $75,527 for the research project "Improving technology transfer in profitable and sustainable soybean (Recompete; Year 1 of 3)."

UADA requested funding for $137,615 for the research project "Science for Success – Arkansas support for national soybean research and extension program (Recompete; Year 1 of 3)."

UADA requested funding for $210,672 for the research project "Soybean research verification program (Recompete; Year 1 of 3)."

UADA requested funding for $76,621 for the research project "Integrated Management of soybean nematodes in Arkansas (Recompete; Year 1 of 3)."

UADA requested funding for $263,375 for the research project "Soybean weed management: A team approach for improved control and profitability (Recompete; Year 1 of 3)."

UADA requested funding for $10,000 for the research project "Soybean enterprise budgets and production economic analysis (Recompete; Year 1 of 3)."

UADA requested funding for $42,491 for the research project "Arkansas Soybean Performance Trials (Recompete; Year 1 of 1)."

UADA requested funding for $39,339 for the research project "Soybean as a conversion crop within integrated crop-livestock systems (Initial; Year 1 of 3)."

A member asked where the research would be conducted. The presenter responded that it would take place at the Livestock and Forestry Research Station in Batesville and the Southwest Research and Extension Center in Hope.

UADA requested funding for $85,391 for the research project "Fertilization of soybean (Recompete; Year 1 of 3)."

UADA requested funding for $52,179 for the research project "Field-based determination of chloride tolerance in soybean (Recompete; Year 1 of 3)."

UADA requested funding for $65,325 for the research project "Influence of cover crops and soil health on soybean (Recompete; Year 1 of 3)."

UADA requested funding for $37,760 for the research project "Monitoring the extent of potassium deficiency and chloride toxicity in Arkansas soybean fields (Recompete; Year 1 of 1)."

Chairman Doyle called for a short break.
Meeting resumed.

PROMOTION PROJECT AWARDS
The board then reviewed and approved funding for submitted promotion project proposals. Inoussa Zaki, Chief Financial Officer for the Arkansas Department of Agriculture, monitored funding decisions in an excel sheet document, answering any questions from members. **ATTACHMENT 26**

Motion to approve funding for all American Soybean Association (ASA) project proposals for $42,450:

- **2027 Arkansas Biomass-Based Diesel Initiative (BBDI) Funding Proposal for $5,000;**
- **2027 ASA Action Partnership (ASAAP) Membership Proposal for $6,000;**
- **2027 ASA Awards Celebration Sponsorship Proposal for $6,000;**
- **2027 Innovation to Market (I2M) Work Group Membership Proposal for $7,500;**
- **2027 Soybean Leadership Academy Proposal for $3,000;**
- **2027 Young Leaders Program Proposal for $9,200;**

- **2027 SoyStats Funding Proposal for $750; and**
- **2027 ASA Economic Analysis and Support Proposal for $5,000.**

Moved by Patrick Matt Smith, seconded by John Freeman. Motion carried.

Motion to approve funding for the Clean Fuels Alliance America's "State Market and Environment Support" & "Market Expansion Drive" promotion projects for $40,000; Moved by John Freeman, seconded by Josh Cureton. Motion carried.

Motion to approve funding for the World Initiative for Soy in Human Health's (WISHH) "WISHH Markets: Building Demand for US Soy Trade Together" promotion project for $50,000; Moved by Josh Cureton, seconded by West Higginbothom. Motion carried.

Motion to approve funding for the United States Meat Export Federation's (USMEF) "USMEF Membership: A US Pork Promotion Partnership" promotion project for $8,600; Moved by John Freeman, seconded by Patrick Matt Smith. Motion carried.

Motion to approve funding for Arkansas Soybean Association's "Grow for the Green Contest" promotion project for $206,900. Moved by Josh Cureton, seconded by John Freeman. Members discussed and agreed that many farmers are benefiting from the contest in the state, suggesting UADA reach out to members for contest rules review by members. Motion carried.

Motion to approve funding for Arkansas State University at Newport's (ASUN) "Soy to Soil – Community Agriculture Day at ASUN" promotion project for $11,000; Moved by Josh Cureton, seconded by Matthew Roberson. Motion carried.

Motion to approve funding for UADA's "Poinsett County Agriculture Day" promotion project for $8,070. Moved by Matthew Roberson, seconded by Patrick Matt Smith. Motion carried.

Motion to approve funding for UADA's "The Arkansas Irrigation Yield Contest" promotion project for $10,000; Moved by John Freeman, seconded by West Higginbothom. Motion carried.

Motion to approve promotion project funding for UADA's "Soybean Science Challenge" for $87,018 as well as the "Arkansas Future Agriculture Leaders Tour" for $5,000. Moved by Patrick Matt Smith, seconded by Matthew Roberson. Motion carried.

Members discussed the promotion proposal from Arkansas Future Farmers of America (FFA) Foundation, noting that the United Soybean Board (USB) outlines certain rules for funding projects.

Motion to approve promotion project funding for the Arkansas FFA Foundation's "Arkansas Leadership Conference" for $25,000; Moved by West Higginbothom, seconded by John Freeman. Motion carried.

Motion to approve funding for the Arkansas FFA & 4-H's "Joint funding proposal for promotion of education on corn, sorghum, and soybeans for Arkansas 4-H and FFA Youth at Commodity Classic 2027" promotion project for $15,000; Moved by Patrick Matt Smith, seconded by Josh Cureton. Motion carried.

Motion to approve funding for the Three County Fair & Rodeo's "All Things Soybeans" promotion project for $13,840; Moved by BJ Royce Rogers, seconded by West Higginbothom. Motion carried.

Motion to approve funding for the Cross County Farm Bureau Women's Leadership Committee's "Cross County Youth Ag Day" promotion project for $10,000; Moved by Matthew Roberson, seconded by Patrick Matt Smith. Motion carried.

Motion to approve funding for the Botanical Garden of the Ozarks' "Chefs in the Garden" promotion project for $6,500, contingent upon their focus on soybean use as an animal-fed protein; Moved by West Higginbothom, seconded by John Freeman. Motion carried.

Motion to approve funding for Four States Fair & Rodeo's "Ag Learning Center" promotion project for $10,000; Moved by Patrick Matt Smith, seconded by Matthew Roberson. Motion carried.

Motion to approve funding for the Soy Aquaculture Alliance's (SAA) "SAA QSSB Membership" promotion project for $25,000; Moved by BJ Royce Rogers, seconded by John Freeman. Motion carried.

Motion to approve funding for all the United States Soybean Export Council's (USSEC) project proposals for a total of $95,000:

- **2026 Soy Connext Sponsorship for $5,000;**
- **Japan Soy Foods Support for $15,000;**
- **Support of Soy Excellence Centers for $15,000;**
- **Utilization of US Soy in the Americas for $25,000;**
- **2026 USSEC Membership for $10,000; and**
- **US Soy Promotion in Europe for $25,000.**

Moved by West Higginbothom, seconded by Patrick Matt Smith. Motion carried.

Motion to approve funding for an additional year of marketing and support services from the Communications Group for $335,275; Moved by West Higginbothom, seconded by Josh Cureton. Motion carried.

RESEARCH PROJECT AWARDS

Motion to approve funding for the Iowa Soybean Association's "Farmers Fueling the Future" research project for $15,000; Moved by Patrick Matt Smith, seconded by Royce Rogers. Motion carried.

Motion to approve funding for the National Aeronautics and Space Administration (NASA) Acres and University of Maryland's "Collaborative AgMet Graphics for Within-Season Crop Conditions & Progress Tracking" research project for $97,547; Moved by Josh Cureton, seconded by Royce Rogers. Motion carried.

Motion to approve funding for Chicot Insights LLC's "Developing Overhead Irrigation Recommendations for Arkansas Soybean Production" & "Structural Irrigation Strategies that Improve Soybean Productivity, Profitability, and Aquifer Stability" for a funding total of $111,040; Moved by Patrick Matt Smith, seconded by West Higginbothom. Motion carried.

Motion to approve funding for all Mid-South Soybean Board's research projects for a total of $155,916.75; Moved by West Higginbothom, seconded by Patrick Matt Smith. Motion carried.

Motion to fund all "active**" UADA research projects for a total of $848,218; Moved by West Higginbothom, seconded by Josh Cureton. Motion carried.**

The board reviewed all UADA initial and recompeting research project proposals and voted to fund, table, or take no action on each.

Motion to approve funding for UADA's "Soybean potential yield map and yield gap analysis for Arkansas" research project proposal for $54,255; moved by Patrick Matt Smith, seconded by Josh Cureton. Motion carried.

Motion to approve funding for UADA's "Establishing a long-term rotational study" research project proposal for $18,980; Moved by West Higginbothom, seconded by Josh Cureton. Motion carried.

Motion to approve funding for UADA's "Developing a screening pipeline and candidate gene pool for nematode resistance in soybean" research project proposal for $30,767; Moved by John Freeman, seconded by Patrick Matt Smith. Motion carried.

Motion to approve funding for UADA's "Effects on carcass characteristics, meat quality, and consumer acceptability of inclusion of raw whole soybeans in growing and finishing diets for farm finished beef" research project proposal for $36,250; Moved by Matthew Roberson, seconded by John Freeman. Motion carried.

Motion to approve funding for UADA's "Immunomodulatory effects of isoflavones from soybean meal in broilers challenged with coccidiosis" research project proposal for $41,788; Moved by Josh Cureton, seconded by Matthew Roberson. Motion carried.

Motion to approve funding for UADA's "Increasing adoption of elevation data and irrigation scheduling on furrow-irrigated soybeans" research project proposal for $28,520; Moved by West Higginbothom, seconded by Josh Cureton. Motion carried.

Motion to approve funding for UADA's "Water management advancements for irrigated soybeans" research project proposal for $239,487; Moved by John Freeman, seconded by West Higginbothom. Motion carried.

Motion to approve funding for UADA's "Field testing and optimization of biocontrol products targeting Palmer Amaranth (pigweed)" research project proposal for $45,000; Moved by Patrick Matt Smith, seconded by West Higginbothom. Motion carried.

Motion to approve funding for the following UADA's recompeting research project proposals for a total of $493,532:

- **Development of High-yielding soybean cultivars with broad resilience to stressors for $199,526;**
- **Genomic prediction and biological insight to enhance the efficiency of soybean breeding for $104,180; and**
- **Soybean germplasm enhancement using genetic diversity for $189,826.**

Moved by West Higginbothom, seconded by Patrick Matt Smith. Motion carried.

Motion to approve funding for UADA's "Determining the value of fungicide application using on-farm trials" research project proposal for $62,000; Moved by John Freeman, seconded by Patrick Matt Smith. Motion carried.

Motion to approve funding for UADA's "Understanding tap root decline, septoria brown spot, and orange leaf spot; soybean diseases of increasing importance in Arkansas" research project proposal for $40,154; Moved by Josh Cureton, seconded by John Freeman. Motion carried.

Motion to approve funding for the following UADA's recompeting research project proposals for a total of $1,289,092:

- **Investigating emerging production recommendations for sustainable soybean production for $232,136;**
- **Improving technology transfer in profitable and sustainable soybean for $75,527;**
- **Science for Success – Arkansas Support for national soybean research and extension program for $137,615;**
- **Soybean research verification program for $210,672;**
- **Integrated management of soybean nematodes in Arkansas for $76,621;**

- **Soybean weed management: a team approach for improved control and profitability for $263,375;**
- **Soybean enterprise budgets and production economic analysis for $10,000;**
- **Arkansas soybean performance trials for $42,491;**
- **Fertilization of soybean for $85,391;**
- **Field-based determination of chloride tolerance in soybean for $52,179;**
- **Influence of cover crops and soil health in soybean for $65,325; and**
- **Monitoring the extent of potassium deficiency and chloride toxicity in Arkansas soybean fields for $37,760.**

Moved by West Higginbothom, seconded by Josh Cureton. Motion carried.

Discussion ensued regarding variety names on seed labels.

Motion to approve funding for UADA's "Use of gossypol to inhibit reproduction as a model for feral swine control" research project proposal for $60,000; Moved by Patrick Matt Smith, seconded by West Higginbothom. Motion carried.

Motion to approve funding for UADA's "Improving grain yield stability in Arkansas soybean" research project proposal for $50,108; Moved by West Higginbothom, seconded by Matthew Roberson. Motion carried.

OTHER BUSINESS

Discussion ensued regarding the Communications Group's mural grant proposal. Carson Horn with the group indicated that they intend to reapply for these grants annually.

Motion to grant the Communications Group flexibility in selecting a location for the mural, such as Stuttgart; Moved by Matthew Roberson, seconded by West Higginbothom. Member Freeman expressed his desire to see an American flag somehow incorporated within the mural, prompting some discussion. Motion carried.

Discussion ensued regarding the need for a representative to the USSEC's soy excellence center.

Motion to appoint Brad Doyle as a board representative to USSEC's soy excellence center; Moved by Patrick Matt Smith, seconded by West Higginbothom. Motion carried.

Motion to approve all board travel for 2026 calendar year; Moved by West Higginbothom, seconded by John Freeman. Motion carried.

Amy Lyman, Promotion Board Administrator for the Arkansas Department of Agriculture, mentioned that travel reimbursement forms are ready for board members to sign.

Chairman Doyle mentioned changing up the summer meeting location, prompting some discussion. It was decided that Amy Lyman will investigate potential options.

Chairman Doyle brought up the board's ability to set parameters on certain project proposals in the future, such as on salaries or equipment.

Member Freeman noted the upcoming 250th anniversary of America's founding and the 100th year of soybeans in Arkansas, and suggested adding red, white, and blue elements to the board's logo as a commemorative treatment. Discussion ensued.

The potential for Arkansas Soybean Promotion Board official license plates in the state was contemplated.

Zaki mentioned the board's grand total spending of $4,387,032.75 on promotion and research projects.

ADJOURNMENT
Meeting adjourned around 4:00pm.

_____
Brad Doyle, Chairman

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ADJOURNMENT
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Brad Doyle, Chairman

ATTACHMENT 1

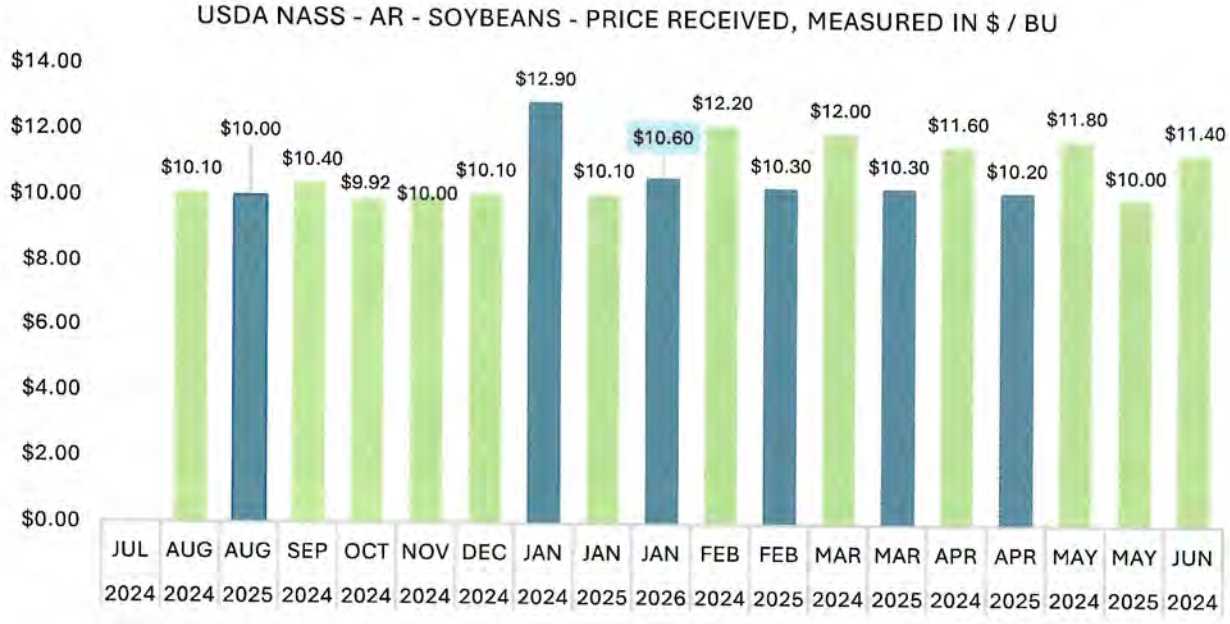
Arkansas Soybean Promotion Board
Financial Statement
For The Period July 1, 2025 - February 28, 2026

	June 2023	June 2024	June 2025	February 2026	Budget 2026
Beginning Balance	$ 6,231,490	$ 9,347,445	$ 11,110,780	$ 9,765,759	$ 10,118,195
Revenue					
Total Collections	$ 10,663,495	$ 10,364,704	$ 8,464,488	$ 5,694,323	$ 7,491,550
Less					
USB Transfer	$ 4,948,222	$ 4,688,217	$ 4,085,363	$ 2,727,248	$ 3,488,066
Other QSSB Transfers	$ 438,553	$ 417,200	$ 125,563	$ 60,440	$ 299,662
State Collection Fee	$ 317,198	$ 308,582	$ 250,087	$ 169,158	$ 215,757
Net Transfer to the Board	$ 4,959,521	$ 4,950,705	$ 4,003,476	$ 2,737,477	$ 3,488,066
Other Income	$ 4,276	$ 47,846	$ 12,315	$ -	$ 7,500
Total Revenue	$ 4,963,797	$ 4,998,551	$ 4,015,790	$ 2,737,477	$ 3,495,566
Expenses					
Promotion	$ 590,162	$ 519,592	$ 950,967	$ 429,395	$ 498,257
Research	$ 1,239,261	$ 2,702,160	$ 4,291,651	$ 119,089	$ 3,351,276
Board Expenses	$ 18,510	$ 13,465	$ 11,607	$ 1,207	$ 13,465
Total Expenses	$ 1,847,932	$ 3,235,217	$ 5,254,224	$ 549,691	$ 3,862,998
Ending Balance	$ 9,347,354	$ 11,110,780	$ 9,872,346	$ 11,953,545	$ 9,750,763
Remaining Allocation					
Other Liabilities	$ 46,691	$ 157,735	$ 106,587		$ -
Research	$ 1,485,989	$ 1,664,286	$ 1,738,182	$ 1,619,094	$ 1,619,094
Promotion	$ -	$ 83,843	$ 438,229	$ 216,257	$ 216,257
Total Remaining Allocation	$ 1,532,680	$ 1,905,864	$ 2,282,997	$ 1,835,350	$ 1,835,350
Funds Available	$ 7,814,674	$ 9,204,915	$ 7,589,348	$ 10,118,195	$ 7,915,412

Arkansas Soybean Promotion Board
Annual Collections

	June 2024	June 2025	February 2026	Budget 2026	Estimated Budget 2026		
USDA Soybean Estimates							
NASS SOYBEANS - ACRES PLANTED	2,980,000	3,050,000	2,590,000	2,590,000	2,590,000	2,590,000	2,590,000
NASS SOYBEANS - ACRES HARVESTED	2,950,000	3,020,000	2,570,000	2,570,000	2,570,000	2,570,000	2,570,000
NASS SOYBEANS - YIELD, MEASURED IN BU / ACRE	53	55	55	55	55	55	55
NASS SOYBEANS - PROD, MEASURED IN BU	156,350,000	166,100,000	141,350,000	141,350,000	141,350,000	141,350,000	141,350,000
NASS SOYBEANS - PRICE RCVD, MEASURED IN $ / BU	$ 13.10	$ 10.20	$ 10.60	$ 10.60	$ 10.60	$ 10.60	$ 10.60
NASS SOYBEANS - PRODUCTION, MEASURED IN $	$ 2,048,185,000	$ 1,694,220,000	$ 1,498,310,000	$ 1,498,310,000	$ 1,498,310,000	$ 1,498,310,000	$ 1,498,310,000
Implied Checkoff Based on NASS	$ 10,240,925	$ 8,471,100	$ 7,491,550	$ 7,491,550	$ 7,491,550	$ 7,491,550	$ 7,491,550
Total Soybean Checkoff Collections For Arkansas				100%	100%	95%	90%
Assessed Bushels	153,516,906	164,530,126	119,872,743	141,350,000	141,350,000	134,282,500	127,215,000
Assessed Bushels Value	2,026,794,850	1,695,606,280	1,140,519,992	$ 1,498,310,000	$ 1,498,310,000	$ 1,352,224,775	$ 1,213,631,100
In State Collections	$ 9,942,016	$ 8,180,403	$ 5,593,218	$ 7,191,591	$ 7,191,591	$ 6,490,411	$ 5,825,189
Out of State Collections	$ 422,688	$ 284,085	$ 101,105	$ 299,959	$ 299,959	$ 270,713	$ 242,967
Total Checkoff Collections	$ 10,364,704	$ 8,464,488	$ 5,694,323	$ 7,491,550	$ 7,491,550	$ 6,761,124	$ 6,068,156
Implied Price	$ 13.20	$ 10.31	$ 9.51	$ 10.60	$ 10.60	$ 10.07	$ 9.54
Net Collections for Arkansas Soybeans							
Total Checkoff Collections	$ 10,364,704	$ 8,464,488	$ 5,694,323	$ 7,491,550	$ 7,491,550	$ 6,761,124	$ 6,068,156
QSSB Transfer							
Alabama	$ -		$ 5,709	$ 18,415	$ 18,415	$ 16,619	$ 14,916
Colorado	$ -		$ 76	$ 87	$ 87	$ 78	$ 70
Florida	$ -			$ 127	$ 127	$ 115	$ 103
Georgia	$ -			$ 68	$ 68	$ 61	$ 55
Illinios	$ 1,092		$ 1,697	$ 1,799	$ 1,799	$ 1,623	$ 1,457
Indiana	$ -			$ 124	$ 124	$ 112	$ 100
Iowa	$ -			$ 1,291	$ 1,291	$ 1,165	$ 1,045
Kansas	$ -		$ 66	$ 204	$ 204	$ 184	$ 166
Kentucky	$ -			$ 3,246	$ 3,246	$ 2,929	$ 2,629
Louisiana	$ 11,675	$ 13,661	$ 2,693	$ 7,113	$ 7,113	$ 6,419	$ 5,761
Michigan	$ -			$ 1,716	$ 1,716	$ 1,548	$ 1,390
Minnesota	$ -		-	$ 67	$ 67	$ 61	$ 55
Mississippi	$ 170,846	$ 44,790	$ 11,147	$ 85,890	$ 85,890	$ 77,516	$ 69,571
Missouri	$ 218,283	$ 28,925	$ 19,064	$ 121,455	$ 121,455	$ 109,613	$ 98,379
Nebraska	$ -			$ 113	$ 113	$ 102	$ 92
North Dakota			$ 1,377				
North Carolina			$ 954				
Ohio	$ -			$ 2,933	$ 2,933	$ 2,647	$ 2,376
Oklahoma	$ 2,833	$ 14,995	$ 84	$ 19,679	$ 19,679	$ 17,760	$ 15,940
South Dakota			$ 869				
Tennessee	$ 5,627	$ 9,251	$ 10,058	$ 19,252	$ 19,252	$ 17,375	$ 15,594
Texas	$ 6,844	$ 13,940	$ 6,645	$ 15,839	$ 15,839	$ 14,295	$ 12,830
Wisconsin	$ -			$ 245	$ 245	$ 221	$ 198
TOTAL QSSB Transfer	$ 417,200	$ 125,563	$ 60,440	$ 299,662	$ 299,662	$ 270,445	$ 242,726
United Soybean Board Payment	$ 4,688,217	$ 4,085,363	$ 2,727,248	$ 3,488,066	$ 3,488,066	$ 3,147,979	$ 2,825,333
Arkansas Misc Tax Collection Fee	$ 308,582	$ 250,087	$ 169,158	$ 215,757	$ 215,757	$ 194,720	$ 174,763
Net Transfer to the Board	**$ 4,950,705**	**$ 4,003,476**	**$ 2,737,477**	**$ 3,488,066**	**$ 3,488,066**	**$ 3,147,979**	**$ 2,825,333**
Difference from Budget							
Net Arkansas Assessed Soybean Bushels							
Gross Transfers to the Board *less QSSB Transfers*	$ 9,947,503	$ 8,338,925	$ 5,633,883	$ 7,191,888	$ 7,191,888	$ 6,490,679	$ 5,825,429
Bushels Assessed	153,516,906	164,530,126	119,872,743	141,350,000	141,350,000	134,282,500	127,215,000
Implied Price	$13.20	$10.31	$9.51	$10.60	$ 10.60	$ 10.07	$ 9.54
NASS Soybean Production Estimate	156,350,000	166,100,000	141,350,000	141,350,000	141,350,000	141,350,000	141,350,000
Bushel Difference	2,833,094	1,569,874	21,477,257	-	-	7,067,500	14,135,000
Percent of Bushels Assessed	98.2%	99.1%	84.8%	100%	100%	95%	90%
Uncollected Checkoff	$ 187,019	$ 80,894	$ 1,021,719	$ -	$ -	$ 355,849	$ 674,240
Percent Checkoff Collected	97%	98%	75%	96%	96%	87%	78%
Remainder Due to State	$ 93,509.25	$ 40,446.82	$ 510,859.29	$ -	$ -	$ 177,924	$ 337,120

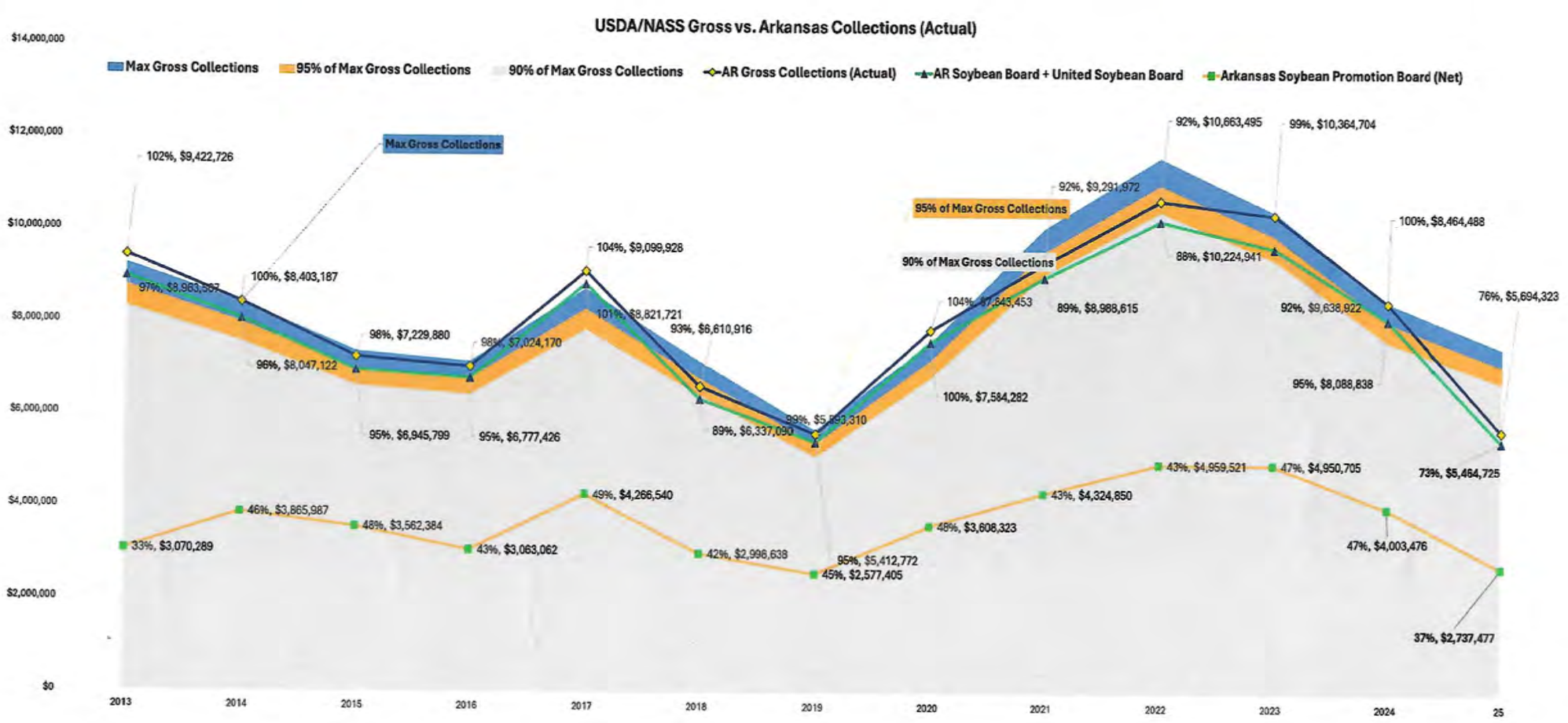
Year	Period	Data Item	Value
2024	JUL	SOYBEANS - PRICE RECEIVED, MEASURED IN $ / BU	
2024	AUG	SOYBEANS - PRICE RECEIVED, MEASURED IN $ / BU	$10.10
2025	AUG	SOYBEANS - PRICE RECEIVED, MEASURED IN $ / BU	$10.00
2024	SEP	SOYBEANS - PRICE RECEIVED, MEASURED IN $ / BU	$10.40
2024	OCT	SOYBEANS - PRICE RECEIVED, MEASURED IN $ / BU	$9.92
2024	NOV	SOYBEANS - PRICE RECEIVED, MEASURED IN $ / BU	$10.00
2024	DEC	SOYBEANS - PRICE RECEIVED, MEASURED IN $ / BU	$10.10
2024	JAN	SOYBEANS - PRICE RECEIVED, MEASURED IN $ / BU	$12.90
2025	JAN	SOYBEANS - PRICE RECEIVED, MEASURED IN $ / BU	$10.10
2026	JAN	SOYBEANS - PRICE RECEIVED, MEASURED IN $ / BU	$10.60
2024	FEB	SOYBEANS - PRICE RECEIVED, MEASURED IN $ / BU	$12.20
2025	FEB	SOYBEANS - PRICE RECEIVED, MEASURED IN $ / BU	$10.30
2024	MAR	SOYBEANS - PRICE RECEIVED, MEASURED IN $ / BU	$12.00
2025	MAR	SOYBEANS - PRICE RECEIVED, MEASURED IN $ / BU	$10.30
2024	APR	SOYBEANS - PRICE RECEIVED, MEASURED IN $ / BU	$11.60
2025	APR	SOYBEANS - PRICE RECEIVED, MEASURED IN $ / BU	$10.20
2024	MAY	SOYBEANS - PRICE RECEIVED, MEASURED IN $ / BU	$11.80
2025	MAY	SOYBEANS - PRICE RECEIVED, MEASURED IN $ / BU	$10.00
2024	JUN	SOYBEANS - PRICE RECEIVED, MEASURED IN $ / BU	$11.40



2025 Production #s from USDA NASS 2025 Forecast Data

Arkansas soybean acreage, yield, production, price, and check-off rate with estimated maximum gross collections for years 2013 to 2025

Production Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	25
Fiscal Year, July 1 - June 30	FY-2014	FY-2015	FY-2016	FY-2017	FY-2018	FY-2019	FY-2020	FY-2021	FY-2022	FY-2023	FY-2024 Estimate	FY-2025 Estimate	FY-2026 Estimate
Planted Acres	3,270,000	3,230,000	3,200,000	3,130,000	3,530,000	3,270,000	2,650,000	2,820,000	3,040,000	3,180,000	2,980,000	3,050,000	2,590,000
Harvested Acres	3,240,000	3,200,000	3,170,000	3,090,000	3,500,000	3,210,000	2,610,000	2,800,000	3,000,000	3,140,000	2,950,000	3,020,000	2,570,000
Yield, measured in bushels / acre	43.5	49.5	49	47	51	50.5	49	51.5	52	52	54	55	55
Production, measured in bushels	140,940,000	158,400,000	155,330,000	145,230,000	178,500,000	162,105,000	127,890,000	144,200,000	156,000,000	163,280,000	159,300,000	166,100,000	141,350,000
Price received, measured in $ / bushels	$13.10	$10.60	$9.46	$9.83	$9.77	$8.81	$8.87	$10.50	$12.90	$14.20	$13.10	$10.20	$10.60
	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Total Estimated Value of Production	$1,846,314,000	$1,679,040,000	$1,469,421,800	$1,427,610,900	$1,743,945,000	$1,428,145,050	$1,134,384,300	$1,514,100,000	$2,012,400,000	$2,318,576,000	$2,086,830,000	$1,694,220,000	$1,498,310,000
Rate	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
Max Gross Collections	**$9,231,570**	**$8,395,200**	**$7,347,109**	**$7,138,055**	**$8,719,725**	**$7,140,725**	**$5,671,922**	**$7,570,500**	**$10,062,000**	**$11,592,880**	**$10,434,150**	**$8,471,100**	**$7,491,550**
95% of Max Gross Collections	$8,769,992	$7,975,440	$6,979,754	$6,781,152	$8,283,739	$6,783,689	$5,388,325	$7,191,975	$9,558,900	$11,013,236	$9,912,443	$8,047,545	$7,116,973
90% of Max Gross Collections	$8,308,413	$7,555,680	$6,612,398	$6,424,249	$7,847,753	$6,426,653	$5,104,729	$6,813,450	$9,055,800	$10,433,592	$9,390,735	$7,623,990	$6,742,395
AR Gross Collections (Actual)	$9,422,726	$8,403,187	$7,229,880	$7,024,170	$9,099,928	$6,610,916	$5,593,310	$7,843,453	$9,291,972	$10,663,495	$10,364,704	$8,464,488	$5,694,323
AR Soybean Board + United Soybean Boar	$8,963,567	$8,047,122	$6,945,799	$6,777,426	$8,821,721	$6,337,090	$5,412,772	$7,584,282	$8,988,615	$10,224,941	$9,638,922	$8,088,838	$5,464,725
Other Qualified State Soybean Boards	$459,159	$356,064	$284,081	$246,744	$278,207	$273,826	$180,538	$268,286	$303,357	$438,553	$417,200	$125,563	$60,440
United Soybean Board (Net)	$5,597,066	$3,923,480	$3,161,306	$3,497,455	$4,281,474	$3,141,139	$2,667,418	$3,731,732	$4,385,343	$4,948,222	$4,688,217	$4,085,363	$2,727,248
Arkansas Soybean Promotion Board (Net)	$3,070,289	$3,865,987	$3,562,384	$3,063,062	$4,266,540	$2,998,638	$2,577,405	$3,608,323	$4,324,850	$4,959,521	$4,950,705	$4,003,476	$2,737,477
AR Actual Gross Collections % of MGC	102%	100%	98%	98%	104%	93%	99%	104%	92%	92%	99%	100%	76%
AR Soybean & USB % of MGC	*97%*	*96%*	*95%*	*95%*	*101%*	*89%*	*95%*	*100%*	*89%*	*88%*	*92%*	*95%*	*73%*
QSSB % of MGC	*5%*	*4%*	*4%*	*3%*	*3%*	*4%*	*3%*	*4%*	*3%*	*4%*	*4%*	*1%*	*1%*
USB % of MGC	*61%*	*47%*	*43%*	*49%*	*49%*	*44%*	*47%*	*49%*	*44%*	*43%*	*45%*	*48%*	*36%*
AR Soybean % of MGC	*33%*	*46%*	*48%*	*43%*	*49%*	*42%*	*45%*	*48%*	*43%*	*43%*	*47%*	*47%*	*37%*


USDA/NASS Gross vs. Arkansas Collections (Actual)
Max Gross Collections
95% of Max Gross Collections
90% of Max Gross Collections
AR Gross Collections (Actual)
AR Soybean Board + United Soybean Board
Arkansas Soybean Promotion Board (Net)
$14,000,000
$12,000,000
$10,000,000
$8,000,000
$6,000,000
$4,000,000
$2,000,000
$0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
25
102%, $9,422,726
97%, $8,963,367
100%, $8,403,187
96%, $8,047,122
98%, $7,229,880
95%, $6,945,799
98%, $7,024,170
95%, $6,777,426
104%, $9,099,928
101%, $8,821,721
93%, $6,610,916
89%, $6,337,090
99%, $5,893,310
95%, $5,412,772
104%, $7,843,453
100%, $7,584,282
92%, $9,291,972
89%, $8,988,615
92%, $10,663,495
88%, $10,224,941
99%, $10,364,704
92%, $9,638,922
100%, $8,464,488
95%, $8,088,838
76%, $5,694,323
73%, $5,464,725
33%, $3,070,289
46%, $3,865,987
48%, $3,562,384
43%, $3,063,062
49%, $4,266,540
42%, $2,996,638
45%, $2,577,405
48%, $3,608,323
43%, $4,324,850
43%, $4,959,521
47%, $4,950,705
47%, $4,003,476
37%, $2,737,477

2025 STATE AGRICULTURE OVERVIEW
Arkansas

† *Survey Data from Quick Stats as of: Mar/11/2026*

Farms Operations †

Farm Operations - Area Operated, Measured in Acres / Operation	368
Farm Operations - Number of Operations	37,000
Farm Operations - Acres Operated	13,600,000

Livestock Inventory †

Cattle, Cows, Beef - Inventory (First of Jan. 2026)	848,000
Cattle, Cows, Milk - Inventory (First of Jan. 2026)	2,000
Cattle, Incl Calves - Inventory (First of Jan. 2026)	1,560,000
Goats, Meat & Other - Inventory (First of Jan. 2026)	30,000
Goats, Milk - Inventory (First of Jan. 2026)	4,100
Turkeys - Production, Measured in Head	22,000,000

Milk Production †



Crops - Planted, Harvested, Yield, Production, Price (MYA), Value of Production †
Sorted by Value of Production in Dollars

Commodity	Planted All Purpose Acres	Harvested Acres	Yield	Production	Price per Unit	Value of Production in Dollars
SOYBEANS						
SOYBEANS	2,590,000	2,570,000	55 BU / ACRE	141,350,000 BU	10.6 $ / BU	1,498,310,000
RICE						
RICE	1,284,000	1,250,000	7,480 LB / ACRE	93,449,000 CWT	9.35 $ / CWT	873,748,000
CORN						
CORN, GRAIN		790,000	182 BU / ACRE	143,780,000 BU	4.2 $ / BU	603,876,000
CORN, SILAGE		3,000	13 TONS / ACRE	39,000 TONS		
CORN	810,000					
COTTON						
COTTON, UPLAND	520,000	515,000	1,398 LB / ACRE	1,500,000 480 LB BALES	0.592 $ / LB	426,240,000
COTTON, COTTONSEED				452,000 TONS	246 $ / TON	111,192,000
COTTON	520,000	515,000	1,398 LB / ACRE	1,500,000 480 LB BALES		
HAY						
HAY, (EXCL ALFALFA)		1,270,000	2.3 TONS / ACRE	2,921,000 TONS	125 $ / TON	365,125,000
HAY		1,270,000	2.3 TONS / ACRE	2,921,000 TONS	125 $ / TON	365,125,000
HAY & HAYLAGE						
HAY & HAYLAGE						365,125,000
HAY & HAYLAGE, (EXCL ALFALFA)						365,125,000
PEANUTS						
PEANUTS	48,000	47,000	5,000 LB / ACRE	235,000,000 LB	0.215 $ / LB	50,525,000
WHEAT						
WHEAT	110,000	70,000	57 BU / ACRE	3,990,000 BU	5.2 $ / BU	20,748,000
WHEAT, WINTER	110,000	70,000	57 BU / ACRE	3,990,000 BU	5.2 $ / BU	20,748,000
SWEET POTATOES						
SWEET POTATOES, UTILIZED				(D) CWT		
SWEET POTATOES, PROCESSING					(D) $ / TON	(D)
SWEET POTATOES	(D)	(D)	(D) CWT / ACRE	(D) CWT	(D) $ / CWT	(D)
SWEET POTATOES, FRESH MARKET					(D) $ / CWT	(D)

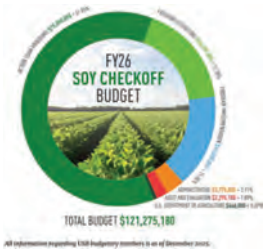
(NA) Not Available
(D) Withheld to avoid disclosing data for individual operations
(S) Insufficient number of reports to establish an estimate
(X) Not Applicable
(Z) Less than half the rounding unit

ATTACHMENT 2

United Soybean Board Overview

ROBERT PETTER





USB Work Groups

	VALUE Action Team	VOLUME Action Team
Innovation & Technology Priority Area	Industrial	Fuel
Health & Nutrition Priority Area	Food	Feed
Infrastructure & Connectivity Priority Area	Sustainable Production	Export

Communications & Education Committee

Mission Partners

USSEC U.S. SOYBEAN EXPORT COUNCIL

ASA American Soybean Association

WISHH WORLD INITIATIVE FOR SOY IN HUMAN HEALTH

Checkoff Initiatives

- Soy Aquaculture Alliance
- Soy Connection
- Soy New Uses
- Soy Transportation Coalition
- Soybean Meal Info Center
- Soybean Research Information Network (SRIN)
- Soy Value
- Take Action

Checkoff Partners

- Animal Ag Alliance
- Center for Food Integrity (CFI)
- Center for Integrated Pest Management (CIPM)
- Clean Fuels Alliance America
- Council for Agricultural Science and Technology (CAST)
- Crop Protection Network (CPN)
- Soybean Cyst Nematode (SCN) Coalition
- SNI Global
- U.S.A. Poultry and Egg Export Council (USAPEC)
- U.S. Farmers and Ranchers in Action (USFRA)
- U.S. Meat Export Federation (USMEF)

State of the Soy Industry

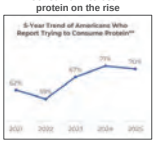
Seed oils, ultra-processed foods & pesticides at stake



Competition with Brazil and overproduction



Consumer interest in protein on the rise



Tough farm economy



Tech advancements and digital transformation



New revenue streams for farmers



Industrial

- Investing in new industrial uses for soybeans — over 1,000 soy-based products on the market
- **Key partnerships:** Goodyear tires, Skechers shoes, BioSpan Technologies, SoyLei
- Innovations include soy-based firefighting foam, concrete protectant, motor oil, and asphalt
- Bio-based products differentiate companies through sustainability credentials



Take Home Messages

- For 35 years the Soy Checkoff has remained laser focused on creating volume and value for U.S. soybean farmers
- Looking 5-10 years out to ensure U.S. farmers they will continue to have viable markets and continued innovation
- Key investment areas moving forward: **Food; Feed; Fuel; Industrial Uses; Exports; Sustainable Production**

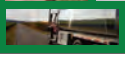
35TH USB

THANK YOU











ATTACHMENT 3

ARKANSAS SOYBEAN PROMOTION BOARD

Communications Report

Mid-Year | March 2026

Presented by The Communications Group

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Campaign Overview

July - December 2025 v. July -December 2024

Website

- 28,130 sessions v. 18,881 sessions (2024)
- Traffic peaked in November - 8,357 users
- Paid social was the top driver

Advertising

- 896,869 Impressions v. 773,401 (2024)
- November was a top performer:
  - Clicks up 33%, YouTube views up 45%
- Field to Film series drove consistent engagement

Public Relations

- 81 stories v. 102 stories (2024)
- Top performing story: Arkansas Soybean Month
- 26.7M impressions by Dec. 2025

Social Media

- 140 posts v. 195 posts (2024)
- 136,008 Impressions v. 221,073 (2024)
- Steady follower growth

Bean Brief

- 6,572 sends v. 7,589 sends (2024)
- Open rate -40% | 1.9% CTR

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2026 at a Glance

Events:

- Tri-State Soybean Forum - Jan 9
- ASA 60th Annual Meeting - Feb 9
- ASU Agribusiness Conference - Feb 11
- Farm & Gin Show - Feb 26-28
- **Arkansas Women in Agriculture Annual Conference - March 17-18**
- **Plantation Museum Sakura Festival - March 21**
- **Ag Hall of Fame Ceremony - March 27**

Museum Exhibit:

- Museum of the Arkansas Grand Prairie - current until May
- Arkansas State Capital Museum - Following Labor Day thru Mid-November
- Ag Learning Center - Early 2027

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Soy-tennial Mural

- Milestones:
  - March Meeting - Present project to the board
  - July Meeting - Present creative concept, location, etc.
  - September - Artist begins painting
  - November - Mural is complete; ceremony is held



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501-515-0849

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ATTACHMENT 4

ARKANSAS SOYBEAN PROMOTION BOARD

FISCAL YEAR 2027
(JULY 2026 – JUNE 2027)

DAY 1 PROPOSALS

COMPILED BY:

ARKANSAS DEPARTMENT OF AGRICULTURE

Arkansas Soybean Promotion Board

Table of Contents - Member Notes

REF #	ENTITY	PROJECT TITLE & STATUS	REPRESENTATIVE NAME	PREV. FUNDING AMOUNT ($)	REQUESTED AMOUNT ($)	NOTES
PROMOTION PROPOSALS - DAY 1						
1 - PI-01	American Soybean Association	2027 Arkansas Biomass-Based Diesel Initiative (BBDI) Funding Proposal - ***INITIAL (PRIOR HISTORY); YEAR 1 OF 1***	Kate Maher	$ -	$5,000.00	
1 - PI-02	American Soybean Association	2027 ASA Action Partnership (ASAAP) Membership Proposal **- *INITIAL (LAPSED RETURN); YEAR 1 OF 1***	Kate Maher	$ -	$6,000.00	
1 - PR-01	American Soybean Association	2027 ASA Awards Celebration Sponsorship Proposal - ***RECOMPETE; YEAR 3 OF 1***	Kate Maher	$ 6,000.00	$6,000.00	
1 - PR-02	American Soybean Association	2027 Innovation to Market (I2M) Work Group Membership Proposal **- *RECOMPETE; YEAR 3 OF 1***	Kate Maher	$ 7,500.00	$7,500.00	
1 - PR-03	American Soybean Association	2027 Soybean Leadership Academy Proposal - ***RECOMPETE; YEAR 3 OF 1***	Kate Maher	$ 3,000.00	$3,000.00	
1 - PR-04	American Soybean Association	2027 Young Leaders Program Proposal - ***RECOMPETE; YEAR 3 OF 1***	Kate Maher	$ 9,200.00	$9,200.00	
1 - PR-05	American Soybean Association	2027 SoyStats Funding Proposal **- *RECOMPETE; YEAR 3 OF 1***	Kate Maher	$ 600.00	$750.00	
1 - PR-06	American Soybean Association	2027 ASA Economic Analysis and Support Proposal - Arkansas **- *RECOMPETE; YEAR 3 OF 1***	Kate Maher	$ 5,000.00	$5,000.00	
2 - PI-07	Clean Fuels Alliance America	State Market and Environmental Support **- *INITIAL; YEAR 1 OF 1***	Brad Shimmens	$ -	$20,000.00	

Arkansas Soybean Promotion Board

Table of Contents - Member Notes

2 - PR-09	Clean Fuels Alliance America	Market Expansion Drive ***- RECOMPETE; YEAR 3 OF 1***	Brad Shimmens	$ 20,000.00	$20,000.00	
3 - PR-10	WISHH	WISHH Markets: Building Demand for US Soy Trade Together ***- RECOMPETE; YEAR 3 OF 1***	Gena Perry	$ 50,000.00	$50,000.00	
4 - PI-08	US Meat Export Federation	USMEF Membership: A U.S. Pork Promotion Partnership ***- INITIAL; YEAR 1 OF 1***	John Hinners	$ -	$8,600.00	***submitted across multiple AR commodity checkoff boards***
5 - PR-11	Arkansas Soybean Assoc	Recognizing Soybean Production Excellence by the continuation of the "Grow for the Green & Race for 100" Soybean Yield Challenge Contests ***- RECOMPETE; YEAR 16 OF 1***	Dawn Howe	$ 206,900.00	$206,900.00	
6 - PI-09	ASU Newport	Soy to Soil- Community Agriculture Day at ASUN ***- INITIAL; YEAR 1 OF 1***	Lindley Gilliaum	$ -	$11,000.00	
7 - PR-12	UADA	Poinsett County Ag Day ***- RECOMPETE; YEAR 2 OF 1***	Christie Wagley	$ 4,815.06	$8,070.00	
7 - PR-13	UADA	The Arkansas Irrigation Yield Contest ***- RECOMPETE; YEAR 9 OF 1***	Chris Henry	$ 10,000.00	$10,000.00	***submitted across multiple AR commodity checkoff boards***
7 - PA-01	UADA	Soybean Science Challenge ***- ACTIVE; YEAR 3 OF 3***	Julie Robinson	$ 85,525.00	$87,018.00	
7 - PA-02	UADA	Arkansas Future Agriculture Leaders Tours ***- ACTIVE; YEAR 2 OF 3***	Julie Robinson	$ 5,000.00	$5,000.00	***submitted across multiple AR commodity checkoff boards***
8 - PI-10	Arkansas FFA Foundation	Investment the Future of Arkansas Agriculture – Agricultural Education, Career Success, and FFA ***- INITIAL; YEAR 1 OF 1***	Taylor Wiseman	$ -	$100,000.00	***submitted across multiple AR commodity checkoff boards***

Arkansas Soybean Promotion Board

Table of Contents - Member Notes

8 - PR-14	Arkansas FFA & Arkansas 4-H Foundations	Joint Funding Proposal for Promotion of Education on Corn, Sorghum, and Soybeans for Arkansas 4-H and FFA Youth - ***RECOMPETE; YEAR 3 OF 1***	Taylor Wiseman	$ 15,000.00	$15,000.00	***submitted across multiple AR commodity checkoff boards***
9 - PI-11	Three County Fair	All Things Soybeans - ***INITIAL; YEAR 1 OF 1***	Cathy Helton	$ -	$13,840.00	
10 - PI-12	Cross County Farm Bureau Women's Leadership Committee	Cross County Youth Ag Day - ***INITIAL; YEAR 1 OF 1***	Stacy Witcher	$ -	$10,000.00	***submitted across multiple AR commodity checkoff boards***
11 - PI-13	Botanical Garden of the Ozarks	Chefs in the Garden - ***INITIAL; YEAR 1 OF 1***	Ashley Wardlow	$ -	$12,500.00	***submitted across multiple AR commodity checkoff boards***
12 - PR-15	Ag Learning Center at Four States Fair & Rodeo	Ag Learning Center Educational Program - ***RECOMPETE; YEAR 2 OF 1***	Taylor Wiseman	$ 10,000.00	$20,000.00	***submitted across multiple AR commodity checkoff boards***
13 - PI-14	Arkansas Hunger Relief Alliance INC	Arkansas Staples for Strong Families - ***INITIAL; YEAR 1 OF 1***	Jennifer Owens Buie	$ -	$45,000.00	***submitted across multiple AR commodity checkoff boards***
14 - PI-15	Soy Aquaculture Alliance	SAA QSSB Membership - ***INITIAL; YEAR 1 OF 1***	Katie Hall	$ -	$25,000.00	
RESEARCH PROPOSALS - DAY 1						
14 - RI-01	Soy Aquaculture Alliance	SAA Aquaculture Feed Research Contribution - ***INITIAL; YEAR 1 OF 1***	Katie Hall	$ -	$75,000.00	
15 - RI-02	Iowa Soybean Association	Farmers Fueling the Future - ***INITIAL; YEAR 1 OF 1***	Matt Herman	$ -	$15,000.00	

Arkansas Soybean Promotion Board

Table of Contents - Member Notes

16 - RI-03	NASA Acres / Univ of Maryland	Collaborative AgMet Graphics for Within-Season Crop Conditions & Progress Tracking ***- INITIAL; YEAR 1 OF 1***	Katie Hall	$ -	$97,547.00	
17 - RI-04	Chicot Insights LLC	Utilization of Precision Agricultural Technology Along with Machine Learning to Optimize Fertility Applications While Improving Soybean Productivity and Profitability at the Field Scale. ***- INITIAL; YEAR 1 OF 3***	Zach Reynolds	$ -	$38,320.60	***submitted across multiple AR commodity checkoff boards***
17 - RI-05	Chicot Insights LLC	Developing Overhead Irrigation Recommendations for Arkansas Soybean Production ***- INITIAL; YEAR 1 OF 3***	L. Jason Krutz	$ -	$41,020.00	***submitted across multiple AR commodity checkoff boards***
17 - RI-06	Chicot Insights LLC	Automated Irrigation Technologies that Improve Soybean Productivity, Profitability, and Aquifer Stability ***- INITIAL; YEAR 1 OF 3***	Zach Reynolds	$ -	$60,992.00	***submitted across multiple AR commodity checkoff boards***
17 - RI-07	Chicot Insights LLC	Structural Irrigation Strategies that Improve Soybean Productivity, Profitability, and Aquifer Stability ***- INITIAL; YEAR 1 OF 3***	L. Jason Krutz	$ -	$70,020.00	***submitted across multiple AR commodity checkoff boards***
18 - RI-08	Mid-South Soybean Board	Beating the Rot: Improving Soybean Resistance to Phytophthora Root and Stem Root in the Mid-south ***- INITIAL; YEAR 1 OF 3***	Dawn Howe	$ -	$3,750.00	
18 - RI-09	Mid-South Soybean Board	Novel Genetic Resources to Improve Soybean Seed Quality ***- INITIAL; YEAR 1 OF 3***	Dawn Howe	$ -	$8,454.00	
18 - RI-10	Mid-South Soybean Board	Spray application of double stranded RNA for simultaneous management of multiple soybean fungal and insect disease ***- INITIAL; YEAR 1 OF 1***	Dawn Howe	$ -	$11,956.00	
18 - RI-11	Mid-South Soybean Board	Evaluating early soybean for productivity and herbicide efficacy ***- INITIAL; YEAR 1 OF 1***	Dawn Howe	$ -	$3,015.50	

Arkansas Soybean Promotion Board

Table of Contents - Member Notes

18 - RI-12	Mid-South Soybean Board	Unlocking novel genetic pathways involved in syncytia development for durable soybean cyst nematode resistance ***- INITIAL; YEAR 1 OF 3***	Dawn Howe	$ -	$13,544.00	
18 - RI-13	Mid-South Soybean Board	Modernizing Phosphorus and Potassium Recommendations and Improving Return on Investment for Climate-Smart Corn - Cover Crop - Soybean Cropping System ***- INITIAL; YEAR 1 OF 3***	Dawn Howe	$ -	$10,000.00	
18 - RI-14	Mid-South Soybean Board	Porous soy proteins for the delivery of vitamins ***- INITIAL; YEAR 1 OF 3***	Dawn Howe	$ -	$5,500.00	
18 - RI-15	Mid-South Soybean Board	Characterizing Soybean Genotypes for Phosphorus Efficiency ***- INITIAL; YEAR 1 OF 3***	Dawn Howe	$ -	$14,253.00	
18 - RI-16	Mid-South Soybean Board	Screening elite soybean lines for drought tolerance and developing high-throughput drought screening methodologies for the Mid-south ***- INITIAL; YEAR 1 OF 3***	Dawn Howe	$ -	$16,250.00	
18 - RI-17	Mid-South Soybean Board	Initiative of a Soybean Mutation Breeding Pipeline: Creation of Superior Traits Towards Quick Releasing Improved Soybean Varieties ***- INITIAL; YEAR 1 OF 3***	Dawn Howe	$ -	$3,750.00	
18 - RI-18	Mid-South Soybean Board	Foliar boron application to minimize flowers abortion and improve yield in soybean under drought/ranfed conditions ***- INITIAL; YEAR 1 OF 1***	Dawn Howe	$ -	$7,500.00	
18 - RI-19	Mid-South Soybean Board	Genetic Approaches for Enhancing Salt Tolerance in Soybean ***- INITIAL; YEAR 1 OF 1***	Dawn Howe	$ -	$10,000.00	

Arkansas Soybean Promotion Board

Table of Contents - Member Notes

18 - RA-01	Mid-South Soybean Board	Expanding potential market demand for and Access to Whole Soy Foods through Nutrition Education - ***ACTIVE; YEAR 2 OF 3***	Dawn Howe	$ 8,311.25	$7,500.00	
18 - RA-02	Mid-South Soybean Board	Leveraging Photosynthetic Efficiency traits for improving soybean productivity in the Mid-South - ***ACTIVE; YEAR 2 OF 3***	Dawn Howe	$ 7,500.00	$7,500.00	
18 - RA-03	Mid-South Soybean Board	Enhanced synthetic microbiome communities to manage sudden death - ***ACTIVE; YEAR 2 OF 2***	Dawn Howe	$ 4,527.25	$6,277.25	
18 - RA-04	Mid-South Soybean Board	Breeding maturity group 4 soybean with enhanced resistance to suthern root-knot nematode by reducing galling and nematode reproduction - ***ACTIVE; YEAR 2 OF 3***	Dawn Howe	$ 15,000.00	$26,667.00	

DAY 1 TOTALS		
	PREV (FY26)	**CURRENT (FY27)**
PROMOTION:	$ 438,540.06	$710,378.00
RESEARCH:	$ 35,338.50	$553,816.35

DAY 2 BEGINS ON NEXT PAGE

1 - PI-01

Organization/Institution Submitting Proposal:
American Soybean Association

Project Title:
2027 Arkansas Biomass-Based Diesel Initiative (BBDI) Funding Proposal

Project Type:
Promotion

Name of Project Manager:
Kate Maher

Name of Project Team Member 1:
Alexa Combelic

Name of Project Team Member 2:
Josh Rahm

Statement of Justification or Purpose of the Project (75 word maximum):
The Biomass-Based Diesel Initiative (BBDI) directly supports a market that Arkansas soybean farmers rely on: strong, stable demand for soy oil. With major policy decisions underway in Washington and in key clean-fuel states, Arkansas needs a coordinated voice to ensure soy stays competitive. BBDI allows ASA to protect and grow this critical market by advocating for policies that support crush margins, maintain soy oil's value and preserve long-term profitability for Arkansas growers.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Through BBDI, ASA will advocate for Arkansas growers in federal and state clean-fuel programs by engaging regulators, advancing farmer-focused RVO and 45Z guidance, shaping LCFS policies and pushing back on rules that disadvantage soy oil. Arkansas's priorities will inform these efforts, ensuring soy's carbon benefits are recognized and feedstock access remains fair. This coordinated advocacy helps protect demand for soy oil, support crush capacity and secure reliable, long-term market opportunities for Arkansas farmers.

BUDGET

Amount of Funding Needed for Project:
$5,000.00

Contribution Amount (from organization or sponsor):
$575,000.00

Arkansas Soybean Promotion Board FY27 BBDI Unrestricted Funding Proposal

1. **Requested Budget**: $5,000 Unrestricted Funding

2. **Concept Description.** Provide a concise description of the proposed concept.

Biomass-Based Diesel Initiative (BBDI)

The Biomass-Based Diesel Initiative (BBDI) is an ASA-led initiative to coordinate industry-wide efforts to support biomass-based diesel (BBD). The main objective for the initiative is to protect the interest of soybean farmers related to BBD via various collaborative efforts. BBDI provides ASA with expanded resources to make the largest impact possible on biofuels policies in Washington, D.C., and around the country!

Thanks to your investments, ASA continues its biofuel advocacy leadership through the Biomass-Based Diesel Initiative (BBDI). Federally, BBDI work is focused on finalizing key biofuel policies to prioritize soy and other agricultural feedstocks, while on the state level, we continue to engage with states to shape low carbon fuel programs to support key markets for U.S. farmers.

By funding BBDI, states and other contributors ensure ASA has the resources to maintain consistent advocacy in key markets that lack state soybean associations, and our reach is growing as we begin to venture into advocacy in foreign fuel programs.

BBDI funding provides ASA resources to continue advocacy on Renewable Volume Obligations (RVOs) and 45Z Clean Fuel Production Credit guidance. ASA's steadfast efforts, supported by the BBDI, have resulted in additional positive momentum for our policy goals.

The initiative is designed as a two-pronged approach with ASA leading the BBDI advocacy effort and a joint initiative with the Iowa Soybean Association called Farmers Fueling the Future (FFF). The key benefit to supporting this initiative is being part of a collaborative effort to support soybean farmers via soy bio mass-based diesel advocacy efforts. The initiative includes stakeholders beyond soy – including partners who rely on a strong farm economy, rail and other transportation, equipment manufacturers and other commodity groups. The soybean checkoff at the state and national levels combined, has invested hundreds of millions of dollars to build the biomass-based diesel industry from the ground up as a new use for soybean oil. This industry now utilizes many feedstocks and has been subjected to tax and regulatory policies that have crippled the industry and created an unfavorable market for soy as a feedstock. No matter how many checkoff dollars are invested in biomass-based diesel, without the appropriate policy and regulatory environment, it cannot thrive. This is where the BBDI becomes critically important in

translating the research and technical information from FFF into advocacy and favorable policy outcomes for our farmers.

This project requests unrestricted funding to support ASA's continued advocacy on behalf of soy biomass-based diesel at both the national level as well as in states such as California, New Mexico, Oregon, Washington and others where there is no state soy presence, yet the market potential for soy bio mass-based diesel is large.

Soy biomass-based diesel is at a crossroads. Decisions made by policymakers at this juncture will impact the biofuels industry for years to come. We must act now and leverage all resources to get shuttered biodiesel plants up and running to ensure a strong market for soy biomass-based diesel in the future. This project is leveraged by unrestricted funds from state associations and industry partners, such as NOPA, SABR, and John Deere.

Over several decades, soybean farmers single-handedly created and led the investment in growing soybean oil demand through an innovative new use – biodiesel. This has now turned into a global industry that has expanded to renewable diesel and the potential of sustainable aviation fuel (SAF) and maritime. Add Maritime here

Competition for soy oil as a biomass-based diesel feedstock continues to be an issue, and farmers must have a strong market to ensure soy oil utilization.

Biomass-based Diesel Initiative (BBDI) offers the forum to coordinate across state soy organizations and industry partners focused on advocacy support.

Advocacy funding for BBDI enables:

1. Additional biofuels leadership resources for the ASA Government Affairs team and the role of Government Affairs Director, Josh Rahm. His work supplements efforts on the Federal policy stage run by Alexa Combelic. In addition to providing expertise on current issues such as LCFS, 45Z, RVOs and carbon intensity scoring, BBDI funding enables Josh to prepare for future issues.
2. Resources enable ASA to lead advancement of policy outcomes that impact soy oil as a feedstock in states such as California, Washington, Oregon and New Mexico.
3. Resources for farmer advocacy fly-ins as well as development of advocacy communications to support outreach efforts

3. **Background.** Frame the problem or challenge your proposal will address. Why is it an opportunity for the Indiana soybean industry?

In 2024, ASA began coordinating the initiative to address these issues, as requested by multiple state soy organizations. ASA proposed the Biomass-Based Diesel Initiative (BBDI), and it was created and is administered through ASA. Funds from this advocacy proposal go to ASA for ASA-led advocacy work via the BBDI, and checkoff funds are solely managed by FFF.

4. **Proposed Methods/Tactics.** Please provide a brief explanation of the approach. Describe sufficiently to understand the approach at a high level without disclosing intellectual property.

ASA Advocacy Top-Line Priorities in State Clean Fuels Policy & Programs

Through BBDI investments, ASA is now able to actively engage with state regulators, elected officials, maintain ongoing advocacy relationships, and pursue policies that support U.S. soybean farmers.

As we look ahead at state regulatory and legislative agendas, ASA continues to:

- Support farmer-first, low carbon fuels policies and programs as technology-neutral, market-based programs that reduce fuel carbon intensity based on sound science, while preserving affordability and supply diversity, prioritizing soybean oil supply and demand.
- Highlight that soy-biomass-based diesel delivers proven, near-term greenhouse gas reductions, support U.S. farmers, rural economies, and energy security, as well as use existing infrastructure.
- Underscore that GREET-based lifecycle analysis and current agricultural data show strong climate performance driven by productivity gains, not land conversion.
- Advocate for program designs that avoid outdated indirect land use change (ILUC) assumptions, reject arbitrary feedstock caps, and protect farmer data by preventing burdensome farm-level reporting.
- Ensure that grounded in current science, low carbon fuel programs can be national models that advance decarbonization while supporting domestic agriculture.

Lasting Impact. How will this project be sustained, scaled, and/or commercialized over time? (750 characters).

ASA is the leading national voice of U.S. soybean farmers when it comes to advocacy work, and the need to ensure the proper regulatory, tax and policy environment in Washington, D.C. will continue. The issues and challenges have eclipsed the ability of one person to navigate. With administration changes in Washington, D.C., the policy environment for biofuels is changing daily (sometimes hourly). While we cannot fully know what issues ASA will have to address in future administrations, we do know that challenges and opportunities will continue to exist, and that ASA must be there with adequate resources to address them if we are to maintain and grow this important market for soybean oil.

5. **Audience-specific communication plan.** Describe how the results of the project or key messages/content will be delivered to the target audience(s) and how will you measure your success in reaching and influencing those audiences?

National Policy Makers and Staff: Advocacy for soy-derived biomass-based diesel

Select State Policy Makers and Staff as well as California Air Resources Board (CARB) in California, New Mexico Environment Department (NMED) in New Mexico, Department of Environmental Quality (DEQ) in Oregon, Department of Ecology in Washington: Advocacy for soy-derived biomass-based diesel Allied Industry Organizations: Coordinate to leverage stakeholder voices to amplify the efforts of ASA and state affiliate associations.

6. **Desired project outcomes.** Include SMART goal or goals associated with pre-proposal, proposed milestones to measure progress.

1. A strong, profitable and growing domestic biomass-based diesel industry

2. A market environment where U.S. soy is, ideally, the preferred feedstock for biomass-based diesel, but at the very least is economically competitive with other feedstocks for BBD

3. A strong domestic crush industry.

The success of the domestic biofuels industry is based largely on federal programs that add value to the fuel produced. At the same time, even though biofuels benefit from a broad coalition of bipartisan support, issues arise in Congress that either pit biofuels against each other or seek to limit production for the benefit of the petroleum industry.

Individual biofuel programs do not exist in a vacuum. Major biofuel programs add to the overall "credit stack" for the fuel and include value added to the fuel through federal tax credits, the Renewable Fuel Standard (RFS) RIN credits, and state-level Low Carbon Fuel Standard (LCFS) programs.

While it is impossible to anticipate the exact policy, tax and regulatory issues that will be top of mind by the time the next fiscal year rolls around, we do know that there will be a constant, growing stream of challenges that require advocacy work.

7. **Team Attributes.** Please provide a brief description of Team Capabilities, Expertise and Network relevant to the concept.

Steve Censky, ASA CEO and previous Deputy Secretary of Agriculture

Alexa Combelic, ASA Executive Director of Government Affairs as well as ASA's Biofuels and Infrastructure expert

Josh Rahm, Director of Government Affairs and ASA's state policy and Biofuels expert

1 - PI-02

Organization/Institution Submitting Proposal:
American Soybean Association

Project Title:
2027 ASA Action Partnership (ASAAP) Membership Proposal

Project Type:
Promotion

Name of Project Manager:
Kate Maher

Name of Project Team Member 1:
Tracy Snider

Name of Project Team Member 2:
Michelle Hummel

Statement of Justification or Purpose of the Project (75 word maximum):
The ASA Action Partnership (ASAAP) brings together growers, state organizations and industry partners to address shared challenges and influence long-term strategies that shape the soybean sector. Participation ensures Arkansas growers are represented in discussions that affect market stability, regulatory needs and future industry priorities. This collaborative forum strengthens Arkansas's ability to stay informed, contribute to national strategy and support decisions that protect the state's soybean industry and its long-term competitiveness.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
ASA will convene two ASAAP meetings that bring together soybean leaders, industry partners and state organizations for focused discussions on emerging issues, strategic needs and collaboration opportunities. Arkansas participants will engage in dialogue on industry priorities, provide grower input, and participate in updates, focus groups and advisory sessions. This involvement ensures Arkansas perspectives are included in national strategy development and helps the state stay ahead of challenges that impact grower profitability and future industry direction.

BUDGET

Amount of Funding Needed for Project:
$6,000.00

Contribution Amount (from organization or sponsor):
$600,000.00

2027 ASA Action Partnership (ASAAP)
Arkansas Soybean Promotion Board Membership Proposal

The ASA Action Partnership (ASAAP) is a collaborative effort between all soybean industry sectors with a stake in the growth and profitability of the industry. The forum provides the opportunity for state and national checkoff organizations, ASA state affiliates, industry partners and national grower leaders to engage in work to preserve and protect the interests of the soybean industry.

ASAAP Objectives

- Identify and address challenges and issues facing the soybean industry
- Enhance collaboration between soybean growers, soybean organizations and industry
- Impact overall soybean industry strategy and allocate necessary resources to achieve strategic objectives and goals

Meeting Overview

ASAAP meets formally twice a year. The first is a one-day meeting in March. The annual ASAAP retreat in late summer provides an opportunity for in-depth discussions, networking, and industry-wide collaboration.

Member Benefits

Membership in ASAAP allows two participants from Arkansas to participate and engage in ASAAP's annual meetings, attended by soybean industry and grower leaders. Additional membership benefits include:

- ASAAP Updates
- Focus group/farmer advisory council opportunities with members and leaders
- Special recognition of ASAAP Members and Industry Supporters in ASA communications to show appreciation for their support.

ASAAP Funding – ASA State Affiliates and QSSB's*

Membership in ASAAP by ASA's state affiliates and QSSB's is based on the state's annual soybean production.

State Soybean Production	ASAAP Funding Level
40 million bushels of soybeans or greater	$6,000 annual membership
39.9 million bushels of soybeans or less	$1,500 annual membership

ASAAP exists as a collaborative effort to unite industry leaders, grower organizations and soybean grower leaders in creative and forward-thinking dialogue to ensure a secure future for the soybean industry.

The Arkansas Soybean Promotion Board membership in ASAAP, based on the formula above, is $6,000 for 2027.

**ASAAP membership dues invested by the Arkansas Soybean Promotion Board are applied to meeting operational expenses including speaker fees, room rental, audio visual equipment, food and beverage and meeting materials. Funds are not used for lobbying or advocacy.*

1 - PR-01

Organization/Institution Submitting Proposal:
American Soybean Association

Project Title:
2027 ASA Awards Celebration Sponsorship Proposal

Project Type:
Promotion

Name of Project Manager:
Kate Maher

Name of Project Team Member 1:
Kate Maher

Name of Project Team Member 2:
Tracy Snider

Statement of Justification or Purpose of the Project (75 word maximum):
The ASA Awards Celebration honors the achievements of soybean farmers, industry partners and emerging leaders whose work strengthens the entire soy value chain. Participation ensures Arkansas soybean growers are represented in a national forum that showcases excellence in conservation, research and leadership. This visibility highlights Arkansas's contributions, reinforces the state's commitment to innovation and sustainability and helps inspire future leadership within the Arkansas soybean community and the broader U.S. industry.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
ASA will host a national celebration recognizing leadership, conservation achievements and industry innovation during Commodity Classic. Arkansas participants will attend the event, engage with growers and leaders from across the country and gain exposure to best practices that advance the soybean sector. The program includes award presentations, recognition of regional and national honorees and acknowledgment of leadership programs, providing Arkansas growers with inspiration, peer connections and strengthened visibility within the national soybean community.

BUDGET

Amount of Funding Needed for Project:
$6,000.00

Contribution Amount (from organization or sponsor):
$165,000.00

2027 ASA Awards Celebration

Arkansas Soybean Promotion Board Sponsorship Proposal

The American Soybean Association (ASA) has a long and storied history of achievements and leadership. The annual Awards Celebration, held during the Commodity Classic Convention and Trade Show, is an opportunity to recognize the achievements and contributions made by soybean farmers and industry leaders.

The awards program, attended by approximately 650 soybean growers and industry leaders, is truly a night when soybeans shine, as achievements in research, conservation, and leadership are recognized. This celebration of achievements inspires innovation, enhances collaboration, and builds both confidence and pride in our industry.

ASA's annual Conservation Legacy Awards recognize farm management practices of U.S. soybean farmers that are both environmentally friendly and profitable. The awards shine a light on the most progressive farmers, those who have truly embraced consistent and effective conservation practices on their farms.

The top three Soybean Industry awards are announced: The Pinnacle Award, Distinguished Leadership Award, and Outstanding State Volunteer Award. Four regional Winners of Conservation Legacy Awards and recipients are announced LIVE on-stage and one is selected to receive the national CLA. These four regional winners have been recognized for their great conservation efforts—and one of them has also been selected to receive the "National" Conservation Legacy Award for their exceptional accomplishments. The entire Corteva Young Leaders class is recognized via video, as well.

The ASA Awards Celebration is a special soybean-focused evening designed to showcase the industry and recognize:

- Honor leadership achievement and outstanding service by soybean growers, state volunteers and industry leaders
- Achievements in soybean production and research
- Highlight key soybean industry initiatives including those of conservation, sustainability and best management practices
- Inspire innovation and drive future soybean industry growth

A $6,000 investment in the 2027 Awards Celebration will provide the Arkansas Soybean Promotion Board (ASPB) board with preferred seating in a reserved area for up to eight (8) attendees. Additionally, ASPB will be positioned as industry leaders through recognition in:

- Awards Celebration publicity, event signage, and the program booklet
- State sponsors will be recognized by name in the Awards Celebration video and verbally by the event Emcee and ASA President

The 2027 ASA Awards Celebration will be held in conjunction with Commodity Classic March 3-5, 2027 in New Orleans, Louisiana

1 - PR-02

Organization/Institution Submitting Proposal:
American Soybean Association

Project Title:
2027 Innovation to Market (I2M) Work Group Membership Proposal

Project Type:
Promotion

Name of Project Manager:
Kate Maher

Name of Project Team Member 1:
Michelle Hummel

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Participation in ASA's Innovation to Market (I2M) Work Group ensures Arkansas soybean growers have a direct voice in national discussions that shape access to new seed and pesticide technologies. I2M addresses regulatory delays, market barriers and stewardship concerns that directly influence farm productivity in Arkansas. Engaging in this forum helps protect growers' ability to adopt innovative tools, strengthens Arkansas's representation in technology-development conversations and supports long-term competitiveness for the state's soybean industry.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
ASA will convene two annual (I2M) meetings where Arkansas representatives collaborate with trait developers, pesticide registrants and national soybean leaders to evaluate regulatory challenges, market acceptance issues and technology needs. Arkansas participants will contribute to strategy discussions, share state-specific concerns and help identify solutions that support timely innovation and consistent global standards. This involvement ensures Arkansas growers directly influence the future availability of key technologies that affect their productivity, profitability and market access.

BUDGET

Amount of Funding Needed for Project:
$7,500.00

Contribution Amount (from organization or sponsor):
$250,000.00

2027 ASA Innovation to Market (I2M) Work Group
Arkansas Soybean Promotion Board Membership Proposal

The Innovation to Market (I2M) Work Group serves as a consultative forum with a goal to facilitate the domestic and international introduction, commercialization and market acceptance of new innovations in seed and pesticide products. The group accomplishes this through interactions with key industry partners, including biotech trait developers, pesticide registrants and developers of gene-edited soybeans and other plant breeding innovations and farmer leaders representing ASA, USB and USSEC.

I2M Objectives

The primary objectives of the Innovation to Market Work Group are:

- Identify and address challenges and issues impeding the development, commercialization and market acceptance of seed and pesticide products. Examples may include adventitious presence, U.S. and foreign regulatory systems, trade and market barriers, stewardship concerns and education needs.
- Enhance collaboration between soybean growers, soybean organizations and industry partners.
- Create a forum to identify strategies for addressing long-term issues that continue to threaten innovation and productivity in the agriculture industry.
- Identify action areas of mutual interest where soybean growers can work with developers and registrants/member companies to improve the regulatory and market environment for new technologies, both domestically and in overseas markets.
- Facilitate a productive dialogue between developers and registrants and other essential stakeholders to help ensure a stable market environment, trade prospects and greater profit opportunities for U.S. soybean farmers.
- Seek to address asynchronous approvals and consistent standards and regulatory processes throughout all key export countries.

Meeting Overview

The I2M Work Group meets in person twice a year, with at least one meeting being held in Washington, D.C. Meetings are traditionally held in the winter and late summer. The winter meeting will be held in January 2027 in Washington, DC. Summer meeting dates are to be determined.

Member Benefits

Membership in the I2M Work Group allows two participants from Arkansas to participate in and engage in the I2M Work Group's annual meetings.

Additional membership benefits include:

- Interaction with industry leaders to become more informed on specific challenges facing developers of seed and pesticide products.
- The opportunity to work with industry representatives and members of the soy family to identify strategies to ensure innovations in seed and pesticide products remain available to farmers.
- Recognition as an organization that supports the significant work of the I2M Work Group as it protects farmers access to key seed and pesticide tools that enhance their productivity and profitability.
- I2M member organizations are recognized in ASA's communications related to the group's activities.

I2M Work Group Annual Membership – Arkansas Soybean Promotion Board: $7,500

**I2M Work Group membership dues invested by the Arkansas Soybean Promotion Board are applied to meeting operational expenses including speaker fees, room rental, audio visual equipment, food and beverage and meeting materials. Funds are not used for lobbying or advocacy.*

1 - PR-03

Organization/Institution Submitting Proposal:
American Soybean Association

Project Title:
2027 Soybean Leadership Academy Proposal

Project Type:
Promotion

Name of Project Manager:
Kate Maher

Name of Project Team Member 1:
Erin Glarner

Name of Project Team Member 2:
Farris Haley

Statement of Justification or Purpose of the Project (75 word maximum):
The Soybean Leadership Academy builds stronger, more effective leaders for state and national soybean organizations. Through expert-led sessions on governance, collaboration, communication and industry trends, the program equips grower leaders and staff with the tools they need to guide their organizations and contribute meaningfully to the soybean sector. This training enhances coordination across the value chain, strengthens organizational leadership capacity and prepares participants to serve confidently at state, regional and national levels.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
ASA will deliver a multi-day leadership program featuring expert-led sessions on agricultural policy, communication, governance and organizational leadership. Arkansas participants will build practical skills that strengthen their ability to serve on state boards, represent Arkansas soybean interests and contribute to long-term industry strategy. Through workshops, peer networking and interaction with national leaders, the Academy helps develop a deeper bench of informed, confident Arkansas grower-leaders who can effectively guide the state's soybean organization and its future.

BUDGET

Amount of Funding Needed for Project:
$3,000.00

Contribution Amount (from organization or sponsor):
$175,000.00

2027 Soybean Leadership Academy
Arkansas Soybean Promotion Board Proposal

Soybean Leadership Academy is an elite educational program designed to provide tools and techniques that enable state and national soybean Board and Association leaders to be more effective, efficient and inspired leaders.

Working with top leadership trainers, facilitators and industry experts, **Soybean Leadership Academy** will provide:

- Targeted training to state and national soybean board leaders and staff, increasing their effectiveness as leaders and as boards
- Enhanced collaboration between state affiliate and national soybean organizations, strengthening the voice of U.S. agriculture
- Interaction between senior soybean leadership and newer board members creating strong peer networking opportunities

Soybean Leadership Academy provides sessions led by industry experts on markets and trends, unleashing ideas and fostering collaboration, board governance, inclusion and resilience.

The 2027 **Soybean Leadership Academy** will be held in early January 2027 at a location to be determined in the Midwest that is more accessible to our soybean states. The program format is generally as follows:

<u>Day #1</u>
Participants Arrive
Welcome Reception & Dinner at Hotel

<u>Day #2</u>
Breakfast
General Session
Leadership Training Sessions focused on Ag Policy Outlook, Communications, Roles of Leadership in Associations, Leadership Lifecycle and Panel discussions and other training to develop effective leaders
Lunch with Speaker
Continued Leadership Training Sessions
General Session
Dinner and Networking Opportunities

<u>Day #3</u>
Breakfast
General Session
Adjourn

A copy of the 2026 Soybean Leadership Academy Agenda is attached for reference.

Investment

Soybean Leadership Academy is designed for participation by grower leaders and staff. Participating in the program is an investment in both your organization and leadership team.

State and national soybean Boards and Associations are encouraged to invest in Soybean Leadership Academy, providing training for senior level grower leaders, including the state president and chair, as well intermediate level board members with a desire to advance in their leadership journey. Senior and managerial staff participation at the state and national level is also encouraged.

The funding tiers below are suggested investment levels, and will provide for programming, meals, meeting materials and networking activities. Travel and hotel costs will be the responsibility of the participating organization.

2027 Soybean Leadership Academy Funding Tiers

Sponsorship Level	Investment	Suggested Number of Participants
Platinum	$25,000 and above	Ten or more participants
Gold	$12,000	Eight (8) participants
Silver	$6,000	Four (4) participants
Bronze	$3,000	Two (2) participants

ASA proposes that the Arkansas Soybean Promotion Board pledge $3,000 for a Bronze sponsorship of the 2027 Soybean Leadership Academy which includes the opportunity to send two (2) or more participants.

Under the guidelines established through the adoption of ASA's 2016 Strategic Plan, state affiliates are provided representation on the ASA's Board through a base-level investment. Investment in the **Soybean Leadership Academy** will be counted by ASA towards additional grower representation on ASA's Board of Directors.

Sponsors will be recognized throughout the event in program related materials and promotions, as well as on the registration website and signage.

ASA respects the responsibility and authority of the Soybean Promotion, Research and Consumer Information Act (7 U.S.C. 6301-6311) (the "Act") and the Soybean Promotion and Research Order (8 CFR Part 1220) (the "Order") and as such can assure state organizations that the checkoff dollars given and used to fund these programs are not used for lobbying, advocacy or membership generating activities.

1 - PR-04

Organization/Institution Submitting Proposal:
American Soybean Association

Project Title:
2027 Young Leaders Program Proposal

Project Type:
Promotion

Name of Project Manager:
Kate Maher

Name of Project Team Member 1:
Erin Glarner

Name of Project Team Member 2:
Farris Haley

Statement of Justification or Purpose of the Project (75 word maximum):
The Young Leader Program develops the next generation of soybean industry leaders through training in communications, organizational leadership and industry awareness. By preparing growers to engage at state, regional and national levels, the program strengthens the leadership pipeline essential for advancing the soybean sector. Participants gain skills, knowledge and peer networks that support effective board service, informed decision-making and long-term industry stewardship, ensuring Arkansas growers remain strong voices within the broader soybean community.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
ASA will deliver a multi-phase leadership development experience combining communications training, industry updates, business skill development and exposure to national policy discussions. Participants engage in classroom instruction, hands-on exercises and peer networking across three training phases, including sessions aligned with Commodity Classic and ASA's July Board Meeting. These activities build leadership capacity, deepen understanding of soybean issues and create a strong cohort of informed growers prepared to contribute to state, regional and national organizations.

BUDGET

Amount of Funding Needed for Project:
$9,200.00

Contribution Amount (from organization or sponsor):
$209,000.00

2027 Young Leader Program
Arkansas Soybean Promotion Board Proposal

In 1984 the Young Leader Program was started to help identify and train leaders for the soybean industry. Forty years later, the program continues to be a groundbreaker, recognizing the value both partners play in a farming operation and training them equally, encouraging and emphasizing the importance of diversity in the soybean industry. Today, the *Young Leader Program* continues to set the bar for leadership training in agriculture, identifying and training innovative and engaged growers to serve as the voice of the American farmer (actual age is not a factor).

Structure

The *ASA Corteva Agriscience™ Young Leader Program* two-phase training program challenges and educates participants. Phase I of the training takes place at the Corteva headquarters in Johnston, Iowa in early December 2026. The program continues in February of 2027 with training held in conjunction with the annual Commodity Classic Convention and Trade Show in New Orleans, Louisiana. A third phase of training is available for a select number of participants from the current class. This third-phase program, scheduled for July 2027, includes participation in the ASA July Board Meeting. Traditionally the third phase of training has been limited to 10 members of the current class and interested participants are asked to apply for the limited program spots. Participants for the *Young Leader Program* are sourced from the twenty-six soybean state affiliates and Canada. Each year 45-50 growers take part in the program.

Program Goals and Outcomes

Each phase of the *Young Leader Program* is designed to meet specific training goals and deliver clear program objectives. Phase II of the training incorporates feedback from the class to deliver a custom educational experience that reflects the needs of the participants.

Phase I Objectives – 100% Compliant

- Communications Training – including public communication, interpersonal interaction and business leadership including DiSC training
- Soybean industry overview including USB and ASA Updates
- Soybean Industry and Technology Pipeline
- Peer relationship development

Phase II Objectives – 75% Compliant

- Soybeans in the international marketplace
- Soybean and issues updates – provided in part through participation in Commodity Classic
- Business specific training including advanced communications, multi-generational farming
- Personal and Professional Development

Phase III Objectives – 25% Compliant

- Board policies and protocols
- Soybean Issues Update – provided through participation in the ASA Legislative Forum
- An introduction to policy and Hill visits
- Crop Protection Pipeline and Technology

(Past Agenda Samples Available Upon Request)

The *Young Leader Program* provides newly identified and upcoming soybean leaders with critical leadership training. Through sessions on communications, organizational leadership and soybean industry updates, participants are better prepared to address state level issues while understanding their national implication. This is especially important as growers assume seats on regional, state and national checkoff and association boards. Additionally, the *Young Leader Program* provides each participant with a peer group of other innovative and progressive farmers. These networks help aid collaboration regionally and nationally and provide solid sounding boards regarding business decisions both for state soybean organizations and their individual farming operations.

Most *Young Leaders* alumni become active members of their state organizations, and many take advanced leadership positions on their state and national boards and allied grower organizations. Former *Young Leaders* who have been or are currently engaged in national soy organization leadership include ASA President Scott Metzger of Ohio and ASA Chairman Caleb Ragland of Kentucky. Other past program graduates include numerous individuals in executive leadership on ASA, USB, and USSEC boards as well as a USDA Undersecretary, a State Secretary of Agriculture and the current Secretary of the Department of Homeland Security.

Investment

In 2027, ASA and Corteva Agriscience are again offering the opportunity for state affiliates to partner on the program by providing scholarships via matching funds to cover tuition costs. This option is at the request of state affiliates made during the development of the ASA strategic plan. QSSB involvement in the program will provide the Arkansas Soybean Promotion Board with the opportunity to send additional grower couple(s) as participants in Phase I and Phase II of the *Young Leader* training until the program reaches a total of 52 participants.

2027 ASA Corteva Agriscience Young Leader Budget

The total compliant portion of the budget for the 2027 ASA Corteva Agriscience *Young Leader Program* is $209,000 (inclusive of travel, lodging, meals, meeting materials, speaker's fees, networking events, and program implementation for Phase I, Phase II and 25% of Phase III of the training). ASA and Corteva will continue to fund the non-compliant portion of the program and all compliant portions of the program not matched by QSSBs. Tuition cost estimates per attendee are based upon an average of 45 attendees.

We ask the Arkansas Soybean Promotion Board to invest $9,200 in tuition for one couple to participate in the 2027 ASA Corteva Young Leader Program. *

A financial summary will be provided at the conclusion of the training detailing the expenses and costs as outlined above.

*QSSB's may provide tuition funding for up to two couples in the program for a maximum investment of $18,400

*ASA respects the responsibility and authority of the Soybean Promotion, Research and Consumer Information Act (7 U.S.C. 6301-6311) (the "Act") and the Soybean Promotion and Research Order (8 CFR Part 1220) (the "Order") and as such can assure the soybean growers of **Arkansas Soybean Promotion Board** that the checkoff dollars given and used to fund these programs are not used for lobbying, advocacy or membership generating activities.*

PAST ARKANSAS YOUNG LEADER PROGRAM PARTICIPANTS

Thomas R. Jacobs	DeWitt	AR
Michael Overstreet	Osceola	AR
Gary Sitzer	Weiner	AR
Tom Jones	Pottsville	AR
Richard LaFargue	Gillett	AR
Richard Howard	Marion	AR
Scott Everett	McCrory	AR
Johnny H Wilson	Hickory Ridge	AR
W. David Fogleman	Marion	AR
Robert Stobaugh	Atkins	AR
John Nance	Newport	AR
Robert H. Seidenstricker	Hazen	AR
Byron E. Orewiler	Crawfordsville	AR
Joseph G Torian	Conway	AR
Joseph W. Whittenton, III	Forrest City	AR
John S Cooper	Wynne	AR
Jackie C. Prince	Biscoe	AR
Kevin Hoke	Jonesboro	AR
David Farabough	Grady	AR
Joe Thrash	Houston	AR
Tim Smith	Clarendon	AR
Scott Matthews	Weiner	AR
Dannie L. Daughhetee	Proctor	AR
John Allen	West Memphis	AR
Tim Fisher	Wynne	AR
Stephen Brad Doyle	Weiner	AR
Nathan Wright	Harrisburg	AR
Andy Noble	DeWitt	AR
Reid Hornbeck	Dewitt	AR
Ryan Bell	Des Arc	AR
Adam Cloninger	England	AR
James Bisswanger	Ethel	AR
Derek Holden	bad	AR
Layne Miles	MC Gehee	AR
James Wray, Jr.	Trumann	AR
Kyle Schlenker	Wynne	AR
Caper Robinson	Watson	AR
Wes D. Kirkpatrick	Tillar	AR
Terrance Scott	Cotton Plant	AR
Luke Nannemann	Arkadelphia	AR

2026 ASA Corteva Agriscience Young Leaders

State spelled	Applicants_Name	Last
Illinois	Austin	Anderson
Indiana	Lucas	Windell
Indiana	Eric	Lindauer
Iowa	Jackson	Drost
Iowa	Amanda	Drost
Kansas	Katey	Foster
Kansas	Deven	Foster
Kansas	Levi	Manche
Kansas	Teresa	Manche
Kentucky	Kean	Schnieber
Maryland (Mid-Atlantic)	Paul	Saathoff
Maryland (Mid-Atlantic)	Bailee	Saathoff
Michigan	Brady	Brown
Michigan	Samantha	Gierman
Minnesota	Andrew	Mages
Mississippi	James	Roberts
Mississippi	Caroline	Roberts
Missouri	Rex	Meyr
Nebraska	Jonathon	Meis
North Carolina	Hunter	Lee
North Carolina	Sarah Grace	Lee
North Carolina	Chase	Johnson
North Carolina	Abigail	Johnson
North Dakota	Brandon	Dale
North Dakota	Kristine	Hankins
Ohio	Jonathan	Zucker
Ohio	Alyssa	Zucker
South Dakota	Chris	Diedrich
Tennessee	Paine	Keiser
Virginia	Jayson	Gill
Wisconsin	Eric	Wuthrich
Wisconsin	Jaclyn	Wuthrich
Canada	Jake	Elgersma
Canada	Luke	Hannam
Canada	Naomi	Hannam

2026 ASA Young Leader Program

Phase II: February 23-26, 2026

Lodging and Welcome Reception
Drury Plaza Hotel San Antonio Riverwalk
105 South St. Mary's St. | San Antonio, TX

Training, Alumni Reception and Awards Celebration
Henry B. Gonzalez Convention Center
900 E. Market St. | San Antonio, TX

DRAFT

Monday, February 23, 2026 – *Dress: Casual (Jeans are okay)*

6:00 p.m.	Welcome Reception & Dinner (*Guests include ASA Staff and State Representatives*)	**Drury Plaza Hotel**

Tuesday, February 24, 2026 – *Dress: Business Casual*

7:00 a.m.	Breakfast (on own at hotel)	**Drury Plaza Hotel**
8:00 a.m.	Welcome and Meeting Overview - *Matt Rekeweg, Corteva Agriscience* - *Erin Glarner, ASA*	**Room: 225AB**
8:15 a.m.	The Importance of Engagement - *Scott Metzger, ASA President*	
8:45 a.m.	ASA Government Affairs Session	
9:15 a.m.	Break	
9:30 a.m.	"Leading with Your Story" - *Michele Payn, Cause Matters Corporation*	
12:30 p.m.	Lunch	**Room: 225C**
1:30 p.m.	ASA Economics Session	
2:00 p.m.	Corteva Session	
3:00 p.m.	Adjourn	
4:00 p.m.	Young Leader Alumni Reception	**Room: O'Gorman Terrace (Convention Center, Street level)**
5:00 p.m.	ASA Awards Celebration	**Room: Stars at Night Ballroom (Convention Center, Ballroom level)**

Wednesday, February 25, 2026 – *Dress: Business Casual/No Logo Wear (Individual and group photos will be taken)*

8:00 a.m.	Breakfast (on own at hotel)	**Drury Plaza Hotel**
9:00 a.m.	*ASA Voting Delegates (encouraged to attend)*	**Room: Stars at Night Ballroom (Convention Center, Ballroom level)**
12:00 p.m.	Lunch	**Room: 225C**
12:45 p.m.	"Own it! Grow it! Believe it!" - *Patty Hendrickson, Hendrickson Leadership Group, Inc.*	**Room: 225AB**
2:00 p.m.	Plaque presentation and photos	**Room: 225AB**
3:00 p.m.	*Trade Show (opens 2:30 p.m. until 6:00 p.m.)*	
6:30 p.m.	Young Leader Dinner - *Biga on the Banks*	**Meet in Drury hotel lobby (group to walk to venue)**

Thursday, February 26, 2026 – *On Your Own for Commodity Classic Trade Show & Educational Programming*

Suggested Sessions:	*WILL ADD A LIST OF SUGGESTED SESSIONS*	
6:30 p.m.	*2026 SoyPAC Auction*	**Room: Stars at Night Ballroom (Convention Center, Ballroom level)**

OPTIONAL – Please note non-reimbursable/separate registration required

Friday, February 27, 2026

Participant Departures

DRAFT

1 - PR-05

Organization/Institution Submitting Proposal:
American Soybean Association

Project Title:
2027 SoyStats Funding Proposal

Project Type:
Promotion

Name of Project Manager:
Kate Maher

Name of Project Team Member 1:
Mariah Wollweber

Name of Project Team Member 2:
Vanessa Hunt

Statement of Justification or Purpose of the Project (75 word maximum):
SoyStats® provides a trusted, data-driven source of soybean production, utilization and market information used by growers, customers, media and industry partners. Offering a digital-first format through SoyStats.com, the guide delivers timely charts, updated data and broad global reach. Continued support ensures stakeholders have reliable, accessible soybean statistics that strengthen decision-making, industry visibility and engagement across the value chain. This investment helps maintain one of the most widely recognized resources in the soybean sector.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
ASA will compile, analyze and present annual soybean production, utilization and market data through SoyStats.com, offering dynamic charts and regularly updated information. Activities include distributing digital content to key audiences, providing printed materials that direct users to SoyStats.com, and recognizing supporters across SoyStats assets and ASA communications. The project ensures soybean stakeholders receive clear, credible statistics that inform market understanding and enhance engagement across domestic and international audiences.

BUDGET

Amount of Funding Needed for Project:
$750.00

Contribution Amount (from organization or sponsor):
$10,000.00

2027 SOYSTATS®, A REFERENCE GUIDE TO IMPORTANT SOYBEAN FACTS AND FIGURES
Arkansas Soybean Promotion Board Proposal

PROGRAM SUMMARY

SoyStats®, a Guide to Important Soybean Facts & Figures, provides a trusted, data-driven source of soybean-specific statistics and market information. Designed for use by industry professionals, media, state affiliates and domestic and international soy customers, this annual guide continues to be one of the most widely used and recognized sources for those involved with soybean-related businesses.

SoyStats® is available to domestic and international soybean and soy product customers in a digital first format through SoyStats.com, offering dynamic charts, updated data and a broad global reach. www.SoyStats.com.

Objectives:

- Collect and analyze annual soybean production and utilization data
- Distribute accurate soybean-specific statistics, information and insights to key soybean industry stakeholders
- Expanded access through www.SoyStats.com, offering a broader global reach and enhanced digital usability
- Provide printed materials driving growers, customers and partners to SoyStats.com

A premier soybean industry publication, *SoyStats®* provides its investors valuable visibility across both its digital platform and distributed promotional materials, strengthening their connection to audiences throughout the soybean value chain

***SoyStats®* Investors Benefits:**

- Prominent recognition on SoyStats.com, reaching soybean stakeholders across the globe
- Recognition on printed promotional materials with information to take users directly to SoyStats.com
    - Recognition in ASA's communication vehicles
    - *eBean News*
    - ASA Social Media platforms
- Opportunity to order printed copies of the *SoyStats®* Guide for meetings, events or partner outreach (quantity dependent on investment level)
- Exposure during key industry events where *SoyStats®* is shared with media and key influencers

***SoyStats®* Target Audiences:**

- State Affiliates
- Soybean Customers, (domestic and international)
- Industry Representatives
- Media

ASA Requests $750 from the Arkansas Soybean Promotion Board for the 2027 *SoyStats®, a Reference Guide to Important Soybean Facts & Figures.*

Investment Levels

Gold Level—$4,000

- **Recognition as Gold Sponsor on SoyStats.com**
- **Recognition on printed promotional materials**
- **Up to 200 printed copies available upon request**

Silver Level—$2,000

- **Recognition as Silver Sponsor on SoyStats.com**
- **Recognition on printed promotional materials**
- **Up to 100 printed copies available upon request**

Bronze Level—$750

- **Recognition as Bronze Sponsor on SoyStats.com**
- **Recognition on printed promotional materials**
- **Up to 75 printed copies available upon request**

Direct Purchase:

A state QSSB or association can order printed copies for events or outreach. Boxes of 50 *Soy Stats* Guides - $400 per box (one box minimum order).

1 - PR-06

Organization/Institution Submitting Proposal:
American Soybean Association

Project Title:
2027 ASA Economic Analysis and Support Proposal - Arkansas

Project Type:
Promotion

Name of Project Manager:
Kate Maher

Name of Project Team Member 1:
Scott Gerlt

Name of Project Team Member 2:
Jacquie Holland

Statement of Justification or Purpose of the Project (75 word maximum):
ASA's Economics Department provides essential policy, market and trend analysis that directly affects soybean farmers. Support from the Arkansas Soybean Promotion Board strengthens this work by expanding capacity to quantify outcomes, assess emerging threats and communicate impacts to key influencers. While this proposal reflects Arkansas's specific request, ASA's Economics support model is funded collaboratively and open to all state soybean organizations, ensuring farmers benefit from timely, data-driven insights that inform decisions and advance the soy industry.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
ASA will provide focused economic analysis on issues affecting soybean growers, including pesticide policy, renewable fuels, transportation, trade and the farm safety net. Work includes quarterly threats-and-opportunities updates, early access to ASA economic publications and direct consultation with ASA economists. Though this proposal reflects Arkansas's request, ASA's Economics support model is collaboratively funded and open to all state soybean organizations, ensuring their growers receive timely insights that guide decisions and support the industry.

BUDGET

Amount of Funding Needed for Project:
$5,000.00

Contribution Amount (from organization or sponsor):
$485,000.00

2027 Economic Analysis and Support
Arkansas Soybean Promotion Board Proposal

The American Soybean Association (ASA) and the Arkansas Soybean Promotion Board have been long-time collaborators, working together to enhance the position of soybean farmers as providers of high quality, dependable and competitive soybean-derived products with key influencers and decision makers through the soybean value chain, the agricultural community and in the global marketplace.

Economic Analysis and Support Objectives

ASA's Economics Department serves a critical role for decision makers in the soybean industry by providing analysis of policies, markets, and trends. The ability to quantify outcomes helps to provide insight into the impacts of potential policies on soybean farmers. Furthermore, the economics work positions U.S. soybean farmers interests with influential groups through various tactics. This includes writing articles explaining pertinent issues in the soybean sector, delivering presentations and communicating with other economists about the positioning of the soybean industry.

Support from the Arkansas Soybean Promotion Board will provide the ASA Economics Department with additional tools and resources to further demonstrate the strength and importance of U.S. soy as a diverse oilseed crop on a global level. The tactics outlined below provide varied ways to support, reach, interact and engage with individuals who have direct and indirect impacts on the way farming is done.

Economic Analysis and Support Sponsorship Benefits

Sponsorship of the ASA Economics Department ensures that economic threats and opportunities to Arkansas soybean farmers will be well-understood, discussed and responded to by our Chief Economist and the Economics Department. Likewise, the work of the ASA Economics Department positions U.S. soybean farmers interests with influencer groups through various tactics including but not limited to:

- Economic analysis
- Continued analysis about how pesticide policies affect soybean growers
- Work in renewable fuels, transportation and trade
- Ongoing review and support related to the farm safety net, including crop insurance
- Interactions with other economists related to baseline analysis for markets, conservation programs and safety net spending
- Communicate soybean issues and policy impacts to audiences

Sponsorship creates the opportunity for further interaction with the ASA Economics department via:

- Virtual or in-person briefings at Arkansas Soybean Promotion Board meetings and events by an ASA Economist as requested subject to schedule
- Quarterly threats and opportunities report for the soy industry
- Early copies of economic reports generated by ASA
- Consultations with the ASA Economists
    - Discussions of impacts of state or national policy
    - Suggestions for potential researchers to conduct the research/analysis
    - Suggestions on project scope and design, etc.

A $5,000 investment will support this crucial work, providing both qualitative and quantitative support to help drive not only future success but growth in in the U.S. soybean industry. The work will aid in the positioning the importance of soybean production, soy components and products to the U.S. economy and in global trade.

ASA proposes the Arkansas Soybean Promotion Board fund $5,000 in Economic Support and Analysis in 2027.

2 - PI-07

Organization/Institution Submitting Proposal:
Clean Fuels Alliance America (Clean Fuels)

Project Title:
State Market and Environmental Support

Project Type:
Promotion

Name of Project Manager:
Brad Shimmens

Name of Project Team Member 1:
Jeffrey Earl

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
The State Market and Environmental Support project delivers analytical, legal, and strategic guidance to advance biodiesel, renewable diesel, and sustainable aviation fuel markets. As state regulations, including low carbon fuel standard programs, grow more complex, this project provides timely clarity and expertise to navigate evolving requirements. These state-level initiatives are key drivers of demand for soybean-based feedstocks, creating measurable value for Arkansas soybean producers.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
The project will deliver technical analysis, legal review, and programmatic support related to state clean fuel programs and market development. Activities include evaluating renewable energy initiatives, developing data-driven resources, conducting program assessments, and providing technical input on program design and implementation. Clean Fuels will facilitate information sharing with program managers and industry partners to support clear understanding and their implications for biodiesel, renewable diesel, and SAF markets.

BUDGET

Amount of Funding Needed for Project:
$20,000.00

Contribution Amount (from organization or sponsor):
$0.00

Clean Fuels
ALLIANCE AMERICA

January 30, 2026

Amount Requested: $20,000

Project Name: State Market and Environmental Support

The Clean Fuels State team will provide analytical resources to support stakeholders—including program managers, environmental organizations, environmental justice groups, academia, consumers, and municipal and private fleets—who are shaping state market initiatives for biodiesel, renewable diesel and SAF. A thorough understanding of the rulemaking and legal frameworks underpinning these initiatives is crucial to their success, particularly as the complexity of low-carbon fuel policies continues to grow. The program will supply stakeholders and others with critical data, technical insights, and programmatic expertise, equipping them to navigate and implement effective solutions.

Moving forward, a key focus will be on delivering technical and market insights, including findings from the Trinity Study, to environmental justice groups in states aggressively pursuing decarbonization. Biodiesel, renewable diesel, and SAF offer significant potential as sustainable alternatives to conventional diesel and aviation fuels, particularly in environmental justice and disadvantaged communities. The adoption of these fuels can yield immediate air quality improvements, with reductions in harmful particulate matter (PM) emissions ranging from 50 to 86 percent. Such reductions translate into measurable health benefits, including fewer premature deaths, asthma attacks, and work loss days, and lower cancer risk for populations residing near high diesel and aviation activity areas.

Soybean oil feedstocks play a vital role in the production of these renewable fuels, contributing to the positive environmental outcomes and creating substantial economic value for soybean producers. By demonstrating the critical connection between low-carbon fuels and the agricultural sector, this work underscores how renewable fuel policies can add value back to soybean farmers, strengthening the economic sustainability of agricultural communities while advancing decarbonization goals.

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888.246.3437

cleanfuels.org

Statement of Justification or Purpose of the Project (75 word maximum):

The State Market and Environmental Support project delivers analytical, legal, and strategic guidance to advance biodiesel, renewable diesel, and sustainable aviation fuel markets. As state regulations, including low carbon fuel standard programs, grow more complex, this project provides timely clarity and expertise to navigate evolving requirements. These state-level initiatives are key drivers of demand for soybean-based feedstocks, creating measurable value for Arkansas soybean producers.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):

The project will deliver technical analysis, legal review, and programmatic support related to state clean fuel programs and market development. Activities include evaluating renewable energy initiatives, developing data-driven resources, conducting program assessments, and providing technical input on program design and implementation. Clean Fuels will facilitate information sharing with program managers and industry partners to support clear understanding and their implications for biodiesel, renewable diesel, and SAF markets.

State the goals and objectives of the promotional activity:

The goal of the promotional activity is to increase awareness and understanding of biodiesel, renewable diesel, and sustainable aviation fuel among key audiences. Objectives include communicating the performance, environmental, and economic attributes of these fuels; improving understanding of state clean fuel programs; and supporting informed decision-making that recognizes the role of soybean-based feedstocks in expanding biomass-based diesel markets.

Describe expected benefits to the Arkansas soybean industry from the proposed promotion project:

The State Market and Environmental Support project is expected to deliver significant economic and market benefits to the Arkansas soybean industry by supporting continued growth in biodiesel, renewable diesel, and related clean fuel markets that rely heavily on soybean oil.

Growth in biodiesel and renewable diesel use has been a key contributor to increasing net income at the soybean producer level and across the entire value chain. As a major soybean-producing state, Arkansas has directly benefited from expanded production and use of these fuels. Analysis conducted by the United Soybean Board (USB) and reviewed by USDA's Agricultural Marketing Service demonstrates the substantial role biofuels play in overall soybean value. Using USDA production and price data and USB end-use consumption data, the analysis attributes a portion of total soybean crop value to soybean oil used in biodiesel and renewable diesel production.

In marketing year 2023/24, total U.S. soybean production value was $52.6 billion. Of this, $11.5 billion was generated from soybean oil production, with approximately 47 percent of that oil used for biofuels. As a result, biodiesel and renewable diesel accounted for roughly 10 percent of the total value generated by U.S. soybean farmers, or about $1.30 per bushel. While this figure represents an attribution rather than a direct causal effect, it clearly illustrates the important role biofuel demand plays in supporting soybean pricing and market stability.

In 2024, Arkansas produced approximately 166 million bushels of soybeans. Based on the USB analysis, biodiesel and renewable diesel demand accounted for an estimated $215.9 million in value to Arkansas producers. At the farm level, this translates to nearly $35,750 in value for a grower with 500 acres of soybeans. Beyond farm income, the biodiesel and renewable diesel industry supports broader economic activity. Nationwide, the industry supports more than 107,000 jobs. In Arkansas alone, this equates to approximately $672 million in economic activity, nearly 1,670 jobs, and more than $94 million in wages.

Looking ahead, this project will help sustain and expand these benefits by supporting the year-over-year market growth needed to meet Clean Fuels' vision of reaching six billion gallons of use by 2030. Achieving this goal will require significant increases in soybean oil use as the primary feedstock for biodiesel, renewable diesel, sustainable aviation fuel, and Bioheat® fuel. The planned outcome of Clean Fuels' broader efforts is to increase soybean oil use in these markets by more than 800 million pounds in 2026 compared to 2025 levels, as benchmarked by federal data sources including USDA and the U.S. Energy Information Administration. Continued progress in these markets will strengthen long-term demand, enhance price support, and deliver lasting value for Arkansas soybean producers.

Project Budget:

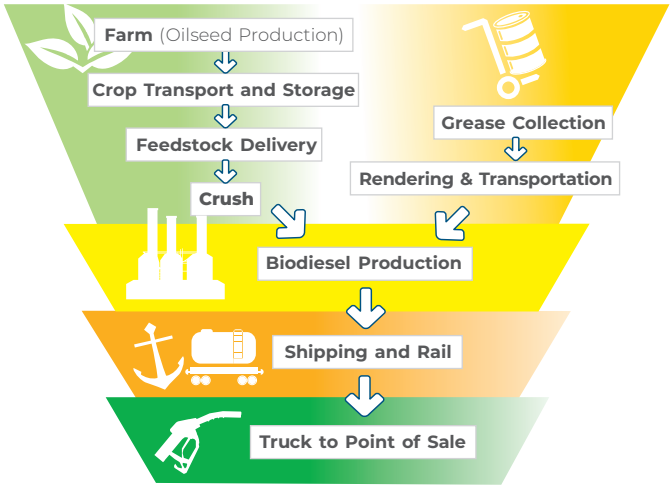
Clean Fuels Time		
Program Staff	2,120 hrs @ $150/hr	$ 318,000
Support Staff	100 hrs @ $110/hr	$ 11,000
Subcontractors Time and Expense		
Shenker, Russo and Clark		$ 60,000
Kahn, Sones, Conway		$ 68,004
Subscriptions/Publications - Lexus Nexus, Argus Media, State House news and others		$ 1,400
Sponsorships		$ 10,000
Membership dues		$ 2,196
Conference registrations		$ 2,400
Travel - Clean Fuels Staff	40 trips @ $1,250/trip	$ 50,000
Total		**$ 523,000**

Clean Fuels ALLIANCE AMERICA

America's Economic Engine

Clean Fuels Growth Accelerates, Strengthening the U.S. Economy

Clean Fuel Value Chain



U.S. Economic Impact (2024)

5 BILLION
Gallons

$42.4 BILLION
Economic Impact

107,400
Jobs

$6 BILLION
Wages

Current Clean Fuel Production Impact by Sector

FARM SECTOR *OILSEED PRODUCTION*	CRUSH SECTOR *OILSEED PROCESSING*	CLEAN FUEL PRODUCTION SECTOR *BIODIESEL AND RENEWABLE DIESEL*
$15.2 B *30% of total impact*	**$3.9 B** *9% of total impact*	**$19.9 B** *47% of total impact*
30,600 *Jobs*	**8,600** *Jobs*	**41,500** *Jobs*
$1.5 B *Wages*	**$410 M** *Wages*	**$2.4 B** *Wages*

Exponential Growth from 2022 - 2024

	2021	2024	SOON
U.S. biodiesel, renewable diesel market (gallons)	*3 billion*	*5.9 billion*	*7.4 billion*
Full-time jobs	*75,200*	*107,400*	*145,700*
Wages paid	*$3.6 billion*	*$6 billion*	*$7.8 billion*
Economic activity	*$23.2 billion*	*$42.4 billion*	*$60.25 billion*

Source: GlobalData, Economic Impact of Biodiesel on the US Economy 2024

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cleanfuels.org

Materials supported by the United Soybean Board, soybean farmers and their checkoff.

CONSOLIDATED REPORT OF

CLEAN FUELS ALLIANCE AMERICA AND AFFILIATE

SEPTEMBER 30, 2025 AND 2024

WILLIAMS KEEPERS LLC
CERTIFIED PUBLIC ACCOUNTANTS & CONSULTANTS

2005 West Broadway, Suite 100
Columbia, MO 65203 | (573) 442-6171

3220 West Edgewood, Suite E
Jefferson City, MO 65109 | (573) 635-6196

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INDEPENDENT AUDITOR'S REPORT

To the Board of Directors of
Clean Fuels Alliance America and Affiliate

Opinion

We have audited the accompanying consolidated financial statements of Clean Fuels Alliance America and Affiliate (the Organization), which comprise the consolidated statements of financial position as of September 30, 2025 and 2024, and the related consolidated statements of activities, functional expenses, and cash flows for the years then ended, and the related notes to the consolidated financial statements.

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Organization as of September 30, 2025 and 2024, and the changes in its net assets and its cash flows for the years then ended in accordance with accounting principles generally accepted in the United States of America.

Basis for Opinion

We conducted our audit in accordance with auditing standards generally accepted in the United States of America (GAAS). Our responsibilities under those standards are further described in the Auditor's Responsibilities for the Audit of the Consolidated Financial Statements section of our report. We are required to be independent of the Organization and to meet our other ethical responsibilities in accordance with the relevant ethical requirements relating to our audit. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Responsibilities of Management for the Consolidated Financial Statements

Management is responsible for the preparation and fair presentation of these consolidated financial statements in accordance with accounting principles generally accepted in the United States of America, and for the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the consolidated financial statements, management is required to evaluate whether there are conditions or events, considered in the aggregate, that raise substantial doubt about the Organization's ability to continue as a going concern within one year after the date that the consolidated financial statements are available to be issued.

Auditor's Responsibilities for the Audit of the Consolidated Financial Statements

Our objectives are to obtain reasonable assurance about whether the consolidated financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance but is not absolute assurance and therefore is not a guarantee that an audit conducted in accordance with GAAS will always detect a material

misstatement when it exists. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control. Misstatements are considered material if there is a substantial likelihood that, individually or in the aggregate, they would influence the judgment made by a reasonable user based on the consolidated financial statements.

In performing an audit in accordance with GAAS, we:

- Exercise professional judgement and maintain professional skepticism throughout the audit.
- Identify and assess the risk of material misstatement of the consolidated financial statements, whether due to fraud or error, and design and perform audit procedures responsive to those risks. Such procedures include examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Organization's internal control. Accordingly, no such opinion is expressed.
- Evaluate the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluate the overall presentation of the financial statements.
- Conclude whether, in our judgment, there are conditions or events in the aggregate, that raise substantial doubt about the Organization's ability to continue as a going concern for a reasonable period of time.

We are required to communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit, significant audit findings, and certain internal control related matters that we identified during the audit.

Report on Supplementary Information

Our audits were conducted for the purpose of forming an opinion on the consolidated financial statements as a whole. The consolidating statements on pages 15-18 are presented for purposes of additional analysis and are not a required part of the consolidated financial statements. Such information is the responsibility of management and was derived from and relates directly to the underlying accounting and other records used to prepare the consolidated financial statements. The information has been subjected to the auditing procedures applied in the audit of the consolidated financial statements and certain additional procedures, including comparing and reconciling such information directly to the underlying accounting and other records used to prepare the consolidated financial statements or to the consolidated financial statements themselves, and other additional procedures in accordance with auditing standards generally accepted in the United States of America. In our opinion, the information is fairly stated in all material respects in relation to the financial statements as a whole.

Williams Keepers LLC

Jefferson City, Missouri
January 13, 2026

CLEAN FUELS ALLIANCE AMERICA AND AFFILIATE
CONSOLIDATED STATEMENTS OF FINANCIAL POSITION
September 30, 2025 and 2024

	2025	2024
ASSETS		
CURRENT ASSETS		
Cash and cash equivalents	$ 2,634,012	$ 3,355,238
Investments	6,211,086	5,755,573
Accounts receivable, net of allowance of $10,000	2,090,855	1,946,174
Prepaid expenses	526,492	581,286
Total current assets	11,462,445	11,638,271
LONG-TERM INVESTMENTS	329,059	170,351
PROPERTY AND EQUIPMENT, NET	1,372,610	1,446,800
OPERATING LEASE RIGHT-OF-USE-ASSET	82,518	231,377
Total assets	$ 13,246,632	$ 13,486,799
LIABILITIES AND NET ASSETS		
CURRENT LIABILITIES		
Accounts payable	$ 558,035	$ 582,980
Deferred revenue	296,408	359,620
Deferred dues	205,500	203,000
Accrued liabilities	337,477	341,578
Operating lease liability	83,259	83,259
Total current liabilities	1,480,679	1,570,437
LONG-TERM OPERATING LEASE LIABILITY	-	136,134
DEFERRED COMPENSATION PAYABLE	244,603	114,679
Total liabilities	1,725,282	1,821,250
NET ASSETS WITHOUT DONOR RESTRICTIONS	11,521,350	11,665,549
Total liabilities and net assets	$ 13,246,632	$ 13,486,799

The notes to consolidated financial statements are an integral part of these statements.

CLEAN FUELS ALLIANCE AMERICA AND AFFILIATE
CONSOLIDATED STATEMENTS OF ACTIVITIES
Years Ended September 30, 2025 and 2024

	2025	2024
REVENUES		
Membership and volume dues	$ 4,080,197	$ 4,922,905
Project funds	10,860,759	12,193,360
Conference income	1,244,508	1,416,309
Federal grants	163,183	341,251
Investment income	627,807	990,340
Other income	275,853	337,761
Total revenues	17,252,307	20,201,926
EXPENSES		
Subcontractor services	7,874,538	8,504,563
Salaries and benefits	4,701,769	4,617,113
Advertising	870,080	1,560,435
Legal fees	760,754	762,941
Food cost	714,530	633,915
Travel	661,314	667,961
Conference/meeting fees and expenses	315,211	261,263
Subscriptions and publications	274,160	225,023
Sponsorship	227,642	244,004
Membership fees	189,936	177,654
Rent and utilities	170,559	158,193
Supplies	141,804	125,965
Insurance	102,109	76,669
Depreciation	74,190	71,890
Promotional materials	65,697	84,835
Internet service	57,605	53,887
Maintenance	37,855	28,846
Telephone	30,840	24,271
Credit card processing fees	30,001	33,376
Media/broadcasting	23,807	17,745
Software expenses	19,860	20,247
Postage and shipping	15,781	16,330
Printing	5,626	19,861
Bad debt expenses	3,306	-
Miscellaneous	27,532	18,722
Total expenses	17,396,506	18,405,709
Change in net assets	(144,199)	1,796,217
Net assets, beginning of year	11,665,549	9,869,332
Net assets, end of year	$ 11,521,350	$ 11,665,549

The notes to consolidated financial statements are an integral part of these statements.

CLEAN FUELS ALLIANCE AMERICA AND AFFILIATE
CONSOLIDATED STATEMENT OF FUNCTIONAL EXPENSES
Year Ended September 30, 2025

	Program Services					Supporting Services			
	Communication	Education and Outreach	State and Federal	Technical	Total Program Services	Management and General	Fundraising	Total Supporting Services	Total
Subcontractor services	$ 723,113	$ 1,512,329	$ 1,382,335	$ 3,925,087	$ 7,542,864	$ 164,532	$ 167,142	$ 331,674	$ 7,874,538
Salaries and benefits	626,601	588,935	859,285	727,531	2,802,352	1,863,691	35,726	1,899,417	4,701,769
Advertising	675,080	-	195,000	-	870,080	-	-	-	870,080
Legal fees	-	-	587,678	4,718	592,396	168,358	-	168,358	760,754
Food cost	7,068	548,522	-	60,410	616,000	47,361	51,169	98,530	714,530
Travel	63,721	279,239	84,938	113,727	541,625	33,143	86,546	119,689	661,314
Conference/meeting fees and expenses	17,589	139,787	15,589	66,739	239,704	75,507	-	75,507	315,211
Subscriptions and publications	78,131	122,394	69,444	615	270,584	3,576	-	3,576	274,160
Sponsorship	150,463	32,500	19,169	10,000	212,132	9,610	5,900	15,510	227,642
Membership fees	425	-	114,304	73,667	188,396	1,540	-	1,540	189,936
Rent and utilities	-	-	153,349	-	153,349	17,210	-	17,210	170,559
Supplies	8,438	8,674	2,165	57,250	76,527	45,405	19,872	65,277	141,804
Insurance	-	-	-	-	-	102,109	-	102,109	102,109
Depreciation	-	-	-	-	-	74,190	-	74,190	74,190
Promotional materials	38,203	26,346	-	-	64,549	1,148	-	1,148	65,697
Internet service	4,161	14,184	11,752	1,438	31,535	26,070	-	26,070	57,605
Maintenance	-	2,913	-	-	2,913	34,942	-	34,942	37,855
Telephone	-	-	9,363	-	9,363	21,477	-	21,477	30,840
Credit card processing fees	-	23,811	-	3,604	27,415	1,760	826	2,586	30,001
Media/broadcasting	23,807	-	-	-	23,807	-	-	-	23,807
Software expenses	49	1,200	-	-	1,249	18,611	-	18,611	19,860
Postage and shipping	4,855	531	63	-	5,449	10,332	-	10,332	15,781
Printing	78	403	5,145	-	5,626	-	-	-	5,626
Bad debt expenses	-	-	-	3,306	3,306	-	-	-	3,306
Miscellaneous	20	429	50	9,474	9,973	17,559	-	17,559	27,532
	$ 2,421,802	$ 3,302,197	$ 3,509,629	$ 5,057,566	$ 14,291,194	$ 2,738,131	$ 367,181	$ 3,105,312	$ 17,396,506

The notes to consolidated financial statements are an integral part of these statements.

CLEAN FUELS ALLIANCE AMERICA AND AFFILIATE
CONSOLIDATED STATEMENT OF FUNCTIONAL EXPENSES
Year Ended September 30, 2024

	Program Services					Supporting Services			
	Communication	Education and Outreach	State and Federal	Technical	Total Program Services	Management and General	Fundraising	Total Supporting Services	Total
Subcontractor services	$ 730,667	$ 1,294,399	$ 1,790,896	$ 4,360,177	$ 8,176,139	$ 173,131	$ 155,293	$ 328,424	$ 8,504,563
Salaries and benefits	575,756	671,495	845,543	705,377	2,798,171	1,793,166	25,776	1,818,942	4,617,113
Legal fees	-	-	389,325	-	389,325	373,616	-	373,616	762,941
Advertising	1,070,435	490,000	-	-	1,560,435	-	-	-	1,560,435
Travel	64,701	248,334	116,165	99,470	528,670	43,281	96,010	139,291	667,961
Food cost	8,827	483,613	21	55,173	547,634	40,069	46,212	86,281	633,915
Conference/meeting fees and expenses	20,834	94,528	19,082	73,236	207,680	48,159	5,424	53,583	261,263
Sponsorship	112,200	42,794	38,940	29,250	223,184	14,420	6,400	20,820	244,004
Rent and utilities	-	-	141,654	-	141,654	16,539	-	16,539	158,193
Subscriptions and publications	88,835	100,718	28,454	817	218,824	6,199	-	6,199	225,023
Membership fees	-	-	118,507	57,677	176,184	1,470	-	1,470	177,654
Supplies	3,298	2,324	1,911	46,091	53,624	51,541	20,800	72,341	125,965
Insurance	-	-	-	-	-	76,669	-	76,669	76,669
Internet service	5,601	10	11,252	-	16,863	37,024	-	37,024	53,887
Promotional materials	66,695	17,338	-	-	84,033	802	-	802	84,835
Depreciation	-	-	-	-	-	71,890	-	71,890	71,890
Credit card processing fees	-	26,942	-	2,890	29,832	2,492	1,052	3,544	33,376
Software expenses	2,524	4,000	-	-	6,524	13,723	-	13,723	20,247
Telephone	-	-	8,698	-	8,698	15,573	-	15,573	24,271
Maintenance	-	3,480	-	-	3,480	25,366	-	25,366	28,846
Media/broadcasting	17,745	-	-	-	17,745	-	-	-	17,745
Postage and shipping	216	1,549	771	-	2,536	13,794	-	13,794	16,330
Printing	13,398	2,304	4,159	-	19,861	-	-	-	19,861
Miscellaneous	-	590	-	1,622	2,212	16,510	-	16,510	18,722
	$ 2,781,732	$ 3,484,418	$ 3,515,378	$ 5,431,780	$ 15,213,308	$ 2,835,434	$ 356,967	$ 3,192,401	$ 18,405,709

The notes to consolidated financial statements are an integral part of these statements.

CLEAN FUELS ALLIANCE AMERICA AND AFFILIATE
CONSOLIDATED STATEMENTS OF CASH FLOWS
Years Ended September 30, 2025 and 2024

	2025	2024
CASH FLOWS FROM OPERATING ACTIVITIES		
Change in net assets	$ (144,199)	$ 1,796,217
Adjustments to reconcile change in net assets to net cash provided by operating activities:		
Depreciation	74,190	71,890
Net gain on fair value of investments	(425,221)	(685,484)
Changes in operating assets and liabilities:		
Accounts receivable	(144,681)	394,286
Prepaid expenses	54,794	64,789
Accounts payable	(24,945)	(72,756)
Deferred compensation payable	129,924	114,679
Deferred revenue	(63,212)	291,045
Deferred dues	2,500	(55,000)
Accrued liabilities	8,624	42,933
Net cash provided (used) by operating activities	(532,226)	1,962,599
CASH FLOWS FROM INVESTING ACTIVITIES		
Purchase of property and equipment	-	(7,565)
Purchase of investments	(458,894)	(515,585)
Proceeds from sales and maturities of investments	269,894	212,295
Net cash used by investing activities	(189,000)	(310,855)
Net change in cash and cash equivalents	(721,226)	1,651,744
Cash and cash equivalents, beginning of year	3,355,238	1,703,494
Cash and cash equivalents, end of year	$ 2,634,012	$ 3,355,238

The notes to consolidated financial statements are an integral part of these statements.

CLEAN FUELS ALLIANCE AMERICA AND AFFILIATE

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

1. SIGNIFICANT ACCOUNTING POLICIES

Organization: Clean Fuels Alliance America, formerly National Biodiesel Board, was organized on November 1, 1992, exclusively to advance the common business interests of those parties seeking to advance the use of biodiesel.

Clean Fuel Alliance Foundation, formerly National Biodiesel Foundation (the Foundation), was organized to accomplish activities in the fields of education, science, literature, charity, and religion, including research for the advancement of the use of fuels and other products derived from soybeans.

Principles of consolidation: The accompanying consolidated financial statements include the accounts of the Clean Fuels Alliance America and its affiliate, the Foundation, consistent with the guidelines of U.S. generally accepted accounting principles (GAAP). According to GAAP, if a not-for-profit corporation controls a related entity through a majority voting interest of the related entity, the financial statements of the related entity must be consolidated with those of the controlling entity, and all significant balances and transactions between the two entities must be eliminated in the consolidated statements. A majority of the Foundation's Board of Directors are also members of the Governing Board of the Clean Fuels Alliance Foundation or are representatives of a Clean Fuels Alliance America member company. For financial statement reporting purposes, the consolidated entity is referred to as the Organization.

Basis of accounting: The consolidated financial statements of the Organization have been prepared on the accrual basis of accounting; therefore, revenues are recognized when earned and expenses are recognized when incurred.

Financial statement presentation: The Organization reports information regarding its financial position and activities according to two classes of net assets: without donor restrictions and with donor restrictions.

> *Net assets without donor restrictions*: Net assets available for use in general operations and not subject to donor- (or grantor-) restrictions. As of September 30, 2025 and 2024, the Board of Directors has designated as a general reserve net assets without donor restrictions totaling $6,540,145 and $5,925,924, respectively.
>
> *Net assets with donor restrictions*: Net assets subject to donor- (or certain grantor-) imposed restrictions. Some donor-imposed restrictions are temporary in nature, such as those that will be met by the passage of time or other events specified by the donor. Other donor-imposed restrictions are perpetual in nature, where the donor stipulates those resources be maintained in perpetuity. Donor-imposed restrictions are released when a restriction expires, that is, when the stipulated time has elapsed, when the stipulated purpose for which the resource was restricted has been fulfilled, or both. As of September 30, 2025 and 2024, the Organization did not have any net assets with donor restrictions.

Cash and cash equivalents: Cash and cash equivalents consist of all highly liquid investments with an original maturity of three months or less. The Organization maintains cash balances at established financial institutions. Accounts at these institutions are insured by the Federal Deposit Insurance Corporation (FDIC), subject to certain limitations. At times the Organization maintains cash on deposit at financial institutions in excess of amounts insured by the FDIC.

Investments: Investments in equity securities with readily determinable market values and all investments in debt securities are reported at fair value. Fair value represents the estimated market value of the underlying securities and is generally obtained from the Organization's investment custodians and managers, who obtain quoted market prices and dealer quotes.

Accounts receivable: Accounts receivable are stated at face amount less an allowance for credit losses. The allowance for credit losses is estimated by a combination of specific identification and analysis of historical collection trends. Accounts receivable were $2,090,855; $1,946,174; and $2,340,460; as of September 30, 2025; 2024; and 2023; respectively.

Changes in the allowance for credit losses on accounts receivable is summarized as follows for the years ended September 30:

	2025	2024
Allowance for credit losses, beginning of year	$ 10,000	$ 10,000
Provisions	3,306	-
Write-offs	(3,306)	-
Allowance for credit losses, end of year	$ 10,000	$ 10,000

Property and equipment: Property and equipment is stated at cost, or fair value if contributed, and depreciated on a straight-line basis over the estimated useful lives of the respective assets, ranging from 3 to 40 years. Property and equipment are capitalized if original acquisition value is over $5,000.

Leases: The Organization leases office space and determines if an arrangement is a lease at inception. Operating leases are included in operating lease right-of-use (ROU) assets and operating lease liabilities on the accompanying statements of financial position. Operating lease ROU assets represent the Organization's right to use an underlying asset for the lease term and operating lease liabilities represent the Organization's obligation to make lease payments arising from the lease.

In evaluating contracts to determine if they qualify as a lease, the Organization considers factors such as if it has obtained substantially all of the rights to the underlying asset through exclusivity, if it can direct the use of the asset by making decisions about how and for what purpose the asset will be used, and if the lessor has substantive substitution rights, which may require significant judgement.

Operating lease ROU assets and operating lease liabilities are recognized at commencement date based on the present value of the lease payments over the lease term. The Organization utilizes the risk-free rate to determine the present value of lease payments. The operating lease ROU asset also includes any lease payments made and excludes lease incentives. The lease terms may include options to extend or terminate the lease when it is reasonably certain the Organization will exercise that option. Lease expense for lease payments is recognized on a straight-line basis over the lease term. The Organization's lease agreements do not contain any material residual value guarantees or material restrictive covenants.

Deferred revenue and deferred dues: Deferred revenue represents monies received before yearend for projects that are to be completed in the following fiscal year. Deferred revenue was $296,408; $359,620; and $68,575; as of September 30, 2025; 2024; and 2023; respectively.

Deferred dues represent membership dues received in advance of when the services will be provided. Deferred dues were $205,500; $203,000; and $258,000; as of September 30, 2025; 2024; and 2023; respectively.

Compensated absences: The Organization's staff accrue ten hours of annual leave per month for the first ten years of service. After ten years of service, all staff accrue twelve hours per month. The maximum accrual may not exceed 300 hours per employee. As of September 30, 2025 and 2024, the accrued vacation liability was $337,477 and, $341,578 respectively.

Revenue recognition: Grants are recognized as revenues when earned by meeting grant requirements. Grant funds received for use in subsequent years are recorded as deferred revenues. Dues are recorded based on the year of membership covered by such dues. Therefore, a deferred liability is included in the accompanying consolidated statements of financial position for dues that are received by the Organization in advance of the year covered by those dues. In addition, the Organization has entered into agreements with the United Soybean Board, the American Soybean Association, and qualified state soybean boards to be reimbursed for approved program costs and out-of-pocket expenses incurred. These costs shall not exceed the funding level approved for each specific program authorized. Other revenues are recognized at the time services are provided.

Functional allocation of expenses: The consolidated statements of activities present the natural classification detail of expenses in total. The consolidated statements of functional expenses present the natural classification detail of expenses by function. Accordingly, certain costs have been allocated among the programs and supporting services benefited.

Advertising: The Organization uses media and advertising merchandise to promote its programs. The Organization follows the policy of charging the cost of advertising to expense as incurred. During the years ended September 30, 2025 and 2024, advertising costs totaled $870,080 and $1,560,435, respectively.

Estimates: The preparation of consolidated financial statements in conformity with GAAP requires management to make estimates and assumptions that affect certain reported amounts and disclosures. Accordingly, actual results could differ from those estimates.

Income taxes: Clean Fuels Alliance America is exempt from federal and state income tax under Internal Revenue Service Code Section 501(c)(6). Clean Fuels Alliance Foundation is exempt from federal income tax under Internal Revenue Service Code Section 501(c)(3). However, any income from certain activities not directly related to the tax-exempt purpose of these entities is subject to taxation as unrelated business income. Such unrelated business income results from sales of information technology web hosting, design, and advertising.

Reclassifications: Certain prior year amounts have been reclassified to conform with current year presentation.

Subsequent events: Events that have occurred subsequent to September 30, 2025, have been evaluated through January 13, 2026, which represents the date the Organization's consolidated financial statements were approved by management and therefore were available to be issued.

2. LIQUIDITY AND AVAILABILITY

Financial assets available for general expenditure, that is, without donor or other restrictions limiting their use, within one year of the consolidated statements of financial position date, comprise the following:

	2025	2024
Cash and cash equivalents	$ 2,634,012	$ 3,355,238
Investments	6,211,086	5,755,573
Accounts receivable	2,090,855	1,946,174
	$ 10,935,953	$ 11,056,985

As part of the Organization's strategic plan, the Organization designates all of its investments for a general reserve. The balance of the general reserve was $6,540,145 and $5,925,924 as of September 30, 2025 and 2024, respectively.

3. INVESTMENTS

Investments consisted of the following as of September 30:

	2025		2024	
	Cost	Fair Value	Cost	Fair Value
Certificates of deposit	$ 123,125	$ 134,360	$ 123,125	$ 131,086
Equity mutual funds	1,578,786	3,525,852	1,572,444	3,033,254
Fixed income mutual funds	2,799,335	2,631,130	2,714,335	2,538,145
Other investments	232,457	248,803	221,057	223,439
Total investments	$ 4,733,703	$ 6,540,145	$ 4,630,961	$ 5,925,924

Investment return consisted of the following for the years ended September 30:

	2025	2024
Dividends and interest	$ 240,033	$ 190,371
Net realized gain (loss) on sales of investments	(7,681)	113,711
Net unrealized gain resulting from change in fair value of investments	425,221	685,484
Administrative fees	(29,766)	(27,104)
Total investment return	$ 627,807	$ 962,462

For assets and liabilities required to be reported at fair value, accounting principles generally accepted in the United States of America (GAAP) prescribes a framework for measuring fair value and financial statement disclosures about fair value measurements. A fair value hierarchy has been established that distinguishes between market participant assumptions based on market data obtained from sources independent of the reporting entity (observable inputs that are classified within Levels 1 and 2 of the hierarchy) and the reporting entity's own assumptions about market participant assumptions (unobservable inputs classified within Level 3 of the hierarchy).

The prescribed fair value hierarchy is as follows:

Level 1	Valuation is based upon quoted prices (unadjusted) in active markets for identical assets or liabilities that the Organization has the ability to access.
Level 2	Valuation is based upon quoted prices for similar assets and liabilities in active markets, as well as inputs that are observable for the asset or liability (other than quoted prices), such as interest rates, foreign exchange rates, and yield curves that are observable at commonly quoted intervals.
Level 3	Valuation is generated from model-based techniques that use at least one significant assumption based on unobservable inputs for the asset or liability, which are typically based on an entity's own assumptions, as there is little, if any, related market activity.

In instances where the determination of the fair value measurement is based on inputs from different levels of the fair value hierarchy, the level in the fair value hierarchy within which the entire fair value measurement falls is based on the lowest level input that is significant to the fair value measurement in its entirety. The Organization's assessment of the significance of a particular input to the fair value measurement in its entirety requires judgment and considers factors specific to the asset or liability.

The Organization's assets and liabilities measured at fair value on a recurring basis as of September 30 aggregated by the level in the fair value hierarchy within which those measurements fall, are as follows:

2025 Description	Total	Level 1	Level 2	Level 3
Certificates of deposit	$ 134,360	$ -	$ 134,360	$ -
Equity mutual funds	3,525,852	3,525,852	-	-
Fixed income mutual funds	2,631,130	2,631,130	-	-
Other investments	248,803	248,803	-	-
Total investments	$ 6,540,145	$ 6,405,785	$ 134,360	$ -

2024 Description	Total	Level 1	Level 2	Level 3
Certificates of deposit	$ 131,086	$ -	$ 131,086	$ -
Equity mutual funds	3,033,254	3,033,254	-	-
Fixed income mutual funds	2,538,145	2,538,145	-	-
Other investments	223,439	223,439	-	-
Total investments	$ 5,925,924	$ 5,794,838	$ 131,086	$ -

Level 1 classifications above consist of equity mutual funds, fixed income mutual funds, and other investments that have readily determinable fair values based upon quoted prices in active markets.

Level 2 classifications above consist of certificates of deposits where fair value could be determined based on quoted prices of similar assets.

4. PROPERTY AND EQUIPMENT

Property and equipment consisted of the following as of September 30:

	2025	2024
Land	$ 179,407	$ 179,407
Equipment	173,658	173,658
Building	1,884,319	1,884,319
	2,237,384	2,237,384
Less accumulated depreciation	(864,774)	(790,584)
Property and equipment, net	$ 1,372,610	$ 1,446,800

Depreciation expense for the years ended September 30, 2025 and 2024 totaled $74,190 and $71,890, respectively.

5. LEASES

The Organization has an operating lease for office space, which includes options to extend the lease or options to terminate the lease. Additionally, the Organization has some short-term leases and has elected to apply the short-term practical expedient for them. The components of lease expense were as follows for the years ended September 30:

	2025	2024
Operating lease expense	$ 142,760	$ 142,760
Variable lease expense	7,821	5,274
Total	$ 150,581	$ 148,034

Other information related to leases is as follows:

	2025	2024
Cash paid for amounts included in the measurement of lease liabilities:		
Operating cash flows from operating leases	$ 142,151	$ 138,678
Weighted-average remaining lease term in years for operating leases	0.58	1.58
Weighted-average discount rate for operating leases	4.12%	4.12%

Future minimum lease payments under non-cancellable leases as of September 30, 2025, are as follows for the years ending September 30:

2026	$ 84,117
Less: present value discount	(858)
Total lease liabilities	$ 83,259

6. RETIREMENT PLAN

The Organization maintains a 401(k) retirement plan. All employees who are at least twenty-one years of age and have completed six months of service are eligible to participate in the plan. Eligible employees can contribute up to the maximum allowed by law. The Organization matches employee contributions 100% up to a maximum of 6% of employee compensation for all eligible participants. Contributions made by the Organization to the plan totaled $208,410 and $204,146 for the years ended September 30, 2025 and 2024, respectively.

The Organization also maintains a 457(f) deferred compensation plan. The purpose of this plan is to provide deferred compensation benefits to the Organization's management. During the years ended September 30, 2025 and 2024, the Organization's contributions to the plan totaled $100,000 and $100,000, respectively. The contributions into the plan have been invested into separate accounts. The investments and related deferred compensation payable totaled $244,603 and $114,679 as of June 30, 2025 and 2024, respectively.

7. CONTINGENCIES

The Organization is a party to a number of lawsuits arising in the normal course of business. While the results of the litigation cannot be predicted with certainty and based upon the advice of the Organization's legal counsel, management believes the final outcome of such litigation will not have a material adverse effect on the Organization's financial position or the results of its operations.

SUPPLEMENTARY INFORMATION

CLEAN FUELS ALLIANCE AMERICA AND AFFILIATE
CONSOLIDATING STATEMENT OF FINANCIAL POSITION
September 30, 2025

	Clean Fuels Alliance America	Clean Fuels Alliance Foundation	Eliminations	Consolidated
ASSETS				
CURRENT ASSETS				
Cash and cash equivalents	$ 2,421,778	$ 212,234	$ -	$ 2,634,012
Investments	6,161,182	49,904	-	6,211,086
Accounts receivable, net of allowance of $10,000	2,090,855	-	-	2,090,855
Prepaid expenses	526,492	-	-	526,492
Total current assets	11,200,307	262,138	-	11,462,445
LONG-TERM INVESTMENTS	244,603	84,456	-	329,059
PROPERTY AND EQUIPMENT				
Land	179,407	-	-	179,407
Equipment	173,658	-	-	173,658
Building	1,884,319	-	-	1,884,319
Less accumulated depreciation	(864,774)	-	-	(864,774)
Property and equipment, net	1,372,610	-	-	1,372,610
OPERATING LEASE RIGHT-OF-USE-ASSET	82,518	-	-	82,518
Total assets	$ 12,900,038	$ 346,594	$ -	$ 13,246,632
LIABILITIES AND NET ASSETS				
CURRENT LIABILITIES				
Accounts payable	$ 553,585	$ 4,450	$ -	$ 558,035
Deferred revenue	296,408	-	-	296,408
Deferred dues	205,500	-	-	205,500
Accrued liabilities	337,477	-	-	337,477
Operating lease liability	83,259	-	-	83,259
Total current liabilities	1,476,229	4,450	-	1,480,679
DEFERRED COMPENSATION PAYABLE	244,603	-	-	244,603
Total liabilities	1,720,832	4,450	-	1,725,282
NET ASSETS WITHOUT DONOR RESTRICTIONS	11,179,206	342,144	-	11,521,350
Total liabilities and net assets	$ 12,900,038	$ 346,594	$ -	$ 13,246,632

CLEAN FUELS ALLIANCE AMERICA AND AFFILIATE
CONSOLIDATING STATEMENT OF ACTIVITIES
Year Ended September 30, 2025

	Clean Fuels Alliance America	Clean Fuels Alliance Foundation	Eliminations	Consolidated
REVENUES				
Membership and volume dues	$ 4,080,197	$ -	$ -	$ 4,080,197
Project funds	10,860,759	-	-	10,860,759
Conference income	1,244,508	-	-	1,244,508
Federal grants	-	163,183	-	163,183
Investment income	620,049	7,758	-	627,807
Other income	170,309	233,979	(128,435)	275,853
Total revenues	16,975,822	404,920	(128,435)	17,252,307
EXPENSES				
Subcontractor services	7,669,016	205,522	-	7,874,538
Salaries and benefits	4,701,769	-	-	4,701,769
Advertising	870,080	-	-	870,080
Legal fees	759,389	1,365	-	760,754
Food cost	707,988	6,542	-	714,530
Travel	621,493	39,821	-	661,314
Conference/meeting fees and expenses	313,397	1,814	-	315,211
Subscriptions and publications	274,160	-	-	274,160
Sponsorship	208,142	19,500	-	227,642
Membership fees	189,936	-	-	189,936
Rent and utilities	170,559	-	-	170,559
Supplies	136,552	5,252	-	141,804
Insurance	101,291	818	-	102,109
Depreciation	74,190	-	-	74,190
Promotional materials	65,697	-	-	65,697
Internet service	57,605	-	-	57,605
Maintenance	34,942	2,913	-	37,855
Telephone	30,840	-	-	30,840
Credit card processing fees	29,462	539	-	30,001
Media/broadcasting	23,807	-	-	23,807
Software expenses	19,860	-	-	19,860
Postage and shipping	15,444	337	-	15,781
Printing	5,626	-	-	5,626
Bad debt expenses	3,306	-	-	3,306
Miscellaneous	26,108	1,424	-	27,532
In-kind expenses	-	128,435	(128,435)	-
Total expenses	17,110,659	414,282	(128,435)	17,396,506
Change in net assets	(134,837)	(9,362)	-	(144,199)
Net assets, beginning of year	11,314,043	351,506	-	11,665,549
Net assets, end of year	$ 11,179,206	$ 342,144	$ -	$ 11,521,350

CLEAN FUELS ALLIANCE AMERICA AND AFFILIATE
CONSOLIDATING STATEMENT OF FINANCIAL POSITION
September 30, 2024

	Clean Fuels Alliance America	Clean Fuels Alliance Foundation	Eliminations	Consolidated
ASSETS				
CURRENT ASSETS				
Cash and cash equivalents	$ 3,111,495	$ 243,743	$ -	$ 3,355,238
Investments	5,680,159	75,414	-	5,755,573
Accounts receivable, net of allowance of $10,000	1,944,574	1,600	-	1,946,174
Prepaid expenses	580,194	1,092	-	581,286
Total current assets	11,316,422	321,849	-	11,638,271
LONG-TERM INVESTMENTS	114,679	55,672	-	170,351
PROPERTY AND EQUIPMENT				
Land	179,407	-	-	179,407
Equipment	173,658	-	-	173,658
Building	1,884,319	-	-	1,884,319
Less accumulated depreciation	(790,584)	-	-	(790,584)
Property and equipment, net	1,446,800	-	-	1,446,800
OPERATING LEASE RIGHT-OF-USE-ASSET	231,377	-	-	231,377
Total assets	$ 13,109,278	$ 377,521	$ -	$ 13,486,799
LIABILITIES AND NET ASSETS				
CURRENT LIABILITIES				
Accounts payable	$ 568,565	$ 14,415	$ -	$ 582,980
Deferred revenue	348,020	11,600	-	359,620
Deferred dues	203,000	-	-	203,000
Accrued liabilities	341,578	-	-	341,578
Operating lease liability	83,259	-	-	83,259
Total current liabilities	1,544,422	26,015	-	1,570,437
LONG-TERM OPERATING LEASE LIABILITY	136,134	-	-	136,134
DEFERRED COMPENSATION PAYABLE	114,679	-	-	114,679
Total liabilities	1,795,235	26,015	-	1,821,250
NET ASSETS WITHOUT DONOR RESTRICTIONS	11,314,043	351,506	-	11,665,549
Total liabilities and net assets	$ 13,109,278	$ 377,521	$ -	$ 13,486,799

CLEAN FUELS ALLIANCE AMERICA AND AFFILIATE
CONSOLIDATING STATEMENT OF ACTIVITIES
Year Ended September 30, 2024

	Clean Fuels Alliance America	Clean Fuels Alliance Foundation	Eliminations	Consolidated
REVENUES				
Membership and volume dues	$ 4,922,905	$ -	$ -	$ 4,922,905
Project funds	12,193,360	-	-	12,193,360
Conference income	1,416,309	-	-	1,416,309
Federal grants	2,010	341,251	(2,010)	341,251
Investment income	983,621	6,719	-	990,340
Other income	228,239	210,610	(101,088)	337,761
Total revenues	19,746,444	558,580	(103,098)	20,201,926
EXPENSES				
Subcontractor services	8,122,357	382,206	-	8,504,563
Salaries and benefits	4,619,123	-	(2,010)	4,617,113
Advertising	1,560,435	-	-	1,560,435
Legal fees	762,258	683	-	762,941
Travel	622,667	45,294	-	667,961
Food cost	628,729	5,186	-	633,915
Conference/meeting fees and expenses	259,361	1,902	-	261,263
Sponsorship	224,504	19,500	-	244,004
Subscriptions and publications	225,023	-	-	225,023
Membership fees	177,654	-	-	177,654
Rent and utilities	158,193	-	-	158,193
Supplies	119,768	6,197	-	125,965
Promotional materials	84,835	-	-	84,835
Insurance	75,851	818	-	76,669
Depreciation	71,890	-	-	71,890
Internet service	53,863	24	-	53,887
Credit card processing fees	32,538	838	-	33,376
Maintenance	25,366	3,480	-	28,846
Telephone	24,271	-	-	24,271
Software expenses	20,247	-	-	20,247
Printing	19,861	-	-	19,861
Media/broadcasting	17,745	-	-	17,745
Postage and shipping	16,330	-	-	16,330
Miscellaneous	17,371	1,351	-	18,722
In-kind expenses	-	101,088	(101,088)	-
Total expenses	17,940,240	568,567	(103,098)	18,405,709
Change in net assets	1,806,204	(9,987)	-	1,796,217
Net assets, beginning of year	9,507,839	361,493	-	9,869,332
Net assets, end of year	$ 11,314,043	$ 351,506	$ -	$ 11,665,549

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INDEPENDENT AUDITOR'S REPORT ON COMPLIANCE WITH REGULATORY REQUIREMENTS

To the Board of Directors of
Clean Fuels Alliance America and Affiliate

We have audited, in accordance with auditing standards generally accepted in the United States of America, the consolidated financial statements of Clean Fuel Alliance America and Affiliate (the Organization), which comprise the consolidated statements of financial position as of September 30, 2025 and 2024, and the related consolidated statements of activities, functional expenses, and cash flows for the years then ended, and the related notes to the consolidated financial statements, and have issued our report thereon dated January 13, 2026.

In connection with our audit, nothing came to our attention that caused us to believe that the Organization failed to comply with the terms of the Soybean Promotion, Research and Consumer Information Act of 1990 (the Act) and the Soybean Promotion and Research Order (the Order) relative to the use of funds collected by the State Board, insofar as they relate to accounting matters. However, our audit was not directed primarily toward obtaining knowledge of such noncompliance. Accordingly, had we performed additional procedures, other matters may have come to our attention regarding the Organization's noncompliance with the above-referenced Act and Order, insofar as they relate to accounting matters.

This report is intended solely for the information and use of the Board of Directors and management of Clean Fuels Alliance America and Affiliate, the United Soybean Board, the American Soybean Association, and the United States Department of Agriculture, and should not be used by anyone other than these specified parties.

Williams Keepers LLC

Jefferson City, Missouri
January 13, 2026

2 - PR-09

Organization/Institution Submitting Proposal:
Clean Fuels Alliance America (Clean Fuels)

Project Title:
Market Expansion Drive

Project Type:
Promotion

Name of Project Manager:
Brad Shimmens

Name of Project Team Member 1:
Heather Buechter

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Strategic communications play a vital role in stabilizing existing markets and fostering confidence while laying the groundwork for new opportunities. The Market Expansion Drive Project ensures biodiesel, renewable diesel and sustainable aviation fuel remain highly visible in an increasingly competitive energy landscape, positioning them as viable, trusted solutions. By reaching key audiences with targeted messaging and resources, this approach not only strengthens market confidence but also accelerates adoption, paving the way for sustained growth and industry leadership.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
This project will develop fact sheets, infographics, educational videos, testimonials, and other materials on an ongoing basis. Those assets will be utilized regularly on social media and in promotional advertising to educate target audiences.

BUDGET

Amount of Funding Needed for Project:
$20,000.00

Contribution Amount (from organization or sponsor):
$0.00

Clean Fuels
ALLIANCE AMERICA

January 30, 2026

Amount Requested: $20,000

Project Name: Market Expansion Drive

As the world accelerates its transition toward a low-carbon future, biodiesel, renewable diesel and sustainable aviation fuel (SAF) present promising opportunities to play a pivotal role in hard-to-electrify sectors such as rail, marine, aviation, and home heating. Strategic communications play a vital role in stabilizing existing markets and fostering confidence while laying the groundwork for these new opportunities.

The Market Expansion Drive project employs a proactive, offensive strategy to drive growth. Key tactics for success include launching highly targeted regional advertising campaigns and outreach initiatives tailored to critical stakeholder groups, such as environmental organizations, soybean farmers, sustainability directors in emerging markets, among others. Facilitating coordination among influential organizations will amplify these efforts, uniting the industry's voice and maximizing impact.

This project will employ a mix of advertising, media outreach to industry reporters, social media engagement, and other strategies to showcase data highlighting the quality and cost competitiveness of clean fuels, driving increased demand across diverse sectors. Leveraging geofence marketing, sponsored content, and strategic ad campaigns will direct traffic to cleanfuels.org, providing members and new markets with easy access to educational materials and compelling testimonials.

Strategic advertising ensures biodiesel, renewable diesel and SAF remain highly visible in an increasingly competitive energy landscape, positioning them as viable, trusted solutions. By reaching key audiences with targeted messaging and resources, this approach not only strengthens market confidence but also accelerates adoption, paving the way for sustained growth and industry leadership.

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800.841.5849

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cleanfuels.org

Statement of Justification or Purpose of the Project (75 word maximum):

Strategic communications play a vital role in stabilizing existing markets and fostering confidence while laying the groundwork for new opportunities. The Market Expansion Drive Project ensures biodiesel, renewable diesel and sustainable aviation fuel remain highly visible in an increasingly competitive energy landscape, positioning them as viable, trusted solutions. By reaching key audiences with targeted messaging and resources, this approach not only strengthens market confidence but also accelerates adoption, paving the way for sustained growth and industry leadership.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):

This project will develop fact sheets, infographics, educational videos, testimonials, and other materials on an ongoing basis. Those assets will be utilized regularly on social media and in promotional advertising to educate target audiences.

State the goals and objectives of the promotional activity:

Raising awareness and visibility of the biodiesel, renewable diesel and sustainable aviation fuel industries will help Clean Fuels members and state soybean associations develop positive relationships with key audiences and improve communication about soybean oil's environmental, economic and energy benefits. The clean fuels industry is working to produce six billion gallons by 2030 with significant increases in the use of soybean oil as the industry's primary feedstock. This project will communicate analysis developed by Clean Fuels in support of year-over-year market expansion in biodiesel, renewable diesel, sustainable aviation fuel and Bioheat® fuel. The following objectives will help achieve these goals:

- Market Confidence
  Stabilize existing markets by showcasing the quality, reliability and cost competitiveness of biodiesel, renewable diesel and sustainable aviation fuel.
- Market Expansion
  Drive adoption in hard-to-electrify sectors (rail, marine, aviation, home heating) through targeted advertising, media outreach and digital campaigns.
- Stakeholder Engagement
  Educate key audiences, including farmers, environmental organizations and sustainability leaders, while facilitating coordination among influential partners to amplify impact.
- Industry Leadership
  Elevate clean fuels in the competitive energy landscape, positioning them as trusted, low-carbon solutions that accelerate growth and secure long-term industry leadership.

Describe expected benefits to the Arkansas soybean industry from the proposed promotion project:

This project directly protects and grows the long-term value of Arkansas soybeans by strengthening one of the crop's fastest-growing demand channels: clean fuels. As soybean oil continues to be the cornerstone feedstock for biodiesel, renewable diesel and sustainable aviation fuel, farmer investment in market development helps ensure Arkansas producers remain competitive and well-positioned to supply future production.

By building confidence among fuel buyers, fleets and stakeholders, this effort reduces market volatility, supports stable pricing and helps attract new processing and infrastructure investment in the region. The result is stronger local markets, improved basis opportunities, and greater resilience for Arkansas farmers as global commodity and export markets face increasing uncertainty.

Growth of biodiesel and renewable diesel use has been key to increasing net income at the soybean producer level as well as throughout the value chain. As a soybean producing state, Arkansas has benefited directly from increased production and use of biodiesel and renewable diesel. The United Soybean Board (USB), calculation reviewed by USDA-Agricultural Marketing Service, conducted an enterprise value analysis to uncover the share of the value of United States (U.S.) soybean production that can be attributed to biodiesel and renewable diesel over time. It utilized data from the USDA for crop production and prices and the USB on the breakdown of meal and oil consumption by end use. It took a top-down approach to allocate the value of the crop production to soybean oil sold into biodiesel and renewable diesel production. Of the $52.6 billion in total value in marketing year 2023/24, $17.8 billion was generated from soybean meal production, $11.5 billion was generated from production of soybean oil and remaining amounts for the export and other markets. Since approximately 47% of the soybean oil produced in the U.S. was used for biofuels in MY2023/24, biodiesel and renewable diesel accounted for about 10% of the total production value generated by U.S. soybean farmers. Stated differently, biodiesel and renewable diesel accounted for $1.30 of the value of a bushel of soybeans in marketing year 2023/24. This estimate attributes a portion of the soybean oil's value to biofuel demand, highlighting the significant role of biofuels in soybean pricing. However, this $1.30 is an attribution rather than a direct causal effect; if biofuel demand were to cease, soybean prices would not automatically decrease by this amount. Market dynamics such as supply adjustments and demand elasticity would instead lead to a new price equilibrium.

In 2024, Arkansas produced approximately 166 million bushels. Based on this, biodiesel and renewable diesel accounted for $215.9 million in value for Arkansas producers. At the farm level, biodiesel and renewable diesel accounted for almost $35,750 of value for a grower with 500 acres of soybeans. In addition, the U.S. biodiesel and renewable diesel industry now supports more than 107,000 jobs nationwide. In Arkansas, this translates to $672 million in economic activity, almost 1,670 jobs supported, and more than $94 million in wages.

Looking forward, this project, and others being proposed by Clean Fuels, will help ensure year-over-year growth needed to meet the Clean Fuels vision to use six billion gallons by 2030 with significant increases in the use of soybean oil as the industry's primary feedstock for production biodiesel, renewable diesel, sustainable aviation fuel and Bioheat® fuel. The planned outcome of the overall Clean Fuels effort will be to increase 2026 soybean oil use in these markets by more than 800 million pounds from 2025 usage, as benchmarked by federal data sources such as USDA and DOE's Energy Information Administration.

Project Budget:

Clean Fuels Time		
Program Staff	2,130 hrs @ $150/hr	$ 319,500
Support Staff	180 hrs @ $110/hr	$ 19,800
Advertising		
Nation Branding and education campaign; Brownfield or similar fueling conversations; QSSB publications; Agri-Pulse		$ 1,226,800
Sponsorships		$ 12,000
Subcontractors Time and Expense		
Paulsen or similar		$ 143,500
Cosmic Sauce or similar		$ 31,200
High 5 or similar		$ 68,440
MCMH or similar		$ 45,000
TBD		$ 40,000
Coordinating meetings including food and facility		$ 6,000
Printing		$ 8,000
Promotional Materials		$ 5,000
Supplies/shipping		$ 10,000
Travel - Clean Fuels Staff or Ambassador/Speaker	14 trips @ $1,700/trip	$ 23,800
Total		**$ 1,959,040**

3 - PR-10

Organization/Institution Submitting Proposal:
WISHH program of ASA

Project Title:
WISHH Markets: Building Demand for U.S. Soy Trade Together

Project Type:
Promotion

Name of Project Manager:
Gena Perry

Name of Project Team Member 1:
Vickie Wilks

Name of Project Team Member 2:
Eric DeMerit

Statement of Justification or Purpose of the Project (75 word maximum):
The objective is to expand the number of international markets beyond those we have today by positioning Arkansas and other U.S. soy grower states as a vital ingredient for feed and food manufacturers to use to solve their developing/emerging countries' protein/food supply challenges.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
WISHH applies a regional, sector-specific market development approach, tailoring strategies to the needs and opportunities of each region. WISHH promotes the nutritional, economic, and functional benefits of U.S. soybean meal across animal feed systems—including aquaculture, poultry, dairy, and swine—while advancing soy-based human food markets by supporting processors and innovators using U.S. soy in tofu, beverages, baked goods, and fortified foods.

To drive sustained demand, WISHH strengthens soy adoption in feed and poultry industries and expands soy’s role in human nutrition through university-based food science education and engagement with food and beverage industry leaders. Implementation is supported through targeted technical expertise, in-country consultant visits, educational events, soy promotion campaigns, and trade team activities that build capacity, accelerate adoption, and create lasting market growth.

BUDGET

Amount of Funding Needed for Project:
$50,000.00

Contribution Amount (from organization or sponsor):
$1,200,000.00

WISHH - Arkansas Soybean Promotion Board Proposal

PROJECT TITLE: WISHH Markets – Building Demand for U.S. Soy Trade Together

BUDGET REQUESTED: $50,000 **FISCAL YEAR**: FY27 **PROJECT END DATE**: June 30, 2027

Project Purpose

WISHH – **founded** by U.S. soybean farmers, **governed** by U.S. soybean farmers, and **funded** by U.S. soybean farmers through state soybean boards and the United Soybean Board – represents a direct investment by farmers in partnership with USDA in expanding the reach and impact of U.S. soy worldwide.

At its core, WISHH's mandate is, **building new markets for U.S. soy in regions where there is no demand or demand is just emerging**. From Africa to Asia and Latin America, WISHH identifies opportunities where soy can improve nutrition, strengthen local economies, and meet growing protein needs. By opening doors in these developing markets, WISHH creates lasting demand for U.S. soy and provides a foundation for sustainable trade.

The WISHH team brings over a century of combined expertise in trade, nutrition, and market development. Operating in 25 countries today, WISHH leverages deep knowledge, local partnerships, and innovative strategies to turn U.S. soy into a solution for global food security, economic growth, and sustainable development.

WISHH is opening doors for U.S. soy by identifying markets where soy can fuel local economic growth with the purpose to create new and sustainable export opportunities for Arkansas and other U.S. soybean farmers by positioning soy as a preferred ingredient in feed and food manufacturing worldwide. By opening and expanding markets in developing and emerging countries, together with ASPB's support—this initiative will enhance the bottom line for Arkansas producers, diversifies export risk, and mitigates the impact of slowing demand from traditional markets, including China. Every dollar invested fuels new trade opportunities, strengthens communities, and ensures that the high-quality protein U.S. soy provides reaches those who need it most—making this a win-win for U.S. soybean farmers.

Through these efforts, WISHH strengthens supply chains, linking U.S. soy with new customers who rely on affordable, high-quality protein for both human consumption and animal feed. These connections create lasting demand, helping local businesses thrive while expanding the reach of U.S. agriculture. WISHH also empowers local companies to see the potential of soy as a smart, profitable solution. By demonstrating the nutritional, economic, and sustainable benefits of soy, WISHH helps communities adopt it in ways that improve livelihoods, strengthen markets, and create enduring partnerships. WISHH has a proven track record of establishing U.S. soy customers in markets that historically imported little or no U.S. soy.

Over the last decade, brand-new U.S. soy trade has taken root in WISHH countries, with soybean meal and soy protein ingredient exports continuing growth. By promoting Arkansas and U.S. soy as essential, high-quality protein ingredients, WISHH addresses both global food security challenges and creates sustainable market opportunities for U.S. soybean producers. In the last decade, WISHH has successfully built the commercial readiness of the following markets and transitioned them to USSEC to further grow U.S. soy market share: Pakistan, Bangladesh, Nigeria (poultry), Guatemala, Costa Rica, El Salvador, Dominican Republic, Honduras, Nicaragua and Myanmar.

WISHH Objective

The objective is to expand the number of international markets beyond those we have today by positioning Arkansas and other U.S. soy grower states as a vital ingredient for feed and food manufacturers to use to solve their developing/emerging countries' protein/food supply challenges.

Target Markets and Strategic Rational

WISHH operates in 25 developing and emerging countries across sub-Saharan Africa, Asia, and Latin America. These markets share strong long-term population growth projections and high rankings in protein deficiency and food insecurity, indicating robust demand for protein-rich foods for decades to come. WISHH utilizes market assessments, USDA FAS data and on-the-ground information to prioritize where we invest and how we invest farmer resources to create the best return on investment. The regions also benefit from high levels of private investment in logistics, energy, and financial technologies, which strengthens the supply chain and ensures efficient delivery of U.S. soy products. By strategically positioning soy in these markets, WISHH mitigates global trade risk while creating profitable opportunities for U.S. farmers. Target markets include:

- **Sub-Saharan Africa:** Benin, Burkina Faso, Ethiopia, Ghana, Guinea, Guinea-Bissau, Ivory Coast, Kenya, Mali, Nigeria, Senegal, Sierra Leone, Tanzania, Togo, Uganda, Zambia
- **Asia:** Cambodia, Laos Sri Lanka, Kazakhstan, Tajikistan, Kyrgyzstan, Turkmenistan, Georgia, Azerbaijan
- In CY26 WISHH is working to transition **Latin America to** USSEC due to the expansive and great work WISHH has done to bring those food markets to commercial readiness. WISHH will continue to implement one USDA program in the region in Costa Rica, El Salvador, Guatemala focused on university food science curriculum.

WISHH engages local entrepreneurs, industry influencers, and feed and aquaculture experts to ensure that prospective buyers can confidently adopt U.S. soy into their operations and products.

Overall Objectives

This project directly advances ASPB priorities by expanding global markets, increasing utilization of U.S. and Arkansas soy, and driving the development and demand for U.S soy.

Increasing international usage of Arkansas and U.S. soybeans and soybean-derived products:
WISHH builds demand and sustains new global markets for U.S. soy by connecting buyers, processors, and feed manufacturers with reliable, high-quality supply chains. Through its trade development and technical assistance programs, WISHH demonstrates soy's value in both human food and animal feed, driving measurable increases in international soy utilization. Each new market developed represents expanded demand and revenue opportunities for soybean farmers.

Strengthening customer preference for high-quality, sustainable Arkansas soy:
WISHH promotes the sustainability, traceability, and quality advantages of U.S. soy. By showcasing soy's role in supporting food security, economic growth, and responsible agricultural systems, WISHH helps customers and policymakers around the world recognize U.S. soy as the trusted choice for quality and reliability. These efforts reinforce global confidence in U.S. soy and ensure U.S. farmers are seen as leaders in sustainable production.

Supporting Arkansas farmers with on-farm resources and transportation partnerships:
By opening international channels for soy exports, WISHH creates downstream benefits that extend to Arkansas farms—improving demand signals, market access, and logistical efficiencies. Collaboration with trade partners and supply chain stakeholders helps identify infrastructure and transportation improvements that can reduce costs and enhance competitiveness for Arkansas producers.

This project transforms WISHH's market development expertise into tangible outcomes for Arkansas farmers—turning soy into a vehicle for global nutrition, economic opportunity, and long-term success for the state's agricultural community. These outcomes strengthen Arkansas's agricultural economy while creating a smoother pathway from farm to global market. Supporting WISHH transforms Arkansas soy into more than a commodity—it becomes a catalyst for global nutrition, economic development & trade, and sustainability. Partnering with WISHH opens doors, strengthens markets, and creates measurable, long-term impact for both U.S. farmers and generations to come.

Project Work Plan

WISHH applies a **regional, sector-specific approach** to market development—ensuring strategies that fit the needs and opportunities of each region.

- Promoting the nutritional, economic, and functional benefits of U.S. soybean meal in animal feed, aquaculture, poultry, dairy, and human foods.
- Promoting the nutritional, economic, and functional benefits of U.S. soybean meal in animal feed, aquaculture, poultry, dairy and swine. Advancing soy-based human food markets by supporting processors and innovators using U.S. soy in tofu, beverages, baked goods, and fortified foods.
- Driving growth in soy use for animal feed, aquaculture, and poultry industries—creating consistent demand while supporting local economic development.
- Expanding soy's role in human food and nutrition education by embedding soy science into university curricula and building awareness among food and beverage industry leaders.

To ensure the highest return on investment, WISHH deploys customized tools and activities for each region, including: **Technical consultant visits** and hands-on training for processors and producers, **Educational events, conferences, and seminars** to build market capacity, **Trade teams to the U.S.** for firsthand exposure to soy innovation and quality, **University-level soy education** programs focused on food science and nutrition, **On-the-ground support** from ASA/WISHH in-country representatives across Asia, Africa, and Latin America. Through these targeted strategies, WISHH transforms checkoff investments into global growth, local profitability, and long-term sustainability.

Measurable Project Milestones

Key Performance Indicators (KPIs) will track progress:

- **73%** of current users will continue or expand U.S. soy usage
- **66%** of non-users will adopt U.S. soy products within the year
- **87%** of the target audience will understand the nutritional, economic, and functional benefits of soy
- **87%** will commit to further product R&D incorporating soy

Program Governance, Reporting, and Communication Deliverables

- Farmer-Led Governance: The WISHH Program is guided by U.S. soybean farmers who shape strategy and oversee international program direction.

- Collaborative Communication and Transparency: WISHH is committed to open communication and collaboration with ASPB. Upon request, additional reports or program information will be provided. WISHH also proposes to partner with ASPB's Communications team to design a coordinated content production plan that aligns with ASPB's FY27 editorial calendar, helping share Arkansas's leadership in global soy market development.
- Regular Reporting and Accountability: WISHH will deliver quarterly narrative and financial reports by January 31, April 30, and July 31, followed by a comprehensive final report by October 31, 2027.
- Ongoing Engagement: Program updates will be shared through in-person and virtual presentations to ASPB, providing real-time insight into progress, outcomes, and next steps when requested.
- Amplifying Results and Recognition: WISHH will communicate program achievements and farmer impact through multiple channels, including LinkedIn, YouTube, WISHH.org, ASA eBean, ASA Magazine, and USDA/FAS communications platforms, extending visibility for ASPB's leadership in expanding U.S. soy's global footprint.
- Annual Summary and Next Steps: At the close of each fiscal year, WISHH will provide an annual progress report summarizing outcomes, measurable impacts, and strategic recommendations for continued collaboration and future growth.

Project Team

WISHH's implementation team brings 100 years of combined international business and market development experience, with 83% having lived in countries where WISHH operates. The team leverages an extensive network of USDA staff, international and U.S. industry experts, universities, and NGOs to deliver technical support, mentoring, and relationship-building programs for new customers.

Partnerships and Investment Impact

WISHH thrives on collaboration. By building strong, lasting partnerships with local businesses, nonprofits, universities, and community leaders, WISHH ensures solutions are effective, sustainable, and locally owned. These partnerships generate real-world impact. Together, WISHH and its partners along with U.S. soy farmers strengthen local economies, improve access to nutritious soy-based human food and enhance livestock production with the use of soy-based feed. Your support amplifies the value of U.S. soy, demonstrating its nutritional, economic, and sustainable potential while creating lasting demand.

This investment makes ASPB and the soy farmers it represents part of the solution, and it enables WISHH to build bridges that turn soy into a tool for international development, U.S. trade, and prosperity—delivering measurable impact on the ground and long-term benefits for U.S. soy farmers. WISHH connects U.S. soy with new markets, helping communities grow their economies while accessing affordable, high-quality protein. By building strong supply chains and demonstrating soy's value for food and animal feed, WISHH creates lasting demand for U.S. soy and empowers local businesses to thrive. Supporting WISHH turns soy into more than a commodity—it becomes a tool for nutrition, economic growth, and sustainable development worldwide.

Partnering with WISHH opens doors, strengthens markets, and creates measurable, long-term impact for both U.S. farmers and the communities they serve. U.S. soybean farmer investments in WISHH are critical for securing federal funding and enabling program execution. FY27 investments from ASPB and other U.S. soybean stakeholders will leverage **over $13 million** in USDA/Foreign Agricultural Services, United Soybean Board, and QSSB funding resources. This strategic investment will position Arkansas soybean farmers to expand global market share, enhance profitability, and strengthen the long-term resilience of Arkansas's soybean industry.

WISHH's proven ability to leverage state checkoff investments will continue throughout Fiscal Year 2027, maintaining the strong record established over the past nine years—generating an average of $6 in additional resources for every $1 invested by Qualified State Soybean Boards (QSSBs). This high return amplifies each checkoff dollar, multiplying the impact of Arkansas Soybean Promotion Board (ASPB) investments far beyond the initial contribution.

Beyond financial returns, ASPB's participation in WISHH provides direct, hands-on opportunities for Arkansas farmers**.** Through WISHH-led delegations and trade missions to frontier markets in sub-Saharan Africa, Asia, and Latin America**,** farmer-leaders witness firsthand how their investments are driving real progress—opening doors for soy exports, strengthening business relationships, and advancing food security and economic growth. ASPB's investment in WISHH is more than funding—together, it's a strategic partnership that delivers measurable global impact, market growth, and visibility for Arkansas's soybean industry**.**

Current Funding Source	Amount requested/awarded
USDA/Foreign Market Development and Market Access Program FY26 Projects (Requested)	$3.9 Million
USDA Regional Agricultural Promotion Program/FY24-29 (Awarded)	$5.1 Million
USDA Regional Agricultural Promotion Program/FY25-30 (Awarded)	$6.94 Million
United Soybean Board FY26 Projects (Awarded)	$1.9 Million
20+ other QSSB Investments (Requested)	$1.7 Million

Budget and Narrative and Financial Accountability: WISHH will deliver quarterly narrative and financial reports by January 31, April 30, and July 31, followed by a comprehensive final report by October 31, 2027.

Together, these investments multiply the power of every farmer dollar, expanding soy's reach and creating measurable results across the emerging and developing market continuum. Each dollar helps implement high-impact, market development activities that: **Strengthen soy's role in food and feed systems; Build technical expertise among value chain partners; Improve profitability, efficiency, and sustainability across the supply and demand sides; Create initial trade relationships for U.S. soy in developing and emerging markets.**

The **$50,000 investment** positions Arkansas Soybean Promotion Board and its soybean farmers as a pivotal leader in global soy expansion. It ensures access to federal funding streams, magnifies the value of every farmer dollar, and drives lasting demand for U.S. soy across multiple continents and sectors. Investing now means more than supporting WISHH—it means advancing the future of U.S. soy worldwide**.** Partnering with WISHH opens doors, strengthens markets, and creates measurable, long-term impact for both U.S. farmers and generations to come. Together, we can make U.S. soy a solution for food security, economic growth, and sustainable development—impacting people, communities, and markets for U.S. soybean farmers.

WISHH QSSB General Project Funding Budget		
Project Description	**Budget Request***	**WISHH Proposed Budget**
Contractual Services	**$ 4,563**	**$ 117,000**
Meetings, Workshops and Conferences	**$ 2,574**	**$ 66,000**
Travel	**$ 1,989**	**$ 51,000**
General Project & Project Development	**$ 5,713**	**$ 146,500**
Project Match to USDA Market Development Funding (MAP, FMD, EMP, ATP, RAPP	**$ 33,189**	**$ 851,000**
General Project Implementation Costs	**$ 1,972**	**$ 56,500**
Total 20+ QSSB Funding		**$1,288,000**
Total Arkansas Percentage of QSSB General Budget (3.9% of total WISHH General Project Budget)	**$50,000**	
*For Demonstration Purposes Only – reflects approximately 3.9% of each line item as an example of ASPB's leveraged support.		

4 - PI-08

Organization/Institution Submitting Proposal:
U.S. Meat Export Federation

Project Title:
USMEF Membership: A U.S. Pork Promotion Partnership

Project Type:
Promotion

Name of Project Manager:
John Hinners

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
USMEF's objective with this proposal is to help increase the profitability of soybean producers in Arkansas. Funding for USMEF membership from Arkansas Soybean Promotion Board will support USMEF's worldwide market development program for U.S. pork.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Value-added exports of U.S. pork contribute significantly to rural economic development. Soybean producers, sorghum producers, corn producers, livestock producers and feeders, the packing industry, transportation, agribusiness and export companies all benefit from value-added exports of U.S. red meats. With a substantial amount of soybeans produced in the U.S. destined for the livestock sector, Arkansas soybean producers also benefit directly from value-added exports of U.S. pork.

BUDGET

Amount of Funding Needed for Project:
$8,600.00

Contribution Amount (from organization or sponsor):
$0.00

FY2026 Partnership Proposal
for Arkansas Soybean Promotion Board
January 2026

Organization Name/Address: U.S. Meat Export Federation
1660 Lincoln Street, Suite 2800
Denver, Colorado 80264
Phone: 303-623-6328; Email: jhinners@usmef.org

Title of Project/Proposal: USMEF Membership: A U.S. Pork Promotion Partnership

Purpose/Expected Outcome: USMEF's objective with this proposal is to help increase the profitability of soybean producers in Arkansas. Funding for USMEF membership from Arkansas Soybean Promotion Board will support USMEF's worldwide market development program for U.S. pork.

How Will Project/Proposal Benefit Arkansas Soybean Growers? With a substantial volume of soybeans produced in the U.S. destined for the livestock sector, an increasing level of Arkansas soybean production makes its way onto tables around the world in the value-added form of U.S. pork**.**

Duration of Project/Proposal or Timeframe for Use of Funds: Arkansas Soybean Promotion Board's FY2026

Project Amount Requested from Arkansas Soybean Promotion Board: $8,600. USMEF requests that Arkansas Soybean Promotion Board consider becoming a member of USMEF and become a partner in the promotion of U.S. pork in international markets.

Co-Sponsors of Project/Proposal and Amounts: All funding sources include membership dues, private contributions, USDA, and beef, pork, soybean and feedgrain checkoff programs.

Will the Board's Contribution Help Create Matching Funding? Yes. Arkansas soybean checkoff dollars will be leveraged with funding from USDA, pork and soybean checkoff programs to support an aggressive market development and promotion effort for U.S. pork in leading markets around the world.

USMEF Will Provide Arkansas Soybean Promotion Board the Following Items Upon Request: Annual report, organization's goals and objectives, organizations chart/list of staff, progress report of project proposal, organization's constitution or bylaws, financial report, verified membership list and literature search to avoid duplication.

Overview

Arkansas Soybean Promotion Board (ASPB), in partnership with U.S. Meat Export Federation (USMEF), has an opportunity to increase demand for U.S. pork around the world. This partnership would contribute to an increase in the volume of soybeans consumed to produce U.S. pork for export. Collectively, pork, beef, poultry and dairy producers represent soybean growers' number one customer. Through this partnership, ASPB and USMEF would contribute to positive results for Arkansas soybean producers.

Soybean checkoff funding will be used to support an aggressive promotion effort for U.S. pork in key export markets. Funding support from the Arkansas soybean checkoff will enhance USMEF's ability to stimulate increased exports of U.S. pork. The Arkansas soybean contribution to USMEF's international marketing efforts will also illustrate the validity of investing soybean checkoff dollars in an arena that has excellent potential for growth.

Furthermore, USMEF will leverage every dollar contributed by Arkansas soybean producers to assist in generating additional investment from the USDA, the beef, pork, lamb, soybean, and feed grain checkoff programs, private industry contributions, and international third-party contributions.

U.S. Pork Exports in 2025 Just Below Record Pace

Exports of U.S. pork eclipsed previous highs in both volume and value in 2024, according to USDA. January-October 2025 pork exports reached 2.43 million mt, just 2% below the record pace of 2024. Export value was also down 2% to $6.93 billion. The year-over-year difference is mostly due to a 20% decline in exports to China (which are mainly variety meats), where U.S. pork is subject to burdensome retaliatory duties.

Importance of Pork Exports to the Arkansas Soybean Industry

Value-added exports of U.S. pork contribute significantly to rural economic development. Soybean producers, sorghum producers, corn producers, livestock producers and feeders, the packing industry, transportation, agribusiness and export companies all benefit from value-added exports of U.S. red meats. With a substantial amount of soybeans produced in the U.S. destined for the livestock sector, Arkansas soybean producers also benefit directly from value-added exports of U.S. pork.

In 2024, according to statistics provided by USDA's National Agricultural Statistics Service and data compiled by Dave Juday of World Perspectives, Inc.:

- Pork exports accounted for 3.83 million bushels of Arkansas Soybean usage in 2024.
- In 2024, the market value of pork exports to **Arkansas Soybeans = $42.58 million** (soybeans consumed by pork exports at average soybean price: 3.83 million bushels x $11.11 per bushel)
- Pork exports contributed 13.2% of bushel value = $1.46 per bushel (at an average price of $11.11 per bushel)

USMEF's Plan of Action

In international markets, USMEF works to increase demand for U.S. red meat by building a sustained presence in the retail meat case and on restaurant menus while increasing consumer confidence in the safety and quality of U.S. meat. Efforts are focused on target accounts with the greatest potential to increase their purchases of U.S. meat. In the retail sector, those target accounts are typically national and regional supermarket chains. USMEF's target groups in the food service sector are typically chain restaurants featuring a meat menu and catering services.

USMEF's educational activities are designed to inform these target groups about the availability and attributes of U.S. red meat as well as introduce new applications that illustrate product versatility. USMEF works with targeted buyers to incorporate increased and continuous purchases of U.S. meat into their purchasing plans by helping them to fully understand the long-term profit potential of U.S. meat and by demonstrating this potential through promotional activities. Where appropriate, USMEF may also support and undertake direct-to-consumer activities such as consumer advertising, public relations, social media, e-commerce and consumer events to effectively position U.S. red meats with international consumers.

Funding Request to Arkansas Soybean Promotion Board: $8,600

USMEF respectfully requests that the Arkansas Soybean Promotion Board consider joining USMEF with an annual dues membership of $8,600.

Performance Metrics

USMEF evaluates the impact of its programs at the strategic and tactical levels in each market. USMEF strategies are designed to deliver carefully crafted messages to specific target audiences. The performance

measures gauge the effectiveness of USMEF's strategies at delivering these messages and educating the target audience.

USMEF marketing programs are developed to change purchasing behavior and focus on target audiences that hold the greatest potential to increase purchases, and thus exports, of U.S. pork. To manage the cost of measuring the impact of its strategies, USMEF collects and analyzes information from selected representative members of the target audience. At the tactical level, USMEF collects and analyzes information, such as sales data from promotions, survey results from participants in trade teams and seminars, and estimates of the reach and value of public relations activities, to enhance the execution of selected activities.

USMEF will provide Arkansas Soybean Promotion Board the following items upon request: Annual report, organization's goals and objectives, organizations chart/list of staff, progress report of project proposal, organization's constitution or bylaws, financial report, verified membership list and literature search to avoid duplication.

Brief Description of USMEF Team Capabilities, Expertise and Network:

USMEF has been a participant in USDA export marketing programs since 1976. Since that time, as a cooperator participating in USDA/FAS Market Access programs, it has continuously held the ranking of "highly-effective" given by USDA, a distinction that only the top performing cooperators can achieve. Headquartered in Denver, Colo., USMEF has offices in Beijing, Hong Kong, Mexico City, Monterrey, Seoul, Shanghai, Singapore, Taipei and Tokyo. USMEF also has representatives covering Africa, Europe, the Caribbean, Central America, South America, the Middle East and the Commonwealth of Independent States.

USMEF carries out market development activities in nearly 100 countries around the world. In addition to its global market development, education, and promotion initiatives, USMEF also plays an important role as a resource to the U.S. pork and allied industries in efforts to assess current market conditions, gather market information and address barriers to increased trade. Since its inception, USMEF has successfully managed an increasingly complex worldwide market development and promotion effort. USMEF's international operations are carried out by staff and consultants who are local to the markets, have extensive experience in the meat business, and are highly skilled in the mechanics of conducting successful market development programs.

USMEF

USMEF is a nonprofit trade association working to create new opportunities and develop existing international markets for U.S. beef, pork, lamb, veal and bison.

USMEF is a unique collaboration of nine diverse industry sectors and is funded through membership dues, agricultural commodity checkoff programs and market development programs through USDA. USMEF's nine sectors are: Beef/Veal Producing and Feeding; Farm Organizations; Feedgrains Producers; Lamb Producing and Feeding; Oilseeds Producing; Packing and Processing; Pork Producing and Feeding; Purveying and Trading; Supply and Service Organizations/Agribusiness.

Exporting Arkansas Soybeans through U.S. Pork

In 2024, pork exports accounted for
3.83 million bushels
of Arkansas soybean usage



For the estimated total economic impact:

In 2024, pork exports contributed

13.2% of bushel value = $1.46

based on previous 3-year average percentage per bushel contributed from 2021 – 2023 x $11.11 average per bushel price in 2024

In 2024, the market value of pork exports to
Arkansas Soybeans =
$42.58 million

(soybeans consumed by pork exports at average annual soybean price)

3.83 million bushels x $11.11 per bushel



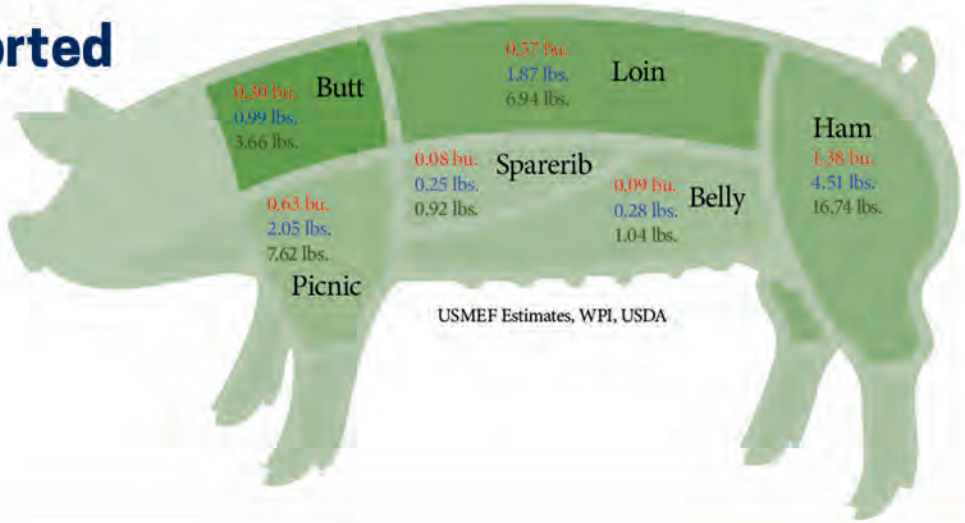
Feed Use by Cuts Exported

Per Head Slaughtered in 2024

Bushels of Corn

Lbs. of DDGS (Dried Distillers Grains)

Lbs. of SBM (Soybean Meal)



USMEF Estimates, WPI, USDA

ARKANSAS SOYBEAN PROMOTION BOARD
HARVESTING THE POTENTIAL

In 2024

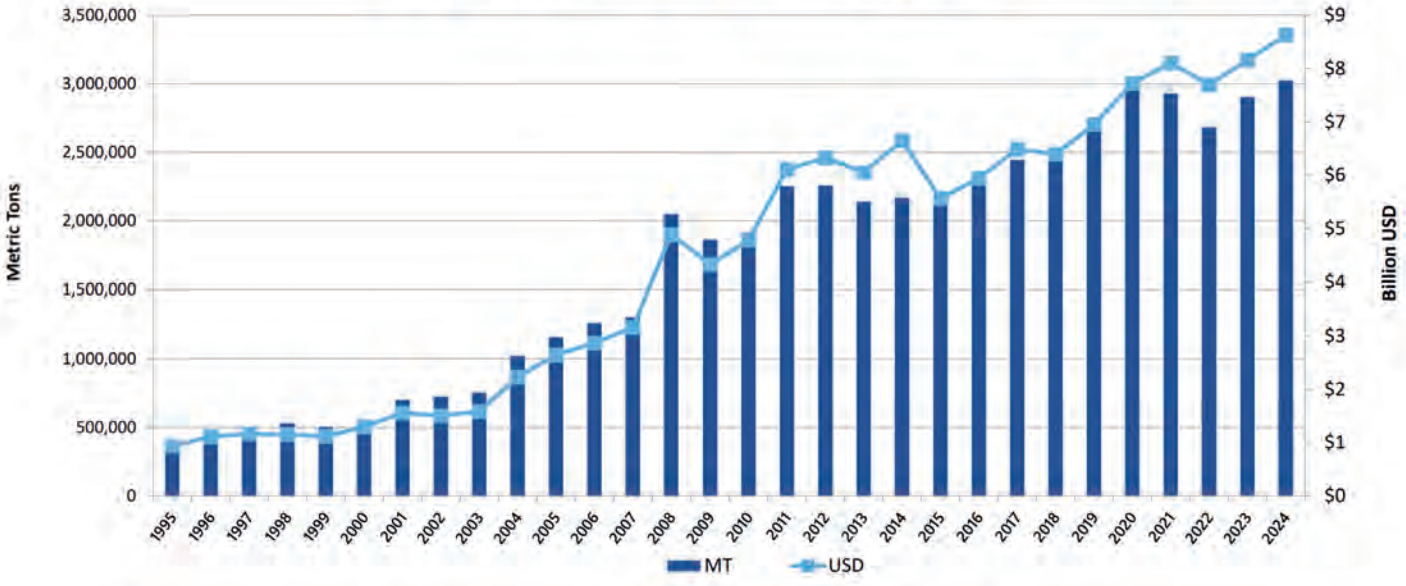
Pork export volume equated to a record 51.5 lbs. per head slaughtered, 10.04 lbs. of which were pork variety meats

30.3% of U.S. pork and pork variety meat production was exported, a new record

Pork production increased by 13% from 2015, while **pork exports increased by 42%** (including variety meats) during the same time

Pork export value equated to **$67 per head** slaughtered in 2024, a new record
(export value divided by 2024 commercial hog slaughter)

U.S. Pork & Variety Meat Exports



"The soybean industry provides critical support for USMEF's efforts to expand global demand for U.S. pork," says USMEF Senior Vice President of Industry Relations John Hinners. **"This study helps quantify the return on that investment."**

Dave Juday
dave@thejudaygroup.com

The U.S. Meat Export Federation (USMEF) is a non-profit trade association that works to create new opportunities and develop existing international markets for U.S. beef, pork and lamb. USMEF is a unique collaboration of nine distinct segments of American agriculture, joining together to implement successful marketing programs for U.S. pork, beef and lamb around the world.

U.S. Meat Export Federation
1660 Lincoln Street, Suite 2800
Denver, CO 80264
Tel 303.623.MEAT (6328)
Fax 303.623.0297
www.usmef.org

For more information about this independent study conducted by World Perspectives, contact John Hinners, Erin Borror, Jessica Spreitzer or Dave Juday.

5 - PR-11

Organization/Institution Submitting Proposal:
Arkansas Soybean Association

Project Title:
Recognizing Soybean Production Excellence by the continuance of the "Grow for the Green & Race for 100" Soybean Yield Challenge Contests

Project Type:
Promotion

Name of Project Manager:
Dawn Howe

Name of Project Team Member 1:
Jeremy Ross

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
To recognize Arkansas soybean producers that obtain very high grain yields and encourage other Arkansas soybean producers to strive for increased grain yields.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Working with the Cooperative Extension Service we will work with producers to increase soybean yields on small plots, rewarding those with the highest yields, and sharing production methods with other producers to increase overall soybean yields in Arkansas.

BUDGET

Amount of Funding Needed for Project:
$206,900.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board Funding Request-2026

TITLE: Recognizing Soybean Production Excellence by the continuance of the "Grow for the Green Yield Challenge Contests"

INVESTIGATORS: Arkansas Soybean Association – Appointed Committee

PRODUCTION SYSTEM: Alternative

STATUS: Existing

STATED GOAL: To recognize Arkansas soybean producers that obtain very high grain yields and encourage other Arkansas soybean producers to strive for increased grain yields.

OBJECTIVES:

1. To recognize and award Arkansas producers who have developed management programs that result in very high grain yields by region.
2. To obtain detailed information from participating Arkansas producers regarding management practices employed to obtain exceptionally high soybean grain yields with differing production systems.
3. The development of a high yield soybean production database program that would be available to producers.
4. To share top grower management practices for the various soybean production systems with other Arkansas soybean producers.
5. NEW FOR 2026 – Look at the economics of field management by requesting "estimated profit per acre" on their contest fields.

APPROACH: This enhanced and expanded proposal builds on the foundation of interest and participation generated by the former "**Race for 100**" Yield Challenge and the current ASPB funded Arkansas "**Grow for the Green Yield Challenge"** contests. This proposal, if funded, will continue to reward Arkansas soybean producers who are able to obtain exceptionally high soybean grain yields with cash and other awards. There will be special recognition to the top three contest participants within the 7 major Arkansas soybean production regions and the conventional producers.

Management of this program is handled by the Arkansas Soybean Association but the research and knowledge of the University of Arkansas Division of Agriculture personnel is vital in assisting the producers.

Information Dissemination: Beginning In 2013 the ARSA **summarized the production practices** of the winners and all of the participants from across the state in a booklet format entitled" 2013 Race for 100 Bushels/Acre Soybean Yield Contest and the 2013 "Grow for the Green Soybean Yield Challenge". This booklet format was also used in all contests since (2014-2025) and the data provided by the participants competing in the "Grow for the Green Soybean Yield Challenge" was distributed at the Arkansas Soybean Association annual meeting, ASPB

Soybean/Corn Conferences, MidSouth Farm & Gin Show and placed on both the ASPB and the ARSA websites in January of 2026. A discussion and overview discussion by Dr. Jeremy Ross of the management practices utilized by these outstanding soybean producers was included in the booklets and again this information is also available on both websites.

Based on the continued interest by Arkansas soybean producers and to enable these producers to assess the new innovations in soybean production as it develops with the state, the ARSA is proposing the following 2026 ASPB Proposal entitled "**The Arkansas 2026 Grow for the Green Yield Challenge".**

Divisions are:
District 1 = Northeast Delta (East of Crowley's Ridge);
District 2 = Northeast (West of Crowley's Ridge)
District 3 = White River Basin;
District 4 = Central & Grand Prairie;
District 5 = East Central Delta;
District 6 = Southeast Delta
District 7 = Western (remaining production regions within the state);

Non-GMO Statewide category = Producer(s) who utilizes a non-GMO soybean variety (without regard to production region)

Champion of Champions – 100 bushel winners (46 members) compete against each other

The monetary prize for placing first, second or third within each Division (1-7 and non-GMO) is as follows: 1st place - $7,500, 2nd place $5,000, 3rd place $2,500.

The Champion of Champions division consists of those producers who have achieved the 100 bu/a. A competition among the best in the state. This budget shows that the Champion division prize is $5000. Additional funds will be used to recognize the 100 bushel club members with a dinner. (Dinner was held in January 2025 – 5 attended and were awarded their watches).

Any producers who obtain soybean grain yields of 100.00 Bu/A or greater for the 1st time will be inducted into the 100 Bushel Club (receive a 100 bushel plaque & watch) and will be eligible to split $5000. Note: *any producers who are new additions to the 100 Bushel Club will be eligible for an expense paid trip for 2 (travel/economy airfare, housing- 2 nights, registration) to Commodity Classic.*

Producers who turn in their harvest report and do not place in their division will receive $200. The goal is to get additional producers to report their harvest yields. Currently about ½ of the entries turn in harvest yields. In 2025, 56% of those entered turned in their harvest information. The number of entries and harvest reports were down from previous years in 2025,

predominately due to spring weather. Heavy rains in March and April resulted in replanting, delayed planting and some even no planting.

INFORMATION GATHERED: Details such as entry dates, field location, agronomic information and grain yield certification will be included on the harvest form. A very detailed template was created electronically in 2020 for each contestant to complete to gather the information other producers need to achieve the high yields.

The data obtained from this form (template) will be analyzed and/or evaluated by the Arkansas Soybean Association, University of Arkansas Division of Agriculture and the Arkansas Soybean Research and Promotion Board (ASPB) to further assist the soybean producers of this state. Funds provided for this project were authorized by the ARSPB from the soybean check-off program.

Arkansas Soybean Promotion Board (ASPB) Sponsorship

a. ASPB financial sponsorship of "Grow for the Green Challenge
b. Producer Recognition
    I. ARSA Web Site
    II. ASPB Web Site
    III. Publicity (Local, State and Regional Publications)
    IV. Presentations at conferences (National Conservation Tillage Meeting) by state agronomist-Dr. Jeremy Ross and top-producers.
c. Distribute production practices information of high yielding soybean producers

PLANNED MILESTONES: Each year this project (yield contest) will be evaluated based on grower participation and grain yields obtained and reported to the Soybean Promotion Board. Yield levels for the various soybean production systems and monetary awards will be evaluated and may be tweaked by Arkansas Soybean Association Yield committee (rules have not been evaluated for 2026 yet).

VALUE TO SOYBEAN INDUSTRY: Arkansas soybean producers are constantly faced with economic and agronomic challenges. These challenges require continual improvement by the grower to obtain increased soybean grain yields and to adopt or utilize new and more efficient technological production practices. This project will help document the present grain yield potential of each production system and provide economic incentive to strive for maximum grain yields regardless of system.

Budget -attached

TOTAL YIELD CONTESTS FUNDING REQUEST - $206,900

BUDGET NOTES:

1. This budget contains $8,000 to be provided to the U of A System Division of Agriculture to use for travel expenses to field plots for the involved county agent and/or county agent trip to Commodity Classic as the Division sees fit. Additionally, this budget contains a request of $400 to be made available to pay designated yield certifying officials at $50 a plot. Approved Contest Officials (ACO) would not be eligible for the award on a field they are the paid consultant or have a conflict of interest with (seed company, chemical company rep etc.).

2. For 2026 –If timing works in the spring, we would like to hold another dinner to create interaction between the 100 Bushel Club membership.

3. Since 2023 we have worked with the Communications Group on printing and advertising. They create and place ads for the program and assist in the creation/printing of entry forms and harvest booklet. This helps create consistency across the board since ASPB is the sponsor of the program.

4. The ASPB is presented with invoices and documentation for reimbursement to the AR Soybean Association for direct costs and expenses.

2026 budget proposal			
8 districts ($15,000 each)			120000
Champion of Champions			5000
Payment for harvest reports			8000
CES travel			8000
Judge reimbursement			400
Administrative ($48 per hour)			8000
Advertising			21000
Printing/postage			12000
Misc (Plaques etc)			3500
Commodity Classic (new 100 bushel club)			7500
Awards lunch - ARSA Annual Meeting			2000
Sponsorship of ARSA Annual Meeting			1000
100 bushel club			5000
(new producers Reaching 100 bushel/acre)			
100 bushel dinner			3000
Watch for 100 bushel club			2500
total requested			206900

6 - PI-09

Organization/Institution Submitting Proposal:
Arkansas State University Newport- Agriculture Technology Department

Project Title:
Soy to Soil- Community Agriculture Day at ASUN

Project Type:
Promotion

Name of Project Manager:
Lindley Gilliaum

Name of Project Team Member 1:
Lindley Gilliaum

Name of Project Team Member 2:
Kristen Wallace

Statement of Justification or Purpose of the Project (75 word maximum):
Soy to Soil: Community Agriculture Day at ASUN is designed to increase public understanding of the role soybeans play in Arkansas agriculture, sustainability, and workforce development. Through hands-on education, career exploration, and community engagement, the event connects students and residents to soybean production, soil health, and soy-based products while strengthening agricultural literacy and promoting future pathways within the state's soybean industry.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
ASUN will plan and host Soy to Soil: Community Agriculture Day through coordinated development of interactive learning stations focused on soybeans, soil health, sustainability, and career pathways. Activities will include hands-on planting, composting demonstrations, cooking with soy, educational exhibits, and structured student engagement supported by faculty, industry partners, and regional career coaches. Outreach, logistics, evaluation, and fiscal reporting will be managed through ASUN's institutional processes.

BUDGET

Amount of Funding Needed for Project:
$11,000.00

Contribution Amount (from organization or sponsor):
$2,000.00

Proposal: Soy to Soil - Community Agriculture Day at ASUN

Goals and Objectives

The proposed event, *Soy to Soil: Community Agriculture Day at ASUN*, is designed to promote broad public awareness of the vital role soybeans play in Arkansas agriculture, rural economies, and sustainable food systems. Hosted by Arkansas State University–Newport (ASUN), the event will provide an engaging, educational environment where community members—particularly K12 and college students —can explore the connections between soybeans, soil health, nutrition, sustainability, and everyday consumer products.

Through hands-on learning experiences and interactive demonstrations, the event will improve agricultural understanding while highlighting soybeans as a key part of Arkansas agriculture and sustainability.

The specific objectives of the event are to:

1. Deliver hands-on, educational programming to a minimum of 200 attendees, with targeted outreach to local K-12 population and ASUN students.
2. Feature interactive soybean-focused exhibits, including cooking demonstrations, seed planting activities, and educational stations linking soy production to soil health and composting practices.
3. Increase community understanding of soy-based products through the distribution of free giveaways, educational signage, and printed informational materials.
4. Provide structured career exploration opportunities that expose participants to agricultural, environmental, and sustainability-focused professions within the soybean industry**.** The Agriculture Technology program prepares students for high-demand careers in row-crop production, seed and chemical sales, and commercial transportation, supported through cross-program collaboration with the Diesel Technology and Commercial Driver Training programs. In partnership with career coaches across approximately ten regional high schools, the program supports intentional student placement into postsecondary pathways aligned with student strengths, workforce needs, and long-term career success.
5. Promote soybeans as a central component of Arkansas's sustainable food system and emerging green economy.

Expected Benefits to the Arkansas Soybean Industry

This event is intentionally structured to support and advance the Arkansas soybean industry through education, outreach, and workforce development. Anticipated benefits include:

- Increased visibility and public awareness of soybeans among diverse, non-farming audiences throughout the Northeast Arkansas Delta region.
- Expanded understanding of soy-based products, including biodiesel, protein-rich foods, and environmentally sustainable materials.

- Improved awareness among students, families, and educators of soybeans' role in soil restoration, conservation practices, and regenerative agriculture systems.
- Development of early interest and career pathways for students into soybean-related fields, supporting long-term workforce needs in rural Arkansas.
- Strengthened public support for local soybean producers, agricultural research, and innovation within the state.

Project Description & Timeline

Event Title: Soy to Soil: Community Agriculture Day at ASUN

Date: Targeting November 2026, during fall harvesting season and Governor proclaimed Arkansas Soybean Month

ASUN Newport Campus – Community Garden and Outdoor Learning Area

Key Components:
Soil & Composting Station
- Soy Planting & Take-Home Station
- Cooking with Soy Demonstration (Snack challenge or vote and rank created soy-based treats)
- Educational Booths with coverage of biodiesel
- Children's Activities
- Community Engagement including local Career Coach Network of Northeast Arkansas high schools
-Intentional invitation to state and local representatives of voting districts and school boards
-Social media post for digital media archive and engagement for any future searches on #CommunityAgDay

Evaluation:
- Participant sign-ins and surveys
- Media/social media coverage and impressions - Feedback from educators and industry partners
- Post-event impact summary to the Arkansas Soybean Promotion Board

Budget and Accountability Plan

The proposed budget for *Soy to Soil: Community Agriculture Day at ASUN* totals $11,000 and reflects a cost-effective investment in agricultural education, community outreach, and workforce awareness. All requested funds directly support program delivery and participant engagement. No administrative or indirect costs are included.

Fiscal Accountability and Reporting

All expenditures will be processed, documented, and tracked through the business office of Arkansas State University–Newport, ensuring compliance with institutional purchasing and financial oversight policies. Receipts, invoices, and payment records will be maintained in accordance with state and university guidelines.

Within 60 days following the event, ASUN will submit:

- A detailed expenditure report documenting the use of all funds
- A narrative event summary outlining attendance, activities, and outcomes
- Photographic documentation and media artifacts
- An impact summary highlighting participant reach, educational outcomes, and community engagement related to soy education

Budget and Accountability Plan

Budget Category	Amount	Justification
Educational Materials (Signage & Handouts)	$1,000	Design and printing of educational signage and take-home materials explaining soybean production, soil health, nutrition, and sustainability. Materials reinforce learning beyond the event.
Event Supplies (Tents, Tables, Equipment)	$2,000	Rental of tents, tables, chairs, and necessary equipment to host multiple outdoor educational stations while ensuring participant safety and accessibility.
Transportation for K–12 School Groups	$1,200	Bus transportation assistance to reduce access barriers for rural K–12 students and families and support equitable participation.
Honoraria for Guest Educators	$1,000	Modest stipends for agricultural professionals, Extension educators, and industry partners providing demonstrations, instruction, and career pathway discussions.
Soy-Based Giveaways (Seed Kits & Snacks)	$800	Educational seed kits and soy-based food samples that reinforce event learning objectives and promote awareness of soy products.
Student Support Stipends (Non-Administrative)	$2,000	Compensation for ASUN student workers assisting with event setup, logistics, educational stations, and attendee engagement. No administrative salaries included.
Print & Local Radio Promotion	$1,200	Targeted outreach through printed flyers, posters, and local radio announcements to reach families, schools, and community members across Northeast Arkansas.
Soil Health & Composting Display	$500	Materials for hands-on soil health and composting demonstrations connecting soybeans to regenerative agriculture practices.
Photography, Video & Media Archiving	$500	Professional documentation of the event for reporting, evaluation, outreach, and public accountability.
Event Subtotal	**$10,200**	
Contingency & Materials Buffer	$800	Reserved for unanticipated material needs, minor cost fluctuations, or weather-related adjustments to ensure uninterrupted event delivery.
Total Project Budget	**$11,000**	No administrative or indirect costs included.

7 - PR-12

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Poinsett County Ag Day

Project Type:
Promotion

Name of Project Manager:
Christie Wagley

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Youth program in Poinsett County that connects kids with agriculture.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Kids in Poinsett County learn about agriculture through hands-on educational activities. Participants receive a SPB sponsored tee-shirt.

BUDGET

Amount of Funding Needed for Project:
$8,070.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: ***Poinsett County Ag Day 2026***

Lead Investigators: Christine Wagley

Co-Investigators:

Status and Duration of Funding: New, Year 1 of 1

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Education

Stated Goal: Ag Day is a hands-on educational activity where children learn about regional farming, soybeans and crops, nature, and wildlife. The target audience is 2nd and 3rd grade students. The annual event is hosted by the Poinsett County Extension office and held at the Main Street Learning Park in Harrisburg, Arkansas. This annual event has been very successful over the past 9 years. The 2025 Poinsett County Ag Day broke previous attendance records, with a total of 534 youth and 70 community volunteers. The community has highly supported this event by providing volunteers ranging from farmers, ag professionals, 4-H leaders, FFA students and other local businesses.

Specific Objectives: Ag Day will provide youth participants with an informal hands-on educational experience for youth emphasizing local products that our agricultural commodities provide, and the role that agricultural industry plays in our local economy. Students will rotate through ten stations with activities such as hulling rice, tasting rice based-food items such as a Rice Krispy treat, sampling soy milk and roasted soy nuts, and getting to see and touch crops grown in Poinsett County (rice, soybeans, grain sorghum, corn, peanuts and cotton), a chance to milk a cow with the cow simulator, drone demonstrations, AR Game & Fish demonstrations, NRCS watershed education and beekeeping tips.

Methods: Direct hands-on educational event set up similar to a field day.

Planned Milestones:

March-May 2026: *Poinsett County Ag Day 2026 Planning; marketing; meetings with school coordinators.*

May-August 2026: *Solicit exhibitors; create station map; order ice chests and personalization for ice chests; meeting with Office of Emergency Management.*

August 2026: *Collect individual T-shirt orders, submit orders to supplier.*

September 2026: *Receive orders; Sort and deliver T-shirts to participants.*

October 2026: *Final preparations for Ag Day; Host Poinsett County Ag Day 2026; Evaluations and Reflections.*

Value to Soybean Industry: Educational; promotion of soybean use; building community investment in youth.

Budget Justifications/Explanation of Travel and Direct Costs:

Budget details:

Item	Estimated Cost	Narrative
Participant T-shirts	$6,820.00	Each Ag Day participant will receive a screen-printed t-shirt to wear at Ag Day (with soybean and 4-H promotional messaging). T-shirts will be delivered prior to the event so that participants will have shirts to wear for Ag Day and afterwards.
Ice Chests Each ice chest will have AR Soybean Promotion Board branding & would be available to use for appx 5 years.	$1,250.00	Ice chests will be placed in between stations at Ag Day and hydration breaks build into the schedule. Youth participants, exhibitors and volunteers will be provided bottles of water throughout the event.
TOTAL	****$8,070***	****quoted prices as of 1/9/26***

University of Arkansas System Division of Agriculture

Promotion Board Budget

Christine Wagley *Poinsett County Ag Day 2026*

Year	2026/2027	**Project Year**	New, Year 1 of 1	**Version: 8.0 (09/22/2025)**
Lead Investigator	Christine Wagley	**Co-PI #1**		
Co-PI #2		**Co-PI #3**		
Department	CES Community, Professional, & Economical Development			
Commodity Board	Soybean Promotion Board			
Project Title	Poinsett County Ag Day 2026			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Christine Wagley				Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	CES	AES	CES	CES			
Fulltime Personnel							
Position Title / **Name** *(if position is filled)* / **% Time**	**Salaries**				**Total**	**AES**	**CES**
					$0	$0	$0
					$0	$0	$0
					$0	$0	$0
					$0	$0	$0
					$0	$0	$0
Subtotal: Salaries	$0	$0	$0	$0	$0	$0	$0
Graduate Student							
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition. / **Name** *(if position is filled)* / **% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
					$0	$0	$0
					$0	$0	$0
					$0	$0	$0
					$0	$0	$0
					$0	$0	$0
Tuition Calculator Information					$0	$0	$0
Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0
Hourly							
	Wages				**Total**	**AES Portion**	**CES Portion**
Hourly-Personnel					$0	$0	$0
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0
Fringe Benefits							
Fringe benefits are calculated when salary and wage amounts are entered above.	**Benefits**				**Total**	**AES Portion**	**CES Portion**
Fulltime Personnel	$0	$0	$0	$0	$0	$0	$0
Graduate Students	$0	$0	$0	$0	$0	$0	$0
Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$0	$0	$0	$0	$0	$0	$0
Personnel Total	$0	$0	$0	$0	$0	$0	$0
Travel							
Justify out-of-state travel in proposal.	**Travel**				**Total**	**AES Portion**	**CES Portion**
In-State					$0	$0	$0
Out-of-State					$0	$0	$0
Travel Total	$0	$0	$0	$0	$0	$0	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Christine Wagley *Poinsett County Ag Day 2026*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$8,070				$8,070	$0	$8,070
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$8,070	$0	$0	$0	$8,070	$0	$8,070
	Total for Proposal	$8,070	$0	$0	$0	$8,070	$0	$8,070

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

7 - PR-13

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
The Arkansas Irrigation Yield Contest

Project Type:
Promotion

Name of Project Manager:
Chris Henry

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Irrigation contest prize money.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
These funds are distributed directly to the farmers from the Dept of Ag. Paid to winners of 2026 irrigation contest.

BUDGET

Amount of Funding Needed for Project:
$10,000.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: The Arkansas Irrigation Yield Contest

Lead Investigators: Chris Henry, Associate Professor, Water Management Engineer, RREC

Status: Year 9

Goal: The University of Arkansas Division of Agriculture has been demonstrating irrigation Water Management Practices on cooperator farms for five years. Experience has shown that when applied effectively water use can be reduced by 24% on average with no yield penalty. Reductions in water use of around 40% have been documented. The adoption rate of Computerized Hole Selection is over 40% indicating that this is now a mainstream practice in Arkansas. However, a significant need still exists to secure the sustainability of irrigated agriculture in Arkansas. It is still unknown and not well documented how much irrigation water use is needed for crops in Arkansas. A critical need is the documentation of the irrigation water use that is possible with a combination of IWM practices and the ingenuity of Arkansas farmers.

Approach: An irrigation yield contest is proposed. No such contest exists that incorporates the competitive nature of maximizing yield with maximizing water use efficiency. Many growers are familiar with the state and National Corn Growers Contest, National Wheat Growers contest and Arkansas's own "Go for the Green" soybean yield contest. The contest would be operated using the existing proposal supporting irrigation water management projects previously and currently proposed to these boards. Current yield contests focus only on yield, where this contest would highlight Arkansas farmer's efforts to improve sustainability and profitability, which are paramount to the future of agriculture.

Planned Milestones: What is proposed is funding directly from each commodity board of $10,000 to fund the first place award the corn irrigation contest. Essentially each commodity board would support the award for its commodity. The boards would provide the award directly to the first place winner $6,000, for second place $3,000 and for third place $1,000. The rules are similar to existing commodity yield contests, with the additional requirement of a propeller flow meter, sealed by the program and that the yield must exceed the county average irrigated yield for the county (to eliminate dryland or severe deficit entries). Contestants will be announced at the annual Arkansas Soil and Water Conservation Conference in Jonesboro, Arkansas in late January 2025.

Value to the Industry: A $10,000 award payable directly to the winner of the contest for the respective commodity is requested to provide an incentive to enter the contest. Support for the contest logistics, advertising, meter loaning, and operation of the contest will be done under the irrigation project. The contest has shown that those that know someone in the contest are have significantly more acres of IWM on their farms than those who do not. The contest has been responsible for influencing over half of the irrigators in Arkansas.

7 - PA-01

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Soybean Science Challenge

Project Type:
Promotion

Name of Project Manager:
Julie Robinson

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
The Soybean Science Challenge addresses gaps in science education by engaging Arkansas jr high and high school students in real-world, soybean-focused learning. Through interactive curriculum, applied research, and partnerships, the project builds student knowledge of soybean science, sustainability, and careers while strengthening awareness of Arkansas agriculture and supporting the long-term vitality of the state's soybean industry.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Project activities include reviewing and updating existing SSC curriculum; developing new, teacher-informed lessons; delivering interactive online courses with modules, quizzes, & assessments; mentoring students in applied soybean research; supporting teachers through training & resources; coordinating science fair partnerships and awards; and promoting participation through Extension, schools, media, and statewide and national education networks.

BUDGET

Amount of Funding Needed for Project:
$87,018.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Soybean Science Challenge (SSC)
Lead Investigators: Dr. Julie Robinson
Co-Investigators: Dr. Jeremy Ross
Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): Ongoing
Research Areas: Education

Stated Goal: The mission of the Soybean Science Challenge is to engage Arkansas junior high and high school science students and teachers in real-world, Arkansas-specific soybean science education through original curriculum and diverse educational experiences and partnerships with educators, agencies, NGOs, and media at state, regional, and national levels.

Objectives

1. Develop and deliver original educational resources for junior high and high school students to enhance soybean science learning.
2. Increase awareness of soybeans' economic value, sustainability, and related careers through engaging content and outreach.
3. Expand knowledge of diverse soy products and uses by integrating real-world applications into classroom activities.
4. Boost student participation in applied soybean research through mentoring and recognition programs like the Soybean Science Challenge awards.
5. Establish statewide and national educational partnerships to leverage ASPB resources and bring Arkansas soybean research into classrooms nationwide.
6. Support educators and communities by providing training webinars, workshops, and resources for school and community gardens.

Methods

The Soybean Science Challenge (SSC) is an authentic, real-world learning experience designed to engage Arkansas junior high and high school students in agricultural science. Through an interactive online course, students explore the science and economics of soybeans while developing critical thinking and research skills. The SSC connects classroom learning to real-world applications, fostering awareness of agricultural sustainability and career opportunities.

A series of interactive modules have been developed that include learning challenges and quizzes for students to progress through. Pre-course and post-course assessments quantitatively measure knowledge gains. To qualify for the research challenge, students must achieve 80% or higher on all module quizzes and post-test. Successful participants then engage in applied research projects supported by vetted science-based resources, the Soybean Seed Store, and personalized mentoring from teachers and University of Arkansas System Division of Agriculture scientists.

This proposal includes reviewing and updating the current library of lessons and developing new content in consultation with teachers. Teachers will be encouraged to integrate SSC resources into their classrooms; invite local farmers as guest speakers; and organize farm visits (virtual or in-person) to provide students with firsthand exposure to soybean production.

The Grow Your Own Protein project will continue to be marketed to schools and community gardens in partnership with the Natural Soybean and Grain Alliance. The focus of the program is to engage students and communities in learning about agriculture; specifically, about soy as a food product and its role in healthy eating and sustainability.

Educational materials will be shared via Extension Agents, websites (uaex.uada.edu/soywhatsup, themiraclebean.com), newsletters, social media, teacher associations, STEM centers, and conferences. The program aims to connect students with local farmers and highlight Arkansas agriculture's importance.

The SSC is a real-world learning program for Arkansas junior high and high school students, focusing on soybean science, economics, and sustainability. The Soybean Science Challenge (SSC) employs diverse educational strategies and original, peer-reviewed content to engage Arkansas junior high and high school students in applied research and soybean-based lessons. It uses an interactive online course with modules, quizzes, and assessments to build critical thinking and research skills. The curriculum is updated annually and approved by the Arkansas Department of Education for professional development credit.

Planned Milestones:

1. Formalize a comprehensive project management and evaluation plan.
2. Develop and distribute new educational resources to students and teachers.
3. Provide mentoring, communication, and instructional support for Arkansas junior high and high school science students.
4. Coordinate sponsorships, partnerships, and logistics for all Arkansas Regional Science Fairs and the State Science Fair, including agreements, judging, awards, and media outreach.
5. Promote SSC participation in STEM nights and present at K–12 and agriculture-related conferences, while maintaining collaboration with media and community partners.
6. Manage program evaluation data to improve resources, outcomes, and statewide impact.

Value to Soybean Industry:
The Soybean Science Challenge connects Arkansas junior high and high school students with agricultural sustainability through hands-on, relevant learning. It addresses gaps in curriculum by fostering critical thinking about food, fuel, feed, research, and sustainability—issues shaping their future. The program benefits the soybean industry by engaging youth in scholarship and skill-building, while teachers gain free online resources to emphasize the importance of Arkansas agriculture and soybean production.

Budget Justifications/Explanation of Travel and Direct Costs:
The SSC program has been streamlined for greater impact and efficiency. To enable statewide expansion and retain skilled staff, the proposal includes increased staffing while keeping other budget areas stable or reduced. Key activities include online workshops, regional travel, and participation in education and agriculture events, all without increasing the in-state travel budget due to improved processes. Promotional spending is reduced by $1,000 (4%) while maintaining visibility. Hiring a full-time program coordinator assigned to the program and retaining the curriculum coordinator strengthens professional development, mentorship, and lesson plan creation. Increased staff hours and benefits reflect program growth.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Robinson, Julie *Soybean Science Challenge*

Year	2026/2027	**Project Year**	
Lead Investigator	Robinson, Julie	**Co-PI #1**	Ross, Jeremy
Co-PI #2		**Co-PI #3**	
Department	CES Community, Professional, & Economical Development		
Commodity Board	Soybean Promotion Board		
Project Title	Soybean Science Challenge		

Version: 8.0 (09/22/2025)

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Robinson, Julie	Ross, Jeremy			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI		CES	CES	CES	CES			
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Soybean Science Cha	Keith Harris	50%	$27,500				$27,500	$0	$27,500
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$27,500	$0	$0	$0	$27,500	$0	$27,500
	Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information						$0	$0	$0
	Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0
			Hourly						
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel		$21,000				$21,000	$0	$21,000
	Hourly-Students						$0	$0	$0
	Subtotal: Hourly		$21,000	$0	$0	$0	$21,000	$0	$21,000
			Fringe Benefits						
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$7,590	$0	$0	$0	$7,590	$0	$7,590
	Graduate Students		$0	$0	$0	$0	$0	$0	$0
	Hourly Personnel		$1,428	$0	$0	$0	$1,428	$0	$1,428
	Hourly-Students		$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits		$9,018	$0	$0	$0	$9,018	$0	$9,018
	Personnel Total		$57,518	$0	$0	$0	$57,518	$0	$57,518
			Travel						
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State		$6,000				$6,000	$0	$6,000
	Out-of-State						$0	$0	$0
	Travel Total		$6,000	$0	$0	$0	$6,000	$0	$6,000

University of Arkansas System Division of Agriculture

Promotion Board Budget

Robinson, Julie *Soybean Science Challenge*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$23,000				$23,000	$0	$23,000
	Fertilizer/Chemicals					$0	$0	$0
	Publication	$500				$500	$0	$500
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$23,500	$0	$0	$0	$23,500	$0	$23,500
	Total for Proposal	$87,018	$0	$0	$0	$87,018	$0	$87,018

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

7 - PA-02

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Arkansas Future Agriculture Leaders Tours

Project Type:
Promotion

Name of Project Manager:
Julie Robinson

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
The Arkansas Future Ag Leaders Tour strengthens agricultural career readiness by helping students understand farmers' needs and industry challenges. The free program builds key job skills employers find lacking and allows students who couldn't otherwise participate to join. Touring sites statewide also exposes future professionals to real-world operations and career opportunities across Arkansas.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
The 2026 Arkansas Future Ag Leaders Tour will recruit juniors and seniors statewide for a five-day professional development and industry tour. Students will complete leadership and career-readiness training, then visit agricultural operations across all regions to explore careers and meet professionals. Key actions include marketing, application review, tour coordination, participant communication, and post-tour evaluation.

BUDGET

Amount of Funding Needed for Project:
$5,000.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Arkansas Future Ag Leaders Tour
Lead Investigators: Julie Robinson
Co-Investigators: Dr. Jeremy Ross
Status and Duration of Funding: Year 2 of 3
Research Areas: Education

Stated Goal:
A five-day professional development opportunity for undergraduate juniors and seniors enrolled in Colleges of Agriculture or are pursuing agriculture related majors across the state of Arkansas. Agriculture and agriculture related professions are the number one employer in the state. This one-week experience will enhance students' leadership and employability skills, provide first-hand networking opportunities with potential employers, and highlight the vast resources, services, and careers available through Arkansas' agriculture industry. Participants will get to interact with farmers, producers, vendors, and many others that support the agricultural industry in Arkansas. The goal of this tour is to better prepare and inform new graduates. The tour helps participants discover jobs across the state, keeping homegrown talent in-state, and local.

Specific Objectives:
- Increase participant's employability in agricultural careers.
- Acquaint participants with the vast resources, market segments, and services available through Arkansas' number one industry.
- Provide participants with a "bird's eye view" of current employment opportunities in the Arkansas agriculture industry.
- Increase student's options and opportunities by networking with future employers.

Methods:
The fifth annual Arkansas Future Ag Leaders Tour was hosted in October 2025. Fifteen students from four universities across the state participated. The tour was successful in connecting students with employers. To continue to provide this same professional development for future agricultural professionals, project coordinators are planning a five-day state-wide tour for undergraduate students who are in their junior and senior year of college. The call for applications will go out to all colleges with agriculture-related academic departments, including Arkansas State University, Arkansas Tech University, Southern Arkansas University, University of Arkansas – Fayetteville, University of Arkansas – Little Rock, University of Arkansas – Monticello, and University of Arkansas – Pine Bluff. The tour will begin at the Arkansas 4-H Center in Little Rock, on Monday, May 11, 2026. Participants will engage in leadership and team building activities to get to know each other and the coordinators. Participants will also participate in professional development activities related to networking, key tips for snagging the job of their dreams, and career advancement strategies. Each day, participants will travel across the state to pre-arranged tour sites to visit facilities and network with professionals. This will allow students to experience first-hand the diversity of opportunities within Arkansas' agriculture industry. Growers, producers, processors, manufacturers, educators, and research facilities will host students across Arkansas.

Planned Milestones:

1. Formalization of a detailed project management and evaluation plan: February
2. Creation and dissemination of marketing resources: February.
3. Applications open: March
4. Coordination of the tour, scheduled for May 11 – 15, 2026 including arrangement and confirmation of tour stops including North East Arkansas, North West Arkansas, South East Arkansas, Southwest Arkansas, and Central Arkansas.
5. Communication with participants leading up to the tour: April
6. Conduct the Arkansas Future Ag Leaders Tour: May 11 – 15
7. Collaboration with news media and community partners to leverage resources. Management and utilization of program evaluation data to improve participation experience and outcomes.

Value to Soybean Industry:

The Arkansas Future Ag Leaders Tour helps create a more prepared and informed workforce that better understands the needs and dynamics of the farmers and producers that they will serve in their agricultural related careers across the state. This professional development program addresses some job readiness skills that have been identified as deficient by employers. Other states, such as Georgia and South Carolina, offer similar opportunities for undergraduates for a significant cost. By providing this opportunity for free, many students who would not be able to otherwise afford to pay their way can participate, in addition to missing a week of work in order participate. The greatest value to the soybean industry is that this provides an opportunity to inform and educate future agriculture industry professionals and leaders about challenges facing farmers and producers. In addition, touring across the state makes students aware of what jobs are available in the state and in local communities all across Arkansas.

Budget Justifications/Explanation of Travel and Direct Costs:

Coordination will be provided by the University of Arkansas System Division of Agriculture project team, led by Community, Professional, and Economic Development faculty and staff. Monetary support for this project totals in the amount of $20,000. Program coordinators are requesting $5,000 from the Soybean Promotion Board and seeking additional contributions from other commodity and industry groups to fund the total. The greatest expenses for this program are lodging, meals, and bus rental. Funds will support meals for participants and guest speakers, vehicle usage and mileage, lodging, and materials and supplies. Program coordinators will utilize a coach bus to transport participants across the state. While several meals are usually donated by some of the companies visited, not all meals are covered and there are still mileage and fuel expenses, lodging, and supplies that need to be budgeted.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Robinson, Julie *Arkansas Future Ag Leaders Tour*

Year	2026/2027	**Project Year**	Year 2 of 3
Lead Investigator	Robinson, Julie	**Co-PI #1**	Ross, Jeremy
Co-PI #2		**Co-PI #3**	
Department	CES Community, Professional, & Economical Development		
Commodity Board	Soybean Promotion Board		
Project Title	Arkansas Future Ag Leaders Tour		

Version: 8.0 (09/22/2025)

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Robinson, Julie	Ross, Jeremy			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI		CES	CES	CES	CES			
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$0	$0	$0	$0	$0	$0	$0
	Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information						$0	$0	$0
	Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0
			Hourly						
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel						$0	$0	$0
	Hourly-Students						$0	$0	$0
	Subtotal: Hourly		$0	$0	$0	$0	$0	$0	$0
			Fringe Benefits						
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$0	$0	$0	$0	$0	$0	$0
	Graduate Students		$0	$0	$0	$0	$0	$0	$0
	Hourly Personnel		$0	$0	$0	$0	$0	$0	$0
	Hourly-Students		$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits		$0	$0	$0	$0	$0	$0	$0
	Personnel Total		$0	$0	$0	$0	$0	$0	$0
			Travel						
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State		$4,500				$4,500	$0	$4,500
	Out-of-State						$0	$0	$0
	Travel Total		$4,500	$0	$0	$0	$4,500	$0	$4,500

University of Arkansas System Division of Agriculture

Promotion Board Budget

Robinson, Julie *Arkansas Future Ag Leaders Tour*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$500				$500	$0	$500
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$500	$0	$0	$0	$500	$0	$500
	Total for Proposal	$5,000	$0	$0	$0	$5,000	$0	$5,000

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

8 - PI-10

Organization/Institution Submitting Proposal:
Arkansas FFA Foundation

Project Title:
Investment the Future of Arkansas Agriculture – Agricultural Education, Career Success, and FFA

Project Type:
Promotion

Name of Project Manager:
Taylor Wiseman

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
This project advances career readiness and leadership development for Arkansas FFA members and agricultural education students, while strengthening the future workforce of the state's soybean industry. Through investments in career development events, agriscience research, agricultural mechanics training, scholarships, and leadership programming, the Arkansas FFA Foundation will provide hands-on, relevant experiences that connect classroom learning to real-world agricultural careers. This partnership ensures over 18,000 FFA members are prepared to lead and sustain Arkansas agriculture.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
The Arkansas FFA Foundation will execute this project by directing funds toward career development, leadership training, and hands-on agricultural learning opportunities. Activities include supporting Career Development Events and proficiency awards, conducting the statewide Agriscience Fair, equipping the Agricultural Mechanics Lab, awarding scholarships, facilitating participation in the Arkansas Youth Institute, and enhancing agricultural advocacy and leadership development training. All activities will be managed according to approved budgets, with progress reported to the Arkansas Soybean Promotion Board.

BUDGET

Amount of Funding Needed for Project:
$100,000.00

Contribution Amount (from organization or sponsor):
$389,000.00

ARKANSAS FFA FOUNDATION

301 CATHERINE PARK ROAD
HOT SPRINGS, AR 71913
(501) 463-1417
ARKANSASFFA.ORG/FOUNDATION

2026 ARKANSAS SOYBEAN PROMOTION BOARD PARTNERSHIP PROPOSAL

The Arkansas Soybean Promotion Board's support of the Arkansas FFA Foundation will help cultivate the next generation of agricultural leaders—many of whom will directly shape the future of Arkansas's soybean industry.

FFA is the premier school-based youth leadership organization in the nation. In Arkansas, FFA empowers students in **more than 80% of school districts** by providing essential skills, a supportive network, and access to career pathways in agriculture and beyond. This partnership will create opportunities for more than **18,000 Arkansas FFA members** and **26,500 agricultural education** students across **217 FFA chapters**.

$100,000 INVESTMENT

AGRICULTURAL EDUCATION + CAREER SUCCESS + LEADERSHIP DEVELOPMENT

For your $100,000 investment, you will receive:

- Platinum partner recognition at State FFA Convention & Expo (3,900 attendees)
- Logo placement on convention t-shirt
- Three-minute greeting to FFA members and guests during a general session
- Logo displayed on pre-session screens
- 30-second video played during all six pre-sessions
- Three 10'x10' booths during the State FFA Convention & Expo
- Signage throughout convention and expo with logo
- Annual report, website, and mobile app recognition
- Specialized recognition for reach program supported (see following details)





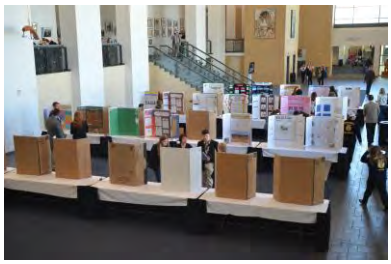


Ready to Partner? We would be honored to collaborate with the **Arkansas Soybean Promotion Board** to grow the future of Arkansas agriculture. **Together, we grow leaders, careers, and the future of Arkansas agriculture.**

INVESTMENT IN AGRICULTURAL EDUCATION – $29,500

- **Agriscience Fair Support ($15,000)**
  - The Arkansas FFA Agriscience Fair provides recognition to students engaged in outstanding experimental immersion projects and celebrates students conducting research on real-world ag issues. Six competition pathways include:
    - Plant Systems
    - Power, Structural and Technical Systems
    - Food Products and Processing Systems
    - Animal Systems
    - Environmental Service/Natural Resource Systems
    - Social Science
  - **Recognition:** Logo displayed as sponsor during event and during award presentation.





- **Student and Teacher Training @ Agricultural Mechanics Lab ($10,000)**
  - Help us equip the Greenway Agricultural Mechanics Lab, a $2.5 million state-funded facility, with tools and resources. The lab features:
    - 3,000 sq. ft. workshop space
    - Two classrooms for hands-on instruction
    - Programming for both students and teacher training
  - **Recognition:** Join the donor wall inside the lab.



- **Arkansas Youth Institute and World Food Prize ($4,500)**
  - Each student presents their findings on pressing global food security and agricultural issues at the annual Arkansas Youth Institute. Top students will attend the prestigious **Global Youth Institute** in Des Moines, IA.
  - **Recognition:** Logo displayed as sponsor during award presentation. Availability to award on stage.

INVESTMENT IN CAREER DEVELOPMENT AND SUCCESS - $25,500

- **Career Pathway and Career Development Event Support ($20,000)**
  - Agricultural Proficiency Awards honor FFA members who, through supervised agricultural experiences, have developed specialized skills that they can apply toward their future careers. Over 22 award areas, including **Diversified Crop Production** and **Fiber/Oil Crop Production**.
  - Career Development Events allow FFA members to develop critical thinking skills and effective decision-making skills, foster teamwork, and promote

communication as they develop career skills. Events include **Agricultural Mechanics**, **Agriculture Communications**, and **FFA Creed Speaking**.
  - **Recognition:** Logo displayed as pathway sponsor for awards of three proficiency areas and two Career Development Events during state convention. Availability to award on stage.

- **Scholarships ($5,500)**
  - Fund five $1,000 scholarships for graduating seniors pursuing education in agriculture-related fields.
  - 93% of FFA members attend college or vocational school after high school.[1]
  - **Recognition:** Logo displayed as sponsor during scholarship presentation. Availability to award on stage.





INVESTMENT IN LEADERSHIP DEVELOPMENT - $45,000

- **Arkansas Leadership Conference ($25,000)**
  - Arkansas Leadership Conference is Arkansas FFA's premier leadership development opportunity. Over **540 students from 90+ chapters** spend four days at Camp Couchdale engaged in learning, hands-on experiences, and **1,600 hours of community service** projects to develop and hone their agricultural advocacy, leadership, teamwork, relational, and service skills. Arkansas Leadership Conference is hosted and facilitated by the State FFA Officer Team.



  - **Recognition:** Logo on leadership camp t-shirts. Invitation to banquet and student meet-and-greet. Video to play during each week of leadership camp. Recognition on website and social media.

- **Marion D. Fletcher Leadership Center Classroom ($20,000)**
  - Support agricultural and leadership education by naming a classroom in the newly renovated facility at Camp Couchdale to support continued FFA member leadership development and training of agricultural educators.
  - Since its founding, over 1 million FFA members and visitors have been at Camp.
  - **Recognition:** A plaque will recognize your organization and mission.

[1] National FFA Organization and Purdue University Research Collaboration (2019), https://mdfarmbureau.com/wp-content/uploads/2020/03/Employability-Skills-and-Academic-Success-of-FFA-Membership.pdf.

ESTIMATED BUDGET

INVESTMENT IN AGRICULTURAL EDUCATION – $29,500

Agriscience Fair	$ 15,000	Supports six categories of the Agriscience Fair. Provides space to hold the statewide contest ($4,000), recognition and awards ($9,000), and supports contest for FFA members to compete ($2,000).
Ag Mechanics Lab Student and Teacher Training	$ 10,000	Funding will directly help cover the cost of the facility (supplies, maintenance, utilities, insurance, etc.) to offset the cost of use by FFA members, agricultural education students, and agricultural educators.
Arkansas Youth Institute and World Food Prize	$ 4,500	Provides travel assistance for top students and chaperone to attend the Global Youth Institute in Des Moines, Iowa. Funds awards for participants.

INVESTMENT IN CAREER DEVELOPMENT AND SUCCESS - $25,500

Career Pathway and Career Development Event	$ 20,000	Supports three career or leadership development events (such as Agricultural Mechanics, Agriculture Communications, and FFA Creed Speaking). Funding will be used for contest set up and management ($3,000), scantrons and grading equipment ($1,200), awards and recognition of winners ($1,500), and scholarship travel funds to compete at the national contest ($1,800). Supports proficiency awards in Plant Systems Pathway area (up to 22 categories) such as Diversified Crop Production and Fiber/Oil Crop Production. Program awards monetary awards to multiple state champion members and FFA chapters ($350 each), along with awards and stage recognition ($4,800).
Scholarships	$ 5,500	Fund five $1,000 scholarships for graduating seniors pursuing education in agriculture-related fields. Additional funding will cover the promotion of the scholarships, awarding the scholarships, and commodity board recognition.

INVESTMENT IN LEADERSHIP DEVELOPMENT - $45,000

Arkansas Leadership Conference	$ 25,000	Funds will be used for the leadership and agricultural advocacy curriculum ($5,000), state officers training, facilitation, and lodging of the 3 week event ($10,000), supplies ($2,500), and use of the event space to host the conference ($7,500).
Marion D. Fletcher Leadership Center Classroom	$ 20,000	Funding will directly help cover the cost of the classroom (maintenance, utilities, insurance, etc.) to offset the cost of use by FFA members, agricultural education students, and agricultural educators.

ACCOUNTABILITY PLAN

The Arkansas FFA Foundation will use all funds in accordance with this grant proposal and provide updates to the commodity board as commitments are fulfilled. Both the Arkansas FFA Foundation and the Arkansas FFA Association are governed by separate Boards of Directors, operate under approved annual budgets, and maintain monthly financial statements. Established in 1970, the Arkansas FFA Foundation is a 501(c)(3) nonprofit. Financial records and filings are managed by an independent accounting firm, with an additional third-party firm conducting the annual audit. The most recent audit report is included with this proposal. More information can be found at arkansasffa.org/foundation.

ARKANSAS FFA FOUNDATION, INC.
HOT SPRINGS, ARKANSAS

FINANCIAL STATEMENTS
JUNE 30, 2025 AND 2024

ARKANSAS FFA FOUNDATION, INC.
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JUNE 30, 2025 AND 2024

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ECHOLS, THOMPSON & KNEEBONE LTD
CERTIFIED PUBLIC ACCOUNTANTS

INDEPENDENT AUDITOR'S REPORT

The Officers and Directors
Arkansas FFA Foundation Inc.
Hot Springs, Arkansas

Opinion

We have audited the accompanying financial statements of Arkansas FFA Foundation (The Foundation), which comprise the statements of financial position – modified cash basis as of June 30, 2025 and the related statements of activities, functional expenses, and cash flows – modified cash basis for the year then ended, and the related notes to the financial statements.

In our opinion, the accompanying financial statements present fairly, in all material respects, the financial position of the Foundation as of June 30, 2025, and the changes in its net assets and its cash flows for the year then ended in accordance with the modified cash basis of accounting as described in Note 1.

Basis for Opinion

We conducted our audits in accordance with auditing standards generally accepted in the United States of America (GAAS). Our responsibilities under those standards are further described in the Auditor's Responsibilities for the Audit of the Financial Statements section of our report. We are required to be independent of the Foundation and to meet our other ethical responsibilities in accordance with the relevant ethical requirements relating to our audits. We believe that the audit evidence we obtained is sufficient and appropriate to provide a basis for our audit opinion.

Basis of Accounting

We draw attention to Note 1 of the financial statements, which describes the basis of accounting. The financial statements are prepared on the modified cash basis of accounting, which is a basis of accounting other than accounting principles generally accepted in the United States of America. Our opinion is not modified with respect to this matter.

Responsibilities of Management for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with the modified cash basis of accounting as described in Note 1 and for determining that the modified cash basis of accounting is an acceptable basis for the preparation of the financial statements in the circumstances.

Management is also responsible for the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, management is required to evaluate whether there are conditions or events, considered in the aggregate, that raise substantial doubt about the Foundation's. ability to continue as a going concern for one year after the date that the financial statements are available to be issued.

Auditor's Responsibilities for the Audit of the Financial Statements

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance but is not absolute assurance and therefore is not a guarantee that an audit conducted in accordance with generally accepted auditing standards will always detect a material misstatement when it exists. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal controls. Misstatements, including omissions, are considered material if there is a substantial likelihood that, individually or in the aggregate, they would influence the judgement made by a reasonable user based on the financial statements.

In performing an audit in accordance with generally accepted auditing standards, we:

- Exercise professional judgement and maintain professional skepticism throughout the audit.
- Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, and design and perform audit procedures responsive to those risks. Such procedures include examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of Arkansas FFA Foundation Inc. internal control. Accordingly, no such opinion is expressed.
- Evaluate the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluate the overall presentation of the financial statements.
- Conclude whether, in our judgement, there are conditions or events, considered in the aggregate, that raise substantial doubt about Arkansas FFA Foundation Inc. ability to continue as a going concern for a reasonable period of time.

We are required to communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit, significant audit findings, and certain internal control related matters that we identified during the audit.

Echols, Thompson & Kneebone, Ltd.

ECHOLS, THOMPSON & KNEEBONE, LTD.

December 15, 2025

ASSETS

	2025	2024
CURRENT ASSETS:		
Cash and Cash Equivalents	$ 194,024	$ 411,047
Investments	477,769	232,084
Contributions Receivable	-	1,827
TOTAL CURRENT ASSETS	671,793	644,958
PROPERTY AND EQUIPMENT:		
Land and Land Improvements	50,643	225,463
Buildings and Building Improvements	-	3,163,262
Furniture, Fixtures and Equipment	-	4,968,157
Less: Accumulated Depreciation	-	(2,438,790)
TOTAL PROPERTY AND EQUIPMENT	50,643	5,918,092
TOTAL ASSETS	**$ 722,436**	**$ 6,563,049**

LIABILITIES AND NET ASSETS

CURRENT LIABILITIES:		
Payroll Taxes Payable	$ -	$ 17,263
TOTAL CURRENT LIABILITIES	-	17,263
LONG TERM LIABILITIES:	-	-
TOTAL LONG TERM LIABILITIES	-	-
TOTAL LIABILITIES	-	17,263
NET ASSETS WITHOUT DONOR RESTRICTIONS	194,024	395,611
NET ASSETS WITH DONOR RESTRICTIONS	528,412	6,150,176
	722,436	6,545,786
TOTAL LIABILITIES AND NET ASSETS	**$ 722,436**	**$ 6,563,049**

SEE ACCOMPANYING NOTES AND ACCOUNTANT'S AUDIT REPORT

	2025
NET ASSETS WITHOUT DONOR RESTRICTIONS	
REVENUES WITHOUT DONOR RESTRICTIONS	
Camp Income and Camp Use	$ 114,175
Donations and Contributions	197,304
Grants	145,102
Investment Income	14,052
Unrealized Gains and Losses	35,877
Fundraising Revenue	29,631
Prior Period Refunds	36,324
TOTAL REVENUES WITHOUT DONOR RESTRICTIONS	572,467
EXPENSES	
Program Services	266,568
Management and General	261,800
Fundraising	-
TOTAL EXPENSES	528,368
INCREASE (DECREASE) IN NET ASSETS WITHOUT DONOR RESTRICTIONS	44,099
NET ASSETS WITH DONOR RESTRICTIONS	
REVENUES WITH DONOR RESTRICTIONS	
Grants	-
TOTAL REVENUES WITH DONOR RESTRICTIONS	-
EXPENSES	
Donor Restricted Assets released from Restriction	(5,867,449)
TOTAL EXPENSES	(5,867,449)
INCREASE IN NET ASSETS WITH DONOR RESTRICTIONS	(5,867,449)
NET INCREASE (DECREASE) IN NET ASSETS	(5,823,350)
NET ASSETS - BEGINNING OF YEAR	6,545,786
NET ASSETS - END OF YEAR	**$ 722,436**

SEE ACCOMPANYING NOTES AND ACCOUNTANT'S AUDIT REPORT

ARKANSAS FFA FOUNDATION, INC.
STATEMENT OF FUNCTIONAL EXPENSES
FOR THE YEAR ENDED JUNE 30, 2025

Account Description	Program	Management & General	Fund Raising	Total
FFA FOUNDATION CAMP EXPENSES:				
Camp Merchandise and Camp Supplies	7,076	-	-	7,076
Camp Meals and Kitchen Supplies	37,978	-	-	37,978
Camp Repairs and Maintenance	13,239	-	-	13,239
Camp Payroll and Salaries	84,088	-	-	84,088
Camp Telephone & Utilities	25,758	-	-	25,758
Camp Insurance	10,009	-	-	10,009
	178,148	-	-	178,148
FFA FOUNDATION OPERATING EXPENSES:				
Legal and Professional	-	31,355	-	31,355
Bank and Investment Advisory Fees	-	5,741	-	5,741
Office Supplies and Expense	-	21,463	-	21,463
Outside Services and Support	-	42,650	-	42,650
Salaries and Wages	-	123,786	-	123,786
Payroll Tax Expense	-	16,258	-	16,258
Retirement Plan Expense	-	1,851	-	1,851
State Officers Expense	-	13,933	-	13,933
Travel and Meetings	-	4,763	-	4,763
	-	261,800	-	261,800
FFA FOUNDATION GRANTS AND SCHOLARSHIPS:				
Grants Awarded	67,670			67,670
Scholarships Awarded	20,750	-	-	20,750
	88,420	-	-	88,420
Total	**266,568**	**261,800**	**-**	**528,368**

SEE ACCOMPANYING NOTES AND ACCOUNTANT'S AUDIT REPORT

	2025
CASH FLOWS FROM OPERATING ACTIVITIES:	
Cash without Donor Restriction from Grants, Fund Raising and Donations Received	$ 558,415
Depreciation	-
Cash Paid for Expenses	(528,368)
Cash provided by decrease in Contributions Receivable	1,827
Increase/Decrease in Payables	(17,263)
NET CASH PROVIDED (USED) BY OPERATING ACTIVITIES	14,611
CASH FLOWS FROM INVESTING ACTIVITIES:	
Cash paid for Furniture and Equipment	$ (11,557)
Cash Transferred to Endowment Funds	$ (234,129)
Cash provided by Investment Income	$ 14,052
NET CASH PROVIDED (USED) BY INVESTING ACTIVITIES	(231,634)
CASH FLOWS FROM FINANCING ACTIVITIES:	
Cash from Loans	$ -
NET INCREASE (DECREASE) IN CASH AND CASH EQUIVALENTS	$ (217,023)
CASH AND CASH EQUIVALENTS AT BEGINNING OF YEAR	411,047
CASH AND CASH EQUIVALENTS AT END OF YEAR	**$ 194,024**

SEE ACCOMPANYING NOTES AND ACCOUNTANT'S AUDIT REPORT

ARKANSAS FFA FOUNDATION, INC.
STATEMENTS OF CASH FLOWS -
FOR THE YEAR ENDED JUNE 30, 2025

RECONCILIATION OF NET INCREASE IN NET ASSETS TO NET CASH PROVIDED BY OPERATING ACTIVITIES:

	2025
NET INCREASE (DECREASE) IN NET ASSETS (EXHIBIT B)	**$(5,823,350)**
ADJUSTMENTS TO RECONCILE INCREASE IN NET CASH PROVIDED BY OPERATING ACTIVITIES:	
Depreciation	-
Fixed Assets Transferred at Net Book Value to FFA Association	5,867,449
Cash Provided Through Investment Income	(14,052)
Cash Paid Out - Prior Year Accrued Liabilities	(17,263)
Current Year Accrued Liabilities	-
Net change in Contributions Receivable	1,827
NET CASH FLOW FROM OPERATING ACTIVITIES	**$ 14,611**

SEE ACCOMPANYING NOTES AND ACCOUNTANT'S AUDIT REPORT

Note 1. **Summary of Significant Accounting Policies**

Organization and Nature of Activities – The Arkansas FFA Foundation ("The Foundation") is a private non-profit organization formed in July 1970. The Foundation supports the activities of FFA Association chapters throughout the state of Arkansas. The Future Farmers of America is an intracurricular student organization for those interested in agriculture and leadership. The Foundation receives donations from businesses and individuals, operates a camp and raises funds to support the mission of the FFA and FFA members in schools across Arkansas.

The Arkansas FFA Foundation works in partnership with the National FFA Organization. The National FFA Organization remains committed to the individual student, providing a path to achievement in premier leadership, personal growth and career success through an agricultural education. FFA continues to help the next generation rise up to meet those challenges by helping its members to develop their own unique talents and explore their interests in a broad range of agricultural career pathways.

Basis of Accounting – the accompanying financial statements have been prepared on the modified cash basis of accounting which is a special purpose framework of accounting other than accounting principles generally accepted in the United States of America. Under the modified cash basis of accounting, certain revenue and related assets are recognized when received and not necessarily earned, and certain expenses and related liabilities are recognized when paid rather than when the obligations were incurred.

The Foundation reports information regarding its financial position and activities according to the following two classes of net assets:

Net Assets Without Donor Restrictions – Net assets that are not subject to or are no longer subject to donor-imposed stipulations.

Net Assets with Donor Restrictions – Net assets whose use is limited by donor-imposed time/and or purpose restrictions.

Cash Equivalents – The organization considers all highly liquid investments with a maturity of three months or less when purchased to be cash equivalents.

Investments – The Foundation's investments are reported at fair value. Fair value is the price that would be received to sell an asset or paid to transfer a liability in an orderly fashion between market participants at the measurement date. Changes in fair value ae recorded in the period in which they occur. See Note 10 for further discussion of fair value measurements. Realized gains and losses on sales of securities are recognized on the transaction trade dates. Dividend income is recorded on the ex-dividend date, and interest income is accrued as it is earned.

Investments (Continued) - Investment return presented on the statements of activities includes dividends, interest, other investment income, as well as the realized and unrealized gains and losses, and is net of investment expenses. Contributed investment securities are recorded based on the average of the high and low market prices on the date the investment securities are received. Generally, the Foundation liquidates contributed investment securities on the same day they are received, or as soon as reasonably possible thereafter. The difference between the initial recorded value and the sales proceeds is included in investment return on the statements of activities.

Revenue and Revenue Recognition – Contributions, including unconditional promises to give, are recognized as support in the statements of activities in the period received or when the Foundation becomes aware that a promise to give has been made, whichever occurs first. Conditional promises to give, that is, those with a measurable performance or other barrier and a right of return are not recognized until the conditions on which they depend have been met.

Contributions that are restricted by the donor are recorded as increases in net assets with donor restrictions. When a restriction expires (that is, when a stipulated time restriction ends or purpose restriction is accomplished), net assets with donor restrictions are reclassified to net assets without donor restrictions and reported in the statements of activities as net assets released from restrictions.

Allowance for uncollectible contributions receivable is determined based on historical experience, an assessment of economic conditions and a review of subsequent collections. Management believes all contributions receivable are fully collectible, as such no allowance for uncollectible contributions receivable has been recorded. If amounts become uncollectible, they will be expensed when that determination is made.

Functional Expenses – The Foundation allocates its expenses on a functional basis among various programs and supporting services. Expenses that can be identified with a specific program or supporting service are charged directly to the related program or supporting service according to their natural expenditure classification. Salaries and benefits are common to several functions and are allocated to programs and supporting services based on estimates of time worked.

Estimates – The preparation of these financial statements in conformity with the modified cash basis of accounting, a special purpose framework, requires management to make estimates and assumptions that affect certain reported amounts and disclosures in the financial statements. Accordingly, actual results could differ from those estimates.

Property and Equipment – Property and equipment are recorded at cost. Assets that cost more than $250 are capitalized. Land is the sole asset on the balance sheet as of June 30, 2025 therefore, there will be no depreciation expense for fiscal year 2025. Had the Foundation had depreciable assets, the depreciation would be recorded using the straight-line method based on the estimated useful lives of the respective assets as follows:

Furniture and Equipment	5-7 Years
Leasehold Improvements	15 Years

Income Taxes – The organization is exempt from income taxes under section 501(c)(3) of the Internal Revenue Code and a similar provision of state law. While the Organization is a tax-exempt organization, it is still subject to income tax on any unrelated business taxable income. The organization did not have any unrelated business income. No provision for income taxes has been made in the accounts as the Organization's basis of accounting requires recognizing this tax payment on unrelated business income in the year in which it is paid. Under statute, the Organization's tax returns are open to U.S. federal tax examinations up to three years from the due date of the return.

Note 2. **Cash on Deposit with Banks**

The Organization uses one financial institution for placement of its cash deposits. Cash and Cash Equivalents (highly liquid investments with maturities of three months or less) at year end were below limits set by the Federal Deposit Insurance Corporation (FDIC) and were therefore fully insured.

	2024	2025
Malvern National Bank	$411,047	$194,024

Note 3. **Significant Accounting Changes**

On October 31, 2024 the FFA Foundation Board approved the transfer of Foundation assets to the Arkansas FFA Association, a related party transaction. The transfer of assets was recorded at Net Book Value, and the total amount of the transfer was $5,867,449.00.

Land and Land Improvements	$ 174,820.00
Building and Building Improvements	$3,163,262.00
Furniture, Fixtures and Equipment	$4,968,157.00
Accumulated Depreciation	($2,438,790.00)
	$5,867,449.00

Note 4. Related Parties

The FFA Foundation is the primary fundraising body for the FFA Association. The support extended to the FFA Association is provided through Scholarships, Programs and Activities that support the common mission of both organizations, the values of premier leadership, personal growth, and career success in agricultural education.

Note 5. Subsequent Events Review

Events subsequent to the Foundation's June 30, 2025 year end were reviewed as of December 15, 2025 which is also the date the financial statements were available to be issued.

Note 6. Disclosures on Liquidity and Availability

The foundation has $194,024 of financial assets available within 1 year of the balance sheet date to meet cash needs for general expenditures from its operating and certificate of deposit accounts. There are no restrictions that make them unavailable for general expenditure within one year of the balance sheet date. The Foundation has budgeted expenditure for fiscal year 2026 of $273,280. The foundation also has $477,769 of financial assets that are restricted to supporting scholarship funds and local chapters.

Note 7. Investments

The framework for measuring fair value provides a fair value hierarchy that prioritizes the inputs to valuation techniques used to measure fair value. The hierarchy gives the highest priority to unadjusted quoted prices in active markets for identical assets or liabilities (Level 1) and the lowest priority to unobservable inputs (Level 3). The three levels of the fair value hierarchy are described as follows:

Level 1 Inputs to the valuation methodology are unadjusted quoted prices for identical assets or liabilities in active markets that the FFA Foundation has the ability to access.

Level 2 Inputs to the valuation methodology include the following:

- Quoted prices for similar assets or liabilities in active markets
- Quoted prices for identical or similar assets or liabilities in inactive markets
- Inputs other than quoted prices that are observable for the asset or liability
- Inputs that are derived principally from or corroborated by observable market data by correlation or other means

If the asset or liability has a specified (contractual) term, the Level 2 input must be observable for substantially the full term of the asset or liability.

Level 3 Inputs to the valuation methodology are unobservable and significant to the fair value measurement.

The asset or liability's fair value measurement level within the fair value hierarchy is based on the lowest level of any input that is significant to the fair value measurement. Valuation techniques maximize the use of relevant observable inputs and minimize the use of unobservable inputs.

The following is the description of the valuation methodologies used for assets measured at fair value.

- The fair values of mutual funds are determined based on the daily closing price as reported by the fund. These funds are required to publish their daily net asset value (NAV) and to transact at that price.
- The fair values of exchange traded funds are determined based on the closing price as reported by the fund. The funds are priced continuously throughout the day but are required to publish their daily NAV at market close based on the value of the underlying securities.
- The fair values of equities are determined based on the closing price reported on the active market in which the individual securities are traded.
- The fair values of U.S. Treasury obligations, government-sponsored entity obligations and bonds are determined based on pricing models maximizing the use of observable inputs for similar securities.
- The fair values of real property are determined based on an appraisal at the date of acquisition. The appraisal considered sales of comparable property at the date of acquisition.

The preceding methods described may produce a fair value calculation that may not be indicative of net realizable value or reflective of future fair values. Furthermore, although the FFA Foundation believes its valuation methods are appropriate and consistent with other market participants, the use of different methodologies or assumptions to determine the fair value of certain financial instruments could result in a different fair value measurement at the reporting date.

The following are the fair values of the FFA Foundations assets measured on a recurring and nonrecurring basis at June 30, 2025 and 2024. Level 1 and 2 investments are measured on a recurring basis and level 3 investments are measured on a nonrecurring basis. There have been no changes in methodologies used at June 30, 2025 and 2024.

June 30, 2025

INVESTMENTS	FAIR VALUE	LEVEL 1	LEVEL 2	LEVEL 3
CASH	$194,024	$194,024	$0	$0
PORTFOLIO	$477,769	$0	$477,769	$0
BUILDINGS	$0	$0	$0	$0
LAND	$50,643	$0	$0	$50,643
EQUIPMENT	$0	$0	$0	$0
TOTAL	$722,436	$194,024	$477,769	$50,643

June 30, 2024

INVESTMENTS	FAIR VALUE	LEVEL 1	LEVEL 2	LEVEL 3
CASH	$411,047	$411,047	$0	$0
PORTFOLIO	$232,084	$0	$232,084	$0
BUILDINGS	$3,163,262	$0	$0	$3,163,262
LAND	$225,463	$0	$0	$225,463
EQUIPMENT	$4,968,157			$4,968,157
TOTAL	$9,000,013	$411,047	$232,084	$8,356,882

8 - PR-14

Organization/Institution Submitting Proposal:
Arkansas 4-H Foundation and Arkansas FFA Foundation

Project Title:
Joint Funding Proposal for Promotion of Education on Corn, Sorghum, and Soybeans for Arkansas 4-H and FFA Youth

Project Type:
Promotion

Name of Project Manager:
Taylor Wiseman (FFA)

Name of Project Team Member 1:
John Thomas (4-H)

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
This project provides Arkansas 4-H and FFA state officers with direct exposure to the nation's premier production agriculture event, the Commodity Classic. By attending, officers gain firsthand knowledge of corn, sorghum, and soybean production, innovation, and advocacy. This experience prepares them to become informed ambassadors and future leaders who will share insights with thousands of Arkansas youth, strengthening the long-term vitality of the state's agricultural industries.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Funding will support travel, lodging, meals, registration, and related expenses for Arkansas 4-H and FFA state officers and chaperones to attend the 2027 Commodity Classic. Officers will participate in educational sessions, tours, and the trade show, gaining exposure to agricultural technology and advocacy. Following the event, officers will present their experiences to the commodity boards and share knowledge statewide. Expenses are incurred by 4-H or FFA and submitted for reimbursement after the event.

BUDGET

Amount of Funding Needed for Project:
$15,000.00

Contribution Amount (from organization or sponsor):
$0.00

Joint Funding Proposal for Promotion of Education on Corn, Sorghum, and Soybeans for Arkansas 4-H and FFA Youth

From:	Arkansas 4-H Foundation Arkansas FFA Foundation
To:	Arkansas Corn and Grain Sorghum Board Arkansas Soybean Promotion Board
Support Level:	Up to $15,000 per commodity board
Program of Support:	2027 Commodity Classic (New Orleans, Louisiana)
Impact:	Arkansas State 4-H and State FFA Officers
Dates:	March 3-5, 2027

Proposal

- The Arkansas Corn and Grain Sorghum Board and the Arkansas Soybean Promotion Board jointly and equally provide funding to sponsor each state officer delegation, 4-H and FFA, including up to seven state 4-H officers and six state FFA officers, along with additional staff, or chaperones, to attend the 2027 Commodity Classic.
- Funding will cover transportation, lodging, meals, registrations, tours, admissions, and other related expenses necessary to achieve the goals of this proposal.
- The Arkansas Corn and Grain Sorghum Board and the Arkansas Soybean Promotion Board will each receive a summary and receipts of expenses incurred. These expenses will be divided equally between the boards not to exceed $15,000 per board. Unused expenses will not be transferred to the following year.
- State 4-H and State FFA officers will be available to attend each commodity board's meeting after the event to present on their time at the 2027 Commodity Classic.



2025-2026 Arkansas 4-H and FFA State Officers


2024-2025 State FFA Officers presenting to the Arkansas Soybean Promotion Board about their time at the 2025 Commodity Classic.

Importance

By supporting this proposal, the Arkansas Corn and Grain Sorghum Board and the Arkansas Soybean Promotion Board will directly invest in preparing the next generation of advocates, producers, and leaders for your industries.



Arkansas 4-H has over 130,000 Arkansas youth who participate in 4-H programs per year in all 75 counties in the state.

Arkansas FFA has over 18,000 FFA members and is in 80% of school districts in the state. Arkansas FFA makes a positive difference in the lives of students by developing their potential for premier leadership, personal growth, and career success through agricultural education.

The Commodity Classic is unlike any other event in agriculture. Your support ensures Arkansas 4-H and FFA officers are among the select few student leaders nationwide who experience this event and return ready to share that knowledge across our state. This investment not only develops future agricultural leaders but also creates ambassadors for corn, sorghum, and soybeans who will share their Commodity Classic experiences with thousands of peers when they return to Arkansas.

4-H and FFA pride themselves in a learning by doing model, where members actively participate in projects, events, competitions, and real-world experiences. Attending the Commodity Classic provides members a rare opportunity to witness grassroots advocacy and agricultural innovation firsthand, and it provides excellent networking among agricultural industries. The event showcases the most up-to-date technology. This show is the premier, production agriculture focused event showcasing how an idea, need, or a problem can be addressed through partnership, collaboration, and advocacy.



According to the most recent Census of Agriculture, the average age of an Arkansas farmer is 57.6, an increase from the previous census.[1] The membership of both 4-H and FFA is increasing. These members are developing a love of agriculture and rural Arkansas. Engaging them at the Commodity Classic and having them subsequently attend the respective Commodity Board Meetings will inspire career paths in farming and agriculture—helping ensure a strong future workforce as today's farmers age.

Commodity Classic is unlike any other event in agriculture. With your support, the state officers will experience:

- **Incredible insight** through a full slate of educational sessions designed to showcase efficiency, profitability, and continual improvement.
- **Eye-opening innovation and technology** showcased in the huge trade show—where they will see the latest advancements and understand the wide variety of careers in agriculture.

[1] USDA NASS 2022 Census of Agriculture, https://www.nass.usda.gov/Publications/AgCensus/2022/Full_Report/Volume_1,_Chapter_1_State_Level/Arkansas/st05_1_052_052.pdf.

- **Visionary thought leaders** and innovators in agriculture who will challenge the way they think about and advocate for agriculture.
- **The spectacular energy** of being around thousands of positive, talented farmers who share a passion for agriculture and knowledge.

Budget Estimate

Items	**Estimated Amount** (Each board would support up to 50% of total cost)
Travel (Air or mileage/vehicle)	$17,000
Hotel	$5,000
Meals and Incidentals	$5,000
Registration	$3,000
Total	**$30,000**

Budget Notes

- Items will be reimbursed after the expense is incurred by 4-H or FFA, with a limit of $15,000 per commodity board in total. Funding will cover transportation, lodging, meals, registrations, tours, admissions, and other related expenses necessary to achieve the goals of this proposal.
- The Arkansas Corn and Grain Sorghum Board and the Arkansas Soybean Promotion Board will each receive a summary and receipts of expenses incurred. These expenses will be divided equally between the boards not to exceed $15,000 per board. Unused expenses will not be transferred to the following year.

Accountability Plan

The Arkansas 4-H Foundation and Arkansas FFA Foundation will use all funds in accordance with this grant proposal and provide updates to the commodity board as commitments are fulfilled. Both foundations are governed by Boards of Directors, operate under approved annual budgets, maintain monthly financial statements, and are 501(c)(3) nonprofits. More information can be found at arkansas4hfoundation.org and arkansasffa.org/foundation.

Conclusion

Thank you for your previous support, allowing the 4-H and FFA state officers to attend the 2025 and 2026 Commodity Classic. We respectfully request your investment of up to $15,000 per commodity board to make this opportunity possible for 2027. Together, we can prepare the next generation of leaders who will champion Arkansas corn, sorghum, and soybean industries in Arkansas.



9 - PI-11

Organization/Institution Submitting Proposal:
Three County Fair

Project Title:
All Things Soybeans

Project Type:
Promotion

Name of Project Manager:
Cathy Helton

Name of Project Team Member 1:
Reagan Blansett

Name of Project Team Member 2:
Makenzie Minton

Statement of Justification or Purpose of the Project (75 word maximum):
The purpose of this project is to provide educational and real life experiences to the youth of community.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Each year we host education days during our fair where the schools come and participate. This year we plan on taking our education days to each county. This year we are putting more of an emphasis on soybean production and all that soybeans offer. Our goal is to educate the youth and the community on where thier food, clothing, and other resources come from. We also want to bring to light all the job oppourtinity that ag has to offer our community and beyond.

BUDGET

Amount of Funding Needed for Project:
$13,840.00

Contribution Amount (from organization or sponsor):
$1,500.00

Our goals for the Three County Fair is to provide educational experiences for our classrooms in each county, Cross, Jackson, and Woodruff. Soybeans are grown in each one of the counties that we represent. We want to educate on all the uses that soybeans can offer such as livestock feed, oils, candles, food that we eat, etc. Our objective is to teach students and the community about the importance of soybeans and how they are planted, grown, harvested, and used in everyday products around us. We would like to have the soybeans in all stages for them to feel and interact with; soybean seeds, soybean plants, dried soybean plants, and harvested soybeans as well as including a picture board that shows the process of planting, tending, and harvesting of the soybeans. We also would like to have products and examples available of what all soybeans are used in and in what forms (liquid, whole, ground, or crushed). We would partner with local seed dealers and farmers to help acquire the seeds, plants and end product. We would also get together with our local grocery stores in each county to gather some of the items to display that contain some sort of soybean in them. We would get with each county's local equipment dealerships to ensure we also have the equipment present needed to grow and harvest soybeans and potential guest speakers. Within all three counties, we hope to educate over 500 students.

The expected benefits to the Arkansas Soybean Industry would be the greater knowledge of the participants that are involved in our education days at our fair about soybeans and their uses. Other expected benefits would be possible career related opportunities that soybeans can offer such as farmers, producers, seed dealers, equipment sales, chemical sales, and the list continues.

Like stated above, being able to promote generic soybeans and their use across many fields like agriculture, food systems and industrial applications allows us to educate these students about how they are a reliable source for our community. By focusing on what all a soybean can do and its relevance to the delta will engage our audience and help promote soybeans in general without giving a nod to any specific producer or business. Just like rice, soybeans are not only important to Arkansas but globally as well. Soybeans help provide feed and supplies around the world. We like to incorporate new and interesting educational activities that the students can interact with that pertain to our counties and our state.

Budget

10 Corrugated reusable plastic signs with stakes	$ 1,500.00
Tent rental	4,500.00
Port a Potties	1,100.00
Generator for electricity if needed	800.00
Misc. paper product	500.00
Paperback copy of the book My Family Soybean Farm	
To each student	6,520.00
Hardback copy to each school for each classroom	420.00
Total	$15,340.00

10 - PI-12

Organization/Institution Submitting Proposal:
Cross County Farm Bureau Women's Leadership Committee

Project Title:
Cross County Youth Ag Day

Project Type:
Promotion

Name of Project Manager:
Stacy Witcher

Name of Project Team Member 1:
Jennifer Martin

Name of Project Team Member 2:
Don Mills

Statement of Justification or Purpose of the Project (75 word maximum):
Cross County Farm Bureau's Women's Leadership Committee desires to share the importance of agriculture with all elementary students in our county. We believe that the best way to convey the mission, the purpose and the necessity of farming / ranching, is for students to learn directly from farmers and ranchers and those who support farming and ranching. We intend to accomplish this mission by hosting an youth agriculture education day (Ag Day) on the campus of all three elementary schools in our county.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Elementary students will visit multiple stations during Youth Ag Day. There will be ten stations with experts from multiple agriculture specialities, including a hands on station where students will physically handle soybeans in various forms while receiving educational instruction. Students and staff members will also receive t-shirts with sponsors listed on the back. Event t-shirts tend to circulate for years and generate residual promotion.

BUDGET

Amount of Funding Needed for Project:
$10,000.00

Contribution Amount (from organization or sponsor):
$1,000.00

Project Funding Request

Cross County Farm Bureau Women's Leadership Committee is seeking funds from the Arkansas Soybean Promotion Board in the amount of $10,000 for a Youth Agriculture Education Day for elementary students in Cross County Arkansas. Funding is needed to provide tents for agriculture stations, signage, handouts and t-shirts for students and teachers.

Project Overview

Cross County Farm Bureau Women's Leadership Committee has entered the classrooms of the elementary schools in our county multiple times over the last several years. The more interaction we have had with elementary students, who live in predominately rural and agricultural communities, the more we realized the need for agricultural education for students. Today's elementary students believe their chicken nuggets come from the store and not from the animals raised by farmers, they think rabbits hatch from eggs delivered by the Easter Bunny, and that the soybeans, rice, and corn they consume everyday comes from factories and not family farms.

Our regular Ag in the Classroom visits have shared knowledge from farmers and ranchers with students and put a face to the mysterious farmer. However, we have realized that yearly visits to individual classrooms are not having a big enough impact. We want to dramatically increase our outreach and take elementary agricultural education to the next level. We are hosting the first annual Cross County Youth Ag Day (Youth Ag Day) on the campus of the three elementary schools in our county this spring. Our Youth Ag Days will potentially reach more than 1,400 students as well as numerous teachers and staff members.

Last year, members and junior members of our Women's Leadership Committee assisted with an Ag Day held in Poinsett County. Students arrived by the bus load and spent an hour visiting stations where they learned about different aspects of Arkansas agriculture. After seeing how many students learned from the station experts and hands on activities, we realized that by providing an entire day devoted to agriculture with multiple hands on stations would make a much larger impact than visiting individual classrooms for less than an hour.

Our plan is to rent large tents, have them erected on school property and use them to house stations such as a petting zoo, handling of soybeans, rice and corn, demonstrations from the Rice Research Center, ag drone demonstration, ag equipment display and more. By utilizing the existing school property, we can provide easy accessibility for the schools and exposure to every student in Wynne and Cross County school districts. The tents will allow us to conduct our Youth Ag Day no matter what the weather forecast is.

Wynne Primary School would visit one morning, followed by Wynne Intermediate School the next day. Cross County Elementary students would visit the following week.

Each student and teacher will receive a t-shirt that will be sent home earlier in the week to be worn to Youth Ag Day. Boxes of bagged handouts from Arkansas Farm Bureau and commodity promotion boards will be delivered to each classroom, allowing every elementary child in the entire county to go home with Ag Readers on commodities and livestock raised in Arkansas.

We also intend to utilize FFA student members to serve as guides leading the students from station to station and county 4-H members have offered to run the petting zoo and other stations as needed. By including these volunteer student organizations, we will expand Youth Ag Day beyond the elementary schools.

Sponsors of Youth Ag Day will have the option to have their logo included on t-shirts provided to each student and on the banner welcoming students. This banner will be displayed prominently on the school campuses. Sponsors can also provide information, flyers or booklets they would like included in the handout bags sent home with each child.

Project Budget

T-shirts provided for each student, teacher and volunteer - $12,000

Tents, tables, chair rental for two locations - $7,000

Signage - $2,000

Drinks/snacks for volunteers running stations - $500

Ag Readers for children - $4,000

Portable Toilets for volunteers - $350

Generator Rental - $600

Miscellaneous supplies (paper, name tags, bags, rubber bands, etc) $500

Total expected expenditures $26,950

Project Accountability and Fiduciary Stewardship

This project is being carried out by Cross County Farm Bureau Women's Leadership Committee with oversight by the Cross County Farm Bureau Board. All funding and expenditures will be handled by Cross County Farm Bureau.

We are applying for grants from a few sources. While we would prefer to offer the program to all students, lack of funding would cause the program reach to be scaled back. Any excess funds not used directly for our Youth Ag Day program will be used to purchase agriculture picture books for school and county libraries.

11 - PI-13

Organization/Institution Submitting Proposal:
Botanical Garden of the Ozarks

Project Title:
Chefs in the Garden

Project Type:
Promotion

Name of Project Manager:
Ashley Wardlow

Name of Project Team Member 1:
Nina Estes

Name of Project Team Member 2:
Madison Soderquist

Statement of Justification or Purpose of the Project (75 word maximum):
Chefs in the Garden is a high-visibility regional culinary event that offers an effective platform to promote Arkansas-grown soybeans through chef engagement and consumer education. This project will introduce guests to the versatility, nutritional value, and culinary applications of soybeans through tasting experiences, educational signage, and direct interaction with chefs. By highlighting soybeans in a trusted, experiential setting, the project supports increased consumer awareness, chef adoption, and demand for Arkansas-grown soybeans.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Chefs in the Garden will incorporate Arkansas-grown soybeans and soybean-derived ingredients into chef-created tasting dishes, highlighting their versatility across culinary applications. Station-level signage and educational displays will identify soybean use and share information about Arkansas soybean production, nutrition, and sustainability. Guests will engage directly with chefs to learn about preparation and sourcing. The Arkansas Soybean Promotion Board will be invited to host an educational booth, and chefs incorporating soybeans will receive special recognition as part of the event's friendly culinary competition.

BUDGET

Amount of Funding Needed for Project:
$12,500.00

Contribution Amount (from organization or sponsor):
$12,500.00

Proposal: Promoting Arkansas Soybeans at *Chefs in the Garden*
Submitted to: Arkansas Soybean Promotion Board
Submitted by:
Botanical Garden of the Ozarks
Fayetteville, Arkansas
Executive Director: Ashley Wardlow
www.bgozarks.org

The Opportunity: Promoting Arkansas Soybeans through Regional Culinary Education & Engagement

Chefs in the Garden is Northwest Arkansas ʾpremier garden-to-table tasting event, produced with lead partner Tyson Foods. The Botanical Garden of the Ozarks respectfully requests support to promote Arkansas-grown soybeans through chef engagement and consumer education during the 2026 event. This project will introduce guests to the versatility of Arkansas soybeans across culinary applications, with strong regional visibility and hands-on learning opportunities.

Project Description & Background
Hosted annually at the Botanical Garden of the Ozarks, *Chefs in the Garden* welcomes more than 1,200 guests for an evening of chef-created tasting dishes, live music, and community connection. Chefs prepare and serve original dishes while engaging directly with guests, creating a high-impact educational environment well suited for agricultural promotion.

Support from the Arkansas Soybean Promotion Board would allow the Garden to introduce soybeans as a featured Arkansas crop, highlighting their role in nutrition, culinary innovation, and sustainable agriculture. This project promotes Arkansas soybeans generically, without reference to specific brands or businesses.

Goals & Objectives
Primary Goal: Increase consumer awareness and use of Arkansas-grown soybeans through culinary engagement and education.

Objectives:

- Provide regional consumers with direct experiences tasting and learning about Arkansas-grown soybeans
- Highlight Arkansas' leadership role in U.S. soybean production
- Engage chefs in menu-inspiring use of Arkansas-grown soybeans

- Deliver clear, generic soybean education through signage, displays, and guest materials
- Encourage ongoing home-use of Arkansas-grown soybeans through guest takeaway materials
- Reinforce the connection between soybeans, community health, and access to nutritious food

Project Activities

Culinary Showcase of Arkansas Soybeans

Participating chefs will be encouraged to incorporate Arkansas soybeans or soybean-derived ingredients (e.g., edamame, tofu, soy oil, soy-based sauces) into tasting dishes.

Public Education & Signage

Station-level signage and displays will identify soybean use and share information about Arkansas soybean production, nutrition, and sustainability.

Arkansas Soybean Education Booth

The Board will be invited to host a staffed booth offering any preferred combination of the following: educational materials, engagement activities, cooking and preparation information, industry background. Board staff or partners may engage directly with guests.

Chef Competition Alignment

Each year, chefs participate in a friendly culinary competition. In 2026, bonus scoring credit will be awarded for the use of Arkansas-grown soybeans or soybean-derived ingredients, encouraging thoughtful integration and professional adoption.

Benefits to the Arkansas Soybean Industry

This project has regional impact with statewide relevance and is uniquely positioned to:

- Increase consumer awareness of Arkansas soybeans
- Expand chef familiarity and menu integration
- Promote soybeans as a healthy household staple
- Strengthen agricultural identity in Northwest Arkansas

Budget

Organizational Contribution: $12,500 (Cash + In-Kind)

- Staff time for event execution & education coordination
- Event infrastructure & production
- Communications & design

- Culinary coordination & competition support
- Volunteer coordination
- Guest service logistics

Requested from Arkansas Soybean Promotion Board: $12,500

Category	Amount
Educational signage & displays	$4,000
Chef engagement & culinary integration	$3,000
Event branding & communications	$2,500
Guest education materials	$2,000
Education booth support	$1,000
Total Request	**$12,500**

Impact Reporting & Accountability Plan
The Botanical Garden of the Ozarks will provide the following upon request:

- A written post-event report
- Attendance totals & demographic summary
- Summary of chef participation
- Sample educational & promotional materials
- Media and digital engagement analytics
- Photographs
- Budget utilization summary
- Confirmation of generic promotion

Organizational Capacity
The Botanical Garden of the Ozarks is a respected regional nonprofit public garden dedicated to environmental education and community engagement. *Chefs in the Garden* has successfully operated for more than 18 years, reaching thousands of guests and generating meaningful community support. Our organization has strong event management capability, deep regional partnerships, broad audience reach across Washington and Benton Counties, transparent nonprofit governance and a proven record of stewarding sponsor relationships.

Conclusion
We would be honored to collaborate with the Arkansas Soybean Promotion Board. Together, we can inspire thousands of consumers, elevate Arkansas agriculture, and strengthen appreciation for the crop that feeds our state and nation. We respectfully request $12,500 in promotion funding to support this effort.

Thank you for your consideration.
Warmly,

Ashley Wardlow
Executive Director
Botanical Garden of the Ozarks

12 - PR-15

Organization/Institution Submitting Proposal:
Ag Learning Center at Four States Fair & Rodeo

Project Title:
Ag Learning Center Educational Program

Project Type:
Promotion

Name of Project Manager:
Kristen Larey

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
The purpose of this project is to expand soybean education at the Agricultural Learning Center by helping students understand where soybeans are grown, how they are produced, and their role in everyday products. Through hands-on, age-appropriate learning experiences, students will explore soybean by-products, sustainability, and agriculture's role in food, fuel, and fiber. This project strengthens agricultural literacy and connects future consumers and producers to Arkansas soybeans.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Funds will be used to develop and enhance interactive soybean exhibits, hands-on learning stations, and educational materials at the Agricultural Learning Center. Activities will include student-led exploration of soybean by-products, age-appropriate lessons aligned with state standards, and guided discussions on soybean production and sustainability. Programming will be delivered through field trips, school visits, and public events, reaching thousands of students annually.

BUDGET

Amount of Funding Needed for Project:
$20,000.00

Contribution Amount (from organization or sponsor):
$131,000.00

Arkansas Soybean Research & Promotion Board

2026 Program Proposal- Ag Learning Center at the Four States Fairgrounds

Mission Statement

The Agriculture Learning Center at the Four States Fairgrounds is committed to educating non-rural audiences about the importance of agriculture in Arkansas and the nation. Through interactive lessons, hands-on demonstrations, and real-world applications, we highlight the essential role of Arkansas commodities — including soybeans — in sustaining communities, supporting the economy, and providing everyday products used by families.

By connecting students and the public to where their food, clothing, fuel, and everyday goods originate, the Ag Learning Center cultivates a greater respect and understanding for agriculture and those who produce it.

Key Objectives

1. Advancing Agricultural Education
   - Provide engaging, interactive agricultural instruction for schools and community groups
   - Create memorable hands-on learning experiences that reinforce agricultural concepts
   - Increase student understanding of crop production, plant science, and agriculture careers

2. Promoting Arkansas Soybeans & Other Key Commodities
   - Highlight the role of soybeans in food, fiber, fuel, and everyday products
   - Show how soybean by-products are used in homes, classrooms, vehicles, and industries
   - Increase family and community awareness of Arkansas's leadership in soybean production

3. Strengthening Community Connections
   - Build stronger relationships between rural and non-rural populations
   - Encourage appreciation for Arkansas farmers and agricultural professionals
   - Inspire future agricultural advocates through engaging, age-appropriate lessons

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Vision for the Future

Through expanded partnerships with educators, agricultural organizations, volunteers, and industry leaders, the Ag Learning Center will continue to grow as a regional hub for agricultural literacy. Our vision promotes agriculture not just as food and fiber, but as a foundation for daily life — from the materials used to build homes, to the fabrics in our clothing, to the renewable energy and nutrition that sustain families.

The Arkansas Soybean Promotion Board plays a vital role in this vision as we integrate soybean education into every appropriate program, class, display, and outreach effort.

Project Overview & Program Impact

In 2024–2025, the Ag Learning Center continued to expand through strong school and community partnerships. A wide variety of interactive, sensory-based activities were introduced to help students understand agricultural processes, including soybean production and by-products.

Our proven instructional model — “Hear it, See it, Do it” — ensures lessons are memorable, engaging, and effective. Instead of simply being told about agriculture, students actively experience:

- Soybean window planting activities
- “Farming in a Glove” seed germination experiments
- Soybean greenhouse models
- By-product identification games
- Nutrition and soil demonstrations
- Conservation and soil profile lessons
- Agricultural art, literacy, and STEM connections

Student & Outreach Reach

In addition to the 700+ students reached in late 2024, the Ag Learning Center successfully served over 1,830 students and participants in 2025 through field trips and outreach programs with the following schools and organizations:

- Texarkana ISD & Arkansas ISD districts
- Fouke, Genoa, Nevada, Horatio School Districts
- Learning Station (Texarkana, Fouke, Genoa locations)
- Trinity Summer Camp
- Trinity Kindergarten
- Kiwanis Summer Camp
- Texas & Arkansas Parks and Recreation
- TEACH Homeschool Co-op
- Montessori School
- Deep Wells Co-Op Academy
- First Baptist Church Pre-School
- Church and community groups

Key Soybean & Agriculture Activities Included:

- Soybean window planters (Earth Day)
- Soybean greenhouse stations
- Farming in a Glove (seed germination)
- Bird feeder and conservation lessons
- Soil profile demonstrations
- Walking Tacos (Beef & crop connections)
- Corn, sunflower, pumpkin, soybean, and apple life cycle lessons
- Agricultural literacy through themed units such as *Charlotte’s Web* and *The Very Hungry Caterpillar*
- Seasonal and conservation-focused themes tied to crops and farming

Teachers consistently provide positive feedback and rebook visits for future semesters, validating the effectiveness of our programs.

2026 Goals & Objectives

Goal 1 – Expand Soybean & Commodity Education

- Establish an agricultural literacy library designed for students that highlights soybeans, crop production, and the role of agriculture in everyday life.
- Develop new interactive soybean, soil, and sustainability displays
- Add 3–5 new hands-on soybean education games/ displays

Goal 2 – Build Health & Nutrition Awareness

- Highlight the role of soybeans in food products and balanced diets
- Demonstrate how soybean oil and meal are used in common foods
- Provide student-friendly materials on agricultural nutrition

Goal 3 – Strengthen Volunteer & Community Engagement

- Train additional volunteers in soybean & commodity education
- Expand fair and classroom programming focused on Arkansas crops
- Increase participation in education booths and demonstrations

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Clientele Served

Students & Educators
- Pre-K through 12th grade
- Homeschool groups
- Summer camps
- Teachers and sponsors

General Public
- Four States Fair attendees
- Community event participants
- Families and visitors

Volunteers
- Over 250 community volunteers regularly support programs

Methods of Implementation

- Curriculum-aligned agricultural lessons
- Hands-on games and demonstrations
- Outreach visits to schools and organizations
- Fair and building educational stations
- Interactive displays focused on soybeans and conservation
- Volunteer recruitment

Staff & Administration

Kristen Larey – Director, Ag Learning Center
Certified educator in Arkansas and Texas with 15 years of classroom experience. Kristen develops and delivers all agricultural education programs, coordinates field trips, manages volunteers, and designs curriculum aligned with Arkansas commodities—especially rice.

Lisa Garner – Four States Fair
The Ag Learning Center operates under the umbrella of the Four States Fair. The Fair team collaborates with the Center to support educational programming, manage budgets, and oversee facility maintenance, ensuring the continued success of all programs.

Evaluation Plan

Program success will be measured through:
- Number of students reached
- Teacher and volunteer feedback
- Participation growth
- interactive engagement

Evaluations will be conducted in coordination with:
- Volunteer and Visitor leadership
- Four States Fair Board including CEO
- Arkansas Soybean Promotion Board

Ag Learning Center – 2025 Expense Summary by Category

Expense Category	Description	Amount
Personnel	Staffing, travel, and postage	$65,000
Educational Events & Public Programs	Kid's Day, Fair programming, and large-scale public education events	$18,500
Educational Exhibits & Interactive Displays	Hands-on displays, exhibit materials, and interactive learning stations	$7,500
Instructional Materials & Classroom Supplies	Lesson materials, consumable supplies, and classroom resources	$5,000
Facility Operations & Maintenance	Building upkeep, repairs, utilities, and operational maintenance	$20,000
Marketing, Outreach & Communications	Promotional materials, advertising, and community outreach efforts	$15,000
TOTAL EXPENDITURES		**$131,000**

Currently, the Four States Fair Association serves as a key operational partner to the Ag Learning Center by providing support for core expenses such as personnel and facility operations and maintenance. This partnership allows promotion board funding to be directed primarily toward educational programming, exhibits, materials, and outreach that directly advance commodity promotion and youth agricultural education.

Funding Request

The Ag Learning Center respectfully requests $20,000 from the Arkansas Soybean Promotion Board to support:

- Expanded soybean education
- Interactive exhibits
- Classroom materials
- Outreach supplies
- Development of new soybean-focused activities
- Educational signage and games

THE FOUR STATES FAIR ASSOCIATION, INC., AND ITS WHOLLY OWNED SUBSIDARIES
FINANCIAL STATEMENTS
FOR THE YEAR ENDED DECEMBER 31, 2024

THE FOUR STATES FAIR ASSOCIATION, INC., AND ITS WHOLLY OWNED SUBSIDIARIES
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INDEPENDENT ACCOUNTANT'S REVIEW REPORT

July 17, 2025

To the Board of Directors
The Four States Fair Association, Inc., And its Wholly Owned Subsidiaries
Texarkana, Arkansas

We have reviewed the accompanying financial statements of The Four States Fair Association, Inc., And Its Wholly Owned Subsidiaries (a nonprofit organization), which comprise the statement of financial position as of December 31, 2024, and the related statements of activities and change in net assets, functional expenses, and cash flows for the year then ended, and the related notes to the financial statements. A review includes primarily applying analytical procedures to management's financial data and making inquiries of entity management. A review is substantially less in scope than an audit, the objective of which is the expression of an opinion regarding the financial statements as a whole. Accordingly, we do not express such an opinion.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with accounting principles generally accepted in the United States of America; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement whether due to fraud or error.

Accountant's Responsibility

Our responsibility is to conduct the review engagement in accordance with Statements on Standards for Accounting and Review Services promulgated by the Accounting and Review Services Committee of the AICPA. Those standards require us to perform procedures to obtain limited assurance as a basis for reporting whether we are aware of any material modifications that should be made to the financial statements for them to be in accordance with accounting principles generally accepted in the United States of America. We believe that the results of our procedures provide a reasonable basis for our conclusion.

We are required to be independent of The Four States Fair Association, Inc., And Its Wholly Owned Subsidiaries and to meet our other ethical responsibilities, in accordance with the relevant ethical requirements related to our review.

Accountant's Conclusion

Based on our review, we are not aware of any material modifications that should be made to the accompanying financial statements in order for them to be in accordance with accounting principles generally accepted in the United States of America.

Supplementary Information

The accompanying supplementary information included on pages 11-13 is presented for purposes of additional analysis and is not a required part of the basic financial statements. Such information is the responsibility of management and was derived from, and relates directly to, the underlying accounting and other records used to prepare the financial statements. The supplementary information has been subjected to the review procedures applied in our review of the basic financial statements. We are not aware of any material modifications that should be made to the supplementary information. We have not audited the supplementary information and do not express an opinion on such information.

Wilf & Henderson, P.C.
Wilf & Henderson, P.C.
Certified Public Accountants
Texarkana, Texas

FINANCIAL STATEMENTS

The Four States Fair Association, Inc., and Its Wholly Owned Subsidiaries
Consolidated Statement of Financial Position
December 31, 2024

Assets	
Cash and Cash Equivalents	$ 422,242
Certificates of Deposit	431,639
Accounts Receivable	6,400
Inventories	621
Prepaid Expenses	22,305
Property and Equipment, Net	3,256,933
Other Assets	3,500
Total Assets	$ 4,143,640
Liabilities and Net Assets	
Liabilities	
Accounts Payable	$ 14,401
Deferred Revenue	3,633
Accrued Expenses	53,370
Total Liabilities	71,404
Net Assets	
Without Restrictions	4,069,957
With Restrictions	2,279
Total Net Assets	4,072,236
Total Liabilities and Net Assets	$ 4,143,640

The accompanying notes are an integral part of the financial statements.

The Four States Fair Associaiton, Inc., and Its Wholly Owned Subsidiaries
Consolidated Statement of Activities and Changes in Net Assets
For the Year Ended December 31, 2024

	Without Donor Restrictions	With Donor Restrictions	Total
Revenues			
Grants and Contributions	$ 131,745	$ -	$ 131,745
Fair Income	777,247	-	777,247
RV Space Rentals	123,507	-	123,507
Special Events Gross Revenue	431,032	-	431,032
Membership Dues	2,575	-	2,575
Food and Beverage, net of cost of goods sold	25,166	-	25,166
Other	7,628	-	7,628
Total Revenues	1,498,900	-	1,498,900
Net Assets Released from Donor Restictions			
Contributions - Expiration of Time Restriction	-	-	-
Expenses			
Program Services	1,384,465	-	1,384,465
Food and Beverage	21,681	-	21,681
Supporting Services			
Management and General	307,252	-	307,252
Fundraising	1,500	-	1,500
Total Expenses	1,714,898	-	1,714,898
Non-operating Revenues (Expenses)			
Interest	20,716	-	20,716
Total Non-operating Revenues (Expenses)	20,716	-	20,716
Increase (Decrease) in Net Assets	(195,282)	-	(195,282)
Net Assets at Beginning of Year	4,265,239	2,279	4,267,518
Net Assets at End of Year	$ 4,069,957	$ 2,279	$ 4,072,236

The accompanying notes are an integral part of the financial statements.

The Four States Fair Association, Inc., and Its Wholly Owned Subsidiaries
Consolidated Statement of Functional Expenses
For the Year Ended December 31, 2024

	Program Services	Food and Beverage	Management and General	Fundraising	Total Expense
Advertising	$ 72,358	$ -	$ -	$ -	$ 72,358
Depreciation	151,826	7,282	-	-	159,108
Equipment Rentals	52,111	-	-	-	52,111
Fair Activities	179,630	-	-	-	179,630
Insurance	98,061	-	9,697	-	107,758
Legal and Accounting	4,211	-	11,000	-	15,211
Licenses and Fees	7,322	3,139	15,952	-	26,413
Payroll Taxes	18,904	-	13,689	-	32,593
Postage and Shipping	1,550	-	1,137	-	2,687
Property Taxes	38,034	-	-	-	38,034
Repairs and Maintenance	108,856	9,180	12,889	-	130,925
Salaries and Causal Labor	300,077	-	217,298	-	517,375
Special Events	71,631	-	-	1,500	73,131
Supplies and Miscellaneous	47,979	2,080	155	-	50,214
Telephone and Utilities	228,915	-	25,435	-	254,350
Travel	3,000	-	-	-	3,000
Total	$ 1,384,465	$ 21,681	$ 307,252	$ 1,500	$ 1,714,898

The accompanying notes are an integral part of the financial statements.

The Four States Fair Association, Inc., and Its Wholly Owned Subsidiaries
Consolidated Statement of Cash Flows
For the Year Ended December 31, 2024

Cash Flow from Operating Activities		
Cash received from fair, dues and special events	$	1,386,294
Cash paid to suppliers and employees		(1,553,023)
Interest received		
Grants and contributions received		131,745
Other income		7,628
Net Cash Provided (Used) by Operating Activities		(27,356)
Cash Flow from Investing Activities		
Purchase of Fixed Assets		(100,242)
Interest income		2,177
Net Cash Used in Investing Activities		(98,065)
Cash Flow from Financing Activities		
Net Cash Provided by Financing Activities		-
Net (Decrease) in Cash and Cash Equivalents		(125,421)
Cash and Cash Equivalents at Beginning of Year		547,663
Cash and Cash Equivalents at End of Year	$	422,242

Reconciliation of change in net assets to cash provided by activities:

Change in net assets	$	(195,282)
Adjustments to reconcile change in net assets to net cash provided by operating activities:		
Depreciation		159,108
Interest reinvested		(20,716)
(Increase) decrease in assets		
Accounts receivable, net		26,767
Other assets		2,959
Increase (decrease) in liabilities		
Accounts payable		6,377
Accrued expenses		(7,099)
Unearned revenue		530
Total Adjustments		167,926
Net cash provided (used) by operating activities	$	(27,356)

The accompanying notes are an integral part of the financial statements.

Note 1 - Summary of Significant Accounting Policies

Nature of Activities

The Four States Fair Association, Inc., and Its Wholly Owned Subsidiaries (the Fair) sponsor the Four States Fair each year. The Fair promotes agriculture, livestock, home arts and cultural arts in the four states area. The Fair also rents its facilities for special events held in the arena and on the fairgrounds. The wholly owned subsidiaries, Four States Concessions, Inc., and Four States Expo Center, Inc., operate concessions at the fairgrounds.

Basis of Accounting

The consolidated financial statements of the Fair have been prepared on the accrual basis of accounting and, accordingly, reflect all significant receivables, payables and other liabilities.

Consolidation

The consolidation financial statements include the accounts of the Four States Fair Association, Inc., and Its Wholly Owned Subsidiaries after elimination of all significant intercompany transactions and accounts.

Revenue from Contracts with Customers

Revenue recognition guidance requires the recognition of revenue when promised goods or services are transferred to customers in an amount that reflects the consideration to which the Fair expects to be entitled in exchange for goods or services. The Fair's services that fall within the scope of ASC 606 are presented as sales revenue and are recognized as revenue when the Fair satisfies its obligation to the patron (when the agreement is completed). Services within the scope of ASC 606 include deposits on rentals of facilities, sponsorship agreements, in-kind sponsorship agreements and advance ticket sales.

Financial Statement Presentation

The Fair reports information regarding its financial position and activities according to two classes of net assets: net assets without donor restrictions and net assets with donor restrictions. A description of these categories is as follows:

Net Assets without Donor Restrictions – Net assets which are available for use at the discretions of the Board of Directors and/or management for general operating purposes. Contributions that are restricted by the donor are reported as increases in net assets without donor restriction if the restrictions expire in the fiscal year which the contributions are recognized.

Net Assets with Donor Restriction – Net assets, which consist of contributed funds subject to specific donor-imposed restrictions, are contingent upon specific performance of a future event or a specific passage of time before The Fair may spend the funds. The Fair had $2,279 of net assets with donor restrictions at December 31, 2024.

Note 1 - Summary of Significant Accounting Policies – (continued)

Contributions

Contributions received are recorded as increases in net assets without donor restrictions or net assets with donor restrictions depending on the existence and/or nature of any donor restrictions. When a restriction expires (that is, when a stipulated time restriction ends or purpose restriction is accomplished), net assets with donor restrictions are reclassified to net assets without donor restrictions. If net assets with donor restrictions have met the restrictions in the same year, they are recorded as net assets without donor restrictions.

Use of Estimates

The preparation of consolidated financial statements in conformity with accounting principles generally accepted in the United States of America requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the consolidated financial statements and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from those estimates.

Cash and Cash Equivalents

For purposes of the statements of cash flows, cash and cash equivalents include cash, interest-bearing cash accounts and unrestricted certificates of deposit with an original maturity date less than three months.

Certificates of Deposit

The Fair reports certificates of deposits at cost plus accrued interest, which approximates fair value.

Accounts Receivable

The Fair considers accounts receivable to be fully collectible; accordingly, no allowance for doubtful accounts is required. If amounts become uncollectible, they will be written off when that determination is made.

Accounting principles generally accepted in the United States of America requires the use of the allowance method for recording bad debts. However, management believes that the use of the direct write-off method is not materially different from the results that would have been obtained had the allowance method been followed.

Inventories

Inventories are valued at the lower of cost (generally determined on a first-in, first-out basis) or net realizable value and consist of food, beverages and supplies.

Property and Equipment

Property and equipment items are presented at cost if purchased and fair market value is contributed. The Fair capitalizes all expenditures for property and equipment in excess of $1,000.

Depreciation has been computed by the straight-line method with estimated lives as follows:

Buildings and improvements	5 - 40 years
Equipment, automobiles, furniture, and office equipment	3 - 20 years

Note 1 - Summary of Significant Accounting Policies – (continued)

Deferred Revenue

Deferred revenue included advance ticket sales for events not yet held, in-kind trade sponsorship agreements and deposits on facility rentals. This revenue will be recognized in the year earned.

Compensated Absences

The Organization's policy is to recognize the cost of compensated absences when actually used.

Advertising

All advertising costs are expensed as incurred and totaled $72,358 for 2024.

Leases

The Organization has implemented ASU 2016-02, Leases, which requires lessees to recognize operating and financing lease liabilities and corresponding right-of-use assets on the balance sheet. A right-to-use lease is defined as a contract that conveys control of another entity's nonfinancial asset as specified in the contract for a period of time in an exchange or exchange-like transaction. The lease liability is calculated as present value of the reasonably certain expected payments to be made over the term of the lease and the interest included in the lease payment is recorded as an expense. The Organization did not have any material leases individually or in the aggregate for the fiscal year.

Income Taxes

The Four States Fair Association, Inc., is a nonprofit organization exempt from federal income tax under Internal Revenue Code Section 501(c)(3). Its wholly owned subsidiaries, Four States Expo Center, Inc., and Four States Concessions, Inc., are taxable corporations and each file separately for income tax purposes.

Methods Used for Allocation of Expenses from General and Administrative Activities

The consolidated financial statements report certain categories of expenses that are attributable to one or more programs or supporting functions of the Fair. Salaries and benefits are allocated on the basis of estimates of time and effort.

Note 2 – Liquidity

The Fair's financial assets available within one year of the financial statement date for general expenses consist of cash and certificates of deposits in the amount $851,602, which is cash and certificate of deposits of $853,881 less donor-imposed restrictions of $2,279 (Note 10). The Fair's policy is to structure financial assets to be available as general expenses come due. The policy is that monthly revenues are sufficient to cover monthly expenses, which are, on average around $130,000 per month.

Note 3 – Certificate of Deposit

At December 31, 2024, the Fair held 2 certificates of deposits with interest rates ranging from .15 percent to 5.25 percent. All certificates held were short-term.

Note 4 – Accounts Receivable, Contract Assets and Liabilities

The Fair has the following receivables, contract assets and liabilities:

	12/31/2024	1/1/2024
Contracts receivable	$ 6,400	$ 33,167
Contract assets	-	-
Contract liabilities	$ 3,633	$ 3,013
Revenue recognized in the period:		
Amounts included in contract liabilities at the beginning of the year	$ 3,013	$ 1,084

The timing of revenue recognition, billings and cash collections result in receivables, contract assets and liabilities. Generally, billing occurring subsequent to revenue recognition results in contract assets. However, the Fair also receives advances and deposits from customers before revenue is recognized resulting in contract liabilities. Accounts receivable are recorded when the right to consideration becomes unconditional and includes contract receivables. Contract liabilities are included in deferred revenue in the consolidated statement of financial position.

Note 5 – Property and Equipment

Property and equipment consist of the following:

Land	$ 639,970
Buildings	8,118,523
Furniture and Equipment	1,120,877
	9,879,370
Accumulated Depreciation	6,622,437
Total Property and Equipment	$ 3,256,933

Note 6 – Contribution of Land

The City of Texarkana, Arkansas, has conveyed 105.776 acres of land to the Four States Fair Association, Inc. Title to the contributed property will revert to the City should the Fair cease to operate the Four States Fair and related activities. The City will reimburse the Fair all monies contributed by the Fair for improvements should the reverter clause become effective.

Note 7 – Income Taxes

The Fair files income tax returns in the U.S. federal jurisdiction. Four States Expo Center, Inc., and Four States Concessions, Inc., also file in the state of Arkansas.

In accordance with generally accepted accounting principles, the Fair accounts for uncertainty in income taxes by recognizing tax positions in the consolidated financial statements when it is more-likely-than-not the position will be sustained upon examination by the tax authorities. At December 31, 2024, the Fair had no uncertain tax positions that would require recognition or disclosure. The Fair recognizes interest accrued related to unrecognized tax benefits in

interest expense and penalties in supporting expenses. During the years ended December 31, no interest or penalties were incurred. Tax years 2021 through 2024 are subject to examination for each entity.

Note 7 – Income Taxes – (continued)

Four States Expo Center, Inc., had a taxable loss of $10,645 for 2024, which increased its tax loss carryforward. Four States Concessions, Inc. had a taxable loss of $5,820 for 2024. Tax years 2021 through 2024 are subject to examination.

Note 8 – Net Assets with Donor Restrictions

Net assets with donor restrictions are available for fine arts expenditures and totaled $2,279 at December 31, 2024.

Note 9 –Credit Risk

The Fair maintains its cash accounts at several financial institutions. Cash accounts at each institution are insured by the Federal Deposit Insurance Corporation for up to $250,000. Amounts in excess of insured limits at December 31, 2024 was approximately $97,000.

Note 10 – Concentrations

The Fair received 52% of its revenue from the Four States Fair and Rodeo.

Note 11 – Rental

The Fair rents various types of equipment when needed. All rent payments are expensed as incurred. Rental payments total $52,111 for 2024.

Note 12 – Contributed Services

Contributed services are recognized as contributions if the services (a) create or enhance nonfinancial assets or (b) require specialized skills and would otherwise be purchased by the Fair. A substantial number of unpaid volunteers have also made contributions of their time to assist in the presentation of numerous activities. The value of this contributed time is not reflected in these statements since it is not susceptible to objective measurement or valuation.

Note 13 – Contingencies

The Company qualified for the employee retention credit for three quarters in 2020 and one quarter in 2021. The company claimed this credit by filing a 941X for those quarters. The credit was collected in 2022. The IRS has five years to audit the 941X the company filed.

The company received a Payroll Protection Program Loan in 2020, which was forgiven in its entirety in 2021. The IRS has six years from the date of the forgiveness to audit the loan.

Note 14 – Subsequent Events

Management has evaluated subsequent events through July 17, 2025, the date the consolidated financial statements were available to be issued.

The Four States Fair Association, Inc., and Its Wholly Owned Subsidiaries
Consolidating Statement of Financial Position
December 31, 2024

	FOUR STATES FAIR ASSOCIATION, INC.	FOUR STATES EXPO CENTER, INC.	FOUR STATES CONCESSIONS, INC.	ELIMINATIONS	CONSOLIDATED
Assets					
Current Assets					
Cash and Cash Equivalents	$ 337,949	$ 79,011	$ 5,282	$ -	$ 422,242
Certificates of Deposit	431,639	-	-	-	431,639
Accounts Receivable	6,400	-	-	-	6,400
Inventories	-	203	418	-	621
Prepaid Expenses	22,305	0	-	-	22,305
Intercompany Receivables	131,956	-	-	(131,956)	-
Total Current Assets	930,249	79,214	5,700	(131,956)	883,207
Property and Equipment, at cost					
Building and Improvements	8,033,201	81,107	38,130	-	8,152,438
Equipment	1,012,313	74,649	-	-	1,086,962
Total	9,045,514	155,756	38,130	-	9,239,400
Less: Accumulated Depreciation	(6,472,904)	(141,361)	(8,172)	-	(6,622,437)
Land	639,970	-	-	-	639,970
Property and Equipment, net	3,212,580	14,395	29,958	-	3,256,933
Other Assets					
Investment in subsidiaries	811	-	-	(811)	-
Other Assets	-	-	3,500	-	3,500
Total Other Assets	811	-	3,500	(811)	3,500
Total Assets	$ 4,143,640	$ 93,609	$ 39,158	$ (132,767)	$ 4,143,640
Liabilities and Net Assets					
Current Liabilities					
Accounts Payable	$ 14,401	$ -	$ -	$ -	$ 14,401
Accrued Expenses	53,370	-	-	-	53,370
Deferred Revenue	3,633	-	-	-	3,633
Intercompany Payables	-	58,792	73,164	(131,956)	-
Total Current Liabilities	71,404	58,792	73,164	(131,956)	71,404
Net Assets					
Without Donor Restictions	4,069,957	34,817	(34,006)	(811)	4,069,957
With Donor Restrictions	2,279	-	-	-	2,279
Total Net Assets	4,072,236	34,817	(34,006)	(811)	4,072,236
Total Liabilities and Net Assets	$ 4,143,640	$ 93,609	$ 39,158	$ (132,767)	$ 4,143,640

The Four States Fair Associaiton, Inc., and Its Wholly Owned Subsidiaries
Consolidating Statement of Activities
For the Year Ended December 31, 2024

	FOUR STATES FAIR ASSOCIATION, INC.	FOUR STATES EXPO CENTER, INC.	FOUR STATES CONCESSIONS, INC.	ELIMINATIONS	CONSOLIDATED
Revenues					
Fair Income	$ 777,247	$ -	$ -	$ -	$ 777,247
Membership Dues	2,575	-	-	-	2,575
Special Events	431,032	-	-	-	431,032
RV Space Rentals	123,507	-	-	-	123,507
Food and Beverage, net of cost of goods sold	-	22,431	2,735	-	25,166
Grants & Contributions	131,745	-	-	-	131,745
Other	11,113	-	-	(3,485)	7,628
Total Revenues	1,477,219	22,431	2,735	(3,485)	1,498,900
Expenses					
Program Services	1,384,465	-	-	-	1,384,465
Food and Beverage	-	33,126	8,555	(20,000)	21,681
Supporting Services					
General and Administrative	308,752	-	-	-	308,752
Fundraising	-	-	-	-	-
Total Expenses	1,693,217	33,126	8,555	(20,000)	1,714,898
Non-operating Revenues (Expenses)					
Interest	20,716	-	-	-	20,716
Total Non-operating Revenues (Expenses)	20,716	-	-	-	20,716
Increase (decrease) in net assets	$ (195,282)	$ (10,695)	$ (5,820)	$ 16,515	$ (195,282)

The Four States Fair Association, Inc., and its Wholly Owned Subsidiaries
Consolidating Schedule of Expenses by Functional Classification
For the Year Ended December 31, 2024

	FOUR STATES FAIR ASSOCIATION, INC.		FOUR STATES EXPO CENTER, INC.	FOUR STATES CONCESSIONS, INC.		
	PROGRAM	SUPPORTING	PROGRAM	PROGRAM	ELIMINATIONS	TOTAL
Advertising	$ 72,358	$ -	$ -	$ -	$ -	$ 72,358
Depreciation	151,826	-	2,897	4,385	-	159,108
Equipment Rentals	52,111	-	-	-	-	52,111
Fair Activities	179,630	-	-	-	-	179,630
Insurance	98,061	9,697	-	-	-	107,758
Legal and Accounting	4,211	11,000	-	-	-	15,211
Licenses and Fees	7,322	15,952	1,039	2,100	-	26,413
Payroll Taxes	18,904	13,689	-	-	-	32,593
Postage and Shipping	1,550	1,137	-	-	-	2,687
Property Taxes	38,034	-	-	-	-	38,034
Repairs and Maintenance	108,856	12,889	8,600	580	-	130,925
Salaries and Causal Labor	300,077	217,298	-	-	-	517,375
Special Events	71,631	1,500	-	-	-	73,131
Supplies and Miscellaneous	47,979	155	20,590	1,490	(20,000)	50,214
Telephone and Utilities	228,915	25,435	-	-	-	254,350
Travel	3,000	-	-	-	-	3,000
Total Expenses	$ 1,384,465	$ 308,752	$ 33,126	$ 8,555	$ (20,000)	$ 1,714,898

13 - PI-14

Organization/Institution Submitting Proposal:
Arkansas Hunger Relief Alliance Inc (The Alliance)

Project Title:
Arkansas Staples for Strong Families

Project Type:
Promotion

Name of Project Manager:
Jennifer Owens Buie

Name of Project Team Member 1:
Jessica Chapman

Name of Project Team Member 2:
Jami Kirksey

Statement of Justification or Purpose of the Project (75 word maximum):
Arkansas Staples for Strong Families promotes Arkansas-grown soybeans as affordable, nutritious protein options for families served through food pantries and community programs. By increasing familiarity with soy-based foods through practical cooking education, tastings, and pantry-based promotion, the project helps households incorporate soy into everyday meals. This initiative supports healthier diets while expanding consumer awareness and sustained demand for Arkansas-grown soybean products across diverse communities.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
The Alliance will train and equip pantry and community partners in 8–10 Arkansas counties to promote Arkansas-grown soybean products through cooking demonstrations, tastings, classes, and pantry-based education. Partners will receive soy-focused recipes, signage, and nutrition messaging to integrate into routine distributions and events. At least 40 soy-forward education touchpoints will be coordinated, reinforced through digital outreach, and tracked through participation and reporting metrics.

BUDGET

Amount of Funding Needed for Project:
$45,000.00

Contribution Amount (from organization or sponsor):
$20,500.00

Arkansas Soybean Promotion Board

Project Title: *Arkansas Staples for Strong Families*
Request Amount: $45,000
Geographic Reach: 8–10 priority Arkansas counties

Project Goals & Objectives

The Arkansas Hunger Relief Alliance (the Alliance) proposes Arkansas Staples for Strong Families, a coordinated nutrition education and community promotion initiative designed to increase awareness, consumption, and practical use of Arkansas-grown soybean products. The project will be implemented across 8–10 Arkansas counties through food pantries, community partners, trained volunteers, and public engagement sites.

The goal of this initiative is to promote soy-based foods—such as tofu, edamame, soy milk, textured vegetable protein, and other soybean-derived products—as affordable, versatile, and nutritious protein options that support family meals, particularly for households participating in SNAP, WIC, and charitable food programs.

Objectives

Through this project, the Alliance will:

- Increase household familiarity and confidence in preparing Arkansas-grown soybean products
- Promote soy as a budget-friendly, plant-based protein within culturally relevant meal patterns
- Coordinate at least 40 soy-forward cooking demonstrations, tastings, or nutrition education touchpoints through trained pantry and community partners
- Reach 2,500 households with soybean-focused promotional materials, recipes, and pantry signage
- Equip pantry partners with training and tools to sustain soybean promotion beyond the grant period

Expected Benefits to the Arkansas Soybean Industry

This project directly promotes Arkansas-grown soybeans by:

- Increasing consumer awareness of soy as a nutritious, affordable protein source
- Highlighting soy's versatility across meals, cuisines, and preparation methods
- Introducing soy-based foods through familiar, family-friendly recipes
- Positioning Arkansas soybeans as a reliable, locally grown ingredient that supports healthy eating and household budgets

By building practical cooking skills and positive perceptions, the project encourages families to incorporate more Arkansas-grown soybean products into regular meals—supporting sustained consumer demand and long-term market growth across both rural and urban markets.

Project Description

The Alliance will implement this project through 8–10 counties served by its statewide nutrition education and hunger-relief network, which includes more than 500 member agencies. Rather than delivering all education directly, the Alliance will train, equip, and support pantry and community partners to consistently promote Arkansas-grown soybean products through demonstrations, tastings, classes, and pantry-based education.

Partner-Delivered Nutrition Education Model

Participating pantries and community sites will receive a Soybean Nutrition Education Package developed by the Alliance. This package is designed to integrate easily into existing pantry distributions, community events, and cooking classes, increasing exposure to Arkansas-grown soybeans without increasing staff burden.

Each Nutrition Education Package will include:

- Soy-focused recipe cards and family meal guides (bilingual as appropriate)
- Pantry signage highlighting Arkansas-grown soybeans and their role in affordable, protein-rich meals
- Simple nutrition messaging and talking points for staff and volunteers
- Guidance for sampling, tastings, and brief demonstrations
- Training for pantry staff and volunteers on incorporating soybean promotion into classes, distributions, and outreach

Through this model, soybean promotion becomes embedded in routine pantry operations, extending impact well beyond individual events.

Cooking Demonstrations, Tastings & Education Touchpoints

Using the Nutrition Education Package, trained pantry staff, volunteers, and community educators will coordinate at least 40 soy-forward demonstrations, tastings, or education touchpoints across participating counties. Activities may include:

- Short demonstrations during pantry distributions
- Tastings paired with recipe handouts
- Community tasting stations at health fairs and Alliance member events
- Cooking classes featuring multiple Arkansas-grown foods, with soy positioned as a key protein ingredient

This flexible approach ensures frequent, visible promotion of Arkansas-grown soybeans while supporting broader Arkansas-grown food education efforts.

Community & Digital Promotion

The Alliance will reinforce in-person education with consistent soybean-forward messaging through pantry signage, outreach materials, and digital platforms. Coordinated social media content will highlight Arkansas-grown soybeans, share simple preparation tips, and reinforce affordability, nutrition, and versatility for family meals.

Proposed Activities & Timeline (12 Months)

Quarter 1

- Finalize county selection and partner sites
- Develop recipe materials and signage
- Train pantry staff and volunteers
- Launch soybean awareness campaign

Quarter 2

- Coordinate at least 15 soybean-forward education touchpoints
- Distribute recipe cards and materials in all partner counties
- Promote Arkansas soybeans through digital channels

Quarter 3

- Coordinate an additional 15 education touchpoints
- Host 8–10 community tasting stations
- Expand pantry signage and displays

Quarter 4

- Coordinate 10 final education touchpoints
- Collect participation and evaluation data
- Produce and submit final impact report

Budget — $45,000

Category	Amount
Program Coordination, Training & Reporting	$20,500
Food & Demonstration Supplies	$7,000
Educational Materials & Printing	$6,500
County Partner Mini-Grants	$8,000
Travel	$3,000
Total	$45,000

Accountability

The Alliance will provide a comprehensive year-end report detailing:

- Number of households engaged
- Counties and partner sites served
- Number and type of education touchpoints coordinated
- Materials distributed
- Digital and social media reach
- Participant testimonials and photos
- Final budget report

The Alliance maintains board-approved financial controls and undergoes an annual independent audit. All funds will be used exclusively for promotional and educational activities focused on Arkansas-grown soybeans, in accordance with Promotion Board guidelines.

EGP PLLC
CPAs & Consultants

July 15, 2024

Arkansas Hunger Relief Alliance, Inc.
Board of Directors
1400 West Markham, Suite 304
Little Rock, Arkansas 72201

We have audited the financial statements of Arkansas Hunger Relief Alliance, Inc. as of and for the year ended December 31, 2023, and have issued our report thereon dated July 15, 2024. Professional standards require that we advise you of the following matters relating to our audit.

Our Responsibility in Relation to the Financial Statement Audit
As communicated in our engagement letter dated January 4, 2024, our responsibility, as described by professional standards, is to form and express an opinion about whether the financial statements that have been prepared by management with your oversight are presented fairly, in all material respects, in accordance with accounting principles generally accepted in the United States of America. Our audit of the financial statements does not relieve you or management of its respective responsibilities.

Our responsibility, as prescribed by professional standards, is to plan and perform our audit to obtain reasonable, rather than absolute, assurance about whether the financial statements are free of material misstatement. An audit of financial statements includes consideration of internal control over financial reporting as a basis for designing audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control over financial reporting. Accordingly, as part of our audit, we considered the internal control of Arkansas Hunger Relief Alliance, Inc. solely for the purpose of determining our audit procedures and not to provide any assurance concerning such internal control.

We are also responsible for communicating significant matters related to the audit that are, in our professional judgment, relevant to your responsibilities in overseeing the financial reporting process. However, we are not required to design procedures for the purpose of identifying other matters to communicate to you.

Planned Scope and Timing of the Audit
We conducted our audit consistent with the planned scope and timing we previously communicated to you.

Compliance with All Ethics Requirements Regarding Independence
The engagement team, others in our firm, as appropriate, our firm, and our network firms have complied with all relevant ethical requirements regarding independence.

Significant Risks Identified
The risk of management override of internal controls is considered a significant risk with the potential of fraud for Arkansas Hunger Relief Alliance, Inc.. This risk is considered significant because it may allow circumvent the control environment to conceal fraud. No evidence of fraud came to our attention as a result of our audit procedures.

Qualitative Aspects of the Entity's Significant Accounting Practices

Significant Accounting Policies
Management has the responsibility to select and use appropriate accounting policies. A summary of the significant accounting policies adopted by Arkansas Hunger Relief Alliance, Inc. is included in Note 1 to the financial statements. Arkansas Hunger Relief Alliance, Inc. adopted a new accounting standard in the current year as described below:

> On January 1, 2023, Arkansas Hunger Relief Alliance, Inc. adopted ASU 2016-13 Financial Instruments – Credit Losses (Topic 326): Measurement of Credit Losses on Financial Instruments, as amended, which replaces the incurred loss methodology with an expected loss methodology that is referred to as the current expected credit loss (CECL) methodology. The impact of adopting the new standard did not materially impact the financial statements; therefore, no adjustments were determined necessary as of the adoption date of the standard.

There were no other changes in significant accounting policies, and no matters have come to our attention that would require us, under professional standards, to inform you about (1) the methods used to account for significant unusual transactions and (2) the effect of significant accounting policies in controversial or emerging areas for which there is a lack of authoritative guidance or consensus.

Significant Accounting Estimates
Accounting estimates are an integral part of the financial statements prepared by management and are based on management's current judgments. Those judgments are normally based on knowledge and experience about past and current events and assumptions about future events. Certain accounting estimates are particularly sensitive because of their significance to the financial statements and because of the possibility that future events affecting them may differ markedly from management's current judgments.

The most sensitive accounting estimates affecting the financial statements was management's estimate of the economical useful lives of fixed assets is based on past history of similar types of assets, future plans as to their use, and other factors that impact their economic value to the entity. We evaluated the key factors and assumptions used to develop the estimates of useful lives of the fixed assets and determined that it is reasonable in relation to the basic financial statements taken as a whole.

We evaluated the key factors and assumptions used to develop these estimates and determined that it is reasonable in relation to the basic financial statement taken as a whole and in relation to the applicable opinion units.

Financial Statement Disclosures
The financial statement disclosures are neutral, consistent, and clear.

Significant Unusual Transactions
For purposes of this communication, professional standards require us to communicate to you significant unusual transactions identified during our audit. There were no significant unusual transactions identified during our audit.

Identified or Suspected Fraud
We have not identified or obtained information that indicates that fraud may have occurred.

Significant Difficulties Encountered during the Audit
We encountered no significant difficulties in dealing with management relating to the performance of the audit.

Uncorrected and Corrected Misstatements
For purposes of this communication, professional standards also require us to accumulate all known and likely misstatements identified during the audit, other than those that we believe are trivial, and communicate them to the appropriate level of management. Further, professional standards require us to also communicate the effect of uncorrected misstatements related to prior periods on the relevant classes of transactions, account balances or disclosures, and the financial statements as a whole. Uncorrected misstatements or matters underlying those uncorrected misstatements could potentially cause future-period financial statements to be materially misstated, even though the uncorrected misstatements are immaterial to the financial statements currently under audit.

In addition, professional standards require us to communicate to you all material, corrected misstatements that were brought to the attention of management as a result of our audit procedures. The following material misstatements that we identified as a result of our audit procedures were brought to the attention of, and corrected by, management.

Disagreements with Management
For purposes of this letter, professional standards define a disagreement with management as a matter, whether or not resolved to our satisfaction, concerning a financial accounting, reporting, or auditing matter, which could be significant to Arkansas Hunger Relief Alliance, Inc.'s financial statements or the auditor's report. No such disagreements arose during the course of the audit.

Circumstances that Affect the Form and Content of the Auditor's Report
For purposes of this letter, professional standards require that we communicate any circumstances that affect the form and content of our auditor's report. There are no circumstances that affect the form and content of the auditor's report.

Representations Requested from Management
We have requested certain written representations from management, which are included in the attached letter dated July 15, 2024.

Management's Consultations with Other Accountants
In some cases, management may decide to consult with other accountants about auditing and accounting matters. Management informed us that, and to our knowledge, there were no consultations with other accountants regarding auditing and accounting matters.

Other Significant Matters, Findings or Issues
In the normal course of our professional association with Arkansas Hunger Relief Alliance, Inc., we generally discuss a variety of matters, including the application of accounting principles and auditing standards, significant events or transactions that occurred during the year, operating conditions affecting the entity, and operating plans and strategies that may affect the risks of material misstatement. None of the matters discussed resulted in a condition to our retention as Arkansas Hunger Relief Alliance, Inc.'s auditors.

Other Information Included in Annual Reports
Pursuant to professional standards, our responsibility as auditors for other information, whether financial or nonfinancial, included in Arkansas Hunger Relief Alliance, Inc.'s annual reports, does not extend beyond the information identified in the audit report, and we are not required to perform any procedures to corroborate such other information. However, in accordance with such standards, we have mad certain inquiries of management and evaluated the form, content, and methods of preparing the information to determine that the information complied with U.S. generally accepted accounting principles, that the information is appropriate and complete in relation to our audit of the financial statements. We have also compared and reconciled the supplementary information to the underlying accounting records used to prepare the financial statements or to the financial statements themselves.

Our responsibility also includes communicating to you any information which we believe is a material misstatement of fact. Nothing came to our attention that caused us to believe that such information, or its manner of presentation, is materially inconsistent with the information, or manner of its presentation, appearing in the financial statements.

This report is intended solely for the information and use of the Board of Directors and management of Arkansas Hunger Relief Alliance, Inc. and is not intended to be and should not be used by anyone other than these specified parties.

EGP, PLLC

July 15, 2024

Certified Public Accountants & Consultants
North Little Rock, Arkansas

ARKANSAS HUNGER RELIEF ALLIANCE, INC.

FINANCIAL STATEMENTS AND OTHER INFORMATION

DECEMBER 31, 2023

(With independent auditor's report thereon)

EGP PLLC

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EGP PLLC
CPAs & Consultants

Independent Auditor's Report

To the Board of Directors
Arkansas Hunger Relief Alliance, Inc.

Report on the Audit of the Financial Statements

Opinion

We have audited the financial statements of Arkansas Hunger Relief Alliance, Inc., which comprise the statement of financial position as of December 31, 2023, and the related statements of activities, functional expenses, and cash flows for the year then ended, and the related notes to the financial statements.

In our opinion, the accompanying financial statements present fairly, in all material respects, the financial position of Arkansas Hunger Relief Alliance, Inc. as of December 31, 2023, and the changes in its net assets and its cash flows for the year then ended in accordance with accounting principles generally accepted in the United States of America.

Basis for Opinion

We conducted our audit in accordance with auditing standards generally accepted in the United States of America (GAAS) and the standards applicable to financial audits contained in *Government Auditing* Standards issued by the Comptroller General of the United States. Our responsibilities under those standards are further described in the Auditor's Responsibilities for the Audit of the Financial Statements section of our report. We are required to be independent of Arkansas Hunger Relief Alliance, Inc. and to meet our other ethical responsibilities, in accordance with the relevant ethical requirements relating to our audit. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Responsibilities of Management for the Financial Statements

Management is responsible for the preparation and fair presentation of the financial statements in accordance with accounting principles generally accepted in the United States of America, and for the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, management is required to evaluate whether there are conditions or events, considered in the aggregate, that raise substantial doubt about Arkansas Hunger Relief Alliance, Inc.'s ability to continue as a going concern for one year after the date that the financial statements are issued.

Auditor's Responsibilities for the Audit of the Financial Statements

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance but is not absolute assurance and therefore is not a guarantee that an audit conducted in accordance with GAAS and *Government Auditing Standards* will always detect a material misstatement when it exists. The risk of not detecting a material

misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control. Misstatements are considered material if there is a substantial likelihood that, individually or in the aggregate, they would influence the judgment made by a reasonable user based on the financial statements.

In performing an audit in accordance with GAAS and *Government Auditing Standards*, we:

- Exercise professional judgment and maintain professional skepticism throughout the audit.
- Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, and design and perform audit procedures responsive to those risks. Such procedures include examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of Arkansas Hunger Relief Alliance, Inc.'s internal control. Accordingly, no such opinion is expressed.
- Evaluate the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluate the overall presentation of the financial statements.
- Conclude whether, in our judgment, there are conditions or events, considered in the aggregate, that raise substantial doubt about Arkansas Hunger Relief Alliance, Inc.'s ability to continue as a going concern for a reasonable period of time.

We are required to communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit, significant audit findings, and certain internal control–related matters that we identified during the audit.

Other Matters

Supplementary Information

Our audit was conducted for the purpose of forming an opinion on the financial statements as a whole. The schedule of state assistance on pages 15-16 is presented for purposes of additional analysis and is not a required part of the financial statements. The accompanying schedule of expenditures of federal awards on page 17, as required by Title 2 U.S. *Code of Federal Regulations* (CFR) Part 200, *Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards*, is also not a required part of the financial statements. Such information is the responsibility of management and was derived from and relates directly to the underlying accounting and other records used to prepare the financial statements. The information has been subjected to the auditing procedures applied in the audit of the financial statements and certain additional procedures, including comparing and reconciling such information directly to the underlying accounting and other records used to prepare the financial statements or to the financial statements themselves, and other additional procedures in accordance with auditing standards generally accepted in the United States of America. In our opinion, the information is fairly stated, in all material respects, in relation to the financial statements as a whole.

Other Reporting Required by Government Auditing Standards

In accordance with *Government Auditing Standards*, we have also issued our report dated July 15, 2024, on our consideration of Arkansas Hunger Relief Alliance, Inc.'s internal control over financial reporting and on our tests of its compliance with certain provisions of laws, regulations, contracts, and grant agreements and other matters. The purpose of that report is to describe the scope of our testing of internal control over financial reporting and compliance and the results of that testing, and not to provide an

opinion on internal control over financial reporting or on compliance. That report is an integral part of an audit performed in accordance with *Government Auditing Standards* in considering Arkansas Hunger Relief Alliance, Inc.'s internal control over financial reporting and compliance.

EGP, PLLC

July 15, 2024

Certified Public Accountants & Consultants
North Little Rock, Arkansas

Arkansas Hunger Relief Alliance, Inc.
Statement of Financial Position
December 31, 2023
(See independent auditor's report.)

Assets

Current Assets	
Cash and cash equivalents	$ 3,801,930
Accounts receivable	39,486
Grants receivable	681,388
Prepaid expenses and deposits	19,904
Total Current Assets	4,542,708
Property and Equipment	
Furniture and fixtures	18,293
Office equipment	61,626
Software	7,000
Vehicles	163,820
	250,739
Less accumulated depreciation	(186,633)
Net Property and Equipment	64,106
Other Assets:	
Right-of-use asset	39,040
Rent deposit	2,107
Total Other Assets	41,147
Total Assets	$ 4,647,961

Liabilities and Net Assets

Current Liabilities	
Accounts payable	$ 111,006
Deferred revenue	10,000
Accrued payroll	3,170
Accrued vacation	85,577
Operating lease liabilities- current	40,248
Total Current Liabilities	250,001
Total Liabilities	250,001
Net Assets	
Without donor restriction	2,479,597
With donor restriction	1,918,363
Total Net Assets	4,397,960
Total Liabilities and Net Assets	$ 4,647,961

The accompanying notes are an integral part of these financial statements.

Arkansas Hunger Relief Alliance, Inc.
Statement of Activities
For the Year Ended December 31, 2023
(See independent auditor's report.)

	Without Donor Restrictions	With Donor Restrictions	Totals
Revenues and Other Support:			
Donations - third party	$ 411,811	44,670	456,481
Grants	162,898	4,778,928	4,941,826
Dues	90,637	-	90,637
Joint purchasing program	758,723	-	758,723
Special events	311,330	-	311,330
Other income	31,152	16,700	47,852
Interest income	71,784	-	71,784
Net assets released from restrictions restrictions satisfied by payments	4,905,483	(4,905,483)	-
Total Revenues and Other Support	6,743,818	(65,185)	6,678,633
Expenses:			
Program services	6,215,323	-	6,215,323
Supporting services - management and general	152,130	-	152,130
Supporting services - fundraising	183,878	-	183,878
Total Expenses	6,551,331	-	6,551,331
Change in Net Assets	192,487	(65,185)	127,302
Net Assets - Beginning of Year	2,287,110	1,983,548	4,270,658
Net Assets - End of Year	$ 2,479,597	1,918,363	4,397,960

The accompanying notes are an integral part of these financial statements.

Arkansas Hunger Relief Alliance, Inc.
Statement of Functional Expenses
For the Year Ended December 31, 2023
(See independent auditor's report.)

	Program Services		
	Joint Purchasing	**Gleaning**	**State Food Purchasing Program**
Food purchase	$ 3,122,663	74,140	671,203
Salaries	63,041	26,897	35,835
Grants and awards	-	-	238,827
Employee benefits	20,611	4,646	4,602
Special projects	-	-	-
Payroll taxes	1,607	2,155	4,537
Meetings and training	217	1,758	-
Consulting fees and other services	-	-	-
Rent and utilities	2,174	-	-
Fundraising	-	-	-
Office, equipment and other supplies	16,062	54	-
Information system/technology	466	311	-
Professional fees - audit and payroll service	300	50	-
Marketing, research and printing	31	20	-
Travel	1,091	74	28
Depreciation	-	-	-
Bank service charges	-	-	-
Transportation	2,991	1,413	-
Telephone - office	2,500	200	-
Insurance	-	5,900	-
Telephone - cellular	200	240	520
Postage	-	-	-
Miscellaneous	-	104	-
Total	$ 3,233,954	117,962	955,552

The accompanying notes are an integral part of these financial statements.

Program Services			Supporting Services		
Education and Awareness Raising	**Member Services**	**Total Program Service**	**Management and General**	**Fund Raising**	**Combined Totals (Memo)**
-	-	3,868,006	-	-	3,868,006
571,571	104,518	801,862	64,320	109,804	975,986
80,801	498,475	818,103	-	-	818,103
124,311	17,790	171,960	12,796	17,060	201,816
68,288	1,505	69,793	-	-	69,793
43,205	8,189	59,693	6,623	8,310	74,626
146,718	1,408	150,101	2,162	501	152,764
47,156	924	48,080	-	-	48,080
21,724	13,034	36,932	4,342	2,174	43,448
-	-	-	1,547	37,432	38,979
34,887	29,691	80,694	4,249	444	85,387
14,061	4,871	19,709	1,555	777	22,041
2,183	709	3,242	29,500	123	32,865
10,902	3,147	14,100	2,232	3,442	19,774
32,366	1,691	35,250	-	78	35,328
-	-	-	19,638	-	19,638
-	-	-	270	1,308	1,578
-	2,500	6,904	-	-	6,904
4,036	2,956	9,692	844	422	10,958
3,540	1,180	10,620	590	590	11,800
4,828	836	6,624	480	896	8,000
2,694	802	3,496	-	517	4,013
358	-	462	982	-	1,444
1,213,629	694,226	6,215,323	152,130	183,878	6,551,331

Arkansas Hunger Relief Alliance, Inc.
Statement of Cash Flows
For the Year Ended December 31, 2023
(See independent auditor's report.)

Cash Flows from Operating Activities:		
Change in net assets	$	127,302
Adjustments to reconcile (decrease) increase in net assets to net cash (required) provided by operating activities:		
Depreciation		19,638
Decrease (Increase) in Assets:		
Accounts receivable		58,031
Grants receivable		(33,100)
Prepaid expenses		(10,042)
Increase (Decrease) in Liabilities:		
Accounts payable		17,520
Deferred revenue		(8,500)
Accrued liabilities		12,595
Net Cash Provided (Required) by Operating Activities		183,444
Cash Flows from Investing Activities:		
Capital expenditures		36,842
Operating lease payments		(37,832)
Net Cash Provided (Required) by Investing Activities		(990)
Increase (Decrease) in Cash and Cash Equivalents		182,454
Cash and cash equivalents - beginning of year		3,619,476
Cash and Cash Equivalents - End of Year	$	3,801,930

The accompanying notes are an integral part of these financial statements.

Arkansas Hunger Relief Alliance, Inc.
Notes to Financial Statements
December 31, 2023

1. Nature of Activities and Summary of Significant Accounting Policies

Nature of Activities

Arkansas Hunger Relief Alliance, Inc. (the "Alliance") is a not-for-profit organization that collaborates as a statewide voice advancing equitable solutions to hunger, with a vision of creating a hunger-free Arkansas. The Alliance is a collaborative network of hunger relief organizations.

The Alliance's sources of revenue include membership dues, income from the joint purchasing and cluster purchasing programs, grants, and donations from the general public.

Use of Estimates

The preparation of financial statements in conformity with U.S. generally accepted accounting principles requires management to make estimates and assumptions that affect certain reported amounts and disclosures. Accordingly, actual results could differ from those estimates.

Basis of Accounting

A not-for-profit organization is required to report information regarding its financial position and activities according to two classes of net assets: net assets with donor restrictions and net assets without donor restrictions. In addition, the Alliance is required to present a statement of cash flows. A specific financial statement reporting format has been established for not-for-profit organizations and requires the statement of activities to reflect all changes in net assets. A description of these categories follows:

- Net Assets Without Donor Restrictions - Net assets which are available for use at the discretion of the Board of Directors and/or management for general operating purposes. Contributions that are restricted by the donor are reported as increases in net assets without donor restriction if the restrictions expire in the fiscal year which the contributions are recognized.
- Net Assets With Donor Restriction - Net assets which consist of contributed funds subject to specific donor-imposed restrictions contingent upon specific performance of a future event or a specific passage of time before the Alliance may spend the funds.

The financial statements have been prepared on the accrual basis of accounting in accordance with accounting principles generally accepted in the United States of America.

Liquidity

Assets are presented in the accompanying consolidated statement of financial position according to their nearness of conversion to cash and liabilities according to their nearness of their maturity and resulting use of cash.

Revenue Recognition

Contributions received are recorded as unrestricted, temporarily restricted, or permanently restricted support depending on the existence and/or nature of any donor restrictions. All donor-restricted support is reported as an increase in temporarily or permanently restricted net assets, depending on the nature of the restriction. When a restriction expires (that is, when a stipulated time restriction ends or purpose restriction is accomplished), temporarily restricted net assets are reclassified to unrestricted net assets and reported in the statement of activities as net assets released from restrictions. Donor

restricted assets are reported as unrestricted if receipt and restriction expiration occur in the same reporting period.

Promises to Give

Unconditional promises to give are recorded as contribution revenue when received. Unconditional promises to give that are expected to be collected within one year are recorded at net realizable value. Unconditional promises to give expected to be collected in future years are recorded at the present value of the estimated future cash flows. Conditional promises to give are not included as support until the conditions are substantially met.

The Alliance uses the allowance method to determine uncollectible unconditional promises receivable. The allowance is based on prior years' experience and management's analysis of specific promises made.

Cash and Cash Equivalents

For purposes of the statement of cash flows, the Alliance considers all highly liquid investments available for current use with an initial maturity of three months or less to be cash equivalents.

Accounts Receivable

Receivables are recorded when invoices are issued and are presented in the statement of financial position net of allowance for doubtful accounts. Receivables are written off when they are determined to be uncollectible. The Alliance used the allowance method of accounting for doubtful accounts based on management's analysis of possible bad debts. As of December 31, 2023, management has determined that no allowance is necessary.

Property and Equipment

The Alliance capitalizes furniture, fixtures, machinery and equipment that exceed $500 and computer equipment and software that exceed $250. Lesser amounts are expensed. Purchased depreciable assets are stated at cost. Donated depreciable assets are recorded as contributions at their estimated fair market value at date of receipt. Such donations are reported as unrestricted contributions unless the donor has restricted the donated depreciable assets to a specific purpose. Depreciable assets donated with explicit restrictions regarding their use and contributions of cash that must be used to acquire depreciable assets are reported as restricted contributions. Absent donor stipulations regarding how long those donated assets must be maintained, the Alliance reports expirations of donor restrictions when the donated or acquired assets are placed in service. The Alliance reclassifies temporarily restricted net assets to unrestricted net assets at that time. Depreciation is provided over the estimated useful life of the related asset, generally 3 – 7 years utilizing the straight-line method.

Donated Assets and Services

Donated assets and services, the value of which is measurable, are reflected as contributions in the accompanying statements at their estimated values as of the date of receipt.

Restricted and Unrestricted Revenue and Support

In accordance with generally accepted accounting principles, contributions received are recorded either as revenues without donor restrictions or revenues with donor restrictions, depending on the existence and/or nature of any donor restrictions. Support that is restricted by the donor is reported as an increase in net assets without donor restrictions if the restriction expires in the reporting period in which the support is recognized. All other donor-restricted support is also reported as an increase in

net assets with donor restrictions, depending on the nature of the restriction. When a restriction expires (that is, when a stipulated time restriction ends or purpose restriction is accomplished), net assets with donor restrictions are reclassified to net assets without donor restrictions and reported in the statement of activities as net assets released from restrictions.

Income Taxes

The Alliance is exempt from federal income taxes under Section 501(c)(3) of the Internal Revenue Code and applicable state law. ASC 740, *Income Taxes* requires certain disclosures about uncertain income tax positions. When tax returns are filed, it is probable that most tax positions would be sustained upon examination by taxing authorities. However, it is also possible that some positions might be subject to uncertainty and result in a loss contingency if the amount can be reasonably estimated. The amount recognized is subject to estimation and the amount ultimately sustained for an individual uncertain tax position or for all uncertain tax positions in the aggregate could differ from the amount recognized. Currently, management does not believe that any uncertain tax positions exist under the provisions of ASC 740 or ASC 450, *Contingencies.* No penalties or interest by the Internal Revenue Service or a state taxing authority were incurred and recorded in these financial statements.

The Alliance has filed or will file all applicable Federal income tax returns. Federal income tax statutes dictate that tax returns filed in any of the previous three reporting periods remain open to examination. This includes the tax returns filed for the years ending December 31, 2023, 2022, 2021, and 2020. Currently, the Alliance has no open examination with the Internal Revenue Service.

Joint Purchasing Program

The Alliance places orders of food on behalf of member food banks and arranges for the product to be delivered. Sourced product for food banks may or may not be marked up, at varying rates, to cover administrative costs and members may be billed for their proportionate share of the food. Joint purchase programs, such as the Community Development Block Grant (CDBG), are not marked up.

State Food Purchasing Program

The 2009 Arkansas General Assembly passed legislation to begin a "State Food Purchasing Program" (SFPP). This program receives up to $1 million annually (subject to the applicable terms and conditions of the Revenue Stabilization Act) to (1) purchase food from Arkansas companies and vendors that will be distributed through the charitable food system in Arkansas (2) provide money for local capacity building grants that will help to ensure that the state has an adequate distribution system to get food to the needy and (3) offset the administrative fee for program management and oversight by the Alliance. All hunger relief organizations that are members of the Alliance can apply for these grants. See the Schedule of Government Assistance.

New Accounting Pronouncement

Effective January 1, 2023, the Company adopted Accounting Standards Update (ASU) No. 2016-13, Financial Instruments–Credit Losses (Topic 326): Measurement of Credit Losses on Financial Instruments. The ASU replaces the incurred loss impairment methodology with a current expected credit losses model for all financial assets measured at amortized cost. Financial assets held by the Company that are subject to the ASU include contract receivables, contract retainage, and contract assets. The Company adopted the standard using a modified retrospective approach as of the effective date. No cumulative-effect adjustment to retained earnings was required. The adoption of the standard did not have a material impact on the financial statements and primarily resulted in changes to disclosures.

2. Grants Receivable

Grants receivable consist of amounts due from government agencies or private donors, based on the terms of the related grant agreements. Management periodically reviews the status of all grants receivable for collectability. Each balance is assessed based on management's knowledge of and relationship with the government agency or the donor and the age of the receivable balance. As a result of these reviews, balances deemed to be uncollectible are charged directly to uncollected grants expense. Management believes that the use of the direct write-off method approximates the results that would be presented if an allowance for doubtful accounts was recorded.

3. Depreciable Assets

A summary of changes in depreciable assets for the year ending December 31, 2023 is as follows:

	Balance January 1 2023	Additions and Transfers - Net	Retirements and Transfers - Net	Balance December 31 2023
Depreciable assets				
Furniture and fixtures	$ 18,293	-	-	18,293
Office equipment	59,428	2,198	-	61,626
Software	7,000	-	-	7,000
Vehicles	163,820	-	-	163,820
Total depreciable assets	248,541	2,198	-	250,739
Less accumulated depreciation	(166,995)	(19,638)	-	(186,633)
Net depreciable assets	$ 81,546	(17,440)	-	64,106

4. Leases

The Alliance leases office space from Union Station (US Depot, LLC by its agent Hathaway Group), under a lease that commenced January 1, 2022, and that expired December 31, 2022. The lease was extended for two years. The Alliance's lease is currently classified as an operating lease and it does not have any non-lease components. For operating leases that have a lease term of more than twelve months, and whose lease payments are above a certain threshold, the Alliance recognizes a lease liability and a right-of-use asset in the statement of financial position at the present value of the remaining lease payments until expiration. As the lease contracts generally do not provide an implicit discount rate and the Alliance has no debt, the five-year treasury risk free rate was used in determining the present value of the lease payments based on information available at the time of the commencement of the leases.

At December 31, 2023, the Alliance's future lease obligations of $40,248, represents the present value of future annual rental commitments excluding taxes, insurance and other operating costs for non-cancellable operating leases discounted using the risk free rate at the time the lease was recorded. This amount has been recognized on the statement of financial position as an operating lease liability along with an amount of $39,040 for the operating right-of-use assets.

The Alliance's total lease expense for the year ended December 31, 2023, was $38,954. Future cash flows required to satisfy lease payments are as follows for the years ending December 31:

	Interest	Principal	Total
2024	831	40,248	41,079
Total	$ 831	40,248	41,079

5. Liquidity and Availability of Resources

The Alliance's financial assets available within one year of the statements of financial position date for general expenditure are as follows:

Cash and cash equivalents	$ 3,801,930
Accounts receivable	39,486
Grants receivable	681,388
	4,522,804
Less amounts unavailable for general expenditures within one year due to:	
Accounts payable	(111,006)
Deferred revenue	(10,000)
Accrued expenses	(88,747)
Less amounts unavailable for general expenditures within one year due to:	
Donor restrictions	(1,918,363)
Total financial assets available to management for general expenditures within one year	$ 2,394,688

The Alliance maintains a policy of structuring its financial assets to be available as its general expenditures, liabilities, and other obligations come due.

6. Pension Plan

The Alliance adopted, effective January 1, 2012, a Savings Incentive Match Plan for Employees of Small Employers (SIMPLE) Individual Retirement Account (SIMPLE IRA) covering employees who are reasonably expected to receive at least $5,000 in compensation for the calendar year and who are not covered under a collective bargaining agreement for which retirement benefits were the subject of good faith bargaining. The Alliance makes matching contributions of up to 3% of eligible employees' salaries. Contributions by the Alliance for the year ending December 31, 2023 were approximately $21,805.

7. Net Assets With Donor Restriction

At December 31, 2023, net assets with donor imposed restrictions consisted of the following:

State Food Purchasing Program grant for purchase of food	$	603,293
Various donors - Share Our Strength Collaboration		351,676
PC Hunger Reduction Initiative		214,608
State Food Purchasing Program grant for local capacity building grants		131,315
FA SNAP		128,528
Various donors - Share Our Strength Cooking Matters		97,410
Other - Gleaning grant		84,984
Arkansas Community Foundation - promotional/informational videos		34,550
Various donors - Beef Project		31,931
Food Desert Study		28,497
Liberty Dental Plan		25,000
Tusk Grant 2023		25,000
Murphy Summer Meals Grant		21,499
CBPP WIC Grant		19,830
Latine Funding		15,854
AT&T Grant		13,254
Kroger - Gleaning grant		11,260
State Food Purchasing Program for administration of grant		10,228
Lobby Day for College Pantries		10,000
Walmart - 2017 Program operations grant		9,710
AT&T Summit Grant		9,521
ACH Summer Meals Grants		7,690
Walmart Foundation Grants		6,874
Rebsamen Fund Minority Outreach		5,000
Free/Reduced Lunch Project		3,934
Tito's Block 2 Block Project		3,567
College Hunger Summit 2022		3,511
Arkansas Department of Human Services - Teague General Improvement Fund (GIF) for CM Program		2,973
Blue and You Foundation grant - Healthy Meals on a Tight Budget		2,300
Other		4,566
	$	1,918,363

8. Net Assets Released from Restrictions

Net assets are released from donor restrictions when expenses are incurred that satisfy the restricted purposes. Net assets released from restriction during the year ended December 31, 2023, were as follows:

Other	291,088
State Food Purchasing Program grant for local capacity building grants	238,827
Gleaning grants	107,046
Blue and You Foundation grant - Arkansas Hunger and Nutrition Initiative	92,363
GusNIP	56,054
State Food Purchasing Program for administration of grant	45,522
Tito's Block 2 Block Project	41,749
Food Desert Study	40,936
Robin Hood Grant	39,484
FA SNAP	36,472
Pulaski County Hunger Reduction Initiative	33,000
Mazon A Jewish Response to Hunger Advocacy Grant	27,992
CSPI Consultant Grant 2022	26,810
College Hunger Summit 2022	20,489
CBPP WIC Grant	13,385
Free/Reduced Lunch Project	11,066
Arkansas Department of Human Services - Out of School Program	10,949
Lobby Day for College Pantries	7,000
FRAC Immigration Grant	5,000
CBPP AOC	4,000
Delta Dental Grant	2,500
ACH Summer Meals Grants	2,310
ADH ABRIC	1,400
Walmart - 2017 Program operations grant	459
Various donors - Beef Project	232
	$ 4,905,483

9. Subsequent Events

The Alliance did not have any recognized or non-recognized subsequent events that occurred after December 31, 2023, the statement of financial position date. The Alliance has evaluated subsequent events through July 15, 2024, the date which the financial statements were available to be issued.

Arkansas Hunger Relief Alliance, Inc.
Schedule of State Assistance
For the Year Ended December 31, 2023

Department/Division Program	State Revenues	State Expenditures
State Assistance		
Arkansas Department of Human Services		
State Food Purchasing Program		
(Sub-Grant Number 4600025278)	$ 995,581	955,552
Total State Assistance	$ 995,581	$ 955,552

See accompaning notes to the Schedule of State Assistance.

Arkansas Hunger Relief Alliance, Inc.
Notes to Schedule of Governmental Assistance
December 31, 2023

1. General

The accompanying schedule of governmental assistance presents the activity of all federal and state financial award programs of Arkansas Hunger Relief Alliance, Inc.

2. Basis of Accounting

The accompanying schedule of governmental assistance is presented using the accrual basis of accounting which is described in Note 1 to the financial statements of Arkansas Hunger Relief Alliance, Inc.

3. Other

The Arkansas Coalition for Obesity Prevention "ArCOP" subcontracts with the Arkansas Hunger Relief Alliance, Inc. to administer SNAP Nutrition Education funds for programming supported by Act 1101 of 2017 of the Arkansas General Assembly in support of the Double UP Food Bucks ("DUFB") incentive program. The Alliance does not maintain a contract with the State of Arkansas, and is thus an indirect recipient of these funds. The Alliance's responsibilities will be to expand nutrition education instruction at targeted sites statewide, both intended to increase healthy food purchases and consumption by recipients of SNAP benefits in Arkansas.

All funding provided from ArCOP to the Alliance will be reimbursed on a monthly basis. ArCOP has agreed to fund up to $120,000 ending September 30, 2023 and $120,000 ending September 30, 2022. At December 31, 2023, the Alliance had submitted for reimbursement for all expenditures under the program and still had $13,811 in receivables. The Alliance received this on January 19, 2024. The contract with ArCOP ended on September 30, 2023, and the Alliance will no longer receive funding through this program.

Arkansas Hunger Relief Alliance, Inc.
Schedule of Expenditures of Federal Awards
For the Year Ended December 31, 2023

Federal Grantor/Program Title	Federal Agency/ Pass-Through Entity	CFDA Number	Pass-Through Entity Identifying Number	Amount Expended
Department of Agriculture				
State Administrative Matching Grants for the Supplemental Nutrition Assistance Program	Arkansas Department of Human Services	10.561	4600041972	$ 89,652
Gus Schumacher Nutrition Incentive Program	Arkansas Department of Human Services	10.331	N/A	56,054
Department of Housing and Urban Development (HUD)				
Community Development Block Grant (CDBG)	Arkansas Economic Development Commission	14.228	N/A	2,341,604
			Total Expenditures of Federal Awards	$ 2,487,310

Note to Schedule of Expenditures of Federal Awards

1. Basis of Presentation

The above schedule of expenditures of federal awards (the "Schedule") includes the federal award activity of Arkansas Hunger Relief Alliance, Inc. under programs of the federal government for the year ended December 31, 2023. The information in this Schedule is presented in accordance with the requirements of Title 2 U.S. Code of Federal Regulations Part 200, Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards (Uniform Guidance). Because the Schedule presents only a selected portion of the operations of Arkansas Hunger Relief Alliance, Inc., it is not intended to and does not present the financial position, changes in net assets, or cash flows of Arkansas Hunger Relief Alliance, Inc.

2. Summary of Significant Accounting Policies

Expenditures reported on the Schedule are reported on the accrual basis of accounting. Such expenditures are recognized following the cost principles contained in the Uniform Guidance, wherein certain types of expenditures are not allowable or are limited as to reimbursement.

Federal and state grant funds are considered to be earned to the extent of expenditures made under the provisions of the grant, and accordingly, when such funds are received, they are recorded as unearned revenues until earned.

3. Indirect Cost Rate

Arkansas Hunger Relief Alliance, Inc. has elected not to use the 10-percent de minimis indirect cost rate allowed under the Uniform Guidance.

EGP PLLC
CPAs & Consultants

Independent Auditor's Report on Internal Control over Financial Reporting and on Compliance and Other Matters Based on an Audit of Financial Statements Performed in Accordance with *Government Auditing Standards*

To the Board of Directors of
Arkansas Hunger Relief Alliance, Inc.

We have audited in accordance with auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States, the financial statements of Arkansas Hunger Relief Alliance, Inc., which comprise the statement of financial position as of December 31, 2023, and the related statements of activities, functional expenses, and cash flows for the year then ended, and the related notes to the financial statements and have issued our report thereon dated July 15, 2024.

Internal Control over Financial Reporting
In planning and performing our audit of the financial statements, we considered Arkansas Hunger Relief Alliance, Inc.'s internal control over financial reporting (internal control) as a basis for designing procedures that are appropriate in the circumstances for the purpose of expressing our opinion on the financial statements, but not for the purpose of expressing an opinion on the effectiveness of Arkansas Hunger Relief Alliance, Inc.'s internal control. Accordingly, we do not express an opinion on the effectiveness of Arkansas Hunger Relief Alliance, Inc.'s internal control.

A *deficiency in internal control* exists when the design or operation of a control does not allow management or employees, in the normal course of performing their assigned functions, to prevent, or detect and correct misstatements on a timely basis. A *material weakness* is a deficiency, or a combination of deficiencies, in internal control, such that there is a reasonable possibility that a material misstatement of the entity's financial statements will not be prevented, or detected and corrected on a timely basis. A *significant deficiency* is a deficiency, or a combination of deficiencies, in internal control that is less severe than a material weakness, yet important enough to merit attention by those charged with governance.

Our consideration of internal control was for the limited purpose described in the first paragraph of this section and was not designed to identify all deficiencies in internal control that might be material weaknesses or significant deficiencies. Given these limitations, during our audit, we did not identify any deficiencies in internal control that we consider to be material weaknesses. However, material weaknesses may exist that have not been identified.

Compliance and Other Matters
As part of obtaining reasonable assurance about whether Arkansas Hunger Relief Alliance, Inc.'s financial statements are free from material misstatement, we performed tests of its compliance with certain provisions of laws, regulations, contracts, and grant agreements, noncompliance with which could have a direct and material effect on the financial statements. However, providing an opinion on compliance with those provisions was not an objective of our audit and, accordingly, we do not express such an opinion. The results of our tests disclosed no

instances of noncompliance or other matters that are required to be reported under *Government Auditing Standards.*

Purpose of This Report

The purpose of this report is solely to describe the scope of our testing of internal control and compliance and the results of that testing, and not to provide an opinion on the effectiveness of the entity's internal control or on compliance. This report is an integral part of an audit performed in accordance with *Government Auditing Standards* in considering the entity's internal control and compliance. Accordingly, this communication is not suitable for any other purpose.

EGP, PLLC

July 15, 2024

Certified Public Accountants & Consultants
North Little Rock, Arkansas

EGP PLLC
CPAs & Consultants

Independent Auditor's Report on Compliance for Each Major Program and on Internal Control Over Compliance Required By The Uniform Guidance

To the Board of Directors of
Arkansas Hunger Relief Alliance, Inc.

Report on Compliance for Each Major Federal Program

Opinion on Each Major Federal Program
We have audited Arkansas Hunger Relief Alliance, Inc.'s compliance with the types of compliance requirements identified as subject to audit in the OMB *Compliance Supplement* that could have a direct and material effect on each of Arkansas Hunger Relief Alliance, Inc.'s major federal programs for the year ended December 31, 2023. Arkansas Hunger Relief Alliance, Inc.'s major federal programs are identified in the summary of auditor's results section of the accompanying schedule of findings and questioned costs.

In our opinion, Arkansas Hunger Relief Alliance, Inc. complied, in all material respects, with the compliance requirements referred to above that could have a direct and material effect on each of its major federal programs for the year ended December 31, 2023.

Basis for Opinion on Each Major Federal Program
We conducted our audit of compliance in accordance with auditing standards generally accepted in the United States of America (GAAS); the standards applicable to financial audits contained in *Government Auditing Standards* issued by the Comptroller General of the United States (*Government Auditing Standards*); and the audit requirements of Title 2 U.S. *Code of Federal Regulations* Part 200, *Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards* (Uniform Guidance). Our responsibilities under those standards and the Uniform Guidance are further described in the Auditor's Responsibilities for the Audit of Compliance section of our report.

We are required to be independent of Arkansas Hunger Relief Alliance, Inc. and to meet our other ethical responsibilities, in accordance with relevant ethical requirements relating to our audit. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion on compliance for each major federal program. Our audit does not provide a legal determination of Arkansas Hunger Relief Alliance, Inc.'s compliance with the compliance requirements referred to above.

Responsibilities of Management for Compliance
Management is responsible for compliance with the requirements referred to above and for the design, implementation, and maintenance of effective internal control over compliance with the requirements of laws, statutes, regulations, rules and provisions of contracts or grant agreements applicable to Arkansas Hunger Relief Alliance, Inc.'s federal programs.

Auditor's Responsibilities for the Audit of Compliance
Our objectives are to obtain reasonable assurance about whether material noncompliance with the compliance requirements referred to above occurred, whether due to fraud or error, and express an opinion on Arkansas Hunger Relief Alliance, Inc.'s compliance based on our audit. Reasonable assurance

is a high level of assurance but is not absolute assurance and therefore is not a guarantee that an audit conducted in accordance with GAAS, *Government Auditing Standards*, and the Uniform Guidance will always detect material noncompliance when it exists. The risk of not detecting material noncompliance resulting from fraud is higher than for that resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control. Noncompliance with the compliance requirements referred to above is considered material, if there is a substantial likelihood that, individually or in the aggregate, it would influence the judgment made by a reasonable user of the report on compliance about Arkansas Hunger Relief Alliance, Inc.'s compliance with the requirements of each major federal program as a whole.

In performing an audit in accordance with GAAS, *Government Auditing Standards*, and the Uniform Guidance, we:

- Exercise professional judgment and maintain professional skepticism throughout the audit.
- Identify and assess the risks of material noncompliance, whether due to fraud or error, and design and perform audit procedures responsive to those risks. Such procedures include examining, on a test basis, evidence regarding Arkansas Hunger Relief Alliance, Inc.'s compliance with the compliance requirements referred to above and performing such other procedures as we considered necessary in the circumstances.
- Obtain an understanding of Arkansas Hunger Relief Alliance, Inc.'s internal control over compliance relevant to the audit in order to design audit procedures that are appropriate in the circumstances and to test and report on internal control over compliance in accordance with the Uniform Guidance, but not for the purpose of expressing an opinion on the effectiveness of Arkansas Hunger Relief Alliance, Inc.'s internal control over compliance. Accordingly, no such opinion is expressed.

We are required to communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and any significant deficiencies and material weaknesses in internal control over compliance that we identified during the audit.

Report on Internal Control Over Compliance

A *deficiency in internal control over compliance* exists when the design or operation of a control over compliance does not allow management or employees, in the normal course of performing their assigned functions, to prevent, or detect and correct, noncompliance with a type of compliance requirement of a federal program on a timely basis. A *material weakness in internal control over compliance* is a deficiency, or a combination of deficiencies, in internal control over compliance, such that there is a reasonable possibility that material noncompliance with a type of compliance requirement of a federal program will not be prevented, or detected and corrected, on a timely basis. A *significant deficiency in internal control over compliance* is a deficiency, or a combination of deficiencies, in internal control over compliance with a type of compliance requirement of a federal program that is less severe than a material weakness in internal control over compliance, yet important enough to merit attention by those charged with governance.

Our consideration of internal control over compliance was for the limited purpose described in the Auditor's Responsibilities for the Audit of Compliance section above and was not designed to identify all deficiencies in internal control over compliance that might be material weaknesses or significant deficiencies in internal control over compliance. Given these limitations, during our audit we did not identify any deficiencies in internal control over compliance that we consider to be material weaknesses, as defined above. However, material weaknesses or significant deficiencies in internal control over compliance may exist that were not identified.

Our audit was not designed for the purpose of expressing an opinion on the effectiveness of internal control over compliance. Accordingly, no such opinion is expressed.

The purpose of this report on internal control over compliance is solely to describe the scope of our testing of internal control over compliance and the results of that testing based on the requirements of the Uniform Guidance. Accordingly, this report is not suitable for any other purpose.

EGP, PLLC

July 15, 2024

Certified Public Accountants & Consultants
North Little Rock, Arkansas

Arkansas Hunger Relief Alliance, Inc.
Schedule of Findings and Questioned Costs
For the Year Ended December 31, 2023

Summary of Auditor's Results

Financial Statements

1. The opinion expressed in the independent accountants' report was:

☒ Unmodified ☐ Qualified ☐ Adverse ☐ Disclaimed

2. The independent accountants' report on internal control over financials reporting described:

Material weakness(es)?	☐ Yes	☒ No
Significant deficiency(s) noted that are not considered to be a material weakness(es)?	☐ Yes	☒ None reported

3. Noncompliance considered material to the financial statements was disclosed by the audit:

☐ Yes ☒ No

Federal Awards

4. The independent accountants' report on internal control over compliance with requirements applicable to major federal awards programs described:

Material weakness(es)?	☐ Yes	☒ No
Significant deficiency(s) noted that are not considered to be a material weakness(es)?	☐ Yes	☒ None reported

5. The opinion expressed in the independent accountants' report on compliance with requirements applicable to major federal awards was:

☒ Unmodified ☐ Qualified ☐ Adverse ☐ Disclaimed

6. The audit disclosed findings required to be reported by 2 CFR 200.516?

☐ Yes ☒ No

7. The major program was the Community Development Block Grant (CDBG) 14.228.

8. The threshold used to distinguish between Type A and Type B programs as defined in OMB 2 CFR 200.501 was $750,000.

9. The Organization qualified as a low-risk auditee as that term is defined in 2 CFR 200.520?

☒ Yes ☐ No

Arkansas Hunger Relief Alliance, Inc.
Schedule of Findings and Questioned Costs
For the Year Ended December 31, 2023

Findings Required to be Reported by *Government Auditing Standards*

No matters are reportable

Findings Required to be Reported by 2 CFR 200.500

No matters are reportable

Arkansas Hunger Relief Alliance, Inc.
Summary Schedule of Prior Audit Findings
December 31, 2023

Findings Required to be Reported by *Government Auditing Standards*

No matters were reportable.

Findings Required to be Reported by 2 CFR 200.500

No matters were reportable.

14 - PI-15
(SAA Membership)

14 - RI-01
(SAA Research Project)

Organization/Institution Submitting Proposal:
Soy Aquaculture Alliance

Project Title:
Aquaculture Research for Soy-Based Feeds

Project Type:
Research

Name of Project Manager:
Katie Hall

Name of Project Team Member 1:
Dr. Amrit Bart

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Soy Aquaculture Alliance (SAA) is the QSSB collaboration with 12 state members, responsible for coordinating research, market development and education in U.S. aquaculture. Our research drives demand for soy by maximizing inclusion rates of soy-based feed products in the diets of aquaculture and encouraging growth of the entire aquaculture industry. The U.S. has a $17B trade deficit with China on seafood alone, so growth in U.S. aquaculture is key to growing demand for U.S. Soy.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
SAA requests RFPs and awards research funding for efforts that grow U.S. Soy demand; those projects may increase soy-based feed inclusion rates, reduce barriers to further increase soy in aquaculture diets and/or develop lower-cost, sustainable feed options that encourage growth of the entire industry-- therefore increasing soy usage.

BUDGET

Amount of Funding Needed for Project:
$25,000.00

Contribution Amount (from organization or sponsor):
$750,000.00

Soy Aquaculture Alliance (SAA) is the QSSB collaboration responsible for coordinating research, market development and education in U.S. aquaculture.

Our research drives demand for soy by

1) Maximizing inclusion rates of soy-based feed products in aquaculture diets,
2) Reducing barriers to increasing inclusion rates by addressing Anti-Nutritional Factors (ANFs) and off-flavors, and
3) Encouraging growth of the entire aquaculture industry.

The U.S. has a +$17B trade deficit with China on seafood alone, so growth in U.S. aquaculture is a key piece to growing demand for U.S. Soy.

In addition to a domestic focus, SAA coordinates closely with USSEC, USB, ASA and WISHH to maximize the impact of soy checkoff investments. Aquaculture doesn't have borders, and the resources we create through membership and program support advance soy-based feed in aquaculture around the globe.

Class A Membership with SAA is $25,000. We also request consideration of an optional contribution toward program funding of $75,000. As this would be Arkansas Soybean's first year as a member, and we recognize how challenging budget environments are, we're asking for $25,000 and if Arkansas Soybean is interested in a larger investment, we wanted to provide that information as well.

Benefit to Soybean Growers

SAA's research maximizes inclusion rates and reduces the anti-nutritional factors of soy in aquafeed. Additionally, SAA's market development initiatives are investing checkoff to expand U.S. aquaculture production. Both result in increased demand for soy, especially as farmers seek local markets through new value-added opportunities, all while reducing the leverage China is focusing on in U.S. Soy.

Economic Impact

SAA is slightly different than a one-off project in measuring ROI. Like USSEC, USB, STC and others, our function is to coordinate the U.S. soy checkoff investments to develop a long-term market. We ask applicants to calculate economic opportunities for the species, soy products and potential ROI to soybean farmers. Our team of advisors reviews each project and takes this into consideration to prioritize projects making an impact, both in aquaculture and demand for soy.

Economic Analysis

Aquaculture production is expected to continue to grow 15% through 2030. The U.S. currently imports ~90% of its seafood and has a +$17B trade deficit with China on seafood. U.S. Aquaculture will be a key part of reducing our reliance on China. Depending on the species and life stage, aquaculture feed contains between 5-55% soy protein. SAA continues to maximize soy inclusion and expand domestic production to meet this growing opportunity for soy.

SOY AQUACULTURE
ALLIANCE

Budget Summary : Class A

#	Line Item	Cost
1	SAA QSSB Membership	$25,000.00
2	SAA Aquaculture Feed Research Contribution	$75,000.00
Total:		$100,000.00

Start/End Date: 10-01-2025 through 09-30-2026

Organization: Soy Aquaculture Alliance

Address: 5730 West 74th ST, Indianapolis, IN 46278

Budget Requested: $25,000.00-100,000.00

Institutional Investment: $750,000.00 (anticipated funding for FY2026)

Does SAA have Additional Funding Requests?

Yes, currently SAA sources membership and program funding from 12 additional states ($800,000 in FY2025). SAA requests $25,000 for membership and $75,000 for program support from all Class A members (Class A Members grow >1MM bushels in a year).

Is Research being Conducted Elsewhere?

SAA coordinates between 7-12 projects and programs annually to promote the use of soy in aquaculture. All SAA-funded projects are captured in the National Soybean Checkoff Research Database HERE.

Why SAA and Why Now?

According to the Food and Agriculture Organization of the United Nations (FAO), global fisheries and aquaculture production reached a record 228 million tons in 2023. Aquaculture accounted for 52% of that total.

Aquaculture continues to be the fastest-growing food production sector and is projected to expand steadily through 2030, with global market value expected to reach $315

SOY AQUACULTURE
ALLIANCE

billion by 2030, growing at a CAGR of about 5.4%. Domestic aquaculture development is critical to meeting growing demand and reducing reliance on imports.

SAA continues to maximize soy inclusion and expand domestic aquaculture production to capture this growing opportunity for U.S. soy and is a strategic investment vehicle designed to create long-term, sustainable demand for U.S. soy in the fastest-growing protein sector: aquaculture. Like USSEC, USB, and STC, our role is to coordinate checkoff dollars to build markets that will deliver measurable returns for soybean farmers over time.

Every project we fund undergoes rigorous economic impact analysis. We require Principal Investigators to calculate the potential market opportunity for the species, the soy product involved, and the projected ROI to soybean farmers. Our advisory team prioritizes projects that expand aquaculture production and maximize soy inclusion in feed formulations.

- Aquaculture now produces over half of the world's seafood and is projected to grow steadily through 2030.
- Soy is a critical component of aquaculture feed, with inclusion rates ranging from 5- 55%, and in some cases replacing fishmeal entirely.
- Every additional percentage point of soy inclusion represents millions of bushels of demand.

SAA ensures that U.S. soy remains the preferred protein source in aquaculture feeds globally and domestically. By investing in SAA, soybean associations are not funding isolated research, they are fueling a coordinated strategy to capture a share of a $300+ billion global market and secure long-term demand for U.S. soy.

SAA's research efforts maximize soy inclusion rates and reduce anti-nutritional factors to ensure soy remains the preferred, cost-effective protein source in a rapidly expanding global aquaculture market. One of the most exciting areas of innovation is addressing off-flavors in fish fed soy-based diets; that research could unlock new demand channels for soy-based feeds.

Every dollar invested in SAA is a dollar invested in building long-term, high-volume demand for U.S. soy in the fastest-growing protein sector worldwide.

SOY AQUACULTURE
ALLIANCE

15 - RI-02

Organization/Institution Submitting Proposal:
Iowa Soybean Association

Project Title:
Farmers Fueling the Future

Project Type:
Research

Name of Project Manager:
Matt Herman

Name of Project Team Member 1:
Matt Herman

Name of Project Team Member 2:
Omid Karami

Statement of Justification or Purpose of the Project (75 word maximum):
This project protects and expands demand for U.S. soybeans in biofuel markets by addressing technical and regulatory barriers that suppress soybean oil value. As biofuel eligibility increasingly depends on life cycle modeling, indirect land use change assumptions, and sustainability certification, U.S. soy is often disadvantaged by outdated methods not reflective of modern farming. This work delivers credible, farmer-relevant tools to preserve market access and competitiveness.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
The project will update public life cycle and land use models to reflect crop rotations, evaluate alternative life cycle assessment methods that better credit soybean co-products, and engage regulators shaping domestic and international biofuel markets. It will also develop and pilot a U.S.-centric sustainability and traceability certification framework for biofuel markets. Activities focus on technical analysis, stakeholder engagement, and practical tools that farmers and markets can readily use.

BUDGET

Amount of Funding Needed for Project:
$15,000.00

Contribution Amount (from organization or sponsor):
$300,000.00

Farmers Fueling the Future (FFF)

Organization: Iowa Soybean Association (ISA), in partnership with American Soybean Association (ASA)

Staff Leads: Matt Herman (ISA), Omid Karami (ASA)

Project Period: October 1, 2026 – September 30, 2027

Requested Arkansas Funding: $15,000 (leveraged with multi-state and national funding)

1. Project Purpose and Relevance to Arkansas Soybean Farmers

The goal of Farmers Fueling the Future is to protect and expand long-term demand for U.S. soybeans in domestic and international biofuel markets by removing technical and regulatory barriers that limit market access and suppress the value of soybean oil. Growth in biomass-based diesel, renewable diesel, and sustainable aviation fuel is now the primary driver of soybean oil demand. Access to these markets increasingly depends on life cycle greenhouse gas accounting, indirect land use change (ILUC) modeling, and sustainability certification frameworks.

Arkansas soybean farmers are particularly exposed to these dynamics. As biofuel programs adopt default assumptions that do not reflect modern U.S. production systems, soybeans can face penalties or eligibility restrictions unrelated to actual on-farm practices. Without intervention, these structural issues risk shifting demand toward alternative feedstocks and eroding the value of soybean oil. This project ensures that Arkansas farmers are evaluated based on how they actually farm, not on outdated or globally generic assumptions.

2. Project Objectives

The project has four integrated objectives:

1. Improve the technical accuracy of ILUC and life cycle assessment models used in biofuel markets so they reflect U.S. soybean production systems.
2. Ensure soybean-based fuels are evaluated using methodologies consistent with real-world feed and co-product markets.
3. Engage domestic and international biofuel marketplaces and influence eligibility rules to ensure U.S. soy is accurately represented.
4. Develop and pilot a U.S.-centric sustainability and traceability certification framework suitable for biofuel markets.

3. Key Activities and Deliverables

A. Improved ILUC Modeling for U.S. Soybeans

Current ILUC models commonly assume single-crop systems, overstating land expansion impacts for soybeans. This project will develop public, non-proprietary updates to leading global models to allow modeling of crop rotations. These updates improve realism and reduce structural bias against soy.

Deliverables:

- Rotation-capable updates to GTAP-, GCAM-, and GLOBIOM-based modeling inputs
- Plain-language educational materials explaining ILUC and modeling improvements

B. Alternative Life Cycle Assessment (LCA) Methodologies

Most biofuel programs rely on mass-based allocation that assigns the majority of farm-level emission reductions to soybean meal, limiting the ability of farmers to capture value from climate-smart practices in fuel markets. This project will assess displacement-based approaches for protein meal that better reflect real-world feed substitution.

Deliverables:

- Technical report on protein meal displacement impacts on soybean carbon intensity
- Implementation memo for use by soybean organizations in market engagement

C. No-ILUC / Low-ILUC Production Pathways Relevant to Arkansas

Several domestic and international biofuel programs allow feedstocks to qualify as low-ILUC or no-ILUC when farmers can demonstrate yield increases or production practices that avoid land expansion. This project will focus on production systems highly relevant to Arkansas agriculture.

Low-ILUC practices evaluated will include:

- Increased double cropping and intensified rotations
- Irrigation practices that increase total annual biomass output
- Drainage and water management systems that stabilize yields and reduce land pressure

These practices are already widely used or expanding in Arkansas and represent credible, farmer-driven pathways to demonstrate low land use change risk.

Deliverables:

- Report identifying qualifying practices and their eligibility under major biofuel programs
- Practice-level value estimates comparing compliance costs and potential market benefits

D. International Biofuel Market Access

Biofuel demand growth is increasingly driven by international markets and United Nations–linked programs such as aviation and maritime fuels. The project will engage biofuel marketplaces and technical bodies to ensure improved modeling assumptions and low-ILUC practices are understood and considered.

Deliverables:

- Targeted technical briefings and written submissions to priority marketplaces
- Documentation of engagement outcomes and follow-on requests

E. SSAP-Energy Certification Development and Pilot

The project will develop and pilot an expanded sustainability and traceability certification framework ("SSAP-Energy") for soybeans used in biofuel markets. The framework builds on the existing Soybean Sustainability Assurance Protocol and adds a farm-level certification option while retaining aggregated certification.

The scheme will be designed around U.S. legal requirements and existing data systems to minimize farmer burden, while remaining auditable by independent third-party certification bodies.

Deliverables:

- Documented SSAP-Energy scheme and audit protocols
- Pilot implementation with participating farmers and supply-chain partners

4. Benefits to Arkansas Soybean Farmers

Arkansas soybean farmers will benefit through:

- Preserved and expanded access to biofuel markets that increasingly condition eligibility on ILUC and sustainability criteria
- Reduced risk of unjustified penalties applied to soybean oil

- Greater ability to monetize climate-smart practices already in use in Arkansas production systems
- A practical, U.S.-centric certification pathway aligned with biofuel market requirements

5. Leveraged Funding and Collaboration

Arkansas funding will be leveraged with significant investments from other state soybean organizations, the United Soybean Board, and national partners. Key collaborators include the U.S. Soybean Export Council, Clean Fuels Alliance America, and biofuel producer associations, ensuring strong technical credibility and direct market relevance.

6. Next Steps

Upon completion, project outputs will be positioned for adoption by the market place, modeling institutions, and certification bodies. SSAP-Energy will be refined for broader deployment, and low-ILUC practices relevant to Arkansas will be integrated into ongoing market access efforts, supporting durable demand growth for Arkansas soybeans.

United Soybean Board
Partner Proposal Template
Version 2.0

General Guidance: Use clear and concise writing that can be readily understood. State explicitly how your proposal would align with the USB strategic plan.

- Identify capabilities and expertise of the submitter.
- Identify collaborative funding and execution opportunities with influential partners.
- Explain complex technical terms and jargon at first use. Avoid acronyms.
- Please focus the proposal on the scoped work for this project. As needed, reference past work or potential future work to support your justification for your current proposal.
- Do not include any proprietary information.

a. **Proposal Title: Farmers Fueling the Future**
Organization or Entity Name: Iowa Soybean Association
Project Lead Name: Matt Herman & Omid Karami
Address: 1255 SW Prairie Trail Parkway
City, State, Zip: Ankeny, IA, 50023
Phone: 319-215-0833
Email: mherman@iasoybeans.com; Okarami@soy.org

b. **Proposal Summary** (Please limit to 1,000 words)
This section should address the following:
   - Define the goal that your proposal will address. If successful, what do you expect to achieve?
   - Why should your proposal matter to U.S. soybean farmers, USB and the U.S. soybean industry?
   - Why is this the right proposal at the right time?
   - What will farmers get out of the investment (i.e. deliverables)? Please limit to a max of 4 total.

The goal of this proposal is to protect and expand long-term demand for U.S. soybeans in domestic and international biofuel markets by removing structural barriers that limit market access and suppress the value of soybean oil. Specifically, the project addresses how U.S. soybean production systems are evaluated under life cycle assessment and indirect land use change frameworks, and how sustainability and traceability requirements are implemented in regulated biofuel markets. If successful, this work will deliver technically credible, farmer-relevant tools that reduce unjustified penalties applied to soy, preserve access to growing biofuel markets, and improve the competitiveness of U.S. soybeans relative to alternative feedstocks.

This proposal matters to U.S. soybean farmers and the U.S. soybean industry because growth in soybean oil demand is increasingly driven by biomass-based diesel, renewable diesel, and sustainable aviation fuel. Access to these markets, however, is often constrained by modeling assumptions and certification requirements that do not reflect modern U.S. production practices or existing U.S. legal and regulatory frameworks. In many state and international programs, soybeans face default penalties or eligibility restrictions related to indirect land use change, life cycle greenhouse gas accounting, or sustainability certification. These constraints frequently arise from structural limitations in models or from globally designed certification schemes that impose requirements already addressed by U.S. law. If left unaddressed, these barriers will continue to suppress demand for U.S. soybeans and shift value away from farmers.

This is the right proposal at the right time. Although indirect land use change was removed from the federal 45Z clean fuel production credit, it remains a binding factor in several state programs and is increasingly embedded in international biofuel markets, including aviation and maritime fuels. At the same time, major jurisdictions such as the European Union are actively reconsidering how crop-based feedstocks are treated, with proposals that could restrict or eliminate soy unless it can be demonstrated to be produced under low indirect land use change risk systems. Decisions made in the very near term will shape soybean market access for the next decade. Without credible, technically grounded alternatives, U.S. soy risks being locked into unfavorable assumptions and compliance pathways by default.

This project addresses these risks through four integrated workstreams. First, it will develop updated Global Trade Analysis Project inputs that enable modeling of crop rotations, correcting a structural limitation that inflates indirect land use change estimates for soybeans. Second, it will evaluate alternative life cycle assessment methodologies, including protein meal displacement, to better reflect real-world feed substitution and ensure that climate-smart farming practices are accurately valued and accrued to the farmer. Third, it will engage international regulators and technical bodies to ensure that improved modeling assumptions and methodologies are understood and considered as biofuel markets and policies are being defined. Fourth, it will develop and pilot a U.S.-centric sustainability and traceability certification framework for biofuel markets, building on the existing Soybean Sustainability Assurance Protocol and enabling farmers to demonstrate compliance with market access requirements through independent third-party certification.

Farmers will benefit from this investment in four tangible ways. First, it will reduce unjustified modeling penalties that suppress soybean demand in biofuel markets. Second, it will improve or maintain access to domestic and international markets that increasingly condition eligibility on life cycle performance and land use change risk. Third, it will increase the share of climate-smart agriculture value that flows back to the farm by improving how emissions reductions and sustainability attributes are recognized in fuel markets. Fourth, it will provide farmers and state soybean organizations with a practical, auditable certification pathway designed around U.S. law and production systems, reducing compliance burden while preserving flexibility as biofuel market requirements evolve.

Together, these outcomes will help ensure that U.S. soybean farmers are evaluated based on how they actually farm, rather than on outdated assumptions embedded in models or certification frameworks not designed for U.S. agriculture.

c. **Start Date:** 10/1/2026
d. **End Date:** 9/30/2027
e. **Projects should be scoped for a single 12-month period. If additional time is needed, please add a justification below (e.g. field research timelines):**

f. **Requested budget from USB? $700k**
g. **Please breakdown the high-level budget for your project by deliverable here:**

Key Deliverables	Description of Deliverable and success metrics	Budget ($) *

1. Development of soy-checkoff Indirect Land Use Change database and materials	Develop a U.S. soybean, public Global Trade Analysis Project (GTAP) model, Global Change Analysis Model (GCAM), and Global Biosphere Management Model (GLOBIOM) updates that enables modeling of crop rotations rather than single-crop-only assumptions. Publish a multi-part educational blog series that explains indirect land use change, the GTAP model, and the importance of rotation-capable modeling, written in plain language for non-technical audiences. Success metrics: (1) Completion and documentation of a GTAP model, Global Change Analysis Model (GCAM), and Global Biosphere Management Model (GLOBIOM) updates that enables crop rotation modeling. (2) Publication of at least five educational blog posts explaining indirect land use change concepts and modeling implications.	$300k
2. Alternative Biofuel LCA Methodologies	Deliverable 2A: Publish a technical report assessing how expanded displacement methods for protein meal in oilseed life cycle assessment would affect carbon intensity outcomes for existing and emerging oilseeds used in biomass-based diesel markets. Deliverable 2B: Publish a report identifying farm practices and cropping technologies that can measurably avoid or eliminate land use change risk at the farm level, and describing how these practices could be recognized in major biofuel market programs. Success metrics: (1) Delivery of two final technical reports (A&B) with clearly stated assumptions, sensitivity cases, and	$100k

Commented [OK1]: If you think it is too much, we can put two of the models instead of all three.

	implications for soybean competitiveness. (2) Completion of at least one stakeholder workshop or webinar to review findings and recommended next steps. (3) Preparation of a short implementation memo suitable for use by state soybean organizations and partners in market engagement.	
3. International Biofuel Market Access	Conduct technical engagement and education with key international biofuel market-setting bodies and regulators (e.g., International Civil Aviation Organization, International Maritime Organization, European Commission, and Environment and Climate Change Canada) on the treatment of U.S. soybeans in life cycle assessment and indirect effects frameworks. Success metrics: (1) Development and execution of a 12-month international engagement plan (2) Preparation and submission of technical briefing materials or written inputs to international policy or methodological processes relevant to biofuel market access. (3) Documentation of engagements, submissions, and follow-on requests or feedback from international stakeholders	100k
4. SSAP-Energy	Develop and pilot an expanded U.S.-centric sustainability and traceability certification framework ("SSAP-Energy") for soybeans used in biofuel markets. The expanded scheme will build on the existing Soybean Sustainability Assurance Protocol and add a farm-level certification option while retaining the ability to certify at an aggregated level. The framework will be designed to align with U.S.	200k

	legal requirements and to be auditable by independent third-party certification bodies. Success metrics: (1) Completion of a documented SSAP-Energy scheme, including scope, eligibility criteria, and audit protocols, suitable for third-party certification. (2) Completion of a mapping of U.S. legal and regulatory requirements against priority biofuel market access requirements. (3) Successful completion of a pilot implementation with participating farmers and, where applicable, supply-chain partners, with documented findings and recommended refinements.	

**Please note that the following expenses cannot be included when creating your budget: Entertainment expenses, University Principal Investigator salaries, University overhead/indirect costs, Spousal/family/companion expenses, Personal expenses, and purchase of capital equipment over $2,500, and any lobbying activities.*

h. **Are you expecting to receive funds from other collaborative partners for this work outside of USB funding?**

If yes, please complete the table and question below:

Source	Status (Pending; confirmed)	Amount – note if in kind
Iowa Soybean Association	Planned to Propose	$300,000
Missouri Soybean Association	Confirmed	$75,000
Ohio Soybean Council	Planned to Propose	$75,000
Illinois Soybean Association	Planned to Propose	$75,000
Wisconsin Soybean Marketing Board		$25,000
Minnesota Soybean Research and Promotion Council	Planned to Propose	$75,000
South Dakota Soybean Research and Promotion Council	Proposal Submitted	$25,000
New York Corn & Soybean Growers Association	Planned to Propose	$25,000
Kentucky Soybean Board	Planned to Propose	$25,000

Tennessee Soybean Promotion Board	Planned to Propose	$50,000
Nebraska Soybean Board	Planned to Propose	$100,000
Indiana Soybean Alliance	Proposal Submitted	$25,000
North Dakota Soybean Council	Planned to Propose	$25,000
Arkansas Soybean Promotion Board	Proposal Submitted	$15,000

i. Briefly describe the role of any key collaborative funding partners and how they will help you achieve the described goal(s) of this project? *(Please limit to 250 words)*

There is a rapidly growing international trade in biofuels, with policy frameworks and life cycle methodologies increasingly set outside the United States. U.S. soy faces many of the same challenges in international markets that it faces domestically, including feedstock caps, land use change penalties, and unfavorable default assumptions. Collaboration with experienced international partners is therefore essential to ensure that U.S. soy is accurately represented in these forums.

The U.S. Soybean Export Council will serve as a key collaborative partner by helping identify priority international markets and technical forums, particularly in the European Union and Canada, and facilitating engagement with policymakers, regulators, and technical working groups. USSEC's established relationships and in-market presence will help ensure that project outputs are delivered to the appropriate decision-makers and aligned with active regulatory and methodological reviews. They are also the owner of the SSAP standard and are the key partner in any expansion of that scheme.

Clean Fuels Alliance America, the Sustainable Advanced Biofuel Refiners, and the Advanced Biofuels Association will serve as critical industry partners representing biomass-based diesel, renewable diesel, and sustainable aviation fuel producers. These organizations will provide technical input, help validate assumptions used in life cycle and indirect effects analysis, and assist in aligning project deliverables with real-world market and compliance needs. Their participation will also help ensure that results are relevant to fuel producers and usable in ongoing regulatory and market access discussions.

Together, these partners will strengthen the technical credibility, policy relevance, and international reach of the project, increasing the likelihood that its findings translate into measurable market access and competitiveness benefits for U.S. soybean farmers.

j. **Next Steps** If this proposal is completed as planned, what would you do next? Please describe the next steps or next phase of this work. If this effort has commercial potential, please describe the potential to monetize this effort. *(Please limit to 300 words)*

If this proposal is completed as planned, the next phase of work will focus on scaling adoption, formalizing methodologies, and translating technical findings into durable market access and value creation for U.S. soybeans.

First, results from the indirect land use change database update and alternative life cycle assessment methodologies will be prepared for broader review and potential adoption by regulators, modeling institutions, and market programs. This will include developing regulator-facing technical submissions, briefing materials, and targeted updates to existing modeling frameworks in collaboration with relevant

industry and policy partners. The objective of this phase is to move from analysis and proof-of-concept to repeatable methods that can be referenced in rulemakings and compliance programs.

Second, the SSAP-Energy certification framework will provide a foundation for implementation and scale. Following pilot completion, the scheme could be refined, formally recognized by certification bodies, and made available for broader farmer participation. This would allow state soybean organizations and supply-chain partners to support certification at scale, reducing transaction costs and compliance uncertainty for farmers seeking access to regulated biofuel markets.

Third, international engagement will transition from initial technical education to sustained participation in ongoing regulatory and methodological processes. This includes responding to draft regulations or guidance documents, supporting follow-on consultations, and maintaining a coordinated U.S. soybean presence in priority international biofuel forums to ensure that improvements achieved through this work are preserved over time.

While this effort is not intended to directly generate commercial products, it has clear monetization potential through improved market access, reduced carbon intensity penalties, increased eligibility for premium biofuel markets, and lower compliance costs for certified U.S. soybeans. These outcomes translate directly into more durable and higher-value demand for U.S. soybean farmers.

k. Methods

For scientific research proposals and others requiring further methodological description, please outline your proposed methods. For proposals including a field research component, be sure to indicate what region(s) would be most impacted by the findings and recommendations of the proposed research. *(Please limit to 1,200 words excluding tables, charts and references)*

Indirect Land Use Change

This project will enable the U.S. soybean industry to develop and maintain public, non-proprietary Global Trade Analysis Project (GTAP) model, Global Change Analysis Model (GCAM), and Global Biosphere Management Model (GLOBIOM) tailored to U.S. soybean production systems. All models are primarily economic modeling frameworks used by U.S. states and international market programs to estimate indirect land use change. Although indirect land use change was removed from the federal 45Z clean fuel production credit, indirect effects remain relevant in many state programs and international markets, several of which continue to apply substantial penalties to soybean-based fuels. These penalties often disadvantage soy relative to competing feedstocks such as tallow, used cooking oil, and distillers corn oil.

The primary technical focus of this work will be expanding the GTAP, GCAM, and GLOBIOM models to allow modeling of crop rotations rather than single-crop systems. This structural limitation is a key driver of inflated indirect land use change estimates for soybeans and other row crops. Enabling rotation-capable modeling will improve the realism of indirect effects estimates and strengthen the industry's ability to evaluate emerging oilseeds and alternative feedstocks that are increasingly positioning themselves as low-risk or premium options in biofuel markets.

This work will be conducted in coordination with the United Soybean Board, Clean Fuels Alliance America, the American Soybean Association, the U.S. Soybean Export Council, and relevant oilseed processing stakeholders. To further strengthen technical credibility, the project team intends to collaborate with

academic partners experienced in GTAP, GCAM, GLOBIOM, and land use modeling, which may include the University of California–Davis, Purdue University, and other similarly positioned institutions.

Review and Development of Life Cycle Assessment Methodologies

In fiscal year 2026, Farmers Fueling the Future conducted an initial review of greenhouse gas life cycle assessment methodologies used in major U.S. and international biofuel markets. That review identified opportunities to improve how soybean-based fuels are treated relative to competing feedstocks. In fiscal year 2027, this project will expand that work by assessing how alternative methodologies, when applied consistently across oilseeds, would affect soybean carbon intensity outcomes.

Protein Meal Displacement

Current federal and state biofuel programs rely on the Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies (GREET) model and use mass-based allocation to assign farming emissions between oil and meal. While straightforward, this approach assigns the majority of farm-level emission reductions to the meal fraction, leaving those benefits uncredited in fuel markets. Under typical soybean crushing yields, approximately 80 percent of emission reductions are assigned to meal, limiting the value farmers can capture from climate-smart practices.

This project will evaluate displacement-based approaches for protein meal that better reflect real-world substitution in animal feed markets. Existing data from partners, particularly the United Soybean Board and IFEEDER, will be used to assess substitution relationships among major feed ingredients. These methods would place oilseeds on a more consistent methodological footing with corn ethanol, which already benefits from displacement approaches and exhibits greater sensitivity to climate-smart agriculture practices.

Farmers Fueling the Future will work with the United Soybean Board, Clean Fuels Alliance America, IFEEDER, Life Cycle Associates, and Argonne National Laboratory to characterize protein meal composition and determine substitution relationships among soybean meal, canola meal, distillers dried grains, and other major feed ingredients. This work will build directly on the live ration life cycle assessment incorporated into the GREET model in 2022.

No-Indirect Land Use Change Pathways

Several existing and emerging biofuel markets, including the International Civil Aviation Organization's Carbon Offsetting and Reduction Scheme for International Aviation, the European Union Renewable Energy Directive, and prospective International Maritime Organization regulations, include mechanisms that allow individual farms to demonstrate production without indirect land use change. Such mechanisms can increase feedstock value where carbon intensity is monetized and, in some cases, are required to maintain market access.

In fiscal year 2026, Farmers Fueling the Future evaluated whether higher-yielding crop varieties could qualify as a single technology capable of mitigating indirect land use change risk. In fiscal year 2027, this work will be expanded to identify additional practices and technologies that measurably increase total biomass yield, such as improved genetics, crop rotations, irrigation, and drainage. These practices will be evaluated for potential recognition under relevant international frameworks, and practice-specific value calculators will be developed to estimate farmer-level benefits relative to incremental costs.

This work is time-sensitive, as several jurisdictions are considering policies that would restrict crop-based feedstocks unless produced under low indirect land use change risk systems. The project will support both technical engagement and farmer readiness in anticipation of these policy developments.

International Biofuel Market Development and Access

Biofuel markets are increasingly international, with demand growth concentrated in Canada, the European Union, and United Nations-regulated sectors such as aviation and maritime transport. Although U.S. soy has inherent advantages relative to some competing origins, these advantages are not consistently reflected in international modeling and policy frameworks.

This project will work with the U.S. Soybean Export Council, the American Soybean Association, Clean Fuels Alliance America, and the United Soybean Board to engage international regulators and technical bodies on the treatment of U.S. soy in life cycle assessment and indirect effects modeling. Engagement will be supported through collaboration with relevant non-soy organizations to ensure access to priority forums and consultations.

Priority activities will include participation in Canada's review of life cycle methodologies for waste and residue feedstocks, engagement in the International Civil Aviation Organization Fuel Task Group, technical input through the International Maritime Organization process, and targeted dialogue with the European Union on crop-based feedstock eligibility and yield-enhancing practices.

SSAP-Energy Scheme Development and Pilot

This project will develop and pilot an expanded sustainability and traceability certification framework for U.S. soybeans used in biofuel markets, referred to as SSAP-Energy. The framework will build on the existing Soybean Sustainability Assurance Protocol by adding a farm-level certification pathway while retaining the ability to certify soybeans at an aggregated level. The objective is to create a U.S.-centric, auditable framework aligned with U.S. legal and regulatory requirements and suitable for independent third-party certification.

The methodological approach will focus on defining scheme scope, audit structure, and data requirements in coordination with U.S. soybean organizations and supply-chain stakeholders, with particular attention to minimizing farmer burden through the use of existing data systems. Priority biofuel markets will inform scheme requirements related to traceability, land use change risk, and sustainability attributes.

U.S. legal and regulatory requirements will be mapped against priority market access requirements to identify areas of alignment and remaining gaps. A neutral standards development organization will be engaged through a competitive process to support scheme development. The resulting framework and audit protocols will be reviewed with independent certification bodies to confirm auditability and recognition potential prior to finalization.

The completed SSAP-Energy Scheme will be piloted with participating farmers and, where applicable, supply-chain partners to test implementation and audit practicality. Findings from the pilot will be documented and used to refine the scheme prior to broader deployment.

Organization Name: Iowa Soybean Association/American Soybean Association
Proposal Title: Farmers Fueling the Future

For the Budget Description: Enter the Description, Quantity and Price fields for each item. Totals will automatically calculate. For personnel, list hours x rate and consider using a blended rate. International travel should be noted as such as a separate line and include dates, location and purpose of travel. See the Sample Budget Sheet below for examples of the level of detail that should be provided. You must enter a number in both the Quantity and Price fields for the Total to calculate**. PLEASE NOTE, NO MORE THAN FOUR DELIVERABLES ARE ALLOWED. The deliverable titles can be found on your proposal under "Deliverables". These should also match what you enter into smartsheet when submitting your proposal.**

Key Deliverable 1 Title: Development of soy-checkoff Indirect Land Use Change database and materials			
Planned Activities: Development and documentation of a Global Trade Analysis Project database update enabling crop rotation modeling for U.S. soybeans; publication of a multi-part educational blog series explaining indirect land use change concepts and modeling assumptions in plain language; preparation and delivery of technical presentations to relevant external stakeholders.			
Milestones: 1) Completion and internal validation of crop rotation–enabled GTAP database update 2) Documentation of database structure, assumptions, and limitations 3) Publication of educational blog series on indirect land use change and modeling implications 4) Delivery of technical briefings or presentations to external stakeholders			
Anticipated Timeline: **Q1 (Oct–Dec): Database development and initial validation; begin educational blog series** **Q2 (Jan–Mar): Finalize database update and documentation; continue blog publication** **Q3 (Apr–Jun): Complete blog series; prepare technical presentation materials** **Q4 (Jul–Sept): Deliver external presentations and briefings**			
On-staff indirect land use change modeler (full-year allocation supporting GTAP c	2080	$ 134.62	$ 280,000.00
GTAP data licenses, databases, and technical support software	1	$ 10,000.00	$ 10,000.00
Domestic travel for technical presentations and stakeholder briefings related to p	3	$ 3,333.33	$ 10,000.00
			$ -
			$ -
			$ -
			$ -
			$ -
		Key Deliverable 1 Subtotal	$ 300,000

Key Deliverable 2 Title: Alternative Biofuel LCA Methodologies			
Planned Activities: Assessment of alternative life cycle assessment methodologies relevant to soybean-based biofuels, including (1) evaluation of displacement-based approaches for protein meal in oilseed systems and (2) identification and evaluation of farm practices and cropping technologies that can measurably reduce or eliminate indirect land use change risk. Activities include development of technical reports, validation of assumptions with partners, execution of a limited pilot audit to test practice-level methodologies, and preparation of materials for stakeholder and regulator education			
1) Finalization of scope, assumptions, and data inputs for protein meal displacement analysis 2) Completion of displacement modeling and draft technical report on protein meal displacement (Deliverable 2A) 3) Identification of candidate farm practices and cropping technologies relevant to low or no indirect land use change risk 4) Development of methodology and draft report for practice-based pathways, including audit considerations (Deliverable 2B) 5) Completion of a limited pilot audit to test feasibility, data requirements, and audit practicality of selected practices 6) Finalization of both technical reports and delivery of a stakeholder workshop or webinar summarizing findings, pilot results, and implementation considerations			
Q1 (Oct–Dec): Finalize scope and data inputs for displacement and practice-based analyses **Q2 (Jan–Mar): Complete modeling and draft reports for displacement and low-ILUC practice pathways** **Q3 (Apr–Jun): Conduct limited pilot audit of selected low-ILUC practices; refine methodology based on findings** **Q4 (Jul–Sept): Finalize limited pilot audit of selected low-ILUC practices; reports, prepare implementation memo, and conduct stakeholder workshop or webinar**			
Technical report on low or no indirect land use change practices and technologie	1	$ 60,000.00	$ 60,000.00

Technical report assessing displacement-based life cycle accounting for protein m	1	$ 30,000.00	$ 30,000.00
Stakeholder communication and dissemination of findings, including workshop	1	$ 10,000.00	$ 10,000.00
			$ -
			$ -
			$ -
			$ -
			$ -
		Key Deliverable 2 Subtotal	$ 100,000

Key Deliverable 3 Title: International Biofuel Market Access			
Planned Activities: Technical engagement and information exchange with international biofuel market-setting bodies and regulators to improve understanding of U.S. soybean production systems, life cycle assessment methodologies, indirect effects modeling, and sustainability frameworks. Activities include preparation of technical briefing materials, participation in relevant technical forums or working groups, and coordination with partner organizations to ensure consistent and accurate representation of U.S. soy in international biofuel market discussions.			
Milestones: 1) Identification of priority international biofuel markets, regulatory processes, and technical forums relevant to U.S. soy 2) Preparation of technical briefing materials summarizing project findings on life cycle assessment, indirect land use change, and sustainability frameworks 3) Participation in identified technical forums or working groups to present and discuss findings 4) Documentation of engagements, written submissions, and technical feedback received from international stakeholders			
Anticipated Timeline: **Q1 (Oct–Dec): Identify priority markets and forums; begin preparation of technical briefing materials** **Q2 (Jan–Mar): Participate in initial technical engagements and working group discussions** **Q3 (Apr–Jun): Continue technical engagement and update materials based on project findings** **Q4 (Jul–Sept): Complete remaining engagements and document outcomes and feedback**			
Farmers Fueling the Future staff time supporting international technical engagem	520	$ 144.23	$ 75,000.00
Participation in international biofuel technical working groups relevant to life cyc	1	$ 15,000.00	$ 15,000.00
Membership or affiliation fees providing access to international biofuel life cycle	1	$ 10,000.00	$ 10,000.00
			$ -
			$ -
			$ -
			$ -
			$ -
		Key Deliverable 3 Subtotal	$ 100,000

Key Deliverable 4 Title: SSAP-Energy Scheme
Planned Activities: Development and pilot of an expanded U.S.-centric sustainability and traceability certification framework (“SSAP-Energy”) for soybeans used in biofuel markets. Activities include defining scheme scope and governance, mapping U.S. legal and regulatory requirements against priority biofuel market access requirements, engaging a neutral standards development organization to support scheme design, developing auditable certification and verification protocols, and conducting a limited pilot to test implementation and audit practicality with participating farmers and supply-chain partners.
Milestones: 1) Definition of SSAP-Energy scheme principles, including supply-chain scope, crop coverage, geographic applicability, and audit structure (individual versus group certification) 2) Identification of priority biofuel markets where sustainability certification is required or likely to be required for market access 3) Completion of a mapping of U.S. legal and regulatory requirements against priority market access and sustainability requirements 4) Engagement of a neutral standards development organization and development of draft scheme structure and audit protocols 5) Review of draft scheme with independent certification bodies to confirm auditability and recognition potential (stage-gate decision) 6) Completion of a limited pilot implementation with participating farmers and, where applicable, supply-chain partners, including documentation of findings and recommended refinements

Anticipated Timeline: **Q1 (Oct–Dec): Define scheme principles and identify priority markets** **Q2 (Jan–Mar): Complete legal and regulatory mapping; develop draft scheme structure and audit protocols** **Q3 (Apr–Jun): Finalize scheme documentation following certification body review** **Q4 (Jul–Sept): Conduct pilot implementation and document findings and refinements**			
Consulting support from a neutral standards development organization to define	1	$ 40,000.00	$ 40,000.00
Development, documentation, and pilot implementation of the SSAP-Energy cert	1	$ 160,000.00	$ 160,000.00
			$ -
			$ -
			$ -
			$ -
			$ -
			$ -
		Key Deliverable 4 Subtotal	$ 200,000

16 - RI-03

Organization/Institution Submitting Proposal:
NASA Acres / University of Maryland

Project Title:
Collaborative AgMet Graphics for Within-Season Crop Condition & Progress Tracking

Project Type:
Research

Name of Project Manager:
Alyssa Whitcraft

Name of Project Team Member 1:
Ignacio Ciampitti

Name of Project Team Member 2:
Ritvik Sahajpal

Statement of Justification or Purpose of the Project (75 word maximum):
The lack of within-season soybean progress and condition information at county-level impacts soybean farmers and their Board's ability to make management and marketing decisions. This project will help to overcome this information gap through high-collaboration relationships with farmers. We will tailor our proven tools to deliver immediate impact while advancing precision management innovations for Arkansas soybeans. This collaborative model upgrades current research strategies and modernizes agricultural information, putting accurate and relevant decision-support in farmers' hands.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
We will collaborate with the Arkansas Soybean Promotion Board to customize and then deliver twice-monthly, county-level "Agrometeorological Graphics" - a multi-panel dashboard of satellite-based indicators of soybean condition. We will explore with interested farmers transforming these AgMet Graphics into farm-relevant information, enabling future collaborations to build predictive and management-oriented tools like irrigation management. Through ongoing co-creation, these static graphics will evolve into interactive, mobile-ready dashboards, ensuring NASA-supported technology directly benefits producers across the state.

BUDGET

Amount of Funding Needed for Project:
$97,547

Contribution Amount (from organization or sponsor):
$0.00

UNIVERSITY OF MARYLAND
OFFICE OF RESEARCH ADMINISTRATION

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7809 Regents Drive
College Park, Maryland 20742-5141
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oraa@umd.edu
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February 17, 2026

Amy Lyman, Marketing Director
Arkansas Department of Agriculture
Marketing & Communications
Email: amy.lyman@arkansas.gov

Proposal Title: Collaborative AgMet Graphics for Within-Season Crop Condition & Progress Tracking
UMD Proposal Number: 98335
UMD Principal Investigator: Dr. Alyssa Kathleen Whitcraft
UEI: NPU8ULVAAS23 | EIN: 52-6002033

Dear Amy Lyman:

Please find enclosed the above referenced proposal submitted on behalf of the University of Maryland (UMD) and signed by an Authorized Representative. A UMD Proposal Number has been assigned, which you may use to reference this proposal in any future communication with our office. The budget request is in the amount of $97,547.

UMD acknowledges that Dr. Alyssa Kathleen Whitcraft is identified by name as the Principal Investigator (PI) at UMD and the PI intends to carry out all responsibilities identified in the attached proposal. UMD believes the proposed project is fundamental research and does not require that we obtain an export license under Export Control Regulations.

UMD Investigators and Key Personnel have disclosed and certified all projects, activities, co-authorships, affiliations, and other activities, including those performed within and outside of UMD (paid and unpaid), as required by the funding agency and applicable requirements at the time of this proposal and will continue to do so through the life of any resultant award. Furthermore, Investigators and Key Personnel have certified that they are not involved in a "malign foreign talent recruitment program" as defined in Section 10638 of Public Law 117-167 (CHIPS and Science Act).

UMD recognizes that any award resulting from this proposal will include terms and conditions required by the sponsor that are appropriate for a State Institution of Higher Education; that are required by applicable law or regulation on the date of execution; and any other mutually acceptable terms and conditions, except those inconsistent with Uniform Guidance (2 CFR Part 200) or those not allowed under Md. Code, State Fin. & Proc. § 2-901 or the Maryland Constitution. UMD reserves the right to negotiate the terms and conditions of any resulting award.

Please direct any technical questions regarding this proposal to Dr. Alyssa Kathleen Whitcraft at alyssakw@umd.edu. Administrative questions should be directed to Cassandra Burckhalter at cburckha@umd.edu.

UMD looks forward to collaborating with the Arkansas Department of Agriculture on this project.

Sincerely,



Cassie Moore
Assistant Director

Cover Page

Important note: *At the time of submission, the budget is TBD, and will not be $0, nor will our organization's contribution be $0 (as indicated in the submission form). As discussed with Ms. Lyman, the submitting organization (UMD) is closed due to weather and I am disallowed from providing a budget; we will send it ASAP. Nevertheless, as we have been encouraged by a Board member to submit, we are doing so! In the Appendix, we have provided some information.*

Title:

Collaborative AgMet Graphics for Within-Season Crop Condition & Progress Tracking

NASA Acres Research Proposal to the 2026 Arkansas Soybean Promotion Board

Proposal Team:

Principal Investigator: Alyssa Whitcraft, University of Maryland; NASA Acres Executive Director
Director@NASAAcres.org

Co-PI: Ignacio Ciampitti, Purdue University; NASA Acres Chief Agronomist

Co-I: Ritvik Sahajpal, University of Maryland; NASA Acres Crop Yield & Condition Lead

Co-I: Michael Humber, University of Maryland; NASA Acres Deputy Director & Data Lead

Co-I: Guanyuan Shuai, University of Maryland; NASA Acres

Co-I: Allison Bredder, University of Maryland; NASA Acres Strategic Engagement Officer

Collaborative AgMet Graphics for Within-Season Crop Condition & Progress Tracking

NASA Acres Research Proposal to the 2026 Arkansas Soybean Promotion Board

Background & Proposal Summary

Founded in 2023, NASA Acres[1] is NASA's multidisciplinary consortium that works together with farmers and ranchers in the United States to transform satellite data and tools into practical and user-friendly decision support tools. Building on over 50 years of NASA contributing to US agricultural competitiveness, NASA Acres is led by the University of Maryland with multisectoral partners across the US including universities, farmers, ranchers, commodity associations, farm bureaus, and US agriculture's allies. These relationships, including with two farmers in Arkansas, provide clarity and guidance that inform both how to turn our existing data and tools into something accessible and useful to farmers, *and* how to prioritize innovation in satellite data and geospatial tools. Our team is changing the way science traditionally works: we employ a farmer-centric approach, through our "Farm Innovation Ambassador Team," on which two AR farmers sit[2].

Agriculture in the US is facing a great deal of pressure, and neither farmers nor the organizations that represent them should be operating without access to the best possible information. To meet dynamic and evolving challenges to US agricultural profitability, productivity, and resilience, we propose to both take advantage of our robust and validated legacy tools to create impact now, and pave the way for new innovations in precision management technologies that are fit-for-purpose across the Arkansas soybean landscape. We will:

- Downscale our currently state-level "Agrometeorological Graphics", subsequently referred to as "**AgMet Graphics**"- a multi-panel dashboard of satellite-based **indicators** to provide **twice-monthly updates on soybean conditions at the county-level** for all soybean-growing counties in Arkansas, closing an information gap;
- Co-develop with interested farmers AgMet Graphics for tracking soybean crop progress and conditions at the **field-level** across their operations, opening up collaborations toward building predictive and management-oriented tools like irrigation management; and,
- Adapt the AgMet static graphics to an **interactive, mobile-ready conditions monitoring tool** that will place information in the pockets of producers.

True to our commitment to co-creation with farmers, this work will be accomplished through consultations with the AR Soybean Promotion Board and other interested farmers. We will explore together additional indicators and customizations, while supporting interpretation related to the agronomic relevance of these metrics to soybean crop growth and development. Our team will collaborate with the Board and other farmers to improve each deliverable into timely and useful tools. NASA is your space agency - we are here to bring its value down-to-Earth for your benefit.

The AgMet Graphics

Co-I Sahajpal created the AgMet Graphics a decade ago to bring together a variety of satellite-derived indicators (principally from NASA satellite data[3]) at state/provincial levels worldwide. They were created in the context of NASA Harvest (our sister international agriculture program) for international agricultural statistics and economics/markets audiences. These indicators individually provide valuable insights on in-season crop development and the natural factors that underpin it.

[1] Learn more about NASA Acres: https://www.nasaacres.org/
[2] Learn more about NASA Acres FIAT: https://www.nasaacres.org/fiat
[3] Data used in the NASA Harvest & NASA Acres AgMet Graphics: https://www.cropmonitor.org/eo-data

When combined into a single graphical presentation wherein each indicator is presented alongside its historical trends, these AgMet Graphics construct a narrative around crop conditions as they unfold in near real-time (**Figure 1**).

We propose to create these county-level graphics twice monthly. Certain datasets (e.g. precipitation) are available more frequently. Pending the engagement of 1-3 interested farmers—which would require sharing field boundaries and the years in which soybeans were cultivated, and would be strengthened by the provision of planting and harvest dates—we will also pilot field-level AgMet Graphics. (**Example in Appendix).** Please refer to our Ag Data Governance Principles for details on our commitment to keeping farmer data private and secure[4]. During the consultations, we can evaluate the costs/benefits of more frequent AgMet Graphics generation, substantial adjustments, as well as possibilities including a more rapid stream of priority data within the mobile ready (web- or app-based) monitoring tool.

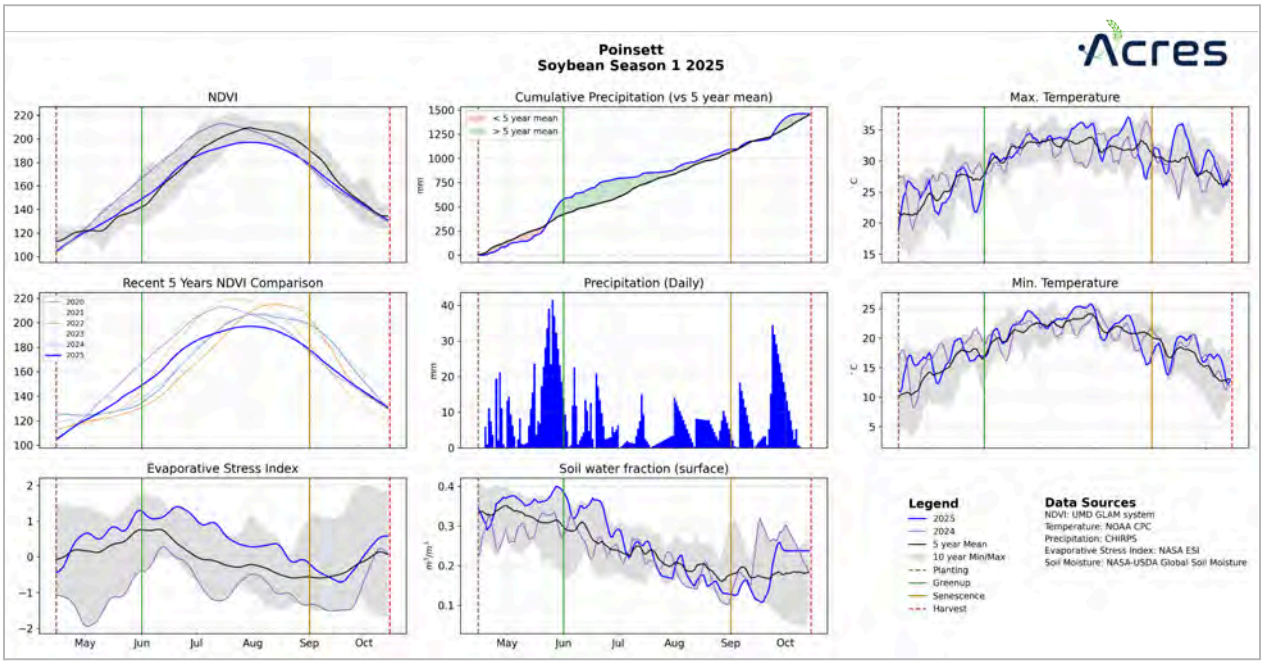


Figure 1: *An example first draft AgMet Graphic produced just for this proposal, showing the existing Indicators for Poinsett County's soybean-growing land as of late Oct 2025. Additional examples are in the Appendix.*

The AgMet Indicators Explained

Basic Components:

Within each plot, there are several main components. The light gray shaded area shows the span of the most recent 10-year minimum and maximum values across the season in order to provide a better understanding of the particular indicator's variability over time. The black line shows the most recent 5-year average values across the season. The purple line shows what the values were across the previous season. The blue lines show what the values are for the current season in near real-time as the season progresses. There are also four vertical lines which correspond with the start of planting, greenup (beginning of plant growth), senescence (late development stage), and the end of harvest, in this case using USDA's usual crop calendars.

[4] Our Ag Data Governance Principles: https://www.nasaacres.org/data-governance

About the Indicators:

Below, we briefly provide a brief description of the indicators. Early in the project, we will organize a workshop with the Board and other interested farmers to support interpretation of agronomic relevance of these metrics to soybean crop growth and development, and kickstart discussions and relationships that underpin iterative farmer feedback to improve the tool.

NDVI: NDVI (Normalized Difference Vegetation Index) is a common indicator of vegetation's growth, increasing as the plant grows, peaking around full pod development/beginning seed, and declining until harvest. When compared to prior years, higher or lower values can indicate better or worse crop conditions. It is important to note the high quality of the data here, as that is a critical factor that differentiates it from drone data. NASA satellites are like an ultra-accurate, well-calibrated thermometer where the measurement you take at any place on any date is directly comparable with measurements in other places and at other times. Meanwhile, drones are more like an oven thermometer. Both have their purposes, but higher accuracy and precision are *critical* for reliable forecasting and interpretation. We include two plots of NDVI; in addition to that described as an example of "Basic Components," the AgMet Graphics also show each of the past 5 years.

Precipitation: There are two plots for precipitation, similar to NDVI. "Cumulative Precipitation" shows the sum of precipitation as the season progresses. When the current season's value passes above the 5 year mean (black line), it is shaded green; conversely, when it is below the 5-year mean, it is shaded red. Cumulative precipitation graphs produced within-season include a 15-day forecast, with a green or red dot indicating if the forecast rain will place this season above or below, respectively, the 5-year mean. This is complemented by the raw daily "Precipitation" graph, allowing the viewer to identify major rainfall events and their cadence.

Soil Water Fraction (SWF): An analog of soil moisture, SWF is provided both for the surface (up to 10 cm, 0-4 in below surface) and subsurface (>10 cm, >4 in below surface). Higher SWF means high soil moisture, and lower SWF means low soil moisture.

Evaporative Stress Index: The Evaporative Stress Index (ESI) estimates water loss due to evapotranspiration (loss of water from soil evaporation and from transpiration through plant leaves). Negative values indicate below-normal evapotranspiration rates, representative of crops that are stressed due to inadequate soil moisture. ESI is good at identifying soil moisture deficits in the early stages and is able to capture flash droughts, which is the quick onset of drought brought on by periods of hot, dry, and windy conditions.

Temperature: This plot tracks the current season's daily mean temperature as compared to the 5-year mean value, values from the previous season, and the 10-year minimum and maximum values. There are also inset red and blue dots that represent temperatures above and below (respectively) user-defined temperature thresholds, to identify excessive hot and cold events.

Proposed and Possible Adjustments to the AgMet Graphics

In addition to the main proposed activities - i.e. **producing these at county-level and field-level with a few interested farmers, and developing/testing a mobile-ready tool for visualizing the indicators** - the easiest adjustments to the AgMet Graphics include: transition from metric to imperial measurement systems, customized temperature thresholds, customized crop calendars, better reference datasets, and alternative presentation to support interpretation. We also can explore additional satellite-based indicators (e.g. phenological stages; solar radiation;

evapotranspiration via OpenET[5], which provides a more direct path toward irrigation recommendations as an eventual objective). The sky (or outer space) is the limit; the most important part of making this a success is close collaboration with the farmers and Board this works aims to serve.

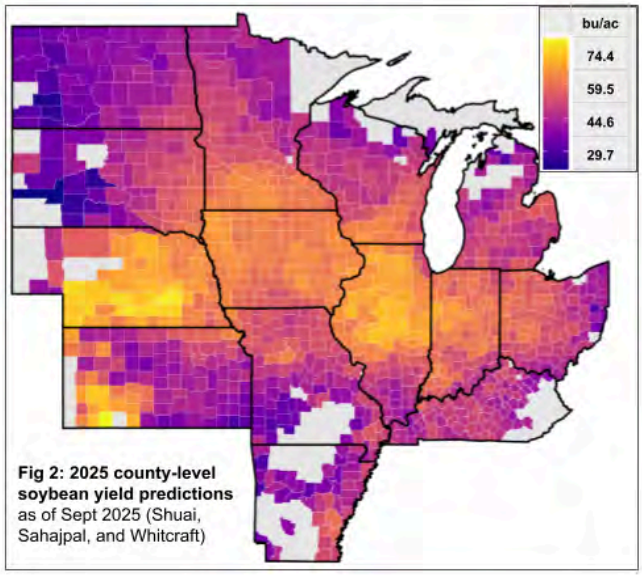


Fig 2: 2025 county-level soybean yield predictions as of Sept 2025 (Shuai, Sahajpal, and Whitcraft)

Paving the Way Forward

Through direct partnership with farmers, this work can chart a path to develop indicators like seed quality before harvest[6] as well as quantitative yield forecasts (**Figure 2**), as have been demonstrated for the American Soybean Association in the recent past[7]. These yield forecasts are fed by many of the AgMet's underpinning satellite data, providing an opportunity for a system that spans crop progress, condition monitoring, and objective yield forecasts. This closes a gap left by USDA's lack of county-level reporting and provides a "second opinion" to complement USDA's official statistics. The soil water fraction and evapotranspiration already feed into irrigation management in select cases, which could be expanded and tested at the field-level in Arkansas.

All of these future indicators will be soybean-specific and will require support from "boots on the ground" collaborations with farmers supported by a growing network of trusted advisors local to growers. Specifically, we envision the next phases of this work being highly collaborative with researchers and cooperative extension at University of Arkansas, building rich technical and innovation support capacities embedded within Arkansas. In sum, this work sets the stage for sub-field-level, high-quality insights that can only result from linking "space-to-farm"—combining ground data with person-to-person collaboration and the sharing of valuable time and resources—to build the most advanced, transparent and trusted source of information for soybean production in the country, all under the guidance and sovereignty of Arkansan farmers.

[5] OpenET: https://etdata.org/
[6] Co-PI Ciampitti has developed novel methods for predicting seed quality with satellite data. Further development of the indicator and its customization for farmers could take place in subsequent years of AR Soybean Promotion Board and NASA Acres collaboration. https://go.umd.edu/CiampittiQuality
[7] First developed for 12 states in 2024, this model is trained on and validated against USDA NASS' final report. This version was deployed in 2025 for ASA leadership as a proof of concept, and included AR and KY for the first time. They were not shared within-season, and are still in the R&D phase. The average accuracy across all US counties is currently within 4.7 bu/ac, and we believe it can be improved.

Appendix

Budget

As explained on the cover page, we cannot currently provide a budget as the University of Maryland disallows it without review, and they have been closed for a week due to weather. We will provide the following information in the interim.

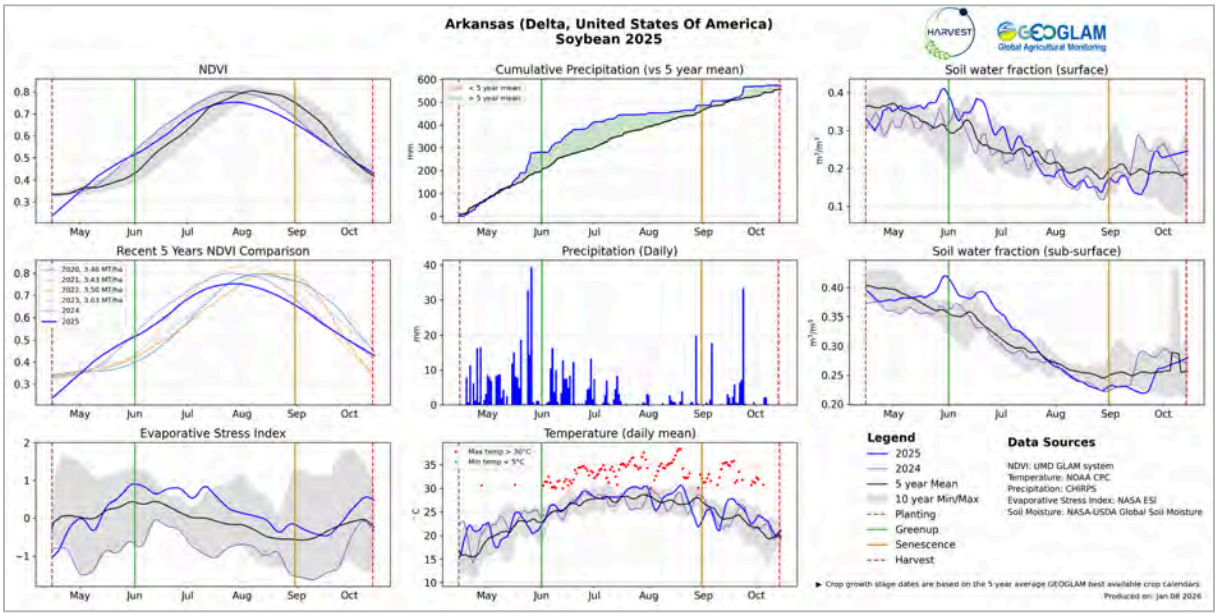
Expense	Purpose
Salaries & Fringe	Covering personnel with effort devoted to: • Customization of AgMet graphics and their twice-monthly delivery at county-level • Processing and analyzing new satellite data (as a component of "exploration of new indicators) • Mobile-ready app development • Ongoing engagement with the Board and farmers voluntarily participating in field- and county-level collaborations • Workshop structuring, participation, and execution • Project leadership and supervision
Travel - Workshop	Early in the project, team members will begin virtual consultations with interested Board members and any other Arkansan soybean farmers. When the county-level reports are satisfactory to the earliest participants, we envision an in-person (if possible) 1.5-2 day long workshop and field visit to foster relationship building (and ideally identify 1-3 farmers to participate in the field-level graphics development), to receive feedback on "beta version" of the county-level graphics, to develop an initial functions and design of the mobile-ready tool, and to orient the NASA team to the "on-the-ground" perspective of soybeans.
Travel - Other	Ongoing consultations with farmers & U of Arkansas forward planning → Team members will visit Arkansas 1-2 times (in addition to the workshop), for further high-touch iterative testing and feedback, new research and indicator scoping (including quality indicators), and development of next steps with the Board and U of Arkansas. The necessary personnel and the duration of visits is pending discussion with the Board.
Computation Support	Supporting computers, software licences, and IT
Misc. research costs	• Infrastructure / cloud computation costs associated with the Graphics generation and the app implementation • Outreach materials and publications

Accountability for the use of funds → We are unsure of what this means, but the university is accustomed to providing auditable effort tracking and reporting.

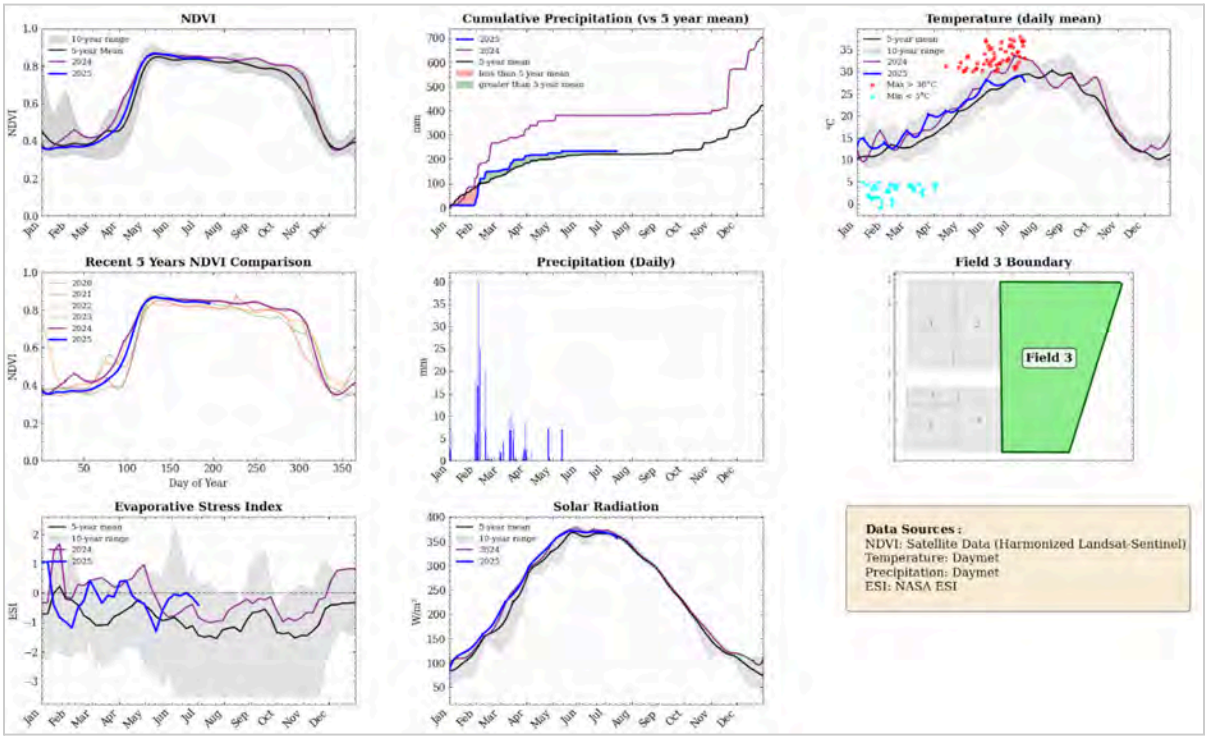
Provide audited financial statements for funding requests over $15,000. → same answer as above.

Additional AgMet Indicator Examples

1) **State-Level -** This is an example of what you can access *right now* via the NASA Harvest / GEOGLAM AgMet Graphics. You can also find provincial examples of soybean in other countries. https://cropmonitortools.org/tools/agmet/



2) **Field-Level Example** - this is another "proof-of-concept" this was produced for a farmer with whom we work for another state. It has been anonymized.



UMCP Budget Justification

Project Title: Collaborative AgMet Graphics for Within-Season Crop Condition & Progress Tracking

PI: Alyssa Whitcraft, PhD
Department of Geographical Sciences

Project Period: 04/01/2026-03/31/2027

SALARIES & WAGES

Senior Personnel

Principal Investigator: Dr. Alyssa Whitcraft, Research Professor and the Executive Director of the NASA Acres Program and the Harvest Sustainable and Regenerative Agriculture Initiative, and a Programme Scientist for GEOGLAM, has ten years of senior leadership experience directing and managing agricultural remote sensing-focused programs. Dr. Whitcraft will be responsible for the scientific management and leadership of this project, and will lead discussions with the Promotions Board related to needs assessment, feedback, and scaling. She will devote 0.48 calendar months (4% effort) to the proposed research project.

Co-Investigator: Dr. Ritvik Sahajpal, Associate Research Professor, has over 10 years of experience with crop forecasting and model development. He developed and produces the AgMet Graphics, which he will lead and supervise the adaptation for this project. He will devote 8% effort each year to the proposed research project.

Co-Investigator: Dr. Michael Humber, Associate Research Professor, and both the Deputy Director and Data Lead for NASA Acres, has vast experience in both remote sensing, data systems, app development, and instruction. He will lead the app development – "mobile-ready" delivery of the AgMet indicators – and he will take part in discussions with the Promotion Board and engaged farmers with respect to the app and future research directions. He will devote 6% effort each year to the proposed research project.

Other Personnel

Post-doctoral researcher: Allison Bredder, Postdoctoral Researcher and Strategic Engagement Officer for NASA Acres, will support all efforts related to partnership development and project coordination/management. She will devote 5% effort each year to the proposed research project.

Post-doctoral researcher: Guanyuan Shuai, Postdoctoral Researcher, has co-developed with Drs. Sahajpal and Whitcraft, a county-level yield forecast for soybean, and has experience operationally deploying the AgMet graphics in other regions. He will be supervised by Ritvik Sahajpal to implement the graphics for the Promotion Board. He will devote 20% effort each year to the proposed research project.

Faculty specialists: Jacob Orser will be responsible for supporting Drs. Sahajpal and Humber in preprocessing satellite datasets for the AgMet graphics and support app development, respectively. He will contribute 18% each year to the proposed project.

Financial Research Coordinator: Anna Wood will provide financial support to ensure the project is in compliance. She will devote 2% effort to the proposed project.

FRINGE BENEFITS

Fringe benefits include health insurance, FICA, unemployment, workers' compensation, retirement, terminal leave payout and employee assistance. Amounts for the sponsor's contribution to employee fringe benefits are calculated using UMD's U.S. Department of Health and Human Services (DHHS) approved fringe rate. Fringe benefit rates are currently being re-negotiated. The proposed rates are as follows: 30.7% for faculty, 36.6% for staff; 22.7% for graduate assistants and limited benefit contractual employees and 5.8% for faculty summer, hourly students and most faculty/staff additional pays. Tuition Remission is a UMD fringe benefit but is not included in the fringe calculation and is budgeted separately as applicable. Additional information about fringe benefits as well as a copy of our rate agreement can be found on the University of Maryland's Office of Research Administration's website. Fringe benefits will be charged in accordance with the federally negotiated rate at the time the cost is incurred. Fringe rates could be adjusted in future years.

EQUIPMENT
None

TRAVEL
Three personnel on the research team will travel to Little Rock, Arkansas to conduct a 1.5-2 day long workshop to foster relationship building. Additional two trips will be taken by the PI or the co-I to Little Rock, Arkansas for data collection and consultation with the Promotion Board and farmers, to train on the graphics and app and receive detailed feedback to improve them.

The cost estimates for airfare and ground transportation are from web pricing. The GSA rates are used for lodging and per diem estimates.

Domestic Travel				
Purpose:	Workshop			
Destination:	Little Rock, Arkansas			
Personnel attending:	3			
Number of Trips	1			
The cost is based on web pricing and the GSA meals reimbu				
Item	**Rate**	**Days**	**Persons**	**Total**
Airfare	$ 500		3	$ 1,500
Lodging	$ 110	2	3	$ 660
Meals	$ 68	2	3	$ 408
Ground Transportation	$ 100	2	3	$ 600
Trip Total				$ 3,168
Total				**$ 3,168**

Purpose:	Data Collection / Consultation			
Destination:	Little Rock, Arkansas and surrounds			
Personnel attending:	1			
Number of Trips	2			
The cost is based on web pricing and the GSA meals reimbu				
Item	**Rate**	**Days**	**Persons**	**Total**
Airfare	$ 500		1	$ 500
Lodging	$ 110	2	1	$ 220
Meals	$ 68	2	1	$ 136
Ground Transportation	$ 100	2	1	$ 200
Trip Total				$ 1,056
Total				**$ 2,112**

RESEARCH MATERIALS

A total of $1,000 is requested for materials to support farmer learning and onboarding to NASA Acres and the AgMet graphics.

OTHER DIRECT COSTS

Computer System Support costs are based on the most recent Department of Geographical Sciences' annual charge for workstations - $1,500 per year per workstation and are prorated based on each personnel's effort on the project and the length of the project.

					Year 1
		Start Date:			4/1/2026
		End Date:			3/31/2027
Personnel:	**Name**	**Dept. Rate**	**# of Machine**	**Effort**	
PI	Whitcraft	$1,500.00	2	4%	$120.00
Co-Investigator	Sahajpal	$1,500.00	2	8%	$240.00
Co-Investigator	Humber	$1,500.00	1	6%	$90.00
Post Doctoral Associate	Shuai	$1,500.00	1	20%	$300.00
Post-Doctorial Associate	Bredder	$1,500.00	1	5%	$75.00
Faculty Specialist	Orser	$1,500.00	1	18%	$270.00
Research Coordinator	Wood	$1,500.00	1	2%	$30.00
Computer System Support Total					**$1,125.00**

PARTICIPANT SUPPORT

A total of $2,000 is requested to support travel of Purdue University-based NASA Acres Chief Agronomist and Farm Innovation Ambassador Team (FIAT) co-lead Ignacio Ciampitti to participate in all discussions with the Promotion Board, the engaged farmers, and U of Arkansas faculty to foster long-term adoption and support in the region.

TOTAL DIRECT COSTS

$96,547

INDIRECT COSTS
$0
According to the sponsor's policy, funds cannot be used for administrative costs or duplicative activities.

TOTAL COSTS
$96,547

Total Budget

Project Title: **Collaborative AgMet Graphics for Within-Season Crop Condition & Progress Tracking**

Start Date: 4/1/2026 **End Date:** 3/31/2027

Principal Investigator: Alyssa Whitcraft, PhD.

Submitted by: University of Maryland College Park

					Year 1		Summary 1-year Total
				Start Date:	4/1/2026		
				End Date:	3/31/2027		
	Name		**An Sal**	**Effort**			
Senior Personnel:							
Principal Investigator	Whitcraft	$	200,512	4%	8,020		8,020
Co-Investigator	Sahajpal	$	168,672	8%	13,494		13,494
Co-Investigator	Humber	$	163,649	6%	9,819		9,819
Co-Investigator				0%	-		-
Co-Investigator				0%	-		-
Co-Investigator				0%	-		-
							-
Total Senior Personnel:					**31,333**		**31,333**
Other Personnel:							
Post-Doctorial Associate	Shuai	$	85,016	20%	17,003		17,003
Post-Doctorial Associate	Bredder	$	86,709	5%	4,335		4,335
Faculty Specialist	Orser	$	69,367	18%	12,486		12,486
Research Coordinator	Wood	$	109,129	2%	2,183		2,183
			$ /hour	Hours			
Hourly Student = $/hrs		$	22	0	-		-
Hourly Student = $/hrs		$	22	0	-		-
Total Other Personnel:					**36,007**		**36,007**
Total Salaries:					67,340		
			Cost	Credits			
Fringe Benefits Faculty	30.7%				20,003		20,003
Fringe Benefits Staff	36.6%				799		799
Fringe Benefits Graduate	22.7%				-		-
Fringe Benefits Hourly	5.9%				-		-
Tuition Remission		$	878	0	-		-
Total Benefits:					**20,802**		**20,802**
Total Salaries & Fringe Benefits:					**88,142**		**88,142**
Equipment: (over $5,000 ea)							-
					-		-
Total Equipment (over $5,000):					**-**		**-**

Project Title: Collaborative AgMet Graphics for Within-Season Crop Condition & Progres

PI: Alyssa Whitcraft, PhD.

Continued - page 2

		Year 1	Summary 3-year Total
Travel:			
Domestic (incl. Canada, Mexico)		5,280	5,280
Foreign		-	-
Total Travel:		**5,280**	**5,280**
Subcontracts			
		-	-
Total Subcontracts:		**-**	**-**
Other Direct Costs:			
Research Materials		1,000	1,000
Publication/Page Charges		-	-
Consultant Services		-	-
Computer System Support		1,125	1,125
Rent		-	-
Participant Support Costs	Ignacio travel	2,000	2,000
Conferences		-	-
Total Other Direct Costs:		**4,125**	**4,125**
TOTAL DIRECT COSTS:		**97,547**	**97,547**
Less Tuition Remission		-	-
Less Equipment Over $5,000		-	-
Less Subcontract A over $25,000		-	-
Less Subcontract B over $25,000			
Less Rent		-	
TOTAL MODIFIED DIRECT COSTS:		**97,547**	**97,547**
F & A COSTS:	0.0%	**-**	**-**
TOTAL PROJECT COSTS:		**$ 97,547**	**$ 97,547**

STATE OF MARYLAND

SINGLE AUDIT REPORT

YEAR ENDED JUNE 30, 2023



CPAs | CONSULTANTS | WEALTH ADVISORS

CLAconnect.com

STATE OF MARYLAND
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INDEPENDENT AUDITORS' REPORT ON INTERNAL CONTROL OVER FINANCIAL REPORTING AND ON COMPLIANCE AND OTHER MATTERS BASED ON AN AUDIT OF FINANCIAL STATEMENTS PERFORMED IN ACCORDANCE WITH *GOVERNMENT AUDITING STANDARDS*

The Honorable Members of the General Assembly and the Governor
State of Maryland

We have audited, in accordance with the auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards* issued by the Comptroller General of the United States, the financial statements of the governmental activities, the business-type activities, the aggregate discretely presented component units, each major fund, and the aggregate remaining fund information of the State of Maryland (the State), as of and for the year ended June 30, 2023, and the related notes to the financial statements, which collectively comprise the State's basic financial statements, and have issued our report thereon dated March 13, 2023.

Our report includes a reference to other auditors who audited the financial statements of certain funds, agencies, and component units of the State of Maryland, which represent the indicated percent of total assets and deferred outflows of resources and total revenues as described in our report on the State's financial statements and as presented in the below table. This report does not include the results of the other auditors' testing of internal control over financial reporting or compliance and other matters that are reported on separately by those other auditors.

		Percentage Audited by Other Auditors	
Opinion Unit	**Fund, Agency, or Component Unit**	**Assets and Deferred Outflows**	**Revenues**
Business-type Activities	Department of Housing and Community Development State Funded Loan Programs Maryland Lottery and Gaming Control Agency Maryland Prepaid College Trust	14%	73%
Aggregate Discretely Presented Component Units	Maryland Environmental Service Maryland Technology Development Corporation University System of Maryland Foundation, Inc. University of Maryland College Park Foundation, Inc. University of Maryland Baltimore Foundation, Inc. University of Maryland Faculty Physicians, Inc. University of Maryland Pediatric Associates P.A. University of Maryland Orthopedic Associates, P.A. Bowie State University Foundation, Inc. Towson University Foundation, Inc. Frostburg State University Foundation, Inc. Coppin State University Development Foundation, Inc. University of Baltimore Foundation, Inc. and University Properties, Inc. Salisbury University Foundation, Inc. UMUC Ventures, Inc. and Subsidiaries Morgan State University Foundation, Inc.	21%	12%
Economic Development Loan Programs - Major Proprietary Fund	Department of Housing and Community Development State Funded Loan Programs	13%	6%
Maryland Lottery and Gaming Control Agency - Major Proprietary Fund	Maryland Lottery and Gaming Control Agency	100%	100%
Maryland Prepaid College Trust Fund - Major Proprietary Fund	Maryland Prepaid College Trust Fund	100%	100%
Aggregate Remaining Fund Information	Maryland Teachers and State Employees Supplemental Retirement Plans Maryland Local Government Investment Pool	14%	44%

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The financial statements of the Maryland Housing Fund, Economic Development Insurance Programs, Maryland Teachers & State Employees Supplement Retirement Plans, Maryland Local Government Investment Pool, Maryland 529 Plan, Bowie State University Foundation Inc., Coppin State College Development Foundation Inc., Frostburg State University Foundation Inc., Salisbury University Foundation Inc., Towson University Foundation Inc., University of Baltimore Inc., University of Maryland Foundation Inc., University of Maryland Baltimore Foundation Inc., UMBC Research Park, and UMUC Ventures were not audited in accordance with *Government Auditing Standards* and accordingly, this report does not include reporting on internal control over the financial reporting on instance of reportable noncompliance with these entities.

Report on Internal Control Over Financial Reporting

In planning and performing our audit of the financial statements, we considered the State's internal control over financial reporting (internal control) as a basis for designing audit procedures that are appropriate in the circumstances for the purpose of expressing our opinions on the financial statements, but not for the purpose of expressing an opinion on the effectiveness of the State's internal control. Accordingly, we do not express an opinion on the effectiveness of the State's internal control.

A *deficiency in internal control* exists when the design or operation of a control does not allow management or employees, in the normal course of performing their assigned functions, to prevent, or detect and correct, misstatements on a timely basis. A *material weakness* is a deficiency, or a combination of deficiencies, in internal control, such that there is a reasonable possibility that a material misstatement of the entity's financial statements will not be prevented, or detected and corrected, on a timely basis. A *significant deficiency* is a deficiency, or a combination of deficiencies, in internal control that is less severe than a material weakness, yet important enough to merit attention by those charged with governance.

Our consideration of internal control was for the limited purpose described in the first paragraph of this section and was not designed to identify all deficiencies in internal control that might be material weaknesses or significant deficiencies and therefore, material weaknesses or significant deficiencies may exist that were not identified.

We identified certain deficiencies in internal control, described in the accompanying schedule of findings and questioned costs as 2023-001, 2023-002, 2023-003, 2023-004 and 2023-005 that we consider to be material weaknesses.

Report on Compliance and Other Matters

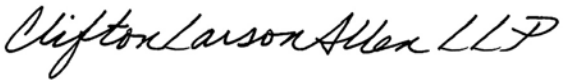
As part of obtaining reasonable assurance about whether the State's financial statements are free from material misstatement, we performed tests of its compliance with certain provisions of laws, regulations, contracts, and grant agreements, noncompliance with which could have a direct and material effect on the financial statements. However, providing an opinion on compliance with those provisions was not an objective of our audit, and accordingly, we do not express such an opinion. The results of our tests disclosed no instances of noncompliance or other matters that are required to be reported under *Government Auditing Standards.*

State of Maryland's Response to Findings

Government Auditing Standards requires the auditor to perform limited procedures on the State's response to the findings identified in our audit and described in the accompanying schedule of findings and questioned costs. The State's responses were not subjected to the other auditing procedures applied in the audit of the financial statements and, accordingly, we express no opinion on the responses.

Purpose of This Report

The purpose of this report is solely to describe the scope of our testing of internal control and compliance and the results of that testing, and not to provide an opinion on the effectiveness of the entity's internal control or on compliance. This report is an integral part of an audit performed in accordance with *Government Auditing Standards* in considering the entity's internal control and compliance. Accordingly, this communication is not suitable for any other purpose.



CliftonLarsonAllen LLP

Baltimore, Maryland
March 13, 2023

CliftonLarsonAllen LLP
CLAconnect.com

INDEPENDENT AUDITORS' REPORT ON COMPLIANCE FOR EACH MAJOR FEDERAL PROGRAM, REPORT ON INTERNAL CONTROL OVER COMPLIANCE, AND REPORT ON THE SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS REQUIRED BY THE UNIFORM GUIDANCE

The Honorable Members of the General Assembly and the Governor
State of Maryland

Report on Compliance for Each Major Federal Program

Qualified and Unmodified Opinions

We have audited the State of Maryland's (the State) compliance with the types of compliance requirements identified as subject to audit in the OMB *Compliance Supplement* that could have a direct and material effect on each of the State's major federal programs for the year ended June 30, 2023. The State's major federal programs are identified in the summary of auditors' results section of the accompanying schedule of findings and questioned costs.

The State's basic financial statements include the operations of the Maryland Water Infrastructure Financing Administration and Maryland Transportation Authority, enterprise funds of the State of Maryland, which received federal awards that are not included in the accompanying Schedule of Expenditures of Federal Awards. Our audit, described below, did not include the operations of these entities because auditors were engaged to perform a separate audit in accordance with the Uniform Guidance.

Qualified Opinion on Major Programs

In our opinion, except for the noncompliance described in the Basis for Qualified and Unmodified Opinions section of our report, the State complied, in all material respects, with the compliance requirements referred to above that could have a direct and material effect on the programs for the year ended June 30, 2023.

Unmodified Opinion on Each of the Other Major Federal Programs

In our opinion, the State complied, in all material respects, with the types of compliance requirements referred to above that could have a direct and material effect on each of its other major federal programs identified in the summary of auditors' results section of the accompanying schedule of findings and questioned costs for the year ended June 30, 2023.

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Basis for Qualified and Unmodified Opinions

We conducted our audit of compliance in accordance with auditing standards generally accepted in the United States of America (GAAS); the standards applicable to financial audits contained in *Government Auditing Standards* issued by the Comptroller General of the United States; and the audit requirements of Title 2 U.S. *Code of Federal Regulations* Part 200, *Uniform Administrative* Requirements*, Cost Principles, and Audit Requirements for Federal Awards* (Uniform Guidance). Our responsibilities under those standards and the Uniform Guidance are further described in the Auditors' Responsibilities for the Audit of Compliance section of our report.

We are required to be independent of the State and to meet our other ethical responsibilities, in accordance with relevant ethical requirements relating to our audit. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion on compliance for each major federal program. Our audit does not provide a legal determination of the State's compliance with the compliance requirements referred to above.

Matter(s) Giving Rise to Qualified Opinion

As described in the accompanying schedule of findings and questioned costs, the State did not comply with requirements regarding the following:

Program/Cluster Title	Assistance Listing	Noncompliance	Finding Number
Emergency Rental Assistance Homeowner Assistance Fund	21.023 21.026	Eligibility	2023-008
Emergency Rental Assistance Homeowner Assistance Fund	21.023 21.026	Allowable Activities/Allowable Costs	2023-009
Coronavirus State and Local Fiscal Recovery Funds	21.027	Suspension and Debarment	2023-010
Coronavirus State and Local Fiscal Recovery Funds, Education Stabilization Fund	21.027 84.425C, D, R, U, V, W	Subrecipient Monitoring	2023-011
Higher Education Institutional Aid	84.031	Allowable Activities/Allowable Costs - Payroll	2023-012 and 2023-013
Higher Education Institutional Aid Education Stabilization Fund	84.031 84.425 J	SEFA Reporting	2023-014
Children's Health Insurance Program, Medicaid Cluster	93.767, 93.775, 93.777, 93.778	Reporting - FFATA	2023-021
Block Grants for Prevention and Treatment of Substance Abuse	93.959	Reporting - FFATA	2023-024

Compliance with such requirements is necessary, in our opinion, for the State to comply with the requirements applicable to that program.

Responsibilities of Management for Compliance

Management is responsible for compliance with the requirements referred to above and for the design, implementation, and maintenance of effective internal control over compliance with the requirements of laws, statutes, regulations, rules and provisions of contracts or grant agreements applicable to the State's federal programs.

Auditors' Responsibilities for the Audit of Compliance

Our objectives are to obtain reasonable assurance about whether material noncompliance with the compliance requirements referred to above occurred, whether due to fraud or error, and express an opinion on the State's compliance based on our audit. Reasonable assurance is a high level of assurance but is not absolute assurance and therefore is not a guarantee that an audit conducted in accordance with GAAS, *Government Auditing Standards*, and the Uniform Guidance will always detect material noncompliance when it exists. The risk of not detecting material noncompliance resulting from fraud is higher than for that resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control. Noncompliance with the compliance requirements referred to above is considered material if there is a substantial likelihood that, individually or in the aggregate, it would influence the judgment made by a reasonable user of the report on compliance about the State's compliance with the requirements of each major federal program as a whole.

In performing an audit in accordance with GAAS, *Government Auditing Standards*, and the Uniform Guidance, we:

- exercise professional judgment and maintain professional skepticism throughout the audit.

- identify and assess the risks of material noncompliance, whether due to fraud or error, and design and perform audit procedures responsive to those risks. Such procedures include examining, on a test basis, evidence regarding the State's compliance with the compliance requirements referred to above and performing such other procedures as we considered necessary in the circumstances.

- obtain an understanding of the State's internal control over compliance relevant to the audit in order to design audit procedures that are appropriate in the circumstances and to test and report on internal control over compliance in accordance with the Uniform Guidance, but not for the purpose of expressing an opinion on the effectiveness of the State's internal control over compliance. Accordingly, no such opinion is expressed.

We are required to communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and any significant deficiencies and material weaknesses in internal control over compliance that we identified during the audit.

Other Matters

The results of our auditing procedures disclosed instances of noncompliance which are required to be reported in accordance with the Uniform Guidance and which are described in the accompanying schedule of findings and questioned costs as items 2023-006, 2023-007, 2023-016, 2023-017, 2023-018, 2023-019, 2023-020, 2023-022, 2023-023 and 2023-025. Our opinion on each major federal program is not modified with respect to these matters.

Government Auditing Standards requires the auditor to perform limited procedures on s response to the State's noncompliance findings identified in our compliance audit described in the accompanying schedule of findings and questioned costs. The State's responses were not subjected to the other auditing procedures applied in the audit of compliance and, accordingly, we express no opinion on the responses.

Report on Internal Control Over Compliance

Our consideration of internal control over compliance was for the limited purpose described in the Auditors' Responsibilities for the Audit of Compliance section above and was not designed to identify all deficiencies in internal control over compliance that might be material weaknesses or significant deficiencies in internal control over compliance and therefore, material weaknesses or significant deficiencies may exist that were not identified. However, as discussed below, we did identify certain deficiencies in internal control over compliance that we consider to be material weaknesses and significant deficiencies.

A *deficiency in internal control over compliance* exists when the design or operation of a control over compliance does not allow management or employees, in the normal course of performing their assigned functions, to prevent, or detect and correct, noncompliance with a type of compliance requirement of a federal program on a timely basis. A *material weakness in internal control over compliance* is a deficiency, or a combination of deficiencies, in internal control over compliance, such that there is a reasonable possibility that material noncompliance with a type of compliance requirement of a federal program will not be prevented, or detected and corrected, on a timely basis. We consider the deficiencies in internal control over compliance described in the accompanying schedule of findings and questioned costs as items 2023-008, 2023-009, 2023-010, 2023-011, 2023-012, 2023-013, 2023-014, 2023-021, and 2023-024 to be material weaknesses.

A *significant deficiency in internal control over compliance* is a deficiency, or a combination of deficiencies, in internal control over compliance with a type of compliance requirement of a federal program that is less severe than a material weakness in internal control over compliance, yet important enough to merit attention by those charged with governance. We consider the deficiencies in internal control over compliance described in the accompanying schedule of findings and questioned costs as items 2023-006, 2023-007, 2023-015, 2023-016, 2023-017, 2023-018, 2023-019, 2023-020, 2023-022, 2023-023 and 2023-025 to be significant deficiencies.

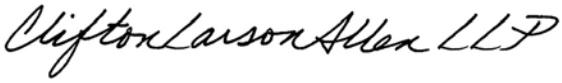
Our audit was not designed for the purpose of expressing an opinion on the effectiveness of internal control over compliance. Accordingly, no such opinion is expressed.

Government Auditing Standards requires the auditor to perform limited procedures on the State's response to internal control over compliance findings identified in our audit described in the accompanying schedule of findings and questioned costs. The State's responses were not subjected to the other auditing procedures applied in the audit of compliance and, accordingly, we express no opinion on the responses.

The purpose of this report on internal control over compliance is solely to describe the scope of our testing of internal control over compliance and the results of that testing based on the requirements of the Uniform Guidance. Accordingly, this report is not suitable for any other purpose.

Report on Schedule of Expenditures of Federal Awards Required by the Uniform Guidance

We have audited the financial statements of the governmental activities, the business-type activities, the aggregate discretely presented component units, each major fund, and the aggregate remaining fund information of the State as of and for the year ended June 30, 2023, and the related notes to the financial statements, which collectively comprise the State's basic financial statements. We issued our report thereon dated March 13, 2024, which contained unmodified opinions on those financial statements. Our audit was conducted for the purpose of forming opinions on the financial statements that collectively comprise the basic financial statements. The accompanying schedule of expenditures of federal awards is presented for purposes of additional analysis as required by the Uniform Guidance and is not a required part of the basic financial statements. Such information is the responsibility of management and was derived from and relates directly to the underlying accounting and other records used to prepare the basic financial statements. The information has been subjected to the auditing procedures applied in the audit of the financial statements and certain additional procedures, including comparing and reconciling such information directly to the underlying accounting and other records used to prepare the basic financial statements or to the basic financial statements themselves, and other additional procedures in accordance with auditing standards generally accepted in the United States of America. In our opinion, the schedule of expenditures of federal awards is fairly stated in all material respects in relation to the basic financial statements as a whole.



CliftonLarsonAllen LLP

Baltimore, Maryland
April 15, 2024

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
U.S. Department of Agriculture				
Agricultural Research Basic and Applied Research	10.001		$ 33,335	$ -
Plant and Animal Disease, Pest Control, and Animal Care	10.025		2,395,533	-
Wildlife Services	10.028		210,710	-
Market News	10.153		5,000	-
Inspection Grading and Standardization	10.162		90,341	-
Market Protection and Promotion	10.163		70,990	-
Wholesale Farmers and Alternative Market Development	10.164		296,695	-
Specialty Crop Block Grant Program - Farm Bill	10.170		546,169	-
COVID-19 Pandemic Relief Activities: Farm and Food Worker Relief Grant Program	10.181		222,673	-
COVID-19 Pandemic Relief Activities: Local Food Purchase Agreements with States, Tribes, and Local Governments	10.182		514,660	-
Sustainable Agriculture Research and Education	10.215		1,716,642	149,567
Pass-Through Montana State University		G25422W7443	44,813	20,297
Pass-Through Northeast Sustainable Agriculture Research and Education		ASSOCCOORDINATO RPDP21AWD00	31,677	-
Pass-Through Northeast Sustainable Agriculture Research and Education		ENE2016034268	52,940	-
Pass-Through Northeast Sustainable Agriculture Research and Education		ENE2016534268	6,278	-
Pass-Through Northeast Sustainable Agriculture Research and Education		LNE2039734268	17,500	-
Pass-Through Northeast Sustainable Agriculture Research and Education		PDP22AWD00001024	78,695	-
Pass-Through Tufts University		FSU236	3,724	-
Pass-Through University of Vermont		2019-38640-29877	26,183	-
Total ALN 10.215 Sustainable Agriculture Research and Education			1,978,452	169,864
1890 Institution Capacity Building Grants	10.216			
Pass-Through Alcorn State University		2021-38821-34727	38,563	-
Pass-Through Delaware State University		18-002HEH	2,456	-
Pass-Through North Carolina Agricultural and Technical State University		2021-38427-34937	25,776	-
Pass-Through Virginia State University		2021-38821-34601	41,541	-
Total ALN 10.216 1890 Institution Capacity Building Grants			108,336	-
Secondary and Two-Year Postsecondary Agriculture Education Challenge Grants	10.226		15,230	-
1994 Institutions Research Program	10.227			
Pass-Through Navajo Tech University		2021-38424-34022	8,091	-
Consumer Data and Nutrition Research	10.253		83,533	-
Agriculture and Food Research Initiative (AFRI)	10.310		201,085	-
Pass-Through University of California		19-1046-001-SF	69,297	-
Pass-Through University of Florida		2018-68011-28374	21,005	-
Total ALN 10.310 Agriculture and Food Research Initiative (AFRI)			291,387	-
Farm Business Management and Benchmarking Competitive Grants Program	10.319			
Pass-Through University of Minnesota		P009577103	19,188	-
Pass-Through University of Minnesota		P010062903	12,181	-
Total ALN 10.319 Farm Business Management and Benchmarking Competitive Grants Program			31,369	-
Beginning Farmer and Rancher Development Program	10.311		84,276	31,356
Crop Protection and Pest Management Competitive Grants Program	10.329		173,789	64,733
Rural Business Development Grant	10.351		26,038	-
State Mediation Grants	10.435		69,993	-
Cooperative Extension Service	10.500		118,099	-
Pass-Through Northeast Center for Risk Management Education		58903	5,088	-
Pass-Through University of Delaware		2018-70027-28588	34,670	-
Pass-Through University of Delaware		59086	17,897	-
Total ALN 10.500 Cooperative Extension Service			175,754	-
Smith-Lever Funding (Various Programs)	10.511		3,612,677	-
Expanded Food and Nutrition Education Program	10.514		522,825	-
Renewable Resources Extension Act and National Focus Fund Projects	10.515		28,933	-

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
U.S. Department of Agriculture (continued)				
Agriculture Risk Management Education Partnerships Competitive Grants Program	10.520			
Pass-Through Northeast Center for Risk Management Education		UDR0000352	1,431	-
Pass-Through Northeast Center for Risk Management Education		UDR0000355	3,217	-
Total ALN 10.520 Agriculture Risk Management Education Partnerships Competitive Grants Program			4,648	-
Centers of Excellence at 1890 Institutions	10.523			
Pass-Through North Carolina Agricultural and Technical State University		2021-38427-34937	13,787	-
Scholarships for Students at 1890 Institutions	10.524		523,872	-
Farm and Ranch Stress Assistance Network Competitive Grants Program	10.525		272,772	-
SNAP Fraud Framework Implementation Grant	10.535		665,685	-
Child and Adult Care Food Program Training	10.536		14,902	-
COVID-19 Pandemic EBT Food Benefits (Noncash)	10.542		172,283,068	-
SNAP Cluster				
Supplemental Nutrition Assistance Program (Noncash)	10.551		1,828,947,110	5,019,674
COVID-19 State Administrative Matching Grants for the Supplemental Nutrition Assistance Program	10.561		16,199,340	-
State Administrative Matching Grants for the Supplemental Nutrition Assistance Program			105,010,226	-
Total ALN 10.561 State Administrative Matching Grants for the Supplemental Nutrition Assistance Program			121,209,566	-
Total SNAP Cluster			1,950,156,676	5,019,674
Child Nutrition Cluster				
School Breakfast Program	10.553		78,446,299	-
National School Lunch Program	10.555		249,800,036	-
Special Milk Program for Children	10.556		156,766	-
Summer Food Service Program for Children	10.559		36,175,929	-
Fresh Fruit and Vegetable Program	10.582		4,698,809	-
Total Child Nutrition Cluster			369,277,839	-
WIC Special Supplemental Nutrition Program for Women, Infants, and Children	10.557		108,982,927	18,468,453
Child and Adult Care Food Program	10.558		51,911,135	-
State Administrative Expenses for Child Nutrition	10.560		5,154,852	104,105
Food Distribution Cluster				
Commodity Supplemental Food Program	10.565		386,814	110,559
Emergency Food Assistance Program (Administrative Costs)	10.568		1,284,182	-
Emergency Food Assistance Program (Food Commodities)	10.569		17,510,094	-
Total Food Distribution Cluster			19,181,090	110,559
WIC Farmers' Market Nutrition Program (FMNP)	10.572		670,596	-
Team Nutrition Grants	10.574		41,647	4,843
Farm to School Grant Program	10.575		46,346	-
WIC Grants To States (WGS)	10.578		94,095	-
Child Nutrition Discretionary Grants Limited Availability	10.579		361,313	361,313
COVID-19 Pandemic EBT Administrative Costs	10.649		7,293,469	-
Cooperative Forestry Assistance	10.664		668,367	215,992
Urban and Community Forestry Program	10.675		422,750	56,068
Forest Legacy Program	10.676		201,928	-
Forest Stewardship Program	10.678		136,991	50,500
State & Private Forestry Cooperative Fire Assistance	10.698		399,469	-
Partnership Agreements	10.699		2,365	-
Research Joint Venture and Cost Reimbursable Agreements	10.707		2,710	-
Technical Agricultural Assistance	10.960		82,228	-
Contract/Other	10.999			
Pass-Through University of Arkansas System		RA1204086	76,604	-
Total U.S. Department of Agriculture			**2,700,540,920**	**24,657,460**
U.S. Department of Commerce				
Statistical, Research, and Methodology Assistance	11.016		38,609	-
Build to Scale	11.024		84,858	-
Connecting Minority Communities Pilot Program	11.028		9,837	-
State Digital Equity Planning and Capacity Grant	11.032		12,445	-
Broadband Equity, Access, and Deployment Program	11.035		4,090	-

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
U.S. Department of Commerce (continued)				
Economic Development Technical Assistance	11.303		132,656	30,426
Economic Development Cluster				
Economic Adjustment Assistance	11.307		8,186,039	-
Pass-Through Operation Hope		01-79 -14965 URI: 114558	21,834	-
Total Economic Development Cluster			8,207,873	-
Interjurisdictional Fisheries Act of 1986	11.407		36,820	-
Sea Grant Support	11.417		17,184	-
Pass-Through Mississippi University		01620032056506	21,126	-
Total ALN 11.417 Sea Grant Support			38,310	-
Coastal Zone Management Administration Awards	11.419		3,740,239	2,033,862
Coastal Zone Management Estuarine Research Reserves	11.420		846,937	770,003
Financial Assistance for National Centers for Coastal Ocean Science	11.426		542,311	-
Climate and Atmospheric Research	11.431		55,332	-
Marine Mammal Data Program	11.439		96,794	-
Environmental Sciences, Applications, Data, and Education	11.440			
Pass-Through ERT, Inc.		23001	56,215	-
Habitat Conservation	11.463		706,216	-
Unallied Science Program	11.472		72,162	72,162
Atlantic Coastal Fisheries Cooperative Management Act	11.474		448,142	-
Arrangements for Interdisciplinary Research Infrastructure	11.619			
Pass-Through University of Delaware - Newark		21100689 PO UDR0000100	509,757	-
Science, Technology, Business and/or Education Outreach	11.620		11,120,031	-
Pass-Through John Hopkins University		2004301700	879,694	-
Total ALN 11.620 Science, Technology, Business and/or Education Outreach			11,999,725	-
Minority Business Resource Development	11.802		212,097	-
MBDA Business Center	11.805		218,599	-
Contract/Other	11.999		129,057	-
Total U.S. Department of Commerce			**28,199,081**	**2,906,453**
U.S. Department of Defense				
Procurement Technical Assistance For Business Firms	12.002		725,439	-
OnRampII	12.014		20,182	-
State Memorandum of Agreement Program for the Reimbursement of Technical Services	12.113		1,124,183	-
Basic and Applied Scientific Research	12.300		281,810	-
ROTC Language and Culture Training Grants	12.357			
Pass-Through Institute of International Education Inc.		PGO1801UMCP19LTC051PO5	349,753	-
Pass-Through Institute of International Education Inc.		PGO1801UMCP19PGO051PO4	152,087	-
Pass-Through Institute of International Education Inc.		PGO1801UMCP19PGO051PO6	252,716	-
Pass-Through Institute of International Education Inc.		PGO2301UMCP19LTCPO1	20,869	-
Total ALN 12.357 ROTC Language and Culture Training Grants			775,425	-
Department of Defense HIV/AIDS Prevention Program	12.350			
Pass-Through Amentum		AM00006185	66,880	-
National Guard Military Operations and Maintenance (O&M) Projects	12.401		20,367,988	-
National Guard Challenge Program	12.404		3,543,893	-
Military Medical Research and Development	12.420			
Pass-Through Dartmouth Hitchcock Clinic		GC10494-02-DGR15450	11,967	-
Pass-Through Henry M. Jackson Foundation for the Advancement of Military Medicine		21885 Contract/CON000774	11,993	-
Total ALN 12.420 Military Medical Research and Development			23,960	-
Basic Scientific Research	12.431		30,378	-
The Language Flagship Grants to Institutions of Higher Education	12.550			
Pass-Through Institute of International Education Inc.		0054UMCP13SSA280PO16	21,218	-
Pass-Through Institute of International Education Inc.		0054UMCP13SSP280PO17	35,000	-
Pass-Through Institute of International Education Inc.		BOR21UMCP13ARAPO1	308,222	-
Pass-Through Institute of International Education Inc.		BOR21UMCP13PERPO2	548,840	-
Total ALN 12.550 The Language Flagship Grants to Institutions of Higher Education			913,280	-

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
U.S. Department of Defense (continued)				
DOD, NDEP, DOTC-STEM Education Outreach Implementation	12.560			
Pass-Through RTI		14-312-0216908-65633L	332,361	-
Economic Adjustment Assistance for State Governments	12.617		3,067,261	54,135
Basic, Applied, and Advanced Research in Science and Engineering	12.630		80,088	-
Pass-Through Mitre Corporation		SB1341-14-CQ-0010	27,360	-
Pass-Through Technology Student Association		Unknown	28,062	-
Total ALN 12.630 Basic, Applied, and Advanced Research in Science and Engineering			135,510	-
Past Conflict Accounting	12.740			
Pass-Through Henry M. Jackson Foundation		1037488	150,887	32,544
Uniformed Services University Medical Research Projects	12.750		219,605	-
Air Force Defense Research Sciences Program	12.800		7,437	-
Language Grant Program	12.900		57,752	-
Mathematical Sciences Grants	12.901		13,464	-
Information Security Grants	12.902		797,700	-
Pass-Through Capitol Technology University		H982302010292	34,557	-
GenCyber Grants Program	12.903		99,555	-
Cyber Security Core Curriculum	12.905		826,505	-
Contract/Other	12.999		2,525,499	74,050
Pass-Through Booz Allen Hamilton		P11255	34,879	-
Pass-Through Booz Allen Hamilton		A23680-2	58,429	-
Pass-Through Catalyst Campus		22125769	12,008	-
Pass-Through Griffiss Institute		Unknown	32,031	-
Pass-Through Johns Hopkins University Applied Physics Laboratory		158224	141,145	-
Pass-Through Swain Techs		Unknown	28,514	-
Pass-Through Texas A&M University		Unknown	3,208	-
Pass-Through University of Pittsburgh		AWD00005137-3	310,455	-
Total ALN 12.999 Contract/Other			3,146,168	74,050
Total U.S. Department of Defense			**36,762,180**	**160,729**
U.S. Department of Housing and Urban Development				
Supportive Housing for Persons with Disabilities	14.181		529,471	11,818
Section 8 Project Based Cluster				
Section 8 Housing Assistance Payments Program	14.195		255,491,149	-
Lower Income Housing Assistance Program Section 8 Moderate Rehabilitation	14.856		302,351	138,155
Total Section 8 Project Based Cluster			255,793,500	138,155
COVID-19 Community Development Block Grants/State's program and Non-Entitlement Grants in Hawaii	14.228		10,485,801	6,983,089
Community Development Block Grants/State's program and Non-Entitlement Grants in Hawaii			6,521,405	5,761,199
Total ALN 14.228 Community Development Block Grants/State's program and Non-Entitlement Grants in Hawaii			17,007,206	12,744,288
COVID-19 Emergency Solutions Grant Program	14.231		4,175,173	867,803
Emergency Solutions Grant Program			1,000,702	136,289
Total ALN 14.231 Emergency Solutions Grant Program			5,175,875	1,004,092
Supportive Housing Program	14.235		931,029	-
COVID-19 Home Investment Partnerships Program	14.239		19,910	-
Home Investment Partnerships Program			9,663,776	-
Total ALN 14.239 Home Investment Partnerships Program			9,683,686	-
COVID-19 Housing Opportunities for Persons with AIDS	14.241		211,471	90,370
Housing Opportunities for Persons with AIDS			1,884,780	1,884,781
Pass-Through Baltimore City Department of Housing & Community Development		4000GRT001370CCA0 00625SC630351	96,098	-
Pass Through - City of Baltimore		MDH006-001_39614	140	-
Pass Through - City of Baltimore		39575	27,029	-
Pass Through - City of Wilmington, Delaware		DE-HO-6F-001	30,486	-
Total ALN 14.241 - Housing Opportunities for Persons with AIDS			2,250,004	1,975,151
Continuum of Care Program	14.267		4,114,501	3,970,260
CDBG Disaster Recovery Cluster				
Hurricane Sandy Community Development Block Grant Disaster Recovery Grants (CDBG-DR)	14.269		20,333	-
Total CDBG Disaster Recovery Cluster			20,333	-

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
U.S. Department of Housing and Urban Development (continued)				
Housing Trust Fund	14.275		5,859,188	-
Youth Homelessness Demonstration Program	14.276			
Pass-Through Maryland Multicultural Youth Center		22052489	102,005	-
Project Rental Assistance Demonstration (PRA Demo) Program of Section 811 Supportive Housing for Persons with Disabilities	14.326		3,392,328	-
Fair Housing Assistance Program State and Local	14.401		474,042	-
Housing Voucher Cluster				
Section 8 Housing Choice Vouchers	14.871		23,213,005	10,203,753
Total Housing Voucher Cluster			23,213,005	10,203,753
Older Adults Home Modification Grant Program	14.921		116,902	-
Contract/Other	14.999		16,230	-
Total U.S. Department of Housing and Urban Development			**328,679,305**	**30,047,517**
U.S. Department of the Interior				
Regulation of Surface Coal Mining and Surface Effects of Underground Coal Mining	15.250		2,124,491	-
Abandoned Mine Land Reclamation (AMLR)	15.252		1,430,123	-
Fish & Wildlife Cluster				
Sport Fish Restoration	15.605		3,958,983	2,211,948
Wildlife Restoration and Basic Hunter Education	15.611		8,914,070	237,367
Total Fish & Wildlife Cluster			12,873,053	2,449,315
Fish and Wildlife Management Assistance	15.608		90,001	75,767
Coastal Wetlands Planning, Protection and Restoration	15.614		17,750	17,750
Cooperative Endangered Species Conservation Fund	15.615		770,660	-
Clean Vessel Act	15.616		368,218	78,979
State Wildlife Grants	15.634		1,024,236	51,105
Endangered Species Recovery Implementation	15.657		16,409	-
NFWF-USFWS Conservation Partnership	15.663			
Pass-Through Elizabeth River Project		20010136	7,871	-
Pass-Through Interfaith Partners for the Chesapeake		23031555	85	-
Total ALN 15.663 - NFWF-USFWS Conservation			7,956	-
Hurricane Sandy Disaster Relief Activities-FWS	15.677		62,274	-
White-nose Syndrome National Response Implementation	15.684		8,862	-
U.S. Geological Survey Research and Data Collection	15.808		165,759	-
National Cooperative Geologic Mapping	15.810		116,158	-
National Geological and Geophysical Data Preservation	15.814		37,222	-
Historic Preservation Fund Grants-In-Aid	15.904		1,584,236	129,352
Outdoor Recreation Acquisition, Development and Planning	15.916		1,031,142	1,031,142
American Battlefield Protection	15.926		29,400	-
Save America's Treasures	15.929		87,286	-
Chesapeake Bay Gateways Network	15.930		22,901	-
Preservation of Historic Structures on the Campuses of Historically Black Colleges and Universities (HBCUs)	15.932		30,307	-
Cooperative Research and Training Programs – Resources of the National Park System	15.945		279,141	-
National Ground-Water Monitoring Network	15.980		33,255	-
Contract/Other	15.999		87,203	8,962
Total U.S. Department of the Interior			**22,298,043**	**3,842,372**
U.S. Department of Justice				
Law Enforcement Assistance Narcotics and Dangerous Drugs Training	16.004		223,043	-
Sexual Assault Services Formula Program	16.017		423,036	419,125
Emmett Till Cold Case Investigations Program	16.031		54,330	-
COVID-19 Coronavirus Emergency Supplemental Funding Program	16.034		2,121,633	659,559
Services for Trafficking Victims	16.320		209,544	18,972
Legal Assistance for Victims	16.524		195,340	-
Grants to Reduce Domestic Violence, Dating Violence, Sexual Assault, and Stalking on Campus	16.525		58,663	-
Juvenile Justice and Delinquency Prevention	16.540		997,857	872,655
Pass-Through National Police Athletic/Activity League		PAL Mentoring	2,851	-
Total ALN 16.540 Juvenile Justice and Delinquency			1,000,708	872,655

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
U.S. Department of Justice (continued)				
Missing Children's Assistance	16.543		274,922	-
State Justice Statistics Program for Statistical Analysis Centers	16.550		74,028	54,494
National Criminal History Improvement Program (NCHIP)	16.554		901,752	-
National Institute of Justice Research, Evaluation, and Development Project Grants	16.560		28,765	-
Crime Victim Assistance	16.575		33,374,669	22,465,521
Crime Victim Compensation	16.576		1,503,676	-
Crime Victim Assistance/Discretionary Grants	16.582		165,144	-
Drug Court Discretionary Grant Program	16.585		41,344	-
Violence Against Women Formula Grants	16.588		2,821,667	2,222,578
Residential Substance Abuse Treatment for State Prisoners	16.593		176,633	94,091
State Criminal Alien Assistance Program	16.606		5,826,467	-
Bulletproof Vest Partnership Program	16.607		13,582	-
Project Safe Neighborhoods	16.609		757,885	752,788
State and Local Anti-Terrorism Training	16.614			
Pass-Through Institute For Intergovernmental Research		22126049	178,063	-
Public Safety Partnership and Community Policing Grants	16.710		1,696,771	-
PREA Program: Strategic Support for PREA Implementation	16.735		19,372	-
Edward Byrne Memorial Justice Assistance Grant Program	16.738		5,154,362	4,425,414
DNA Backlog Reduction Program	16.741		587,805	-
Paul Coverdell Forensic Sciences Improvement Grant Program	16.742		399,706	210,899
Criminal and Juvenile Justice and Mental Health Collaboration Program	16.745		296,850	-
Support for Adam Walsh Act Implementation Grant Program	16.750		194,229	-
Congressionally Recommended Awards	16.753		458,659	-
Harold Rogers Prescription Drug Monitoring Program	16.754		821,096	-
NICS Act Record Improvement Program	16.813		372,965	-
Justice Reinvestment Initiative	16.827		113,116	-
National Sexual Assault Kit Initiative	16.833		570,015	567,567
Body Worn Camera Policy and Implementation	16.835		131,099	-
Comprehensive Opioid, Stimulant, and Substance Abuse Program	16.838		2,551,405	1,860,217
Opioid Affected Youth Initiative	16.842		299,660	-
Equitable Sharing Program	16.922		2,640,677	-
Contract/Other	16.999			
Pass-Through Venable, LLP		Unknown	158,873	-
Total U.S. Department of Justice			**66,891,554**	**34,623,880**
U.S. Department of Labor				
Labor Force Statistics	17.002		1,095,248	-
Compensation and Working Conditions	17.005		137,443	-
Employment Service Cluster				
Employment Service/Wagner-Peyser Funded Activities	17.207		6,725,176	-
Jobs for Veterans State Grants	17.801		2,219,949	-
Total Employment Service Cluster			8,945,125	-
COVID-19 Unemployment Insurance	17.225		149,454,841	-
Unemployment Insurance			346,645,404	-
Total ALN 17.225 Unemployment Insurance			496,100,245	-
Senior Community Service Employment Program	17.235		335,674	-
Trade Adjustment Assistance	17.245		1,143,424	-
WIA Dislocated Workers	17.260		10,360,841	-
WIOA Cluster				
WIOA Adult Program	17.258		12,144,293	-
WIOA Youth Activities	17.259		12,262,387	-
WIOA Dislocated Worker Formula Grants	17.278		2,330,852	-
Total WIOA Cluster			26,737,532	-
Temporary Labor Certification for Foreign Workers	17.273		314,766	-
WIOA Dislocated Worker National Reserve Demonstration Grants	17.280		1,269,731	-
WIOA Dislocated Worker National Reserve Technical Assistance and Training	17.281		1,190,719	-
Apprenticeship USA Grants	17.285		2,730,571	-
Occupational Safety and Health State Program	17.503		4,302,243	-
Consultation Agreements	17.504		866,464	-
Mine Health and Safety Grants	17.600		9,007	-
Local Veterans' Employment Representative Program	17.804		1,491,702	-
Total U.S. Department of Labor			**557,030,735**	**-**

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
U.S. Department of State				
Academic Exchange Programs - Undergraduate Programs	19.009		28,202	-
Academic Exchange Programs - Hubert H. Humphrey Fellowship Program				
Pass-Through Institute of International Education Inc.	19.010	FY23-YALI-CL-UMBC-01	3,693	-
Investing in People in The Middle East and North Africa	19.021			
Pass-Through International Research and Exchanges Board		FY21HEP19UMD01	6,615	-
Public Diplomacy Programs	19.040		21,204	-
Pass-Through Multicultural Ukraine Exchange Network		22010129	1,441	-
Total ALN 19.040 Public Diplomacy Programs			22,645	-
Trans-Sahara Counterterrorism Partnership (TSCTP)	19.222		151,951	62,669
Academic Exchange Programs - English Language Programs	19.421			
Pass-Through FHI 360		PO21002220	196,632	-
Total U.S. Department of State			**409,738**	**62,669**
U.S. Department of Transportation				
COVID-19 Airport Improvement Program	20.106		109,740	-
Airport Improvement Program			19,447,618	-
Total ALN 20.106 Airport Improvement Program			19,557,358	-
COVID-19 Highway Planning and Construction	20.205		12,666,441	-
Highway Planning and Construction			682,357,916	42,014,828
Total ALN 20.205 Highway Planning and Construction			695,024,357	42,014,828
Recreational Trails Program	20.219		1,628,360	1,490,413
Highway Training and Education	20.215		29,565	-
FMCSA Cluster				
Motor Carrier Safety Assistance	20.218		4,213,865	-
Total FMCSA Cluster			4,213,865	-
Commercial Driver's License Program Implementation Grant	20.232		50,559	-
Fuel Tax Evasion-Intergovernmental Enforcement Effort Program Website	20.240		4,731	-
Maglev Project Selection Program - SAFETEA-LU	20.318		5,196,995	-
Railroad Safety Technology Grants	20.321		256,536	-
Consolidated Rail Infrastructure and Safety Improvements	20.325			
Pass-Through University of Delaware		FUDR0000363	6,374	-
Federal Transit Cluster				
COVID-19 Federal Transit Capital Investment Grants	20.500		106,163,372	-
Federal Transit Capital Investment Grants			9,319,642	-
COVID-19 Federal Transit Formula Grants	20.507		303,684,758	19,799,819
Federal Transit Formula Grants			71,760,441	5,454,244
Total ALN 20.507 Federal Transit Formula Grants			490,928,213	25,254,063
State of Good Repair Grants Program	20.525		36,845,748	24,475,366
Buses and Bus Facilities Formula, Competitive, and Low or No Emissions Programs	20.526		7,550,341	7,220,248
Total Federal Transit Cluster			535,324,302	56,949,677
Metropolitan Transportation Planning and State and Non-Metropolitan Planning and Research	20.505		10,434,299	-
COVID-19 Formula Grants for Rural Areas and Tribal Transit Program	20.509		9,706,234	9,706,234
Formula Grants for Rural Areas and Tribal Transit Program			7,784,641	7,749,031
Total ALN 20.509 Formula Grants for Rural Areas and Tribal Transit Program			17,490,875	17,455,265
Transit Services Programs Cluster				
COVID-19 Enhanced Mobility of Seniors and Individuals with Disabilities	20.513		240,119	240,119
Enhanced Mobility of Seniors and Individuals with Disabilities			3,619,059	3,619,059
Total Transit Services Programs Cluster			3,859,178	3,859,178
Rail Fixed Guideway Public Transportation System State Safety Oversight Formula Grant Program	20.528		929,615	-
COVID-19 Public Transportation Innovation	20.530		41,960	41,960
Public Transportation Innovation			189,949	185,230
Total ALN 20.530 Public Transportation Innovation			231,909	227,190
Highway Safety Cluster				
State and Community Highway Safety	20.600		5,577,765	2,555,938
National Priority Safety Programs	20.616		4,028,650	2,417,555
Total Highway Safety Cluster			9,606,415	4,973,493

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
U.S. Department of Transportation (continued)				
National Highway Traffic Safety Administration (NHTSA)				
Discretionary Safety Grants and Cooperative Agreements	20.614		320,887	-
Pass-Through Dunlap and Associates		DTNH2217D00031	123,486	-
Total ALN 20.614 National Highway Traffic Safety			444,373	-
Pipeline Safety Program State Base Grant	20.700		848,511	-
University Transportation Centers Program	20.701			
Pass-Through Penn State University		5902-GMU-DOT-7-103	182,701	-
Pass-Through Penn State University		69A3551847103	22,399	-
Total ALN 20.701 University Transportation Centers			205,100	-
Interagency Hazardous Materials Public Sector Training and Planning Grants	20.703		496,972	256,975
National Infrastructure Investments	20.933		13,386,705	5,156,292
Contract/Other	20.999		1,612,330	-
Pass-Through Calstart Inc.		110-210-008-R2	20,300	-
Total ALN 20.999 Contract/Other			1,632,630	-
Total U.S. Department of Transportation			**1,320,859,584**	**132,383,311**
U.S. Department of the Treasury				
Low Income Taxpayer Clinics	21.008		79,007	-
Pass-Through University of Baltimore Foundation		22-LITC0579-011-00	21,343	-
Total ALN 21.008 Low Income Taxpayer Clinics			100,350	-
COVID-19 Emergency Rental Assistance Program	21.023		64,316,223	13,292,852
COVID-19 Homeowner Assistance Fund	21.026		142,315,567	4,805,288
COVID-19 Coronavirus State and Local Fiscal Recovery Funds	21.027		588,119,714	94,350,714
Pass-Through City of Baltimore		Unknown	47,620	-
Pass-Through Mayor's Office of Neighborhood Safety and Engagement		442207	114,375	45,249
Pass-Through City of Baltimore		Unknown	64,090	-
Pass-Through City of Hagerstown		Unknown	20,000	-
Total ALN 21.027 Coronavirus State and Local Fiscal			588,365,799	94,395,963
Total U.S. Department of the Treasury			**795,097,939**	**112,494,103**
Appalachian Regional Commission				
Appalachian Area Development	23.002		1,160,300	-
Appalachian Research, Technical Assistance, and Demonstration Projects	23.011		61,000	-
Pass-Through East Tennessee State University		22-127-1-54.1	5,000	-
Total ALN 23.011 Appalachian Research, Technical Assistance, and Demonstration Projects			66,000	-
Total Appalachian Regional Commission			**1,226,300**	**-**
Office of Personnel Management				
Intergovernmental Personnel Act (IPA) Mobility Program	27.011		12,694	-
Total Office of Personnel Management			**12,694**	**-**
U.S. Equal Employment Opportunity Commission				
Employment Discrimination Title VII of the Civil Rights Act of 1964	30.001		822,299	-
Total U.S. Equal Employment Opportunity Commission			**822,299**	**-**
Federal Communications Commission				
COVID-19 Emergency Connectivity Fund Program	32.009		345,825	-
Total Federal Communications Commission			**345,825**	**-**
General Services Administration				
Donation of Federal Surplus Personal Property (Noncash)	39.003		33,263,314	-
Contract/Other	39.999		6,676	-
Total General Services Administration			**33,269,990**	**-**
National Aeronautics and Space Administration				
Science	43.001		612,897	-
Pass-Through Universities Space Research Association		364401	8,227	-
Pass-Through Universities Space Research Association		SUBK230007	14,014	-
Total ALN 43.001 Science			635,138	-

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
National Aeronautics and Space Administration (continued)				
Aeronautics	43.002		67,521	-
Pass-Through University of Texas, Austin		UTA21-000385	44,200	-
Total ALN 43.002 Aeronautics			111,721	-
Office of STEM Engagement (OSTEM)	43.008		83,629	-
Pass-Through University of Virgin Islands		219013	8,003	-
Total ALN 43.008 Office of STEM Engagement (OSTEM)			91,632	-
Space Technology	43.012		215,548	-
Total National Aeronautics and Space Administration			**1,054,039**	**-**
National Endowment for the Humanities				
Promotion of the Arts Grants to Organizations and Individuals	45.024		43,750	-
Pass-Through Mid-Atlantic Arts Foundation		185635056C19	34,257	-
Pass-Through Mid-Atlantic Arts Foundation		2022-2646	9,900	-
Total ALN 45.024 Promotion of the Arts Grants to			87,907	-
Promotion of the Arts Partnership Agreements	45.025		4,886,990	-
Pass-Through Mid-Atlantic Arts Foundation		2022-2610	7,000	-
Pass-Through Mid-Atlantic Arts Foundation		2023-4577	4,000	-
Pass-Through Mid-Atlantic Arts Foundation		20232639	8,400	-
Pass-Through Mid-Atlantic Arts Foundation		20232907	12,000	-
Pass-Through Mid-Atlantic Arts Foundation		20232908	8,400	-
Total ALN 45.025 Promotion of the Arts Partnership			4,926,790	-
Promotion of the Humanities Division of Preservation and Access	45.149		66,119	-
Promotion of the Humanities Fellowships and Stipends	45.160		54,281	-
Promotion of the Humanities Research	45.161		87,455	-
Promotion of the Humanities Teaching and Learning Resources and Curriculum Development	45.162		125,208	-
Promotion of the Humanities Public Programs	45.164		51,230	-
Pass-Through National Writing Project		08MD032022BMPU	58,816	-
Total ALN 45.164 Promotion of the Humanities Public			110,046	-
Promotion of the Humanities Office of Digital Humanities	45.169		378,930	171,038
Grants to States	45.310		3,196,898	1,932,741
COVID-19 National Leadership Grants	45.312		85,808	-
Laura Bush 21st Century Librarian Program	45.313		148,560	-
Pass-Through American Library Association		21094623	86,400	-
Pass-Through University of Washington		UWSC12126BPO79105	42,746	-
Total ALN 45.313 Laura Bush 21st Century Librarian			277,706	-
Total National Endowment for the Humanities			**9,397,148**	**2,103,779**
National Science Foundation				
Engineering	47.041		30,878	-
Pass-Through American Association for Engineering Education		769-2076	109,842	-
Pass-Through American University		31663-A220027-S06	90,320	-
Pass-Through Florida A&M University		2055347	29,519	-
Total ALN 47.041 Engineering			260,559	-
Mathematical and Physical Sciences	47.049		78,395	-
Geosciences	47.050		64,964	-
Computer and Information Science and Engineering	47.070		69,861	-
Pass-Through American Association for Engineering Education		2233087-007-MORG	353	-
Pass-Through George Washington University		21-S02	22,576	-
Pass-Through University of Illinois		097053-17576	2,210	-
Total ALN 47.070 Computer and Information Science and Engineering			95,000	-
Biological Sciences	47.074		14,865	-
Pass-Through Minnesota State University Moorhead		407N2021_001	4,722	-
Total ALN 47.074 Biological Sciences			19,587	-
Social, Behavioral, and Economic Sciences	47.075		302,714	-
Pass-Through Texas State University		20030-83490-1	664	-
Total ALN 47.075 Social, Behavioral, and Economic			303,378	-
Education and Human Resources	47.076		3,140,972	325,915
Pass-Through Virginia Tech University		545504-19062	81,726	-
Total ALN 47.076 STEM Education (formerly Education and Human Resources)			3,222,698	325,915

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
National Science Foundation (continued)				
Office of International Science and Engineering	47.079			
Pass-Through Institute of Human Virology, Nigeria		Signed 04/22/2022	6,688	-
Integrative Activities	47.083		22,616	21,830
NSF Technology, Innovation, and Partnerships	47.084			
Pass-Through George Mason University		E2059543	5,775	-
Total National Science Foundation			**4,079,660**	**347,745**
Small Business Administration				
Small Business Development Centers	59.037		2,395,137	802,094
Veterans Outreach Program	59.044		459,291	-
Congressional Grants	59.059		308,500	18,772
State Trade Expansion	59.061		187,298	-
Cybersecurity for Small Business Pilot Program	59.079		27,900	-
Total Small Business Administration			**3,378,126**	**820,866**
U.S. Department of Veterans Affairs				
Veterans State Domiciliary Care	64.014		1,267,665	-
Veterans State Nursing Home Care	64.015		15,005,454	-
VA Grants for Adaptive Sports Programs for Disabled Veterans and Disabled Members of the Armed Forces	64.034		133	-
VHA Inpatient Medicine	64.040		3,107,111	2,449,995
Burial Expenses Allowance for Veterans	64.101		1,740,387	-
Vocational and Educational Counseling for Servicemembers and Veterans	64.125		206,822	-
Contract/Other	64.999		1,616,665	-
Total U.S. Department of Veterans Affairs			**22,944,237**	**2,449,995**
Environmental Protection Agency				
Surveys, Studies, Research, Investigations, Demonstrations, and Special Purpose Activities Relating to the Clean Air Act	66.034		607,450	-
Diesel Emission Reduction Act (DERA) National Grants	66.039		451,260	-
Pass-Through Mid-Atlantic Regional Air Management Association		DL202000102	28,681	-
Pass-Through Mid-Atlantic Regional Air Management Association		DL202100101	953	-
Total ALN 66.039 Diesel Emission Reduction Act (DERA) National Grants			480,894	-
Diesel Emissions Reduction Act (DERA) State Grants	66.040		668,982	-
Environmental Finance Center Grants	66.203		101,046	-
Pass-Through University of North Carolina at Chapel Hill		5116394	19,881	6,862
Pass-Through University of North Carolina at Chapel Hill		5127794	37,961	-
Total ALN 66.203 Environmental Finance Center Grants			158,888	6,862
Water Pollution Control State, Interstate, and Tribal Program Support	66.419		9,056	-
Surveys, Studies, Investigations, Demonstrations, and Training Grants - Section 1442 of the Safe Drinking Water Act	66.424			
Pass-Through University of New Mexico		281131871D	41,372	-
Surveys, Studies, Investigations, Demonstrations, and Training Grants and Cooperative Agreements - Section 104(b)(3) of the Clean Water Act	66.436			
Pass-Through University of New Mexico		281132871D	24,171	-
Voluntary School and Child Care Lead Testing and Reduction Grant Program (SDWA 1464(d))	66.444		334,445	-
Water Quality Management Planning	66.454		483,664	-
Clean Water State Revolving Fund Cluster				
Capitalization Grants for Clean Water State Revolving Funds	66.458		526,000	-
Total Clean Water State Revolving Fund Cluster			526,000	-
Nonpoint Source Implementation Grants	66.460		2,504,334	-
Regional Wetland Program Development Grants	66.461		190,597	-
Chesapeake Bay Program	66.466		5,634,231	605,469
Pass-Through Center for Watershed Protection		19092553	2,173	-
Pass-Through National Fish and Wildlife Foundation		60321072684	34,823	-
Pass-Through National Fish and Wildlife Foundation		60322075722	40,871	-
Pass-Through National Fish and Wildlife Foundation		69826	82,402	37,779
Pass-Through University of New Mexico		281154871D	78,474	-
Pass-Through University System of Maryland Foundation Inc.		AANA	37,097	-
Total ALN 66.466 Chesapeake Bay Program			5,910,071	643,248

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Environmental Protection Agency (continued)				
Beach Monitoring and Notification Program Implementation Grants	66.472		260,605	-
Performance Partnership Grants	66.605		10,446,003	-
Pollution Prevention Grants Program	66.708		150,835	-
Superfund State, Political Subdivision, and Indian Tribe Site-Specific Cooperative Agreements	66.802		340,589	-
Underground Storage Tank (UST) Prevention, Detection, and Compliance Program	66.804		847,834	-
Leaking Underground Storage Tank Trust Fund Corrective Action Program	66.805		124,421	-
Superfund State and Indian Tribe Core Program Cooperative Agreements	66.809		34,974	-
State and Tribal Response Program Grants	66.817		246,551	-
Brownfields Multipurpose, Assessment, Revolving Loan Fund, and Cleanup Cooperative Agreements	66.818		3,693	-
Chesapeake Bay Program Implementation, Regulatory/Accountability and Monitoring Grants	66.964		4,368,936	2,776,511
Contract/Other	66.999		29,106	-
Pass-Through Metropolitan Washington Council of Govts		23-008	40,031	-
Total ALN 66.999 Contract/Other			69,137	-
Total Environmental Protection Agency			**28,833,502**	**3,426,621**
U.S. Department of Energy				
State Energy Program	81.041		1,138,351	-
Weatherization Assistance for Low-Income Persons	81.042		4,064,397	61,903
Office of Science Financial Assistance Program	81.049		188,733	65,266
Pass-Through Johns Hopkins University		2022-1640	8,075	-
Pass-Through Ultramet		19583	42,615	-
Total ALN 81.049 Office of Science Financial Assistance			239,423	65,266
Conservation Research and Development	81.086		8,871	-
Epidemiology and Other Health Studies Financial Assistance Program	81.108			
Pass-Through CPWR: The Center for Construction Research		1080-80	37,824	-
Pass-Through CPWR: The Center for Construction Research		1080-85/DE-FC01-06EH06004	116,955	-
Total ALN 81.108 Epidemiology and Other Health Studies			154,779	-
Stewardship Science Grant Program	81.112			
Pass-Through Krell Institute		17010058	28	-
National Nuclear Security Administration (NNSA) Minority Serving Institutions (MSI) Program	81.123		854	-
Energy Efficiency and Conservation Block Grant Program (EECBG)	81.128		2,439,289	-
State Heating Oil and Propane Program	81.138		96,941	-
Contract/Other	81.999			
Pass-Through SLAC National Accelerator Laboratory		219001	30,000	-
Total U.S. Department of Energy			**8,172,933**	**127,169**
U.S. Department of Education				
Adult Education - Basic Grants to States	84.002		11,525,761	-
Civil Rights Training and Advisory Services (also known as Equity Assistance Centers)	84.004			
Pass-Through American Institutes for Research		0504500206	19,065	-
Title I Grants to Local Educational Agencies	84.010		307,370,836	306,003,760
Migrant Education State Grant Program	84.011		489,934	489,934
Title I State Agency Program for Neglected and Delinquent Children and Youth	84.013		1,342,129	1,227,084
Overseas Programs - Group Projects Abroad	84.021		200,937	-
Special Ed (IDEA) Cluster				
Special Education Grants to States	84.027		260,364,351	252,179,194
Pass-Through Arundel County Public Schools		23-530270	95,991	-
Pass-Through District of Columbia Government		Unknown	390,000	-
Total ALN 84.027 Special Education Grants to States			260,850,342	252,179,194
Special Education Preschool Grants	84.173		7,369,898	7,189,030
Total Special Ed (IDEA) Cluster			268,220,240	259,368,224
Higher Education Institutional Aid	84.031		37,737,939	-
Perkins Loan Cancellations	84.037		31,599	-

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
U.S. Department of Education (continued)				
TRIO Cluster				
TRIO Student Support Services	84.042		1,088,247	-
TRIO Talent Search	84.044		1,103,588	-
TRIO Upward Bound	84.047		3,969,164	-
TRIO Educational Opportunity Centers	84.066		344,243	-
TRIO McNair Post-Baccalaureate Achievement	84.217		494,079	-
Total TRIO Cluster			6,999,321	-
Career and Technical Education -- Basic Grants to States	84.048		21,663,139	20,561,113
Career and Technical Education -- National Programs	84.051		94,945	94,945
Fund for the Improvement of Postsecondary Education	84.116		1,311,709	64,281
Minority Science and Engineering Improvement	84.120		504,534	-
Rehabilitation Services Vocational Rehabilitation Grants to States	84.126		47,639,600	1,664,675
Pass-Through Vermont Agency of Human Services		41434	16,711	-
Pass-Through Vermont Agency of Human Services		42493	23,857	-
Total ALN 84.126 Rehabilitation Services Vocational Rehabilitation Grants to States			47,680,168	1,664,675
Rehabilitation Long-Term Training	84.129		156,459	-
Migrant Education College Assistance Migrant Program	84.149		385,794	-
Rehabilitation Services Client Assistance Program	84.161		5,967	-
Independent Living_State Grants	84.169		453,573	352,980
Rehabilitation Services Independent Living Services for Older Individuals Who are Blind	84.177		520,660	-
Special Education-Grants for Infants and Families	84.181		7,949,047	7,377,089
School Safety National Activities	84.184		422,568	396,467
Pass-Through Prince Georges County Public Schools		21063427	29,005	-
Total ALN 84.184 School Safety National Activities			451,573	396,467
Supported Employment Services for Individuals with the Most Significant Disabilities	84.187		434,843	-
Education for Homeless Children and Youth	84.196		1,388,474	1,375,100
Graduate Assistance in Areas of National Need	84.200		233,255	-
Javits Gifted and Talented Students Education	84.206		399,852	-
Innovative Approaches to Literacy, Full-service Community Schools; and Promise Neighborhoods	84.215		5,638,990	418,495
Centers for International Business Education	84.220		496,752	-
Language Resource Centers	84.229		222,496	-
Pass-Through Duke University		3410031	7,937	-
Total ALN 84.229 Language Resource Centers			230,433	-
American Indian Vocational Rehabilitation Services	84.250		157,950	-
Charter Schools	84.282		2,707,771	2,369,725
Twenty-First Century Community Learning Centers	84.287		11,787,858	10,899,051
Education Research, Development and Dissemination	84.305		977,672	153,583
Pass-Through Educational Testing Service		UMDED305A	63,392	-
Pass-Through Stanford University		62437295137991	16,204	-
Pass-Through Strategic Education Research Partnership Institute		UMDDCPS22	71,188	-
Pass-Through University of Virginia		AWD003002GR100753	75,471	-
Pass-Through University of Virginia		GM10176PO2210409	28,792	-
Pass-Through Virginia Commonwealth University		FP00015845SA002	26,305	-
Total ALN 84.305 Education Research, Development and Dissemination			1,259,024	153,583
Special Education - State Personnel Development	84.323		188,846	88,448
Research in Special Education	84.324		810,994	307,215
Special Education - Personnel Development to Improve Services and Results for Children with Disabilities	84.325		1,191,549	-
Special Education Technical Assistance and Dissemination to Improve Services and Results for Children with Disabilities	84.326		455,792	222,716
Pass-Through University of North Carolina at Charlotte		2021012806UMD	418,972	-
Total ALN 84.326 Special Education Technical Assistance and Dissemination to Improve Services and Results for			874,764	222,716
Gaining Early Awareness and Readiness for Undergraduate Program	84.334		363,215	293,471
Child Care Access Means Parents in School	84.335		40,301	-
Teacher Quality Partnership Grants	84.336		1,866,145	-
Arts in Education	84.351		47,483	-
Rural Education	84.358		125,933	125,933
English Language Acquisition State Grants	84.365		15,714,963	14,602,106

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
U.S. Department of Education (continued)				
Supporting Effective Instruction State Grants				
(formerly Improving Teacher Quality State Grants)	84.367		27,078,434	25,920,659
Pass-Through Howard County Public School System		S367A190019	93,228	-
Total ALN 84.367 Supporting Effective Instruction State Grants			27,171,662	25,920,659
Competitive Grants for State Assessments	84.368		3,540	-
Grants for State Assessments and Related Activities	84.369		5,204,863	88,829
Comprehensive Literacy Development	84.371		825,964	762,838
Statewide Longitudinal Data Systems	84.372		12,226	-
Strengthening Minority-Serving Institutions	84.382		607,032	-
Transition Programs for Students with Intellectual Disabilities into Higher Education	84.407		42,706	-
Pass-Through University of Massachusetts Boston		POB001171339	4,941	-
Total ALN 84.407 Transition Programs for Students with Intellectual Disabilities into Higher Education			47,647	-
Education Innovation and Research (formerly Investing in Innovation (i3) Fund)	84.411			
Pass-Through TERC		44127	41,725	-
Disability Innovation Fund (DIF)	84.421			
Pass-Through State of Connecticut		23SDRCTP01UMD	582,282	-
Supporting Effective Educator Development Program	84.423		241,042	53,102
Student Support and Academic Enrichment Program	84.424		20,200,614	19,920,300
COVID-19 Education Stabilization Funds:				
COVID-19 Governor's Emergency Education Relief Fund	84.425C		32,101,169	31,874,580
COVID-19 Elementary and Secondary School Emergency Relief (ESSER) Fund	84.425D		362,550,278	362,398,148
Pass-Through Prince Georges County Public Schools		57713	3,736	-
Pass-Through Prince Georges County Public Schools		65487	755,116	-
Total ALN 84.425D COVID-19 Elementary and Secondary School Emergency Relief (ESSER) Fund			363,309,130	362,398,148
COVID-19 Higher Education Emergency Relief Fund (HEERF) Student Aid	84.425E		5,600,028	-
COVID-19 HEERF Institutional Aid	84.425F		31,429,283	-
COVID-19 HEERF Historically Black Colleges And Universities (HBCUs)	84.425J		50,098,684	-
COVID-19 HEERF Minority Serving Institutions (MSIs)	84.425L		524,786	-
COVID-19 Coronavirus Response And Relief Supplemental Appropriations Act, 2021 – Emergency Assistance For Non-Public Schools (CRRSA EANs) Program	84.425R		10,083,246	10,083,246
COVID-19 American Rescue Plan - Elementary and Secondary School Emergency Relief (ARP ESSER)	84.425U		446,457,593	420,591,682
COVID-19 American Rescue Plan – Emergency Assistance to Non-Public Schools (ARP EANS) Program	84.425V		3,063,041	3,063,041
COVID-19 American Rescue Plan - Elementary and Secondary School Emergency Relief - Homeless Children and Youth	84.425W		9,755,384	5,724,057
Total ALN 84.425 Education Stabilization Fund			952,422,344	833,734,754
Contract/Other	84.999			
Pass-Through American Institutes for Research		0504520206	19,039	-
Pass-Through American Institutes for Research		4695	30,405	-
Total ALN 84.999 Contract/Other			49,444	-
Total U.S. Department of Education			**1,768,485,109**	**1,508,936,877**
Christopher Columbus Fellowship Foundation				
Contract/Other	85.999		31,430	-
Total Christopher Columbus Fellowship Foundation			**31,430**	**-**
Consumer Product Safety Commission				
Contract/Other	87.999		24,750	-
Total Consumer Product Safety Commission			**24,750**	**-**
National Archives and Records Administration				
National Historical Publications and Records Grants	89.003		228,892	-
Total National Archives and Records Administration			**228,892**	**-**

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Election Assistance Commission				
HAVA Election Security Grants	90.404		1,131,034	-
Total Election Assistance Commission			**1,131,034**	**-**
U.S. Department of Health and Human Services				
Medical Reserve Corps Small Grant Program	93.008		2,135	-
COVID-19 National Organizations of State and Local Officials	93.011		683,496	267,789
Special Programs for the Aging, Title VII, Chapter 3, Programs for Prevention of Elder Abuse, Neglect, and Exploitation	93.041		100,951	60,728
COVID-19 Special Programs for the Aging, Title VII, Chapter 2, Long Term Care Ombudsman Services for Older Individuals	93.042		111,667	98,971
Special Programs for the Aging, Title VII, Chapter 2, Long Term Care Ombudsman Services for Older Individuals			408,349	254,237
Total ALN 93.042 Special Programs for the Aging, Title VII, Chapter 2, Long Term Care Ombudsman Services for Older Individuals			520,016	353,208
COVID-19 Special Programs for the Aging, Title III, Part D, Disease Prevention and Health Promotion Services	93.043		14,592	-
Special Programs for the Aging, Title III, Part D, Disease Prevention and Health Promotion Services			424,596	246,023
Total ALN 93.043 Special Programs for the Aging, Title III, Disease Prevention and Health Promotion Services			439,188	246,023
Aging Cluster				
COVID-19 Special Programs for the Aging, Title III, Part B, Grants for Supportive Services and Senior Centers	93.044		724,569	724,569
Special Programs for the Aging, Title III, Part B, Grants for Supportive Services and Senior Centers			6,239,861	4,714,803
Total ALN 93.044 Special Programs for the Aging, Title III, Part B, Grants for Supportive Services and Senior Centers			6,964,430	5,439,372
COVID-19 Special Programs for the Aging, Title III, Part C, Nutrition Services	93.045		3,793,081	1,252,860
Special Programs for the Aging, Title III, Part C, Nutrition Services			17,467,801	9,634,382
Total ALN 93.045 Special Programs for the Aging, Title III, Part C, Nutrition Services			21,260,882	10,887,242
Nutrition Services Incentive Program	93.053		2,161,399	1,277,684
Total Aging Cluster			30,386,711	17,604,298
Special Programs for the Aging, Title IV, and Title II, Discretionary Projects	93.048		1,027,124	140,010
COVID-19 National Family Caregiver Support, Title III, Part E	93.052		141,803	-
National Family Caregiver Support, Title III, Part E			4,414,584	2,274,183
Total ALN 93.052 National Family Caregiver Support, Title III, Part E			4,556,387	2,274,183
COVID-19 Global AIDS	93.067		22,457,196	4,870,862
Pass-Through University of Washington		UWSC12825 /	306,461	-
Global AIDS				
Pass-Through African Medical and Research Foundation		6 NU2GGH002148-01-01-UMB-US001	2,489,706	-
Pass-Through APIN Public Health Initiatives		GH21-2147-PHIS	78,931	-
Pass-Through Center for Int'l Health, Ed., and Biosecurity - Kenya		CON-001	783,123	-
Pass-Through Center for Int'l Health, Ed., and Biosecurity - Kenya		CON-001/ 6 NU2GGH002332-01	658,652	-
Pass-Through Center for Int'l Health, Ed., and Biosecurity - Kenya		ENT-001	849,957	-
Pass-Through Center for Int'l Health, Ed., and Biosecurity - Kenya		ENT-001/NU2GGH002335-PIM-001	802,966	-
Pass-Through Center for Int'l Health, Ed., and Biosecurity - Kenya		PIM-001/ 6 NU2GGH002333-01	215,237	-
Pass-Through Center for Int'l Health, Ed., and Biosecurity - Kenya		5 NU2GGH002099-04	223,245	-
Pass-Through Institute of Human Virology, Nigeria		ASPIRE YR1	951	-
Pass-Through Institute of Human Virology, Nigeria		Grant # 1 NU2GGH002417-01-0	177,331	-
Pass-Through Institute of Human Virology, Nigeria		NU2GGH002099-04-05	982,487	-
Pass-Through Institute of Human Virology, Nigeria		Signed 05052022	758,324	-
Pass-Through Institute of Human Virology, Nigeria		Signed 1/4/2023	57,844	-
Total ALN 93.067 Global AIDS			20,157	-
Public Health Emergency Preparedness	93.069		30,862,568	4,870,862
Pass-Through Baltimore City Health Department		CO#40406 P556078	10,924,622	4,532,930
Total ALN 93.069 Public Health Emergency Preparedness			803	-
COVID-19 Environmental Public Health and Emergency Response	93.070		10,925,425	4,532,930
Environmental Public Health and Emergency Response			13,138	-
Total ALN 93.070 Environmental Public Health and Emergency Response			1,545,347	1,074,907
			1,558,485	1,074,907

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
U.S. Department of Health and Human Services (continued)				
Medicare Enrollment Assistance Program	93.071		523,993	128,529
Lifespan Respite Care Program	93.072		39,650	-
COVID-19 Cooperative Agreements to Promote Adolescent Health through School-Based HIV/STD Prevention and School-Based Surveillance	93.079			
Pass-Through American Academy of Pediatrics		161035013-NCSMH	12,625	-
Cooperative Agreements to Promote Adolescent Health through School-Based HIV/STD Prevention and School-Based Surveillance			72,884	-
Total ALN 93.079 Cooperative Agreements to Promote Adolescent Health through School-Based HIV/STD Prevention and School-Based Surveillance			85,509	-
Guardianship Assistance	93.090		2,311,733	-
Affordable Care Act (ACA) Personal Responsibility Education Program	93.092		914,954	636,266
Pass-Through Baltimore City Health Department		40011-A	1,760	-
Pass-Through Baltimore City Health Department		FHB66PRE	28,066	-
Total ALN 93.092 Affordable Care Act (ACA) Personal Responsibility Education Program			944,780	636,266
Food and Drug Administration Research	93.103		1,333,551	-
Comprehensive Community Mental Health Services for Children with Serious Emotional Disturbances (SED)	93.104		98,543	-
Pass-Through Tennessee Department of Mental Health		73336	228,147	88,995
Total ALN 93.104 Comprehensive Community Mental Health Services for Children with Serious Emotional Disturbances (SED)			326,690	88,995
Area Health Education Centers	93.107		510,442	397,198
Maternal and Child Health Federal Consolidated Programs	93.110		710,615	597,541
Pass-Through National Assembly on School-based Health		Signed 02032022	58,743	-
Pass-Through National Assembly on School-based Health		Signed 11/1022022	342,577	-
Total ALN 93.110 Maternal and Child Health Federal Consolidated Programs			1,111,935	597,541
Project Grants and Cooperative Agreements for Tuberculosis Control Programs	93.116		1,688,629	316,220
Oral Diseases and Disorders Research	93.121		19,195	-
Nurse Anesthetist Traineeship	93.124		52,986	-
Emergency Medical Services for Children	93.127		216,412	-
Cooperative Agreements to States/Territories for the Coordination and Development of Primary Care Offices	93.130		208,276	-
Injury Prevention and Control Research and State and Community Bas	93.136		10,676,103	280,726
Pass-Through Michigan Department of Health and Human Services		E20223680-00	75,915	5,455
Total ALN 93.136 Injury Prevention and Control Research and State and Community Based Programs			10,752,018	286,181
COVID-19 Community Programs to Improve Minority Health Grant Program	93.137			
Pass-Through Baltimore City Health Dept.		CO#40489	68,387	-
HIV-Related Training and Technical Assistance	93.145			
Pass-Through University of Pittsburgh		CNVA00050178 (137293-2)	27,961	-
Pass-Through University of Pittsburgh		CNVA00050178 (137979-2)	406,123	-
Total ALN 93.145 HIV-Related Training and Technical Assistance			434,084	-
Projects for Assistance in Transition from Homelessness (PATH)	93.150		1,045,105	983,191
Coordinated Services and Access to Research for Women, Infants, Children, and Youth	93.153			
Pass-Through Johns Hopkins University		2005692797	45,134	-
COVID-19 Rural Health Research Centers	93.155		147,838	147,838
Rural Health Research Centers			111,061	-
Total ALN 93.155 Rural Health Research Centers			258,899	147,838
Grants to States for Loan Repayment	93.165		797,160	772,160
Family Planning Services	93.217		5,901,929	4,871,920
Pass-Through Baltimore City Health Department		BCHD835 / AWD000398	68,591	-
Pass-Through Baltimore City Health Department		CO#BCHD856	187,132	-
Total ALN 93.217 Family Planning Services			6,157,652	4,871,920
Traumatic Brain Injury State Demonstration Grant Program	93.234		135,291	1,995
Title V State Sexual Risk Avoidance Education (Title V State SRAE) Program	93.235		564,729	395,816
Grants to States to Support Oral Health Workforce Activities	93.236		215,365	50,980
Mental Health Research Grants	93.242			
Pass-Through Johns Hopkins University		2004707956	11,744	-
Total ALN 93.242 Mental Health Research Grants			11,744	-

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
U.S. Department of Health and Human Services (continued)				
Substance Abuse and Mental Health Services Projects of Regional and National Significance	93.243		6,507,387	4,064,342
Pass-Through Community Human Services		5H79SP021726	28,582	-
Pass-Through Community Human Services		Signed_4/23/2023	29,842	-
Pass-Through Emory University		A554799 (A378367)	16,527	6,353
Pass-Through National Council for Mental Wellbeing		2760.001	26,461	-
Pass-Through South County Healthcare Hospital System		SIGNED11172020	37,217	-
Pass-Through The Bd of Trustees of The Leland Stanford Junior Univ.		61971852-137362	46,972	-
Pass-Through University of Nebraska Medical Center		34-5528-3000-104	129,929	-
Pass-Through University of Texas at Austin		UTA19-001378	29,776	-
Pass-Through Virginia Department of Behavioral Health		H79TI084066	708,955	284,147
Total ALN 93.243 Substance Abuse and Mental Health Services Projects of Regional and National Significance			7,561,648	4,354,842
Early Hearing Detection and Intervention	93.251		135,382	100,978
Poison Center Support and Enhancement Grant	93.253		189,943	-
Occupational Safety and Health Program	93.262		115,187	8,015
COVID-19 Immunization Cooperative Agreements	93.268		15,924,129	-
Immunization Cooperative Agreements			3,902,245	-
Total ALN 93.268 Immunization Cooperative Agreements			19,826,374	-
Viral Hepatitis Prevention and Control	93.270		257,962	69,739
Drug-Free Communities Support Program Grants	93.276			
Pass-Through Cecil County, Maryland		2H79SP020558-06	78,703	-
Drug Abuse and Addiction Research Programs	93.279		157,880	-
Centers for Disease Control and Prevention Investigations and Technical Assistance	93.283			
Pass-Through Catholic Caritas Foundation of Nigeria		Signed on 01/23/23	100,828	-
Teenage Pregnancy Prevention Program	93.297		1,368,278	1,207,974
Pass-Through Healthy Teen Network		TP1AH000234	132,299	-
Total ALN 93.297 Teenage Pregnancy Prevention Program			1,500,577	1,207,974
Small Rural Hospital Improvement Grant Program	93.301		39,033	39,033
Minority Health and Health Disparities Research	93.307			
Pass-Through Morehouse School of Medicine		RCC-SUP-001MSU	33,418	-
Trans-NIH Research Support	93.310			
Pass-Through Johns Hopkins University		2005195350	49,323	-
Pass-Through NADPH		RF00250-2022-0048	16,635	-
Total ALN 93.310 Trans-NIH Research Support			65,958	-
Early Hearing Detection and Intervention Information System (EHDI-IS) Surveillance Program	93.314		156,160	-
COVID-19 Emerging Infections Program	93.317		438,984	-
Emerging Infections Program			1,854,360	711,360
Total ALN 93.317 Emerging Infections Program			2,293,344	711,360
Protecting and Improving Health Globally: Building and Strengthening Public Health Impact, Systems, Capacity and Security	93.318			
Pass-Through Institute of Human Virology, Nigeria		1 NU2HGH000020-01-00	273,442	-
Pass-Through Institute of Human Virology, Nigeria		Signed on 10/13/2022	48,865	-
Total ALN 93.318 Protecting and Improving Health Globally: Building and Strengthening Public Health Impact, Systems, Capacity and Security			322,307	-
COVID-19 CSELS Partnership: Strengthening Public Health Laboratories	93.322		191,139	-
COVID-19 Epidemiology and Laboratory Capacity for Infectious Diseases (ELC)	93.323		9,613,744	1,529,096
Epidemiology and Laboratory Capacity for Infectious Diseases (ELC)			20,146,907	12,964,864
Total ALN 93.323 Epidemiology and Laboratory Capacity for Infectious Diseases (ELC)			29,760,651	14,493,960
State Health Insurance Assistance Program	93.324		1,204,737	475,511
Paralysis Resource Center	93.325			
Pass-Through Reeve Foundation		90PRRC0006-01-00	24,218	-
COVID-19 Behavioral Risk Factor Surveillance System	93.336		30,191	-
Behavioral Risk Factor Surveillance System			539,922	539,922
Total ALN 93.336 Behavioral Risk Factor Surveillance System			570,113	539,922
Public Health Service Evaluation Funds	93.343		74,667	43,479

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
U.S. Department of Health and Human Services (continued)				
COVID-19 Public Health Emergency Response: Cooperative Agreement for Emergency Response: Public Health Crisis Response	93.354		141,697	-
Public Health Emergency Response: Cooperative Agreement for Emergency Response: Public Health Crisis Response			6,473,024	-
Pass-Through Baltimore City Health Department		CO#40406 P556078	486	-
Total ALN 93.354 Public Health Emergency Response: for Emergency Response: Public Health Crisis Response			6,615,207	-
Public Health Informatics & Technology Workforce Development Program (The PHIT Workforce Development Program)	93.355		1,226,248	-
State Actions to Improve Oral Health Outcomes and Partner Actions to Improve Oral Health Outcomes	93.366		486,604	264,189
Flexible Funding Model - Infrastructure Development and Maintenance for State Manufactured Food Regulatory Programs	93.367		479,613	-
National and State Tobacco Control Program	93.387		1,109,820	16,897
Activities to Support State, Tribal, Local and Territorial (STLT)	93.391		8,504,132	4,132,026
Health Department Response to Public Health or Healthcare				
Strengthening Public Health Systems and Services through National Partnerships to Improve and Protect the Nation's Health	93.421		155,048	59,353
Pass-Through National Association of County and City		2021-072002	17,112	-
Total ALN 93.421 Strengthening Public Health Systems and Services through National Partnerships to Improve and Protect the Nation's Health			172,160	59,353
1332 State Innovation Waivers	93.423		467,255,925	-
Improving the Health of Americans through Prevention and Management of Diabetes and Heart Disease and Stroke	93.426		1,419,668	702,615
Every Student Succeeds Act/Preschool Development Grants	93.434		16,857,754	4,447,304
Pass-Through Kennedy Krieger Institute		210340	43,364	-
Pass-Through Wicomico County Partnership for Families and Children		90TP0064	63,788	-
Total ALN 93.434 Every Student Succeeds Act/Preschool Development Grants			16,964,906	4,447,304
The Innovative Cardiovascular Health Program	93.435			
Pass-Through Prince Georges Co. Health Dept.		NU58DP006626-01-00	513,502	-
CDC Undergraduate Public Health Scholars Program (CUPS): A Public Health Experience to Expose Undergraduates Interested in Minority Health to Public Health and the Public Health Professions	93.456			
Pass-Through Kennedy Krieger		1 NU50CD300866-0	22,598	-
ACL Assistive Technology	93.464		647,167	-
Alzheimer's Disease Program Initiative (ADPI)	93.470		253,180	148,945
Title IV-E Prevention Program	93.472		1,015,675	-
Preventing Maternal Deaths: Supporting Maternal Mortality Review Committees	93.478		317,208	174,110
Congressional Directives	93.493		1,302,409	-
Community Health Workers for Public Health Response and Resilient	93.495		394,345	268,529
Family Violence Prevention and Services/ Sexual Assault/Rape Crisis Services and Supports	93.497		59,153	-
COVID-19 Low Income Household Water Assistance Program	93.499		3,670,006	-
Low Income Household Water Assistance Program			3,351,612	-
Total ALN 93.499 Low Income Household Water Assistance Program			7,021,618	-
COVID-19 State Planning and Establishment Grants for the Affordable Care Act (ACA)'s Exchanges	93.525		33,920	-
COVID-19 MaryLee Allen Promoting Safe and Stable Families Program	93.556		504,781	-
MaryLee Allen Promoting Safe and Stable Families Program			11,856,911	115
Total ALN 93.556 MaryLee Allen Promoting Safe and Stable Families Program			12,361,692	115
Temporary Assistance for Needy Families	93.558		251,472,341	74,234
Pass-Through Tennessee Department of Mental Health and Substance Abuse Services		73337	15,079	-
Total ALN 93.558 Temporary Assistance for Needy Families			251,487,420	74,234
Child Support Enforcement	93.563		100,145,856	629,501
Refugee and Entrant Assistance State/Replacement Designee Administered Programs	93.566		33,095,775	-
Refugee and Entrant Assistance Voluntary Agency Programs	93.567		1,302,043	-
Low-Income Home Energy Assistance	93.568		116,290,571	-
COVID-19 Community Services Block Grant	93.569		224,131	-
Community Services Block Grant			10,917,478	457,727
Total ALN 93.569 Community Services Block Grant			11,141,609	457,727

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
U.S. Department of Health and Human Services (continued)				
CCDF Cluster				
COVID-19 Child Care and Development Block Grant	93.575		76,925,332	-
Pass-Through Maryland Family Network		Disc2101MDCDC6	370,161	-
Child Care and Development Block Grant			145,312,210	12,842,612
Pass-Through Maryland Family Network		G1501MDCCDF	254,501	-
Total ALN 93.575 Child Care and Development Block Grant			222,862,204	12,842,612
Child Care Mandatory and Matching Funds of the Child Care and Development Fund	93.596		101,947,320	3,928,097
Total CCDF Cluster			324,809,524	16,770,709
Refugee and Entrant Assistance Discretionary Grants	93.576		14	-
Refugee and Entrant Assistance Wilson/Fish Program	93.583		962,400	-
State Court Improvement Program	93.586		226,780	-
Community-Based Child Abuse Prevention Grants	93.590			
Pass-Through Maryland Family Network		XX01MDFRPG	32,200	-
Chafee Education and Training Vouchers Program (ETV)	93.599		456,083	-
Head Start Cluster				
Head Start	93.600		71,274	26,722
Pass-Through Maryland Family Network		03CH11229 / 03HP000398	666,604	-
Total ALN 93.600 Head Start			737,878	26,722
Total Head Start Cluster			737,878	26,722
Adoption and Legal Guardianship Incentive Payments	93.603		91,273	-
COVID-19 Developmental Disabilities Basic Support and Advocacy Grants	93.630		1,973	-
Developmental Disabilities Basic Support and Advocacy Grants			1,394,691	471,510
Total ALN 93.630 Developmental Disabilities Basic Support and Advocacy Grants			1,396,664	471,510
Children's Justice Grants to States	93.643		247,747	204,418
Stephanie Tubbs Jones Child Welfare Services Program	93.645		4,104,931	-
Child Welfare Research Training or Demonstration	93.648			
Pass-Through The Research Foundation of SUNY		5-92159	24,573	-
Pass-Through The Research Foundation of SUNY		5-95862	35,583	-
Total ALN 93.648 Child Welfare Research Training or Demonstration			60,156	-
Foster Care Title IV-E	93.658		56,201,180	2,598,697
Adoption Assistance	93.659		19,794,942	-
COVID-19 Emergency Grants to Address Mental and Substance Use Disorders During COVID-19	93.665		398,935	398,935
Social Services Block Grant	93.667		52,308,429	-
Child Abuse and Neglect State Grants	93.669		1,228,273	154
Child Abuse and Neglect Discretionary Activities	93.670		324,983	-
Family Violence Prevention and Services/Domestic Violence Shelter and Supportive Services	93.671		3,741,319	3,433,551
John H. Chafee Foster Care Program for Successful Transition to Adulthood	93.674		1,439,714	-
Ending the HIV Epidemic: A Plan for America — Ryan White HIV/AIDS Program Parts A and B	93.686			
Pass-Through Baltimore City Health Department		AD697CMA-F760N-N211S	120,398	-
Pass-Through Baltimore City Health Department		CO#BCHD873	195,045	-
Total ALN 93.686 Ending the HIV Epidemic: A Plan for America — Ryan White HIV/AIDS Program Parts A and B			315,443	-
Maternal Opioid Misuse Model	93.687		382,453	-
Mental and Behavioral Health Education and Training Grants	93.732		1,290,717	26,244
COVID-19 Elder Abuse Prevention Interventions Program	93.747		773,872	-
Elder Abuse Prevention Interventions Program			688,198	
Total ALN 93.747 Elder Abuse Prevention Interventions			1,462,070	-
Children's Health Insurance Program	93.767		330,003,032	1,049,509
Medicaid Cluster				
State Medicaid Fraud Control Units	93.775		4,080,549	-
COVID-19 State Survey and Certification of Health Care Providers and Suppliers (Title XVIII) Medicare	93.777		99,188	-
State Survey and Certification of Health Care Providers and Suppliers (Title XVIII) Medicare			4,892,958	-
Total ALN 93.777 State Survey and Certification of Health Care Providers and Suppliers (Title XVIII) Medicare			4,992,146	-
Medical Assistance Program	93.778		10,692,290,689	45,124,287
Total Medicaid Cluster			10,701,363,384	45,124,287
Opioid STR	93.788		50,036,229	31,532,992
Money Follows the Person Rebalancing Demonstration	93.791		5,388,393	-

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
U.S. Department of Health and Human Services (continued)				
State Survey Certification of Health Care Providers and Suppliers (Title XIX) Medicaid	93.796		2,453,120	-
CARA Act – Comprehensive Addiction and Recovery Act of 2016	93.799		50,000	-
Organized Approaches to Increase Colorectal Cancer Screening	93.800		435,440	367,096
Lung Diseases Research	93.838			
Pass-Through Johns Hopkins University		2005378350	217,015	97,065
Promoting Population Health through Increased Capacity in Alcohol Epidemiology	93.845		50,813	-
National Collaboration to Support Health, Wellness and Academic Success of School-Age Children	93.858		390,495	52,500
Biomedical Research and Research Training	93.859		1,175,123	-
COVID-19 Maternal, Infant and Early Childhood Home Visiting Grant	93.870		896,791	-
Maternal, Infant and Early Childhood Home Visiting Grant			6,990,553	6,346,815
Total ALN 93.870 Maternal, Infant and Early Childhood Home Visiting Grant			7,887,344	6,346,815
Antimicrobial Resistance Surveillance in Retail Food Specimens	93.876		101,486	-
Grants for Primary Care Training and Enhancement	93.884		179,159	-
National Bioterrorism Hospital Preparedness Program	93.889		4,929,268	3,404,840
Cancer Prevention and Control Programs for State, Territorial and Tribal Organizations	93.898		3,206,945	1,936,098
Rural Health Care Services Outreach, Rural Health Network Development and Small Health Care Provider Quality	93.912		165,787	-
Grants to States for Operation of State Offices of Rural Health	93.913		222,993	113,170
COVID-19 HIV Emergency Relief Project Grants	93.914			
Pass-Through Associated Black Charities		H9AHA36919	2,630	-
Pass-Through Connections Thru Life, Inc.		22-2619	63,897	-
Pass-Through Connections Thru Life, Inc.		23-2619-010	11,969	-
HIV Emergency Relief Project Grants				
Pass-Through Associated Black Charities		13-2409	299,421	-
Pass-Through Associated Black Charities		20-2441-006	7,442	-
Pass-Through Associated Black Charities		21-2619	2,985	-
Pass-Through Associated Black Charities		2619-01E	318	-
Pass-Through Associated Black Charities		H89HA00017-28-00	8,866	-
Pass-Through Connections Thru Life, Inc		22-2441	684,930	-
Pass-Through Connections Thru Life, Inc		22-2467	601,273	-
Pass-Through Connections Thru Life, Inc		22-2619	10,725	-
Pass-Through Connections Thru Life, Inc		22-2619-002	121,683	-
Pass-Through Connections Thru Life, Inc		22-2619-004	13,486	-
Pass-Through Connections Thru Life, Inc		22-2619-009	61,789	-
Pass-Through Connections Thru Life, Inc		22-2619-010	23,556	-
Pass-Through Connections Thru Life, Inc		22-2619-016	44,173	-
Pass-Through Connections Thru Life, Inc		22-2619-01A	307,508	-
Pass-Through Connections Thru Life, Inc		22-2619-HR1	41,912	-
Pass-Through Connections Thru Life, Inc		22-2619-NO1	78,257	-
Pass-Through Connections Thru Life, Inc		23-2441	127,579	-
Pass-Through Connections Thru Life, Inc		23-2619-007	413	-
Pass-Through Connections Thru Life, Inc		23-2619-009	5,772	-
Pass-Through Connections Thru Life, Inc		23-2619-016	18,137	-
Pass-Through Connections Thru Life, Inc		Signed on 03/02/2023	79,586	-
Total ALN 93.914 HIV Emergency Relief Project Grants			2,618,307	-
COVID-19 HIV Care Formula Grants	93.917		18,231	-
HIV Care Formula Grants			38,950,225	6,251,444
Pass-Through Baltimore City Health Department		AD697CMA-F760N-N211S	678,454	-
Total ALN 93.917 HIV Care Formula Grants			39,646,910	6,251,444
HIV Prevention Activities Health Department Based	93.940		10,238,319	2,107,604
Pass-Through Baltimore City Health Department		BCHD-711	86,621	-
Pass-Through Baltimore City Health Department		BCHD921	61,006	-
Pass-Through Baltimore City Health Department		CO# BCHD-710	181,836	-
Pass-Through Baltimore City Health Department		CO#39388	8,718	-
Pass-Through Prince Georges County Health Department		AD827IEH	130,457	-
Total ALN 93.940 HIV Prevention Activities Health			10,706,957	2,107,604
Human Immunodeficiency Virus (HIV)/Acquired Immunodeficiency Virus Syndrome (AIDS) Surveillance	93.944		317,947	316,941
Cooperative Agreements to Support State-Based Safe Motherhood and Infant Health Initiative Programs	93.946		312,991	62,328

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
U.S. Department of Health and Human Services (continued)				
COVID-19 Block Grants for Community Mental Health Services	93.958		13,191,261	10,567,824
Block Grants for Community Mental Health Services			14,507,893	14,470,882
Pass-Through Anne Arundel County Mental Health Agency		1B09SM087295-01	67,810	25,000
Pass-Through Washington State Health Care Authority		K5578	35,410	-
Total ALN 93.958 Block Grants for Community Mental			27,802,374	25,063,706
COVID-19 Block Grants for Prevention and Treatment of Substance Abuse	93.959		17,380,603	17,380,603
Block Grants for Prevention and Treatment of Substance Abuse			28,141,117	11,399,452
Total ALN 93.959 Block Grants for Prevention and Treatment of Substance Abuse			45,521,720	28,780,055
Sexually Transmitted Diseases (STD) Prevention and Control Grants	93.977		3,512,975	1,095,103
Preventive Health and Health Services Block Grant	93.991		1,511,514	856,343
Maternal and Child Health Services Block Grant to the States	93.994		10,629,184	3,378,151
COVID-19 Contract/Other	93.999		29,884	-
Contract/Other			3,146,184	-
Pass-Through Johns Hopkins University		2005078529	444,602	270,900
Pass-Through National Association of State Mental Health		SC-3039.1-UMB-01	285,498	-
Pass-Through NY State Conf. of Local Mental Hygiene Directors, Inc.		Task order #7	34,810	-
Pass-Through RTI		Unknown	20,464	-
Pass-Through The Danya Institute, Inc.		SM08785-03	31,087	-
Pass-Through West Virginia Dept of Health and Human Resources		0506-2848	20,853	-
Total ALN 93.999 Contract/Other			4,013,382	270,900
Total U.S. Department of Health and Human Services			**12,944,086,483**	**256,658,013**
Corporation for National and Community Service				
State Commissions	94.003		315,297	315,297
AmeriCorps	94.006		5,792,584	5,792,584
AmeriCorps Commission Investment Fund	94.008		229,097	229,097
Foster Grandparent Cluster				
Foster Grandparent Program	94.011		342,080	-
Total Foster Grandparent Cluster			342,080	-
AmeriCorps September 11th National Day of Service and Remembrance Grants	94.012			
Pass-Through Youth Service America		22010320	3,196	-
Pass-Through Youth Service America		22020838	527	-
Pass-Through Youth Service America		23010365	4,023	-
Total ALN 94.012 AmeriCorps September 11th National Day of Service and Remembrance Grants			7,746	-
Total Corporation for National and Community Service			**6,686,804**	**6,336,978**
Executive Office of the President				
High Intensity Drug Trafficking Areas Program	95.001		6,504,033	-
Total Executive Office of the President			**6,504,033**	**-**
Social Security Administration				
Disability Insurance/SSI Cluster				
Social Security Disability Insurance	96.001		35,372,817	-
Supplemental Security Income	96.006		8,231,201	204,763
Total Disability Insurance/SSI Cluster			43,604,018	204,763
Total Social Security Administration			**43,604,018**	**204,763**
U.S. Department of Homeland Security				
Non-Profit Security Program	97.008		7,802,151	6,952,473
Boating Safety Financial Assistance	97.012		3,373,963	-
Community Assistance Program State Support Services Element (CAP-SSSE)	97.023		137,598	-
Flood Mitigation Assistance	97.029		182,698	169,967
Pass-Through City of Laurel, Maryland		Unknown	33,155	-
Total ALN 97.029 Flood Mitigation Assistance			215,853	169,967
COVID-19 Disaster Grants - Public Assistance (Presidentially Declared Disasters)	97.036		318,049,906	296,964,522
Pass-Through Baltimore City Health Department		BCHDEP823	7,646	-
Disaster Grants - Public Assistance (Presidentially Declared Disasters)			9,121,228	8,952,309
Total ALN 97.036 Disaster Grants - Public Assistance (Presidentially Declared Disasters)			327,178,780	305,916,831
Hazard Mitigation Grant	97.039		2,838,033	1,106,720
National Dam Safety Program	97.041		187,414	-

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
U.S. Department of Homeland Security (continued)				
COVID-19 Emergency Management Performance Grants	97.042		11,283,042	454,049
Emergency Management Performance Grants			5,121,586	2,450,863
Total ALN 97.042 Emergency Management Performance Grants			16,404,628	2,904,912
State Fire Training Systems Grants	97.043		40,000	-
Assistance to Firefighters Grant	97.044		352,322	-
Cooperating Technical Partners	97.045		773,346	-
BRIC: Building Resilient Infrastructure and Communities	97.047		778,412	604,105
Port Security Grant Program	97.056		1,874,675	-
COVID-19 Homeland Security Grant Program	97.067		13,450,342	4,816,775
Pass-Through District of Columbia Government		21UASI603-01	360,892	-
Pass-Through District of Columbia Government		22UASI603-01	378,961	-
Homeland Security Grant Program				
Pass-Through Howard County Government		EMW2019SSSS00064UASI	93,328	-
Pass-Through Howard County Government		EMW2020SS00010UASI	8,039	-
Total ALN 97.067 Homeland Security Grant Program			14,291,562	4,816,775
Rail and Transit Security Grant Program	97.075		181,482	-
Homeland Security Biowatch Program	97.091		3,334	-
Financial Assistance for Targeted Violence and Terrorism Prevention	97.132		76,540	-
Contract/Other	97.999		17,948	-
Total U.S. Department of Homeland Security			**376,528,041**	**322,471,783**
U.S. Agency for International Development				
USAID Foreign Assistance for Programs Overseas	98.001		657,634	-
Pass-Through National Academy of Sciences		2000012545	17,471	-
Total ALN 98.001 USAID Foreign Assistance for Programs Overseas			675,105	-
Contract/Other	98.999			
Pass-Through Chemonics International		72062019D00009/7206 2020F00002	953	-
Pass-Through FHI 360		PO18001685	113,850	-
Total ALN 98.999 Contract/Other			114,803	-
Total U.S. Agency for International Development			**789,908**	**-**
Student Financial Assistance Cluster:				
U.S. Department of Education				
Federal Supplemental Educational Opportunity Grants	84.007		5,930,955	-
Federal Work-Study Program	84.033		6,548,746	-
Federal Perkins Loan Program	84.038		18,156,483	-
Federal Pell Grant Program	84.063		203,945,658	-
Federal Direct Student Loans	84.268		758,456,625	-
Teacl Teacher Education Assistance for College and Higher	84.379		113,766	-
Postsecondary Education Scholarships for Veteran's Dependents	84.408		6,502	-
Total U.S. Department of Education			**993,158,735**	**-**
U.S. Department of Health and Human Services				
Health Professions Student Loans, Including Primary Care Loans/Loans for Disadvantaged Students	93.342		7,337,247	-
Nursing Student Loans	93.364		361,486	-
Total U.S. Department of Health and Human Services			**7,698,733**	**-**
Total Student Financial Assistance Cluster:			**1,000,857,468**	**-**
Research and Development Cluster				
U.S. Department of Agriculture				
Agricultural Research Basic and Applied Research	10.001		4,323,944	-
Pass-Through Arkansas Children's Research Institute		4465MARYLAND	30,783	-
Pass-Through GS1 US, Inc.		22052613	47,181	-
Pass-Through GS1 US, Inc.		22052614	20,750	-
Pass-Through GS1 US, Inc.		22052615	42,794	-
Pass-Through GS1 US, Inc.		22052617	20,750	-
Total ALN 10.001 Agricultural Research Basic and Applied Research			4,486,202	-
Plant and Animal Disease, Pest Control, and Animal Care	10.025		1,544,787	-
Pass-Through University of Delaware		UDR0000160	6,802	-
Total ALN 10.025 Plant and Animal Disease, Pest Control, and Animal Care			1,551,589	-
Wildlife Services	10.028		40,244	-

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
U.S. Department of Agriculture (continued)				
Grants for Agricultural Research, Special Research Grants	10.200		593,341	277,888
Pass-Through Colorado State University		752659	5,939	-
Pass-Through Colorado State University		G5025301	13,645	-
Pass-Through Colorado State University		G9145002	38,013	-
Pass-Through Rutgers The State University of New Jersey		6188NER17BvanEngelsdorp	21	-
Pass-Through University of California - Davis		A22-2056-S001 PO996480	60,363	-
Total ALN 10.200 Grants for Agricultural Research, Special Research Grants			711,322	277,888
Cooperative Forestry Research	10.202		485,321	-
Payments to Agricultural Experiment Stations Under the Hatch Act	10.203		4,443,154	-
Payments to 1890 Land-Grant Colleges and Tuskegee University	10.205		2,169,358	-
Animal Health and Disease Research	10.207		31,148	-
Sustainable Agriculture Research and Education	10.215		2,156	-
Pass-Through Northeast SARE, The University of Vermont		GNE1714831064	48	-
Pass-Through Northeast SARE, The University of Vermont		GNE2023034268	1,621	-
Pass-Through Northeast SARE, The University of Vermont		GNE2125435383	10,067	-
Pass-Through Northeast SARE, The University of Vermont		GNE2126835383	11,850	-
Pass-Through Northeast SARE, The University of Vermont		LNE20406R34268	25,129	-
Pass-Through Northeast SARE, The University of Vermont		LNE20408R34268	53,033	24,118
Pass-Through Northeast SARE, The University of Vermont		LNE22443AWD00000495	24,637	-
Pass-Through Northeast SARE, The University of Vermont		LNE23475RAWD00001024	16,055	-
Pass-Through Northeast SARE, The University of Vermont		ONE2139235383	17,920	-
Pass-Through Northeast SARE, The University of Vermont		ONE2139735383	18,413	-
Pass-Through Northeast SARE, The University of Vermont		SNE22005AWD00000495	7,305	-
Total ALN 10.215 Sustainable Agriculture Research and Education			188,234	24,118
1890 Institution Capacity Building Grants	10.216		1,363,292	272,205
Higher Education - Institution Challenge Grants Program	10.217			
Pass-Through University of California Davis		A211265S001	100,158	-
Biotechnology Risk Assessment Research	10.219		376,096	79,271
Extension Collaborative on Immunization Teaching & Engagement				
Pass-Through Extension Foundation		EXC220212116	78,455	10,198
Agricultural and Rural Economic Research, Cooperative Agreements and Collaborations	10.250		22,234	-
Pass-Through New York University		F222801	36,309	-
Total ALN 10.250 Agricultural and Rural Economic Research, Cooperative Agreements and Collaborations			58,543	-
Consumer Data and Nutrition Research	10.253		23,783	-
Pass-Through Tufts University		AG9033 PO# EP0213337	23,857	-
Total ALN 10.253 Consumer Data and Nutrition Research			47,640	-
Integrated Programs	10.303		143,962	7,722
Homeland Security Agricultural	10.304			
Pass-Through Michigan State University		RC112910L	16,348	-
Pass-Through University of Maine		4321613	6,534	-
Total ALN 10.304 Homeland Security Agricultural			22,882	-
Specialty Crop Research Initiative	10.309		964,038	117,441
Pass-Through North Carolina State University		2017039814	1,594	-
Pass-Through North Carolina State University		2021251802	51,060	-
Pass-Through Pennsylvania State University		S002364USDA	118,111	-
Pass-Through University of Florida		SUB00002391	155,348	-
Total ALN 10.309 Specialty Crop Research Initiative			1,290,151	117,441
Agriculture and Food Research Initiative (AFRI)	10.310		10,566,584	2,903,531
Pass-Through Auburn University		20SFWS205216UM	7,264	-
Pass-Through Auburn University		22AGECON205246UMD	27,873	-
Pass-Through Cornell University		13627720738	41,398	-
Pass-Through Johns Hopkins University		20186700327408	12,919	-
Pass-Through Johns Hopkins University		2004929577	45,468	-
Pass-Through Kansas State University		A200118S001	258,802	-
Pass-Through North Carolina State University		23010385	1,505	-
Pass-Through North Carolina State University		23010386	10,000	-
Pass-Through North Carolina State University		2018053006	358,332	-
Pass-Through Pennsylvania State University		S000183USDA	272,418	-
Pass-Through South Dakota State University		3TD156	64,882	-

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
U.S. Department of Agriculture (continued)				
Agriculture and Food Research Initiative (AFRI) (continued)	10.310			
Pass-Through University of Connecticut		409812	92,706	-
Pass-Through University of Delaware		53286	2,900	-
Pass-Through University of Minnesota		H008051402	7,831	-
Pass-Through University of Wisconsin-Madison		1740	122,103	-
Pass-Through University of Wisconsin-Madison		2630	50,503	-
Pass-Through Virginia Polytechnic Institute and State University		42264619113	514	-
Total ALN 10.310 Agriculture and Food Research Initiative (AFRI)			11,944,002	2,903,531
National Food Safety Training, Education, Extension, Outreach, and Technical Assistance Competitive Grants Program	10.328		80,655	32,137
Crop Protection and Pest Management Competitive Grants Program	10.329		305,936	22,503
Outreach and Assistance for Socially Disadvantaged and Veteran Farmers and Ranchers	10.443		97,441	-
Risk Management Education Partnerships	10.460		5,072	-
Food Safety Cooperative Agreements	10.479		250,351	147,500
Cooperative Extension Service	10.500		1,549,789	-
Pass-Through Northeast Center for Risk Management Education		UDR0000156	21,091	-
Total ALN 10.500 Cooperative Extension Service			1,570,880	-
Expanded Food and Nutrition Education Program	10.514		119,106	-
Rural Health and Safety Education Competitive Grants Program	10.516		157,188	-
Centers of Excellence at 1890 Institutions	10.523		815,229	412,846
Forestry Research	10.652		91,369	-
Cooperative Forestry Assistance	10.664			
Pass-Through Cleveland Metro Parks		21-02-017 PO 20210812	17,025	-
Urban and Community Forestry Program	10.675		10,505	-
International Forestry Programs	10.684		316,130	-
National Agricultural Library	10.700		34,578	-
Research Joint Venture and Cost Reimbursable Agreements	10.707		99,478	-
Community Project Funds - Congressionally Directed Spending	10.723		74,957	-
Grant Program to Establish a Fund for Financing Water and Wastewater Projects	10.864		45,747	-
Soil and Water Conservation	10.902		260,599	1,769
Pass-Through University of Rhode Island		1725140008804010000	49,181	-
Pass-Through University of Rhode Island		1955620009868110	4,275	-
Total ALN 10.902 Soil and Water Conservation			314,055	1,769
Environmental Quality Incentives Program	10.912		281,867	244,215
Pass-Through Indiana University of Pennsylvania		438	72,604	52,861
Pass-Through North Carolina State University		2021103301	177,083	-
Total ALN 10.912 Environmental Quality Incentives Program			531,554	297,076
Conservation Stewardship Program	10.924		73,759	-
Technical Agricultural Assistance	10.960		203,777	-
Research and Development - Department of Agriculture	10.RD			
Pass-Through University of Tennessee		A221403S001	7,562	-
Contract/Other	10.999			
Pass-Through Space Telescope Science Institute		HSTGO15989	6,966	-
Total U.S. Department of Agriculture			**34,761,073**	**4,606,205**
U.S. Department of Commerce				
Integrated Ocean Observing System (IOOS)	11.012		754,137	548,820
Pass-Through Mid-Atlantic Regional Association Coastal Ocean Observing System		UDR0000285	36,172	-
Pass-Through University of Alaska Fairbanks		UAF 15-0070 PO488811	152	-
Total ALN 11.012 Integrated Ocean Observing System (IOOS)			790,461	548,820
Statistical, Research, and Methodology Assistance	11.016			
Pass-Through Boston University		4500003718	203,119	-
Cluster Grants	11.020		281,407	-
Economic Development Technical Assistance	11.303			
Pass-Through Howard University		GRT000157-10006569	13,228	-
COVID-19 Economic Adjustment Assistance	11.307		69,075	8,406
Cooperative Institute (Inter-Agency Funded Activities)	11.405		352,105	52,171

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
U.S. Department of Commerce (continued)				
Sea Grant Support (UMCES)	11.417		2,960,935	1,138,819
Pass-Through The Research Foundation for the State		550117661993511	8,866	-
Total ALN 11.417 Sea Grant Support			2,969,801	1,138,819
Coastal Zone Management Administration Awards	11.419		20,672	-
Coastal Zone Management Estuarine Research Reserves	11.420		89,946	-
Fisheries Development and Utilization Research and Development Grants and Cooperative Agreements Program	11.427		206,555	29,816
Pass-Through Louisiana State University		PO0000182974	743	-
Pass-Through University of California - Davis		A22-3054-S001	29,225	-
Total ALN 11.427 Fisheries Development and Utilization Research and Development Grants and Cooperative Agreements Program			236,523	29,816
Climate and Atmospheric Research	11.431		730,122	-
Pass-Through Rand Corporation		NoCON-000000449	52,784	-
Pass-Through University of Miami		OS00000764 SPC-002017	24,148	-
Total ALN 11.431 Climate and Atmospheric Research			807,054	-
National Oceanic and Atmospheric Administration (NOAA) Cooperative Institutes	11.432		34,988,397	14,952,053
Pass-Through Woods Hole Oceanographic Institute		A101316	62,761	-
Total ALN 11.432 National Oceanic and Atmospheric Administration (NOAA) Cooperative Institutes			35,051,158	14,952,053
Environmental Sciences, Applications, Data, and Education	11.440			
Pass-Through Global Science and Technology Inc.		PSAPROTECH22UMD01	31,998	-
Pass-Through Riverside Technology		PROTECHUOFMDBEA UCHAM	148,201	-
Total ALN 11.440 Environmental Sciences, Applications, Data. and Education			180,199	-
Chesapeake Bay Studies	11.457		400,534	-
Weather and Air Quality Research	11.459		669,962	157,089
Special Oceanic and Atmospheric Projects	11.460		279,891	96,984
Applied Meteorological Research	11.468		12,916	-
Unallied Science Program	11.472			
Pass-Through Rutgers University		#1639 AGREEMENT	36,602	-
Center for Sponsored Coastal Ocean Research Coastal Ocean Program	11.478		334,470	128,909
Pass-Through Louisiana State University		PO-0000032946	64,116	-
Total ALN 11.478 Center for Sponsored Coastal Ocean Research Coastal Ocean Program			398,586	128,909
Educational Partnership Program	11.481		3,057,785	1,697,949
Pass-Through Howard University		000392-10012451 10016731	20,954	-
Pass-Through Howard University		0008971-1000086022	12,238	-
Pass-Through Howard University		0008971-97283/9936-	57,855	-
Pass-Through Howard University		89711000070197	43,090	-
Pass-Through Howard University		89711000093532	11,436	-
Pass-Through Howard University		8971-66110/9935-	2,704	-
Pass-Through Howard University		8971-93530/9636-93531	22,218	-
Pass-Through Research Foundation of CUNY		CM00002163-00	6,603	-
Pass-Through Research Foundation of CUNY		CM00004250-00	17,195	-
Pass-Through Research Foundation of CUNY		CM00005530-00	18,097	-
Pass-Through Research Foundation of CUNY		CM00005750-00	69,346	-
Pass-Through Research Foundation of CUNY		CM00009699-00	33,811	-
Total ALN 11.481 Educational Partnership Program			3,373,332	1,697,949
Coral Reef Conservation Program	11.482			
Pass-Through National Fish & Wildlife Foundation		61013	2	-
Measurement and Engineering Research and Standards	11.609		15,253,171	221,865
Technology Innovation Program (TIP)	11.616			
Pass-Through Prometheus Computing		S8134109CQ0044	122,868	-
COVID-19 Arrangements for Interdisciplinary Research Infrastructure	11.619			
Pass-Through The National Institute for Innovation in Manufacturing Biopharmaceuticals		70NANB21H085	325,576	-
Arrangements for Interdisciplinary Research Infrastructure				
Pass-Through National Cybersecurity Center of Excellence		1161922	5,000	-
Pass-Through University of Delaware		UDR0000051ARP24	254,315	-
Total ALN 11.619 Arrangements for Interdisciplinary Research Infrastructure			584,891	-

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
U.S. Department of Commerce (continued)				
Science, Technology, Business and/or Education Outreach	11.620		113,176	-
Research and Development - Department of Commerce	11.RD			
Pass-Through National Cybersecurity Center of Excellence		1165271	2,434	-
Contract/Other	11.999		22,290	-
Pass-Through Georgia Tech		FA8075-18-D-0008 (BOA146) FA8	49,350	-
Pass-Through Texas A&M University		SA07432118	131,859	-
Total ALN 11.999 Contract/Other			203,499	-
Total U.S. Department of Commerce			**62,516,612**	**19,032,881**
U.S. Department of Defense				
Community Economic Adjustment Assistance for Responding to Threats to the Resilience of a Military Installation	12.003			
Pass-Through Charles County Government		OLDCCUNIVERSITYO FMD001	28,509	-
Military Health Services Research (MHSR)	12.007		225,971	78,714
Collaborative Research and Development	12.114		375,379	-
Pass-Through Engineering, Science and Technology INC		W912HQ20C0021	120,969	-
Pass-Through Engineering, Science and Technology INC		W912HQ23C0032	6,987	-
Total ALN 12.114 Collaborative Research and Development			503,335	-
Commercial Technologies for Maintenance Activities Program	12.225			
Pass-Through National Center for Manufacturing Sciences Inc.		2022138-142232	149,091	-
Basic and Applied Scientific Research	12.300		10,614,722	694,656
Pass-Through Brandeis University		GR404182	1,759	-
Pass-Through Energetics Technology Center		2500001	62,042	-
Pass-Through Energetics Technology Center		2230002	308,491	-
Pass-Through Energetics Technology Center		2500001	313,857	-
Pass-Through George Mason University		E2045222	239,727	-
Pass-Through Indiana University		8718-UMB	51,913	-
Pass-Through Johns Hopkins University		2005869237	65,049	-
Pass-Through Johns Hopkins University Applied Physics		188435911	69,553	-
Pass-Through Johns Hopkins University Applied Physics		Signed on 10/14/2022	14,518	-
Pass-Through RF SUNY Stony Brook University		86059/2/1156876	209,426	-
Pass-Through Rice University		R1A771	54,021	-
Pass-Through Rice University		R1A844	87,567	-
Pass-Through Texas A & M University		M2202551	62,957	-
Pass-Through The Regents Of The University of Colorado - Boulder		1562480	4,876	-
Pass-Through Universita' degli Studi di Padova		N00014-20-1-2579	13,663	-
Pass-Through University of Illinois at Urbana-Champaign		9996317890	130,110	-
Pass-Through University of Minnesota		A008174602	414,116	-
Pass-Through University of Pennsylvania		3885221	162,703	-
Pass-Through University of Southern California		115239289	3,181	-
Pass-Through University of Southern California		SCON00003987	123,628	-
Pass-Through University of Virginia		GR014955SUB00000734	108,000	-
Total ALN 12.300 Basic and Applied Scientific Research			13,115,879	694,656
Naval Medical Research and Development	12.340			
Pass-Through Henry M. Jackson Foundation		5467 HJF#66062	47,558	-
Department of Defense HIV/AIDS Prevention Program	12.350			
Pass-Through Battelle Memorial Institute		861736	81,816	-
Pass-Through Intelligent Automation Inc.		25681	314	-
Total ALN 12.350 Department of Defense HIV/AIDS Prevention Program			82,130	-
Scientific Research - Combating Weapons of Mass Destruction	12.351		556,254	94,357
Pass-Through Johns Hopkins University		SB1341-14-CQ-0010	40,066	-
Pass-Through Virginia Polytechnic Institute and State University		45082619113	71,716	-
Pass-Through West Virginia University		20-658-UMD	189,444	-
Total ALN 12.351 Scientific Research - Combating Weapons of Mass Destruction			857,480	94,357
Research on Chemical and Biological Defense	12.360			
Pass-Through University of Massachusetts Lowell		S513147977AT1P2	17,200	-
COVID-19 Military Medical Research and Development	12.420			
Pass-Through Henry M. Jackson Foundation		HJF AWARD #65543 SUB#5315	19,460	-

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
U.S. Department of Defense (continued)				
Military Medical Research and Development	12.420		8,713,307	1,695,669
Total ALN 12.420 Military Medical Research and Development			8,732,767	1,695,669
Military Medical Research and Development				
Pass-Through 3DFlexible Inc.		18092682	52,473	-
Pass-Through 3DFlexible Inc.		21095016	48,819	-
Pass-Through Advanced Rotorcraft Technology Inc.		210322001	248,379	-
Pass-Through Advanced Technology International		2021435	745,957	-
Pass-Through Cornerstone Research Group, Inc.		20210909	69,301	-
Pass-Through CREARE LLC		90058	14	-
Pass-Through Denver Health and Hospital Authority		FY20.794.002	33,361	-
Pass-Through General Technical Services LLC		PO0000829	142,453	-
Pass-Through Geneva Foundation		S1103202	14,718	-
Pass-Through Henry M. Jackson Foundation		5127	19,823	-
Pass-Through Henry M. Jackson Foundation for the Advancement of Military Medicine		5294 & AJH award:65543	511,501	-
Pass-Through Johns Hopkins Bloomberg School of Public Health		2001205111	1,418	-
Pass-Through Johns Hopkins Bloomberg School of Public Health		2003522951	821	-
Pass-Through Johns Hopkins University		2003522951	3,715	-
Pass-Through Johns Hopkins University		2004234372	3,660	-
Pass-Through Johns Hopkins University		2004307154	662	-
Pass-Through Johns Hopkins University		2005708985	41,811	-
Pass-Through Johns Hopkins University Homewood Division		2004178171	454	-
Pass-Through Medcura		PO2021069	57,474	-
Pass-Through National Center For Manufacturing Sciences		202096	53,204	-
Pass-Through National Center for the Advancement of STEM Education		P00023	15,339	-
Pass-Through National Trauma Institute		CNTR20-PROP-02	31,118	-
Pass-Through Patient-Centered Outcomes Research Institute		PCS-1609-36512	2,012,106	1,350,482
Pass-Through The University of Texas Medical Branch at Galveston		198474501	101,028	-
Pass-Through University of Colorado Denver		FY21.645.006	4,300	-
Pass-Through University of Pittsburgh		CNVA00056666(413614-23)	4,576	-
Pass-Through University of Virginia		AWD-004167.GR101190	6,998	-
Pass-Through Upstate formally University of New York Buffalo		1164069 -89354	7,602	-
Pass-Through Upstate formally University of New York Buffalo		1164069-89354	18,074	-
Total ALN 12.420 Military Medical Research and Development			21,716,693	4,741,820
Basic Scientific Research	12.431		27,613,700	9,611,587
Pass-Through Energetics Technology Center		313	408,442	-
Pass-Through Fairleigh Dickinson University		ARI22001	46,769	-
Pass-Through Harvard University		1340625120002	32,182	-
Pass-Through International Computer Science Institute		279001	121,057	-
Pass-Through Princeton University		SUB0000082	42,552	-
Pass-Through Purdue University		13001259055	107,741	-
Pass-Through University of South Florida		1255117500A	45,408	-
Pass-Through Virginia Polytechnic Institute and State University		45048419113	171,133	-
Pass-Through Worcester Polytechnic Institute		11327GR	69,045	-
Total ALN 12.431 Basic Scientific Research			28,658,029	9,611,587
DOD, NDEP, DOTC-STEM Education Outreach Implementation	12.560		184,539	-
Centers for Academic Excellence	12.598		1,651,554	357,394
Basic, Applied, and Advanced Research in Science and Engineering	12.630		4,021,483	694,429
Past Conflict Accounting	12.740			
Pass-Through Henry M. Jackson Foundation		1039858	54,113	-
Uniformed Services University Medical Research Projects	12.750			
Pass-Through Henry M. Jackson Foundation		2938PO843490	825	-
Pass-Through Henry M. Jackson Foundation		AANA	190,292	-
Pass-Through Henry M. Jackson Foundation		5882 / PO 1038401	42,932	-
Pass-Through Henry M. Jackson Foundation		5920	197,010	-
Total ALN 12.750 Uniformed Services University Medical Research Projects			431,059	-

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
U.S. Department of Defense (continued)				
Air Force Defense Research Sciences Program	12.800		8,939,211	439,831
Pass-Through Battelle Memorial Institute		854515	102,570	-
Pass-Through California Institute of Technology		S395090	320,253	-
Pass-Through Florida International University		736	6,635	-
Pass-Through Harvard University		1304275114552	61,492	-
Pass-Through Innoveering LLC		19010291	7,723	-
Pass-Through Innoveering LLC		19010291	8,889	-
Pass-Through Lehigh University		54481478001	79	-
Pass-Through National Institute of Aerospace		X20801008UMD	83,101	-
Pass-Through Pennsylvania State University		S003167AFOSR	346,375	-
Pass-Through Stanford Research Institute		62455254159327	193,412	-
Pass-Through Stevens Institute of Technology		210286601	41,073	-
Pass-Through The Regents Of The University of Colorado		1553898	562	-
Pass-Through The Regents Of The University of Colorado		1558269	2,853	-
Pass-Through Tulane University		TULSCC5567351819	4,204	-
Pass-Through University at Buffalo/SUNY Research Foundation		R1316433	53,365	-
Pass-Through University of California Los Angeles		1010GWA357	405,925	-
Pass-Through University of Chicago		AWD100482SUB00000154	166,134	-
Pass-Through University of Chicago		AWD102104	283,356	-
Pass-Through University of Colorado at Boulder		1560746 PO 1001542000	179,159	-
Pass-Through University of Illinois at Urbana-Champaign		10879118932	134,949	-
Pass-Through University of Illinois-Urbana/Champaign		092135-17077	34,161	-
Pass-Through University of Kentucky		7800006381	194,847	-
Pass-Through University of New Mexico		271704871D	200,802	-
Total ALN 12.800 Air Force Defense Research Sciences Program			11,771,130	439,831
Mathematical Sciences Grants	12.901		665,931	-
Information Security Grants	12.902		24,362	-
GenCyber Grants Program	12.903		35,947	-
Cybersecurity Core Curriculum	12.905		239,577	-
Research and Technology Development	12.910		8,308,687	1,174,789
Pass-Through CoolCAD Electronics		21010173	34,616	-
Pass-Through GenXComm		GXC1136024FP01	181,850	-
Pass-Through Intelligent Fiber Optic Systems Corporation		20126974	38,514	-
Pass-Through Johns Hopkins University		2004686792	69,808	-
Pass-Through Northwestern University		60064652 UMBC	404,442	-
Pass-Through Raytheon BBN Technologies		LBN9512897	829	-
Pass-Through The Regents Of The University of Colorado		1559925	68,516	-
Pass-Through University of California Los Angeles		0145GYA136	167,352	-
Pass-Through University of Michigan		SUBK00015720 3007285544	79,095	-
Total ALN 12.910 Research and Technology Development			9,353,709	1,174,789
COVID-19 Research and Technology Development	12.RD		304,675	79,160
Research and Development - Department of Defense			61,883,160	8,596,314
Pass-Through Advanced Rotorcraft Technology Inc.		211028001	184,344	-
Pass-Through Advanced Systems & Technologies Inc.		UMD21001	104,076	-
Pass-Through Advanced Systems & Technologies Inc.		UMDNAV050021	204,964	-
Pass-Through Alion Science and Technology		SCF1164207	186,523	-
Pass-Through AlphaSTAR		0701202101LF	102,553	-
Pass-Through Altius Space Machines, Inc.		22083605	69,867	-
Pass-Through Applied Research Associates		S-D00154.00006-03-UMB	88,741	-
Pass-Through Booz Allen and Hamilton Inc.		A8264	636,388	38,494
Pass-Through Booz Allen and Hamilton Inc.		S900659BAH	480	-
Pass-Through Carbon Solutions		21020672	552	-
Pass-Through Carnegie Mellon University		2000147SUB000	79,001	79,001
Pass-Through Coalition for National Trauma Research		CNTR20-HUMA-04	1,890	-
Pass-Through CREARE LLC		S772	36,976	-
Pass-Through CREARE LLC		S796	64,354	-
Pass-Through Durham University		18102894	2,304	-
Pass-Through Dymenso		211025	173,351	-
Pass-Through George Washington University		22SC08	142,321	-
Pass-Through Griffiss Institute		SA10032021030333	3,412	-

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
U.S. Department of Defense (continued)				
Research and Development - Department of Defense (continued)	12.RD			
Pass-Through Haima Therapeutics LLC		W81XWH20C0144. Signed 09.08.21	384,009	-
Pass-Through Humacyte		CLN-PRO-V005	24,966	-
Pass-Through Intelligent Automation Inc.		24221	33	-
Pass-Through Johns Hopkins University		2005907413	333,073	-
Pass-Through Johns Hopkins University Applied Physics Laboratory		158224	198	-
Pass-Through Johns Hopkins University Applied Physics Laboratory		173008	97,399	-
Pass-Through Logistics Management Institute		PO2100638	165,729	-
Pass-Through Maryland Development Center, LLC		S-090920-CP9 DARPA PHII	25,206	-
Pass-Through Microlink Devices Inc.		21063050	55,868	-
Pass-Through Modular Matter		22105183	48,022	-
Pass-Through North Carolina State University		2021115618	8,811	-
Pass-Through Northrop Grumman Corporation		5300002451	11	-
Pass-Through Northrop Grumman Corporation		5300009791	19,664	-
Pass-Through Northrop Grumman Newport News		P000036812	10,657	-
Pass-Through Potomac Research LLC		21126961	188,695	-
Pass-Through Saft America Inc.		PO0358172021SAFT0063	1,097,659	-
Pass-Through Smart Information Flow Technologies		HIDEHOUMD01	65,000	-
Pass-Through Smart Information Flow Technologies		HIDEHOUMD02	33,990	-
Pass-Through Solid Power		SCSP72101	196,452	-
Pass-Through SRI International		55026	88,450	-
Pass-Through SRI International		PO49198	507,617	-
Pass-Through Steel Founders' Society of America Inc.		SPI007	99,091	-
Pass-Through Stevens Institute of Technology		210325707	280,004	-
Pass-Through SunFire Biotechnologies LLC		W81XWH22C0016	6,690	-
Pass-Through Henry M Jackson Foundation for the Advancement of Military Medicine		CON000581 PO1036657	26,032	-
Pass-Through Universal Engineering Sciences Inc		S119005010	50,000	-
Pass-Through University of Florida		SUB00001656	2,213	-
Pass-Through University of Miami		SPC-001359	8,927	-
Pass-Through University of Northern Iowa		S6435B	184,241	-
Pass-Through University of Pennsylvania		578017	127,374	-
Pass-Through Vivacelle Bio, Inc		VBI-S-01	24,042	-
Total ALN 12.RD Research and Development - Department of Defense			68,430,055	8,792,969
Contract/Other	12.999		145,689	-
Pass-Through Johns Hopkins Applied Physics Lab		Unknown	39,996	-
Pass-Through Johns Hopkins Applied Physics Lab		181555 AND 181554	5,801	-
Pass-Through Texas A&M University		Unknown	2,918	-
Total ALN 12.999 Contract/Other			48,715	-
Total U.S. Department of Defense			**153,726,971**	**24,984,877**
U.S. Department of Housing and Urban Development				
General Research and Technology Activity	14.506			
Pass-Through Howard University		GRT000157-10006726	15,169	-
Pass-Through Howard University		GRT00015710007164	121,257	-
Total ALN 14.506 General Research and Technology Activity			136,426	-
Research and Evaluations, Demonstrations, and Data Analysis and Utilization	14.536			
Pass-Through University of Idaho		CB5274-897886	30,204	-
Total U.S. Department of Housing and Urban Development			**166,630**	**-**
U.S. Department of the Interior				
Safety and Environmental Research and Data Collection for Offshore Energy and Mineral Activities	15.441			
Pass-Through Texas A&M University		M2102643	49,304	-
Water Desalination Research and Development	15.506			
Pass-Through City of Westminster		0001	63,299	-
Fish and Wildlife Management Assistance	15.608		36,542	28,950
Pass-Through San Francisco State University		S17-0006	44,964	-
Total ALN 15.608 Fish and Wildlife Management Assistance			81,506	28,950

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
U.S. Department of the Interior (continued)				
Coastal	15.630		167,318	-
Migratory Bird Joint Ventures	15.637		25,940	12,912
Great Lakes Restoration	15.662		30,689	-
NFWF-USFWS Conservation Partnership	15.663			
Pass-Through Future Harvest - Chesapeake Alliance for Sustainable Agriculture		72368	41,745	-
Cooperative Ecosystem Studies Units	15.678		157,399	-
Assistance to State Water Resources Research Institutes	15.805		45,846	17,437
Earthquake Hazards Program Assistance	15.807		80,835	-
U.S. Geological Survey Research and Data Collection	15.808		589,669	-
Pass-Through Cooperative Ecosystem Studies Units		G14AC00072	25,548	-
Total ALN 15.808 U.S. Geological Survey Research and Data Collection			615,217	-
National Land Remote Sensing Education Outreach and Research	15.815			
Pass-Through America View		G18AP00077	17,578	-
Cooperative Research and Training Programs – Resources of the National Park System	15.945		201,547	675
Pass-Through Chesapeake Watershed Cooperative Ecosystem Studies		P20AC00806	20,242	-
Pass-Through Cooperative Ecosystem Studies Units		P17AC01034	189,826	-
Total ALN 15.945 Cooperative Research and Training Programs – Resources of the National Park System			411,615	675
National Park Service Conservation, Protection, Outreach, and Education	15.954			
Pass-Through National Writing Project		P18AC1307	3,410	-
Research and Development - Department of the Interior	15.RD		292,231	128,817
Total U.S. Department of the Interior			**2,083,932**	**188,791**
U.S. Department of Justice				
OVW Research and Evaluation Program	16.026		52,748	23,955
Services for Trafficking Victims	16.320		96,791	17,313
National Institute of Justice Research, Evaluation, and Development Project Grants	16.560		1,495,071	544,544
Pass-Through Pennsylvania State University		S000482NIJ	46,585	-
Pass-Through Rutgers, the State University of New Jersey		1573	288,336	-
Pass-Through University of Pittsburgh		CNVA00059288 (413841-3)	315,665	-
Total ALN 16.560 National Institute of Justice Research, Evaluation, and Development Project Grants			2,145,657	544,544
Criminal Justice Research and Development Graduate Research Fellowships	16.562		368,306	365,453
State and Local Anti-Terrorism Training	16.614			
Pass-Through Institute For Intergovernmental Research		2023NSI001	26,337	-
Edward Byrne Memorial Justice Assistance Grant Program	16.738			
Pass-Through National Criminal Justice Association		2016DPBXK002	24,750	-
Pass-Through Salisbury Police Department		22031215	96,251	-
Pass-Through Salisbury Police Department		23041759	10,197	-
Total ALN 16.738 Edward Byrne Memorial Justice Assistance Grant Program			131,198	-
Economic, High-Tech, and Cyber Crime Prevention	16.752		221,326	-
Second Chance Act Reentry Initiative	16.812			
Pass-Through Baltimore Police Department		15PBJA-22-GG-00039-BRND	105,085	-
Pass-Through Mayor's Office of Neighborhood Safety and Engagement		UMB 51543	170,571	-
Total ALN 16.812 Second Chance Act Reentry Initiative			275,656	-
Byrne Criminal Justice Innovation Program	16.817			
Pass-Through Greater Baybrook Alliance		21010299	10,783	-
Total U.S. Department of Justice			**3,328,802**	**951,265**
U.S. Department of Labor				
WIOA Dislocated Worker National Reserve Demonstration Grants	17.280		138,532	-
Total U.S. Department of Labor			**138,532**	**-**

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
U.S. Department of State				
Conflict and Stabilization Operations	19.121		70,952	-
International Programs to Support Democracy, Human Rights and Labor	19.345			
Pass-Through Center for the Cultivation of Technology		21031597	90,773	-
Pass-Through Internews Network		SGRINXZ21132FD101	150,000	-
Pass-Through Psiphon		21031594	74,979	-
Total ALN 19.345 International Programs to Support Democracy, Human Rights and Labor			315,752	-
Trans-National Crime	19.705		461,604	181,362
Total U.S. Department of State			**848,308**	**181,362**
U.S. Department of Transportation				
Aviation Research Grants	20.108		190,774	-
Air Transportation Centers of Excellence	20.109		852,864	756,725
Highway Research and Development Program	20.200		799,521	-
Pass-Through Delaware Department of Transportation		1840	2,401,657	2,088,097
Pass-Through Metropolitan Washington Council of Governments		21058	309,050	85,867
Total ALN 20.200 Highway Research and Development Program			3,510,228	2,173,964
Highway Planning and Construction	20.205		2,812,943	292,347
Pass-Through Illinois Department of Transportation		0114940719001000	524,126	18,500
Pass-Through Michigan State University		RC113216UMD	93,273	-
Total ALN 20.205 Highway Planning and Construction			3,430,342	310,847
Highway Training and Education	20.215		20,847	-
Transportation Infrastructure Finance and Innovation Act (TIFIA) Program	20.223			
Pass-Through Transportation and Development Louisiana		202SSDOTLT1000347	352,838	-
Motor Carrier Safety Assistance High Priority Activities Grants and Cooperative Agreements	20.237		342,916	-
Railroad Research and Development	20.313		115,583	-
Federal Transit Capital Investment Grants	20.500		37,235	-
Public Transportation Innovation	20.530		430,002	-
University Transportation Centers Program	20.701		1,384,462	592,327
PHMSA Pipeline Safety Research and Development "Other Transaction Agreements"	20.723			
Pass-Through Institute of Gas Technology		S1105	131,306	-
Pass-Through Virginia Department of Transportation		121564	216,269	-
Total ALN 20.723 PHMSA Pipeline Safety Research and Development "Other Transaction Agreements"			347,575	-
Great Ships Initiative	20.818		223,769	143,641
Ballast Water Treatment Technologies	20.819		3,600	-
COVID-19 Research and Development - Department of Transportatio	20.RD		275,103	-
Research and Development - Department of Transportation			4,818,381	1,465,611
Pass-Through Amer. Assoc. of State Highway and Transp. Officials		180053	1,893,839	131,250
Pass-Through Amer. Assoc. of State Highway and Transp. Officials		AS220068	37,585	-
Pass-Through Battelle Memorial Institute		US0010000802593	88,328	-
Pass-Through Illinois Department of Transportation		23UOFMCATTLAB	64,892	-
Pass-Through Oregon Department of Transportation		33855	3,716	-
Pass-Through Pennsylvania Department of Transportation		BOMOUMDIGA2013	931,532	-
Total ALN 20.RD Research and Development - Department of Transportation			8,113,376	1,596,861
Total U.S. Department of Transportation			**19,356,411**	**5,574,365**
U.S. Department of the Treasury				
COVID-19 Coronavirus State And Local Fiscal Recovery Funds	21.027			
Pass-Through City of Baltimore		SLFRP1967	128,245	-
Pass-Through University of North Carolina at Chapel Hill		5124453	219,105	-
Total ALN 21.027 Coronavirus State And Local Fiscal Recovery Funds			347,350	-
Research and Development - U.S. Department of the Treasury	21.RD		13,428	-
Total U.S. Department of the Treasury			**360,778**	**-**

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
Appalachian Regional Commission				
Appalachian Development Highway System	23.003		81,934	-
Total Appalachian Regional Commission			**81,934**	**-**
General Services Administration				
Disposal of Federal Surplus Real Property	39.002			
Pass-Through Battelle Memorial Institute		US0010000784152	303	-
Total General Services Administration			**303**	**-**
Library of Congress				
Research and Development - Library of Congress	42.RD		47,698	-
Total Library of Congress			**47,698**	**-**
National Aeronautics and Space Administration				
Science	43.001		73,889,392	13,768,228
Pass-Through American University		31569A200109S01	51,677	-
Pass-Through Arizona State University		ASUB00001200	18,834	-
Pass-Through Bay Area Environmental Research Institute		AGRMNT DTD	8,713	-
Pass-Through Baylor University		10288201	30,114	-
Pass-Through Boston University		4500003544	29,653	-
Pass-Through Boston University		4500004069	30,776	-
Pass-Through Brookhaven National Laboratory		416425	20,901	-
Pass-Through Catholic University of America		362676 Sub 1	103,979	-
Pass-Through Catholic University of America		363990 Sub 1	3,058,182	-
Pass-Through City College of New York		CM00001813-00	30,985	-
Pass-Through Columbia University		1(GG015558)	148,808	-
Pass-Through Cornell University		13610520745	2,619	-
Pass-Through Dartmouth College		R1557	62,392	-
Pass-Through DePaul University		501732SG2240	27,647	-
Pass-Through Eco Health Alliance		07-298-7096-52366	55,267	-
Pass-Through Howard University		GRT000116100002785 10008569	30,688	-
Pass-Through James Madison University		S21-024-01 Dept. 529172	630	-
Pass-Through Jet Propulsion Laboratory		1364443	49,576	-
Pass-Through Jet Propulsion Laboratory		1659140	5,526	-
Pass-Through Jet Propulsion Laboratory		1659235	1,418	-
Pass-Through Jet Propulsion Laboratory		1675450	22,702	-
Pass-Through Jet Propulsion Laboratory - NASA/CalTech		1572518	3,752	-
Pass-Through Jet Propulsion Laboratory - NASA/CalTech		1586741	114	-
Pass-Through Jet Propulsion Laboratory - NASA/CalTech		1626757	947	-
Pass-Through Jet Propulsion Laboratory - NASA/CalTech		1653426	4,995	-
Pass-Through Jet Propulsion Laboratory - NASA/CalTech		1653861	6,094	-
Pass-Through Jet Propulsion Laboratory - NASA/CalTech		1669907	874,058	-
Pass-Through Jet Propulsion Laboratory - NASA/CalTech		1670351	27,498	-
Pass-Through Jet Propulsion Laboratory - NASA/CalTech		1672922	150,488	-
Pass-Through Johns Hopkins Applied Physics Laboratory		161465	23,310	-
Pass-Through Johns Hopkins University		2004694298	135,909	-
Pass-Through Johns Hopkins University		2004923658	73,976	-
Pass-Through Johns Hopkins University Applied Physics Laboratory		159253	52,628	-
Pass-Through Johns Hopkins University Applied Physics Laboratory		159785	7,994	-
Pass-Through Johns Hopkins University Applied Physics Laboratory		170869	8,724	-
Pass-Through Johns Hopkins University Applied Physics Laboratory		173220	459,254	-
Pass-Through Johns Hopkins University Applied Physics Laboratory		173370	42,499	-
Pass-Through Lowell Observatory		202181211	18,148	-
Pass-Through Montana Space Grant Consortium		G12023W9649	79,164	-
Pass-Through Nanohmics Inc.		21010408	35,160	-
Pass-Through Nanohmics Inc.		NAN1773	1,984	-
Pass-Through National Center for Atmospheric Research		SUBAWD002078	46,847	-
Pass-Through National Radio Astronomy Observatory		PO367446	45	-
Pass-Through Olin College of Engineering		80NSSC19K1585UMD1	19,336	-
Pass-Through Oregon State University		NS299A-B	146	-
Pass-Through Pennsylvania State University		S000850NASA	95,752	-
Pass-Through Planetary Science Institute		1637UMD	80,227	-

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
National Aeronautics and Space Administration (continued)				
Science (continued)	43.001			
Pass-Through Planetary Science Institute		1641UMD	23,035	-
Pass-Through Planetary Science Institute		1754UMD	43,322	-
Pass-Through Science Systems & Application, Inc.		21702-22-030	212,097	-
Pass-Through Science Systems and Applications Inc.		2220322001	26,281	-
Pass-Through Smithsonian Astrophysical Observatory		GO0-21006B	17,920	-
Pass-Through Smithsonian Astrophysical Observatory		GO0-21023A	25,132	-
Pass-Through Smithsonian Astrophysical Observatory		GO0-21076B	8,387	-
Pass-Through Smithsonian Astrophysical Observatory		GO1-22079X	9,224	-
Pass-Through Smithsonian Astrophysical Observatory		GO1-22111B	3,562	-
Pass-Through Smithsonian Astrophysical Observatory		GO2-23011A	7,085	-
Pass-Through Smithsonian Astrophysical Observatory		GO2-23018A	792	-
Pass-Through Smithsonian Astrophysical Observatory		GO2-23091X	18,529	-
Pass-Through Smithsonian Astrophysical Observatory		GO9-20022A	11,807	-
Pass-Through Smithsonian Astrophysical Observatory		SV3-83018	118,883	-
Pass-Through Southwest Research Institute		Q99095NS	26,786	-
Pass-Through Space Telescope Science Institute		HST-GO-14671.001-A	56,344	-
Pass-Through Space Telescope Science Institute		HST-GO-15129.007-A	2,979	-
Pass-Through Space Telescope Science Institute		HST-GO-15833.012-A	456	-
Pass-Through Space Telescope Science Institute		HST-GO-15889.035-A	5,940	-
Pass-Through Space Telescope Science Institute		HST-GO-16448.001-A	505	-
Pass-Through Space Telescope Science Institute		HSTAR16135001A	576	-
Pass-Through Space Telescope Science Institute		HSTGO15357006A	14,120	-
Pass-Through Space Telescope Science Institute		HSTGO15915002A	11,842	-
Pass-Through Space Telescope Science Institute		HSTGO15965003A	16,586	-
Pass-Through Space Telescope Science Institute		HSTGO15978006A	29,983	-
Pass-Through Space Telescope Science Institute		HSTGO16044003A	17,207	-
Pass-Through Space Telescope Science Institute		HSTGO16067001A	8,711	-
Pass-Through Space Telescope Science Institute		HSTGO16089001A	8,762	-
Pass-Through Space Telescope Science Institute		HSTGO16698001A	14,913	-
Pass-Through Space Telescope Science Institute		HSTGO16701007A	17,293	-
Pass-Through Space Telescope Science Institute		HSTGO17081001A	535	-
Pass-Through Space Telescope Science Institute		HSTGO17192002A	6,603	-
Pass-Through Space Telescope Science Institute		HSTGO17192013A	815	-
Pass-Through Space Telescope Science Institute		JWST-GO-01726.002-A	16,867	-
Pass-Through Space Telescope Science Institute		JWSTAR01557001A	4,191	-
Pass-Through Space Telescope Science Institute		JWSTAR02037001A	16,657	-
Pass-Through Space Telescope Science Institute		JWSTGO01556001A	2,471	-
Pass-Through Space Telescope Science Institute		JWSTGO01566002A	3,100	-
Pass-Through Space Telescope Science Institute		JWSTGO01633001A	2,777	-
Pass-Through Space Telescope Science Institute		JWSTGO01701001A	8,883	-
Pass-Through Space Telescope Science Institute		JWSTGO01803002A	12,509	-
Pass-Through Space Telescope Science Institute		JWSTGO01908017A	50,093	-
Pass-Through Space Telescope Science Institute		JWSTGO02107008A	505	-
Pass-Through Space Telescope Science Institute		JWSTGO02127001A	4,614	-
Pass-Through Space Telescope Science Institute		JWSTGO02158013A	1,291	-
Pass-Through Space Telescope Science Institute		JWSTGO02180010A	505	-
Pass-Through Space Telescope Science Institute		JWSTGO02416005A	3,739	-
Pass-Through Space Telescope Science Institute		JWSTGO02547001A	3,399	-
Pass-Through Spectral Sciences Incorporated		34670014794	48	-
Pass-Through Texas Tech University		21M001	30,737	-
Pass-Through The Catholic University of America		363991SUB1	1,796,334	-
Pass-Through The Regents Of The University of Colorado		1558034	3,768	-
Pass-Through The Regents Of The University of Colorado		1558713	15,781	-
Pass-Through The Regents Of The University of Colorado		1559618	3,288	-
Pass-Through Universities Space Research Association		579701	14,371	-
Pass-Through Universities Space Research Association		70063	292	-
Pass-Through Universities Space Research Association		80066	41,352	-
Pass-Through Universities Space Research Association		80136	96,740	-
Pass-Through Universities Space Research Association		80238	49,689	-
Pass-Through Universities Space Research Association		90070	7,922	-
Pass-Through Universities Space Research Association		90076	4,455	-
Pass-Through Universities Space Research Association		90078	6,577	-

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
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Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
National Aeronautics and Space Administration (continued)				
Science (continued)	43.001			
Pass-Through Universities Space Research Association		90107	44,643	-
Pass-Through Universities Space Research Association		90143	2,291	-
Pass-Through Universities Space Research Association		90197	24,700	-
Pass-Through Universities Space Research Association		SOF060173	282	-
Pass-Through Universities Space Research Association		SOF070077	199,859	-
Pass-Through Universities Space Research Association		SOF070126	3,342	-
Pass-Through University Corporation for Atmospheric Research		SUBAWD002077 PO2012678	45,387	-
Pass-Through University of Alabama, Tuscaloosa		A21-0187-S002	73,930	-
Pass-Through University of Alaska-Fairbanks		UA210038	37,301	-
Pass-Through University of Arizona		409534	898	-
Pass-Through University of Arizona		491741	24,434	-
Pass-Through University of Arizona		531782	181	-
Pass-Through University of Arizona, Board of Regents		673605	5,329	-
Pass-Through University of California Berkeley		10129	112,621	-
Pass-Through University of California Berkeley		10937	131,202	-
Pass-Through University of California Berkeley		7550	310,553	-
Pass-Through University of Central Florida		GR1072631	1,116	-
Pass-Through University of Florida		SUB00002270	31,692	-
Pass-Through University of Idaho		NR5893691638	32,648	-
Pass-Through University of Idaho		SP5233880958	1,144	-
Pass-Through University of Iowa		S03581-01	8,497	-
Pass-Through University of Minnesota		A007249102	14,272	-
Pass-Through University of New Hampshire		L0078	67,359	-
Pass-Through University of New Hampshire		L0102	74,480	-
Pass-Through University of North Dakota		UND0025763	11,224	-
Pass-Through University of Pittsburgh		AWD000059194191121	8,387	-
Pass-Through University of Virginia		AWD001559GR100415	16,309	-
Pass-Through University of Washington		UWSC10434	39,605	-
Pass-Through University of Washington		UWSC13333	7,721	-
Pass-Through University of Washington		UWSC13594	3,040	-
Pass-Through University of Wisconsin Madison		0000002296	8,760	-
Pass-Through University of Wisconsin-Madison		949	109,949	-
Pass-Through Washington University, St. Louis		WU-23-0280 ST00011229	68,735	-
Pass-Through Washington University, St. Louis		WU-23-0404 ST00012678	1,669	-
Pass-Through West Virginia University		15920UM	53	-
Pass-Through West Virginia University Research Corporation		21-380-UMBC MM000412118	21,924	-
Pass-Through Woods Hole Oceanographic Institute		A101509	95,303	-
Total ALN 43.001 Science			84,540,335	13,768,228
Aeronautics	43.002		6,642,612	-
Pass-Through Boston University		4500004477	35,485	-
Pass-Through Ohio State University		60061598GR101813	14,155	-
Total ALN 43.002 Aeronautics			6,692,252	-
Exploration	43.003		29,845,268	17,892,335
Pass-Through National Space Grant Foundation		M2MXHAB202206	8,169	-
Pass-Through National Space Grant Foundation		M2MXHAB202303	3,190	-
Total ALN 43.002 Exploration			29,856,627	17,892,335
Space Operations	43.007		23,594	-
Office of Stem Engagement (OSTEM)	43.008		210,096	-
Pass-Through Johns Hopkins University		2005565507	84,637	-
Pass-Through Maryland Space Grant Consortium		2005638738	11,280	-
Pass-Through Maryland Space Grant Consortium		2005757691	8,550	-
Pass-Through National Institute of Aerospace		302004AUMD	35,677	-
Pass-Through Institute of Aerospace		401019UMD	22,746	-
Pass-Through University of the District of Columbia		UDC3ZB20MIROUMD3	86,513	-
Total ALN 43.008 Office of Stem Engagement (OSTEM)			459,499	-
Safety, Security and Mission Services	43.009		665,910	203,080
Pass-Through San Jose State University		2116146093UMD	130,923	-
Total ALN 43.009 Mission Support			796,833	203,080

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
National Aeronautics and Space Administration (continued)				
Space Technology	43.012		201,414	-
Pass-Through Southwest Research Institute		K99061JRG	31,697	-
Pass-Through University of Kentucky		7800006547	91,549	-
Total ALN 43.012 Space Technology			324,660	-
Research and Development - National Aeronautics and Space Administration	43.RD		1,790,939	-
Pass-Through Advanced Analyzer Labs, Inc		22094336	25,000	-
Pass-Through Brimrose Corporation of America		58021	17,648	-
Pass-Through Jet Propulsion Laboratory - NASA/CalTech		1372988	114	-
Pass-Through Jet Propulsion Laboratory - NASA/CalTech		1657818	1,690	-
Pass-Through Jet Propulsion Laboratory - NASA/CalTech		1660266	13,411	-
Pass-Through Jet Propulsion Laboratory - NASA/CalTech		1662562	511	-
Pass-Through Jet Propulsion Laboratory - NASA/CalTech		1684506	60,148	-
Pass-Through Johns Hopkins University Applied Physics Laboratory		132347	12,576	-
Pass-Through Johns Hopkins University Applied Physics Laboratory		179468	7,017	-
Pass-Through National Institute of Aerospace		202019UMD	45,865	-
Pass-Through National Institute of Aerospace		302004BUMD	27,814	-
Pass-Through Princeton Plasma Physics Laboratory		S210921	7,258	-
Pass-Through SETI Institute		SC - 3668	15,494	-
Pass-Through Space Telescope Science Institute		52556	15,307	-
Pass-Through Space Telescope Science Institute		HSTGO15110006A	47	-
Pass-Through Space Telescope Science Institute		HSTGO15455001A	8,128	-
Pass-Through Space Telescope Science Institute		HSTGO15690011A	28,184	-
Pass-Through Space Telescope Science Institute		HSTGO15969001A	6,936	-
Pass-Through Space Telescope Science Institute		HSTGO16307001A	16	-
Pass-Through Space Telescope Science Institute		HSTGO16418005A	2,134	-
Pass-Through Space Telescope Science Institute		HSTGO16496002A	11,249	-
Pass-Through Space Telescope Science Institute		JWSTERS01288003A	21,920	-
Pass-Through Space Telescope Science Institute		JWSTERS01335003A	46,781	-
Pass-Through Space Telescope Science Institute		JWSTERS01366017A	22,062	-
Pass-Through The Regents Of The University of Colorado		1001319513	12,581	-
Pass-Through Universities Space Research Association		80225	21,486	-
Pass-Through Universities Space Research Association		SOF0070	1,939	-
Pass-Through University of Arizona		569369	54,444	-
Total ALN 43.RD Research and Development -			2,278,699	-
Contract/Other	43.999		276,459	-
Total National Aeronautics and Space Administration			**125,248,958**	**31,863,643**
National Endowment for the Humanities				
Promotion of the Arts Grants to Organizations and Individuals	45.024		81,525	-
Promotion of the Humanities Fellowships and Stipends	45.160		16,524	-
Promotion of the Humanities Professional Development	45.163		143,171	-
Museum Grants for African American History and Culture	45.309		140,833	-
National Leadership Grants	45.312		98,327	-
Laura Bush 21st Century Librarian Program	45.313		409,205	-
Total National Endowment for the Humanities			**889,585**	**-**
National Science Foundation				
COVID-19 Engineering	47.041		78,126	13,755
Engineering			13,612,753	2,470,519
Pass-Through American Association for Engineering Education		769-2107	164,038	-
Pass-Through American Society for Engineering Education		7692090	109,111	-
Pass-Through Astrapi		FA864921 P1478	35,234	-
Pass-Through Colorado State University		G-00973-8	9,634	-
Pass-Through Delaware State University - GM		19-070HEH	853	-
Pass-Through Drexel University		920061	52,947	-
Pass-Through Florida International University		201	92,134	-
Pass-Through Johns Hopkins University		2005429630	948	-
Pass-Through Johns Hopkins University		2005432247	2,278	-
Pass-Through Johns Hopkins University		2005447108	89,952	-
Pass-Through Johns Hopkins University		2001929027	42,530	-
Pass-Through Magic Blue LLC		19010159	1,795	-
Pass-Through The Regents of the University of California- Riverside		S-001533	53,128	-

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
National Science Foundation (continued)				
Engineering (continued)	47.041			
Pass-Through University of Cincinnati		013652-00002	55,725	-
Pass-Through University of North Texas		GF30109-4 PO	2,018	-
Pass-Through University of Washington		UWSC12985	503,986	-
Total ALN 47.041 Engineering			14,907,190	2,484,274
Mathematical and Physical Sciences	47.049		22,252,025	1,739,413
Pass-Through Cornell University		794320667	119,851	-
Pass-Through Cornell University		NA18OAR4170096	29	-
Pass-Through Duke University		3332456	200	-
Pass-Through Harvard University		1243815119995	191,671	-
Pass-Through Harvard University		1341495113570	98,854	-
Pass-Through Howard University		9756-14978/95300-1009468	19,607	-
Pass-Through Massachusetts Institute of Technology		S4790	53,719	-
Pass-Through Michigan Technological University		1912006Z3	69,017	-
Pass-Through National Radio Astronomy Observatory		370484	95	-
Pass-Through National Radio Astronomy Observatory		373600	10,295	-
Pass-Through National Radio Astronomy Observatory		377574	18,331	-
Pass-Through Planetary Science Institute		1658UMD	11,498	-
Pass-Through The Catholic University of America		362627SUB1	26,023	-
Pass-Through University of California Davis		A230343S004	6,268	-
Pass-Through University of California Santa Barbara		KK1925	24,184	-
Pass-Through University of Massachusetts Amherst		20015919A	241,676	-
Pass-Through University of Texas at Austin		UTA19-000870	16,297	-
Pass-Through University of Washington		UWSC13134 BPO58531	139,873	-
Pass-Through University of Washington		UWSC13134	6,696	-
Pass-Through University of Washington		UWSC13134 BPO69471	42,885	-
Pass-Through University of Wisconsin Madison		0000002128 (Formerly 845)	227,523	-
Pass-Through University of Wisconsin-Madison		188	73,766	-
Pass-Through University of Wisconsin-Madison		2393	507,385	-
Pass-Through University of Wisconsin-Madison		299	44,427	-
Total ALN 47.049 Mathematical and Physical Sciences			24,202,195	1,739,413
Geosciences	47.050		8,794,900	884,650
Pass-Through Columbia University		1450528	9,938	-
Pass-Through Columbia University		OCE1450528	9,227	-
Pass-Through Southern California Earthquake Center		118063127	68,208	-
Pass-Through The Research Foundation for the State University of New York		R1281995	71,400	-
Pass-Through University Corporation for Atmospheric Research		SUBAWD002940 P2018582	9,053	-
Pass-Through University of California - Davis		A22-3249-S001 PO1032427	91,655	-
Pass-Through University of Nebraska Lincoln		2224006	657	-
Total ALN 47.050 Geosciences			9,055,038	884,650
COVID-19 Computer and Information Science and Engineering	47.070		107,332	-
Computer and Information Science and Engineering			15,235,367	1,377,440
Pass-Through College Of Charleston		521373UM	10,333	-
Pass-Through Computing Research Association		2021CIFUMARYLAND24	144,077	-
Pass-Through Computing Research Association		2021CIFUMaryland57	142,650	-
Pass-Through Cyber Pack Ventures, Inc.		CPVI-2022-108	10,638	-
Pass-Through Dartmouth College		R1384	331,893	-
Pass-Through Dartmouth College		R1492	1,544	-
Pass-Through Embry-Riddle Aeronautical University		GC87066-S1	762	-
Pass-Through Embry-Riddle Aeronautical University		GC87067-S1	830	-
Pass-Through University of California Irvine		20201263	8,055	-
Total ALN 47.070 Computer and Information Science and Engineering			15,993,481	1,377,440
COVID-19 Biological Sciences	47.074		62,626	-
Biological Sciences			8,135,191	272,387
Pass-Through Cary Institute of Ecosystem Studies		3392/200201968	6,654	-
Pass-Through vColumbia University		2220863	18,497	-
Pass-Through Gordon & Betty Moore Foundation		11481	132,267	4,398
Pass-Through Saint Bonaventure University		000985-00001	55,153	-
Pass-Through University of Alabama at Birmingham		000535058SC004	81,386	-
Pass-Through University of California Riverside		S001547	24,926	-
Pass-Through Virginia Tech		1856450 480146-19913	58,455	-
Total ALN 47.074 Biological Sciences			8,575,155	276,785

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
National Science Foundation (continued)				
COVID-19 Social, Behavioral, and Economic Sciences	47.075		23,109	-
Pass-Through Bentley University		231702	1,416	-
Social, Behavioral, and Economic Sciences			3,285,732	338,888
Pass-Through American University		31588-02	5,043	-
Pass-Through Arizona State University		ASUB00000866	74,063	-
Pass-Through University of Illinois at Chicago		17702	964	-
Pass-Through University of Montana		PG19-66297-03	38,413	-
Pass-Through University of Pennsylvania		4763190	30,975	-
Pass-Through University of Pittsburgh		AWD000058680127821	20,151	-
Pass-Through University of Wisconsin-Madison		2518	18,060	-
Total ALN 47.075 Social, Behavioral, and Economic Sciences			3,497,926	338,888
Education and Human Resources	47.076		11,966,867	537,446
Pass-Through Arizona State University		1821628 ASUB00000132	7,375	-
Pass-Through California State University San Marcos		9224085026UMD	14,967	-
Pass-Through Clemson University		24192062015443	1,239	-
Pass-Through Harford Community College (Inc)		16434981002	120	-
Pass-Through Iowa State University		019533A	109,264	-
Pass-Through North Carolina A&T University		260343D	5,304	-
Pass-Through Teachers Development Group		206002F	17,626	-
Pass-Through University of California San Diego		124559513S9002520	85,317	-
Pass-Through University of California, Berkeley		00010200 - PO# BB01299747	10,629	-
Pass-Through University of California, Berkeley		Sub 00010200 POBB01643925	43,600	-
Pass-Through University of Pennsylvania		582251	59,306	-
Pass-Through University of Wisconsin-Madison		856K505	37,821	-
Pass-Through Utah State University		201676599	18,496	-
Pass-Through Utah State University		202933693	31,122	-
Pass-Through Virginia Polytechnic Institute and State University		48096319113	3,959	-
Pass-Through Western Michigan University		WMU905301	21,720	-
Total ALN 47.076 Education and Human Resources			12,434,732	537,446
Polar Programs	47.078		320,358	-
Pass-Through University of Wisconsin-Madison		1307	715,575	-
Total ALN 47.078 Polar Programs			1,035,933	-
COVID-19 Office of International Science and Engineering	47.079			
Pass-Through University of Wisconsin		0000001024	25,371	-
Office of International Science and Engineering			760,039	22,329
Pass-Through American Physical Society		EP30052018	169,691	-
Total ALN 47.079 Office of International Science and Engineering			955,101	22,329
COVID-19 Integrative Activities	47.083		27,911	4,526
Integrative Activities			3,236,116	620,014
Pass-Through Boise State University		6800PO124139	17,979	-
Pass-Through Howard University		9756-10010769 PO10014714	15,920	-
Total ALN 47.083 Integrative Activities			3,297,926	624,540
NSF Technology, Innovation, and Partnerships	47.084		332,307	22,779
Pass-Through ActiveCharge, LLC		2131373	3,571	-
Total ALN 47.084 NSF Technology, Innovation, and Partnerships			335,878	22,779
Research and Development - National Science Foundation	47.RD		1,312,863	-
Pass-Through American Educational Research Association		NSF-DRL #1749275	15,103	-
Pass-Through CoolCAD Electronics		13030801	1,801	-
Pass-Through Johns Hopkins University		2005017015	5,144	-
Pass-Through Nostopharma, LLC		NSF 21-563	157,027	-
Pass-Through University of Michigan		SUBK00013581	28,963	-
Total ALN 47.RD Research and Development - National Science Foundation			1,520,901	-
Contract/Other	47.999		210,600	-
Total National Science Foundation			**96,022,056**	**8,308,544**
U.S. Department of Veterans Affairs				
Research and Development	64.054			
Pass-Through Analytical Mechanics Associates, Inc.		TEAMS3UNIVERSITY OFMARYLAND	39,684	-
Research and Development - U.S. Department of Veterans Affairs	64.RD		3,440,513	-
Total U.S. Department of Veterans Affairs			**3,480,197**	**-**

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
Environmental Protection Agency				
National Estuary Program	66.456		265,933	-
Chesapeake Bay Program	66.466		2,305,690	15,224
Pass-Through Chesapeake Bay Trust		175492	57,018	-
Pass-Through Chesapeake Bay Trust		19570	11,556	-
Pass-Through Chesapeake Conservancy, Inc.		CB-963630-01-0	104,957	-
Pass-Through National Fish & Wildlife Foundation		0600.18.059237	90,852	-
Pass-Through National Fish and Wildlife Foundation		60320071142	28,686	13,019
Pass-Through Oyster Recovery Partnership		#ORP-2018-CHESTRUST	143	-
Total ALN 66.466 Chesapeake Bay Program			2,598,902	28,243
Science To Achieve Results (STAR) Research Program	66.509		190,568	556
Pass-Through Duke University		3431001	92,604	-
Pass-Through University of California-Irvine		2022-1640	97,015	-
Pass-Through University of Texas at Austin		UTAUS-SUB00000764	15,039	-
Total ALN 66.509 Science To Achieve Results (STAR) Research Program			395,226	556
Office of Research and Development Consolidated Research/Training/Fellowships	66.511		2,382	-
Research and Development - Environmental Protection Agency	66.RD			
Pass-Through Ajou University		23031098	40,809	-
Pass-Through Chesapeake Bay Trust		21093	49,612	-
Total ALN 66.RD Research and Development - Environmental Protection Agency			90,421	-
Total Environmental Protection Agency			**3,352,864**	**28,799**
Nuclear Regulatory Commission				
U.S. Nuclear Regulatory Commission Scholarship and Fellowship Program	77.008		402,591	-
Total Nuclear Regulatory Commission			**402,591**	**-**
U.S. Department of Energy				
Office of Science Financial Assistance Program	81.049		10,106,941	320,246
Pass-Through Air Dynamics Industrial Systems Corporation		20084278	11,694	-
Pass-Through Columbia University		1GG015568	140,846	-
Pass-Through Duke University		3230279	94,917	-
Pass-Through HighT-Tech		22041757	60,000	-
Pass-Through Inventwood LLC		DESC0018820UMD2	7,429	-
Pass-Through Lawrence Berkeley National Laboratory		7571709	626,346	-
Pass-Through Lawrence Berkeley National Laboratory		7571709	143,193	-
Pass-Through Massachusetts Institute of Technology		AANA	12,221	-
Pass-Through Massachusetts Institute of Technology		S4690PO236498	60,463	-
Pass-Through Massachusetts Institute of Technology		S5868	374,773	-
Pass-Through Oregon State University		G0211AA	26,794	-
Pass-Through Purdue University		14000459026	15,259	-
Pass-Through Subsurface Insights LLC		SSI2023_UMBC0023568	4,178	-
Pass-Through Thar Energy LLC		22083965	40,096	-
Pass-Through The University of Texas at Austin		UTA18000275	186,985	-
Pass-Through University of Delaware		51605	77,380	-
Pass-Through University of Iowa		S0048901	71,906	-
Pass-Through University of Michigan		3005750010SUBK00011108	127,138	-
Pass-Through University of Missouri - Columbia		C00067173-1	250,768	-
Total ALN 81.049 Office of Science Financial Assistance Program			12,439,327	320,246
University Coal Research	81.057		178,720	10,600
Pass-Through Brookhaven National Laboratory		416553	11,071	-
Pass-Through Leonardo Technologies		LTI89303022AFE00000 3MAR	97,533	-
Total ALN 81.057 University Coal Research			287,324	10,600
Conservation Research and Development	81.086		3,353,893	540,370
Pass-Through Inventwood LLC		21073770	269,150	-
Total ALN 81.086 Conservation Research and Development			3,623,043	540,370
Renewable Energy Research and Development	81.087		1,245,306	427,321
Pass-Through National Renewable Energy Laboratory		21010285	8,405	-
Pass-Through North Carolina State University		2019015603	32,819	-
Pass-Through Oregon State University		G0174AA	49,907	-
Total ALN 81.087 Renewable Energy Research and Development			1,336,437	427,321
Fossil Energy Research and Development	81.089		958,149	243,107

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
U.S. Department of Energy (continued)				
Nuclear Energy Research, Development and Demonstration	81.121		428,888	50,932
Pass-Through Ohio State University		RF01596684	129,274	-
Pass-Through University of Nevada Las Vegas		GR16237	33,777	-
Total ALN 81.121 Nuclear Energy Research, Development and Demonstration			591,939	50,932
Electricity Research, Development and Analysis	81.122			
Pass-Through Argonne National Laboratory operated by UChicago Argonne, LLC		2F60042	142,450	-
Pass-Through Honeywell Federal Manufacturing & Technologies, LLC		N000384691	56,004	-
Pass-Through Honeywell Federal Manufacturing & Technologies, LLC		N000386452	26,837	-
Pass-Through Honeywell Federal Manufacturing & Technologies, LLC		N000421443	46,417	-
Pass-Through Honeywell Federal Manufacturing & Technologies, LLC		N000423630	5,415	-
Pass-Through Lawrence Livermore National Laboratory		B654380	11,698	-
Total ALN 81.122 Electricity Research, Development and Analysis			288,821	-
National Nuclear Security Administration (NNSA) Minority Serving Institutions (MSI) Program	81.123			
Pass-Through University of District of Columbia		DE-NA0003945	32,785	-
Predictive Science Academic Alliance Program	81.124		465,336	203,515
Advanced Research Projects Agency - Energy	81.135		4,191,517	1,753,518
Pass-Through HighT-Tech		22030995	99,158	-
Pass-Through Honeywell International		P0021419	285,172	-
Pass-Through Intel Corporation		CW2059899	212,569	-
Pass-Through Intel Corporation		CW2061425	32,664	-
Pass-Through Inventwood LLC		21063341	13,339	-
Pass-Through Johns Hopkins University		2004670125	4,693	-
Pass-Through The City University of New York School of Medicine		CM0000672000	106,376	-
Pass-Through The University of Texas at Austin		UTA21000223	141,955	-
Pass-Through University of California San Diego		S9001613	199,188	-
Total ALN 81.135 Advanced Research Projects Agency - Energy			5,286,631	1,753,518
Research and Development - U.S. Department of Energy	81.RD		44	-
Pass-Through Argonne Nat'l Lab operated by UChicago Argonne, LLC		2F60023	18,079	-
Pass-Through Argonne Nat'l Lab operated by UChicago Argonne, LLC		2F60079	65,188	-
Pass-Through Argonne Nat'l Lab operated by UChicago Argonne, LLC		9F60266	75,308	-
Pass-Through Brookhaven National Laboratory		158983	404	-
Pass-Through Brookhaven National Laboratory		378913	282,198	-
Pass-Through Fermi National Accelerator Laboratory		592187	1,625	-
Pass-Through Fermi National Accelerator Laboratory		655987	133,822	-
Pass-Through Fermi National Accelerator Laboratory		657027	64,217	-
Pass-Through Fermi National Accelerator Laboratory		687611	7,477	-
Pass-Through Fermi National Accelerator Laboratory		688455	125,672	-
Pass-Through Fermi National Accelerator Laboratory		693786	18,726	-
Pass-Through Lawrence Berkeley National Laboratory		7309125	2,332	-
Pass-Through Lawrence Berkeley National Laboratory		7558879	2,072	-
Pass-Through Lawrence Berkeley National Laboratory		7612257	25,456	-
Pass-Through Lawrence Berkeley National Laboratory		7673249	19,227	-
Pass-Through Lawrence Livermore National Laboratory		B644673	146,437	-
Pass-Through Lawrence Livermore National Laboratory		B648035	1,007	-
Pass-Through Lawrence Livermore National Laboratory		B648183	43,776	-
Pass-Through Lawrence Livermore National Laboratory		B649358	107,518	-
Pass-Through Lawrence Livermore National Laboratory		B653846	32,177	-
Pass-Through Lawrence Livermore National Laboratory		B655031	131,462	-
Pass-Through Lawrence Livermore National Laboratory		B655865	59,940	-
Pass-Through Los Alamos National Laboratory		542243	46,531	-
Pass-Through Los Alamos National Laboratory		608752	3,067	-
Pass-Through National Renewable Energy Laboratory		SUB202010093	147,380	-
Pass-Through Oak Ridge Institute For Science And Education		SAWDWD00850	17,345	-
Pass-Through Oak Ridge National Laboratory		4000200958CW35980	13,245	-
Pass-Through Oak Ridge National Laboratory		CW27236	95,625	-
Pass-Through Pacific Northwest Nat'l Lab operations - Battelle		469079	119,344	-
Pass-Through Pacific Northwest Nat'l Lab operations - Battelle		549024	110,715	-
Pass-Through Pacific Northwest Nat'l Lab operations - Battelle		576071	1,611	-
Pass-Through Pacific Northwest Nat'l Lab operations - Battelle		603207	7,194	-
Pass-Through Pacific Northwest Nat'l Lab operations - Battelle		614547	180,778	-
Pass-Through Pacific Northwest Nat'l Lab operations - Battelle		648219	73,432	-
Pass-Through Pacific Northwest Nat'l Lab operations - Battelle		681353	43,840	-

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
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YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
U.S. Department of Energy (continued)				
Research and Development-U.S. Department of Energy (continued)	81.RD			
Pass-Through Princeton Plasma Physics Laboratory		S018176	11,813	-
Pass-Through SLAC National Accelerator Laboratory operated by Stanford University		193040	188,709	-
Pass-Through The Boeing Company		2035447	96,660	-
Pass-Through United Technologies Research Center		1256546	34,537	-
Pass-Through United Technologies Research Center		1257037	128,906	-
Total ALN 81.RD Research and Development - U.S. Department of Energy			2,684,896	-
Total U.S. Department of Energy			**27,994,688**	**3,549,609**
U.S. Department of Education				
Federal Supplemental Educational Opportunity Grants	84.007		793,949	-
Overseas Programs - Group Projects Abroad	84.021		62,277	-
Federal Work-Study Program	84.033		90,836	-
TRIO Student Support Services	84.042		337,243	-
TRIO Upward Bound	84.047		190,373	-
Federal Pell Grant Program	84.063		7,893,709	-
Fund for the Improvement of Postsecondary Education	84.116		82,504	1,537
TRIO McNair Post-Baccalaureate Achievement	84.217		314,624	-
Education Research, Development and Dissemination	84.305		575,984	303,143
Pass-Through Howard University		150392	15,819	-
Pass-Through Research Foundation Of The City University Of New York (UJ36PVKE4RY9)		R305A210269	47,468	-
Pass-Through Tulane University		TUL-SCC-556411-18/19	12,298	-
Total ALN 84.305 Education Research, Development and Dissemination			651,569	303,143
Teacher Quality Partnership Grants	84.336		648,849	58,140
English Language Acquisition State Grants	84.365		96,789	-
Education Stabilization Fund	84.425			
COVID-19 Higher Education Emergency Relief Fund (HEERF) Student Aid	84.425E		5,257,250	-
COVID-19 HEERF Institutional Aid	84.425F		2,747,589	-
Total ALN 84.425 Education Stabilization Fund			8,004,839	-
Total U.S. Department of Education			**19,167,561**	**362,820**
U.S. Department of Health and Human Services				
COVID-19 Environmental Public Health and Emergency Response	93.070			
Pass-Through National Minority Quality Forum		23020619	62,117	-
Family Smoking Prevention and Tobacco Control Act Regulatory Research	93.077			
Pass-Through The University of Texas Health Science Center		SA0000857	20,162	-
Prevention of Disease, Disability, and Death by Infectious Diseases	93.084		1,591,110	63,542
Pass-Through Johns Hopkins Hospital		2005504027	60,409	-
Pass-Through Rush University Medical Center		21092802-Sub03	17,503	-
Total ALN 93.084 Prevention of Disease, Disability, and Death by Infectious Diseases			1,669,022	63,542
Research on Research Integrity	93.085		214,497	-
Healthy Marriage Promotion and Responsible Fatherhood Grants	93.086		1,060,321	177,135
COVID-19 Food and Drug Administration Research	93.103		579,209	62,700
Food and Drug Administration Research			9,400,009	1,851,768
Pass-Through Battelle Memorial Institute		736542	30,226	-
Pass-Through Childrens Research Institute		3000610801	198,983	-
Pass-Through Duke University Medical Center		234691/240919	3,169	-
Pass-Through University of Florida		SUB00002843	106,883	-
Pass-Through University of Vermont		30689SUB001	45	-
Total ALN 93.103 Food and Drug Administration Research			9,739,315	1,851,768
Maternal and Child Health Federal Consolidated Programs	93.110		17,239	-
Pass-Through HealthEfficient		20105106	12,202	-
Pass-Through Johns Hopkins University School of Medicine		2005204883	260,850	-
Total ALN 93.110 Maternal and Child Health Federal Consolidated Programs			290,291	-

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
U.S. Department of Health and Human Services (continued)				
Environmental Health	93.113		1,624,136	201,138
Pass-Through J. Craig Venter Institute		AANA	113,648	-
Pass-Through J. Craig Venter Institute		JCVI20014	2,204	-
Pass-Through Johns Hopkins University		2004252810	157,551	-
Pass-Through University of Massachusetts Amherst		22017055A	9,005	-
Total ALN 93.113 Environmental Health			1,906,544	201,138
Oral Diseases and Disorders Research	93.121		5,999,688	456,756
Pass-Through Rutgers, the State University of New Jersey		SUB00002487	205,920	-
Pass-Through Rutgers, the State University of New Jersey		Subaward #: 1985	43,330	-
Pass-Through State University of New York		R1136494	14,445	-
Pass-Through Temple University		268451-UMB	28,961	-
Pass-Through The University of Texas Health Science Center at San Antonio		166331/166325	48,186	-
Pass-Through University of California, Irvine		2022-1752	96,680	-
Pass-Through University of California, Los Angeles		Subaward # 30842-UMB	4	-
Pass-Through University of North Carolina at Chapel Hill		5119061	32,819	-
Pass-Through University of Pittsburgh		AWD00006167	6,803	-
Pass-Through University of Pittsburgh		CNVA00056675 (129880-2)	827	-
Pass-Through University of Texas Health Science Center		170627/170626	219,186	-
Total ALN 93.121 Oral Diseases and Disorders Research			6,696,849	456,756
Centers for Research and Demonstration for Health Promotion and Disease Prevention	93.135		752,925	7,540
Injury Prevention and Control Research and State and Community Based Programs	93.136			
Pass-Through Baltimore City Health Department		CO# 39981	24,514	-
COVID-19 Community Programs to Improve Minority Health Grant Program	93.137			
Pass-Through City of Frederick		21105454	1,112,224	293,981
Community Programs to Improve Minority Health Grant Program			295,268	176,409
Pass-Through Baltimore County Health Department		AANA	57,861	-
Pass-Through FHI 360		PO22000889	86,727	-
Total ALN 93.137 Community Programs to Improve Minority Health Grant Program			1,552,080	470,390
NIEHS Hazardous Waste Worker Health and Safety Training	93.142		441,265	-
NIEHS Superfund Hazardous Substances_Basic Research and Education	93.143		248,227	13,585
Pass-Through Johns Hopkins University		2005244760	21,880	-
Coordinated Services and Access to Research for Women, Infants, Children, and Youth	93.153			
Pass-Through Johns Hopkins University - School of Medicine		2003571654	7,918	-
Human Genome Research	93.172		2,963,347	430,179
Pass-Through Dana-Farber Cancer Institute		1228007	1,327	-
Pass-Through Jackson Laboratory		210314-0523-12	94,141	-
Pass-Through University of Iowa		S0384201	10,255	-
Total ALN 93.172 Human Genome Research			3,069,070	430,179
Research Related to Deafness and Communication Disorders	93.173		5,781,002	700,103
Pass-Through Carnegie Mellon University		1090446367247	2,781	-
Pass-Through Columbia University		1(GG014914-01)	24,086	-
Pass-Through Georgetown University		AWD7773169-GR05792	132,624	-
Pass-Through Johns Hopkins University		2005334875	10,871	-
Pass-Through Johns Hopkins University		2005801503	19,937	-
Pass-Through University of Colorado Denver		FY22.909.001 (2-5-B1158)	106,860	-
Pass-Through University of Delaware		58419	171,349	-
Pass-Through West Virginia University		17214UMD	106,481	-
Total ALN 93.173 Research Related to Deafness and Communication Disorders			6,355,991	700,103
Nursing Workforce Diversity	93.178		18,322	-
COVID-19 Immunization Research, Demonstration, Public Information and Education Training and Clinical Skills Improvement Projects	93.185			
Pass-Through National Minority Quality Forum		22052262	83,293	-
Telehealth Programs	93.211		276,428	52,895

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
U.S. Department of Health and Human Services (continued)				
Research and Training in Complementary and Integrative Health	93.213		3,120,320	511,322
Pass-Through Georgetown University		414822_GR411710_UMB	60,123	-
Pass-Through Georgetown University		414919_GR411710-UMB	85,487	-
Pass-Through Johns Hopkins University School of Medicine		2005742575	24,349	-
Total ALN 93.213 Research and Training in Complementary and Integrative Health			169,959	-
Research on Healthcare Costs, Quality and Outcomes	93.226		680,827	89,687
Pass-Through Magee-Womens Research Institute and Foundation		4039MD	33,448	-
Pass-Through Research Institute at Nationwide Children's Hospital		710074-0523-00	15,860	-
Pass-Through University of Texas at Austin		UTAUS-SUB00000885AM1	40,057	-
Total ALN 93.226 Research on Healthcare Costs, Quality and Outcomes			770,192	89,687
National Center on Sleep Disorders Research	93.233		1,248,853	-
Pass-Through Johns Hopkins University - School of Medicine		2003228860	16,398	-
Total ALN 93.233 National Center on Sleep Disorders Research			1,265,251	-
Mental Health Research Grants	93.242		23,021,122	4,501,644
Pass-Through Boston University		4500003966	8,082	-
Pass-Through Broad Institute Inc.		5001494-5500001892	415,701	-
Pass-Through Centre for Addiction and Mental Health Hospital		21-218	55,839	-
Pass-Through Evidence Based Practice Institute, LLC		1R44MH126819-01	63,381	-
Pass-Through Georgia State University		SP00013802-01	96,057	-
Pass-Through Georgia State University		SP00013802-03	23,249	-
Pass-Through Henry Ford Health System		B11239UMD	13,475	-
Pass-Through Johns Hopkins University		P50MH115842	13,078	-
Pass-Through McLean Hospital		2021A016845 / Fund # 401851	25,617	-
Pass-Through Research Foundation for Mental Hygiene, Inc		154737	8,321	-
Pass-Through Research Foundation for Mental Hygiene, Inc		PO 158895	69,829	-
Pass-Through San Diego State University		D1013202SA755A25A1 88C7802S	168,049	-
Pass-Through San Diego State University		D1070403A25A357C7802	258,249	-
Pass-Through The Ohio State University Research Found		GR128258	96,481	-
Pass-Through Trustees of Columbia University in the City of New York		3GG01513201	8,601	-
Pass-Through University of Alabama at Birmingham		000523128-SC002	147,869	-
Pass-Through University of California San Francisco		13713SC	15,747	-
Pass-Through University of California, Irvine		2022-1660	81,216	-
Pass-Through University of California, Irvine		2022-1661	6,637	-
Pass-Through University of Chicago		AWD100327	15,931	-
Pass-Through University of Michigan		SUBK00012604	200	-
Pass-Through University of North Carolina at Greensboro		A230027S001	20,509	-
Pass-Through University of Vermont		32146SUB52470	5,537	-
Pass-Through University of Virginia		AWD004197	4,132	-
Pass-Through Yale University		GR110000 (CON-80002454)	195,656	-
Total ALN 93.242 Mental Health Research Grants			24,838,565	4,501,644
Substance Abuse and Mental Health Services Projects of Regional and National Significance	93.243		321,932	136,076
Pass-Through Baltimore City Health Department		CO #39006	3,351	-
Pass-Through Hugo W. Moser Research Institute at Kennedy Krieger		1H79SM085056-01	314,630	77,652
Pass-Through Lourie Children Center		Signed 01-11-2022	73,945	-
Pass-Through Lourie Children Center		Signed on 10/22/2022	62,320	-
Pass-Through Prince George's County Health Department		4400006630	88,347	-
Pass-Through Prince George's County Health Department		UMB 63017	32,440	-
Pass-Through Strategic Community Services		12071848	123	-
Pass-Through The Danya Institute Inc.		17082255	138,916	-
Pass-Through The Danya Institute Inc.		18123660	158,556	-
Pass-Through The Danya Institute Inc.		18123716	153,751	-
Pass-Through The Danya Institute Inc.		22010090	37,327	-
Total ALN 93.243 Substance Abuse and Mental Health Services Projects of Regional and National Significance			1,385,638	213,728

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
U.S. Department of Health and Human Services (continued)				
Occupational Safety and Health Program	93.262			
Pass-Through Marshfield Clinic Research Institute		60692300	10,694	-
Pass-Through Marshfield Clinic Research Institute		60692400	4,868	-
Pass-Through University of Kentucky		321000249023248	12,171	-
Pass-Through University of Kentucky Research Foundation		321000180619216	8,021	-
Total ALN 93.262 Occupational Safety and Health Program			35,754	-
COVID-19 Immunization Cooperative Agreements	93.268			
Pass-Through Baltimore City Health Department		40632	21,827	-
Alcohol Research Programs	93.273		2,174,920	81,285
Pass-Through The Univ of TX Health Science Center at San Antonio		GF00026-1	927	-
Pass-Through The Univ of TX Health Science Center at San Antonio		GF00028-1	4,323	-
Pass-Through University of Arkansas for Medical Sciences		55197	71,033	-
Pass-Through University of Texas at San Antonio		162257/161901	51,191	-
Total ALN 93.273 Alcohol Research Programs			2,302,394	81,285
Drug-Free Communities Support Program Grants	93.276		3,431	-
COVID-19 Drug Abuse and Addiction Research Programs	93.279		16,430	-
Drug Abuse and Addiction Research Programs			17,772,513	1,064,958
Pass-Through Florida State University		Subaward No. R02053	22,849	-
Pass-Through Friends Research Institute Inc.		11383-S1	1,136	-
Pass-Through Friends Research Institute Inc.		11384-1	32,771	-
Pass-Through Henry Ford Health System		B11238UMD	8,757	-
Pass-Through Mount Sinai		0255-G571-4609	21,336	-
Pass-Through New York University School of Medicine		21A0S1007258	28,278	-
Pass-Through Partnership to End Addiction		Signed_11/16/2022	11,046	-
Pass-Through Purdue University		11001094-062	167,399	-
Pass-Through The Regents of the Univ of California - San Diego		704047	22,943	-
Pass-Through The Regents of the Univ of California, San Francisco		13306SC	16,349	-
Pass-Through University of California, Los Angeles		0875 G XB492	13,526	-
Pass-Through University of Pittsburgh		AWD00000068 (132578-3)	13,306	-
Pass-Through University of Pittsburgh		AWD00006300 (138503-7)	61,419	-
Pass-Through University of Texas at San Antonio		162255/161624	20,731	-
Pass-Through Upstate formally University of New York Buffalo		R1176102	34,033	-
Pass-Through Upstate formally University of New York Buffalo		R1318516	330,859	-
Pass-Through Washington University		ST00010445	463,903	-
Pass-Through Washington University		WU220294	31,965	-
Pass-Through Yale University		CON80004146GR119181	14,484	-
Total ALN 93.279 Drug Abuse and Addiction Research Programs			19,106,033	1,064,958
Centers for Disease Control and Prevention Investigations and Technical Assistance	93.283		101,878	-
Pass-Through Botswana-UMSOM Health Initiative		CDC-GH2232-001-MOD-05	228,840	-
Pass-Through Botswana-UMSOM Health Initiative		CDC-GH2232-001/ 1 NU2GGH002258	256,457	-
Pass-Through Botswana-UMSOM Health Initiative		CDCGH2258001	166,013	-
Pass-Through Botswana-UMSOM Health Initiative		CDCGH2258001 MOD2	2,562	-
Total ALN 93.283 Centers for Disease Control and Prevention Investigations and Technical Assistance			755,750	-
COVID-19 Discovery and Applied Research for Technological Innovations to Improve Human Health	93.286		237,020	-
Discovery and Applied Research for Technological Innovations to Improve Human Health			4,474,061	1,612,933
Pass-Through Brigham and Womens Hospital		125258	162,515	-
Pass-Through Brigham and Womens Hospital		127764	15,886	-
Pass-Through Duke University		A035163	19,223	-
Pass-Through University of Massachusetts Amherst		21015844B00	104,128	-
Pass-Through University of Pennsylvania		582310	17,501	-
Pass-Through University of Pennsylvania		584749	56,561	-
Pass-Through University of Pittsburgh		AWD00004488	29,726	-
Total ALN 93.286 Discovery and Applied Research for Technological Innovations to Improve Human Health			5,116,621	1,612,933

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
U.S. Department of Health and Human Services (continued)				
Teenage Pregnancy Prevention Program	93.297			
Pass-Through Child Trends		1305UMD01	141,226	-
Minority Health and Health Disparities Research	93.307		5,157,138	345,927
Pass-Through Clark Atlanta University		5U54MD007590-34	270,925	-
Pass-Through Johns Hopkins University		U54MD007590 3R01MD013495-04S1	8,924	-
Pass-Through Johns Hopkins University		2005570725	48,166	-
Pass-Through Johns Hopkins University		2005754065	65,923	-
Pass-Through SIMmersion LLC		R44MD014112	17,927	-
Pass-Through University of Pittsburgh		0041119 (124864-9)	921	-
Total ALN 93.307 Minority Health and Health Disparities Research			5,569,924	345,927
COVID-19 Trans-NIH Research Support	93.310		558,539	66,000
Pass-Through Johns Hopkins University School of Medicine		2005195329	39,103	-
Trans-NIH Research Support			9,605,015	2,588,884
Pass-Through Avera Rural Health Services		5UH3OD023279D4	36,549	-
Pass-Through Avera Rural Health Services		5UH3OD023279D5	101,153	-
Pass-Through Duke University		303001153	24,187	-
Pass-Through Duke University		A03-5282	14,441	-
Pass-Through Howard University		GRT00019410008197	23,923	-
Pass-Through Howard University		GRT000194S210004534	256,922	-
Pass-Through Institute of Human Virology, Nigeria		1U54TW01204101	26,250	-
Pass-Through Institute of Human Virology, Nigeria		1U54TW01204101	23,284	-
Pass-Through Institute of Human Virology, Nigeria		5NU2GGH002099-04	270,122	-
Pass-Through Institute of Human Virology, Nigeria		HG007008-09	18,212	-
Pass-Through Institute of Human Virology, Nigeria		PSA 5U54TW012041-02	139,907	-
Pass-Through Johns Hopkins Hospital		2005556440	28,081	-
Pass-Through Johns Hopkins University		2005481188	5,954	-
Pass-Through University of New Mexico		3RGJ7	15,853	-
Total ALN 93.310 Trans-NIH Research Support			11,187,495	2,654,884
COVID-19 Protecting and Improving Health Globally: Building and Strengthening Public Health Impact, Systems, Capacity and Security	93.318		14,000	-
Pass-Through Institute of Human Virology, Nigeria		1 NU2HGH000020-01-00	64,669	-
Pass-Through Institute of Human Virology, Nigeria		Signed on 10/21/2022	114,463	-
Protecting and Improving Health Globally: Building and Strengthening Public Health Impact, Systems, Capacity and Security				
Pass-Through Institute of Human Virology, Nigeria		Signed 08-11-2022	18,331	-
Pass-Through Institute of Human Virology, Nigeria		Signed 4/24/2023	82,824	-
Total ALN 93.318 Protecting and Improving Health Globally: Building and Strengthening Public Health Impact, Systems, Capacity and Security			294,287	-
National Center for Advancing Translational Sciences	93.350		13,856	-
Pass-Through Johns Hopkins University School of Medicine		2004472996	373,659	-
Pass-Through Johns Hopkins University School of Medicine		2004548643	1,093,663	-
Pass-Through Johns Hopkins University School of Medicine		2004552003	324,327	-
Pass-Through Johns Hopkins University School of Medicine		2004799269	46,666	-
Pass-Through Johns Hopkins University School of Medicine		2005664286	15,000	15,000
Pass-Through Johns Hopkins University School of Medicine		2005957019	7,583	-
Total ALN 93.350 National Center for Advancing Translational Sciences			1,874,754	15,000
Research Infrastructure Programs	93.351		1,055,215	-
Biomedical Advanced Research and Development Authority (BARDA), Biodefense Medical Countermeasure Development	93.360			
Pass-Through Janssen Research & Development LLC		63623872FZ3002	1,787	-
Nursing Research	93.361		1,175,686	58,011
Pass-Through University of Pennsylvania		579470	194,699	-
Pass-Through University of Texas at Austin		UTA16-001233	1,609	-
Total ALN 93.361 Nursing Research			1,371,994	58,011

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
U.S. Department of Health and Human Services (continued)				
Cancer Cause and Prevention Research	93.393		3,435,721	693,516
Pass-Through Columbia University		1(GG017719-01)	24,517	-
Pass-Through George Washington University		23-M12	15,245	-
Pass-Through University of Massachusetts, Amherst		21-016090 A 01	15,464	-
Pass-Through University of North Carolina at Chapel Hill		5119057	22,826	-
Pass-Through University of North Carolina at Chapel Hill		5519057	31,088	-
Pass-Through University of Southern California		SCON-00003881	10,894	-
Total ALN 93.393 Cancer Cause and Prevention Research			3,555,755	693,516
COVID-19 Cancer Detection and Diagnosis Research	93.394		386,267	32,116
Cancer Detection and Diagnosis Research			1,776,779	288,030
Pass-Through A&G Pharmaceuticals		Signed 6/19/20	61,602	-
Pass-Through Children's Hospital / Philadelphia		9700051021	2,517	-
Pass-Through Duke University		303000057	70,131	-
Pass-Through Duke University		303001255	130,334	-
Pass-Through		303002211	15,637	-
Pass-Through Duke University		3532540	19,209	-
Pass-Through Feinstein Institute For Medical Research		AWD00001684- U of Marvland	72,418	-
Pass-Through George Washington University		21-M85	10,718	-
Pass-Through George Washington University		21-M90	12,838	-
Pass-Through Georgetown University		424334_GR411508-UMB	3,154	-
Pass-Through Raven Biomaterials LLC		R43CA265589-01A1	121,413	-
Pass-Through University of Pennsylvania		574125	89,571	-
Pass-Through University of Pittsburgh		AWD00006505 (138672-1)	63,486	-
Total ALN 93.394 Cancer Detection and Diagnosis Research			2,836,074	320,146
Cancer Treatment Research	93.395		3,652,610	868,943
Pass-Through A&G Pharmaceuticals		4R44CA224718-02	7,536	-
Pass-Through Children's Hospital/Philadelphia		9500080215-12C	24,805	-
Pass-Through Johns Hopkins University		2004660781	9,121	-
Pass-Through Johns Hopkins University		2004724719	112,200	-
Pass-Through Johns Hopkins University		2005586474	256,209	-
Pass-Through Johns Hopkins University		2005710961	56,158	-
Pass-Through Northwestern University, Chicago Campus		60047359 UMD	3,240	-
Pass-Through NRG Oncology Foundation Inc.		PSA Signed 1/28/2015	293,100	19,575
Pass-Through Regents of The University Of Michigan		SUBK00010553	858	-
Pass-Through Regents of The University Of Michigan		SUBK00016682	15,686	-
Pass-Through Southwest Oncology Group		IRB#80710	6,079	-
Pass-Through The Brigham and Women's Hospital, Inc.		125648	143,152	-
Pass-Through University of North Carolina at Chapel Hill		5118735	11,140	-
Pass-Through University of Pittsburgh		AWD00002317	14,379	-
Pass-Through University of Rochester Medical Center		SUB00000193 / UR FAO GR532118	44,885	-
Total ALN 93.395 Cancer Treatment Research			4,651,158	888,518
Cancer Biology Research	93.396		1,980,258	113,256
Pass-Through Georgetown University		0002341424635GR424 614UMD	15,114	-
Pass-Through Johns Hopkins University		2005028435	94,837	-
Pass-Through Johns Hopkins University		2005128527	34,763	-
Pass-Through Johns Hopkins University		2005456298	164,933	-
Pass-Through University of Pittsburgh		AWD000044111364131	106,025	-
Total ALN 93.396 Cancer Biology Research			2,395,930	113,256
Cancer Centers Support Grants	93.397		3,969,776	217,771
Pass-Through Coriell Institute for Medical Research		A22-0002-S006-A03	186,452	-
Pass-Through Coriell Institute for Medical Research		A22-0002-S012	39,031	-
Pass-Through Johns Hopkins University		2005905406	130,944	-
Pass-Through M.D. Anderson Cancer Center		5P50CA100632-20 / 3002128780	2,557	-
Total ALN 93.397 Cancer Centers Support Grants			4,328,760	217,771
Cancer Research Manpower	93.398		946,892	53,325
Cancer Control	93.399			
Pass-Through Children's Hospital/Philadelphia		2UG1CA189955-06	5,600	-

See accompanying Notes to Schedule of Expenditures of Federal Awards.

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SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
U.S. Department of Health and Human Services (continued)				
COVID-19 ACL National Institute on Disability, Independent Living, and Rehabilitation Research	93.433			
Pass-Through University of Illinois at Chicago		Subaward #:18199	4,460	-
ACL National Institute on Disability, Independent Living, and Rehabilitation Research			1,741,340	594,855
Pass-Through Langston University		LU5201333	80,170	-
Pass-Through Miami University Ohio		G03574	46,330	-
Pass-Through TransCen Inc.		21094683	91,948	-
Pass-Through University of Illinois at Chicago		Subaward #:18199	3,804	-
Total ALN 93.433 ACL National Institute on Disability, Independent Living, and Rehabilitation Research			1,968,052	594,855
Every Student Succeeds Act/Preschool Development Grants	93.434			
Pass-Through Pact		221675	30,999	-
MaryLee Allen Promoting Safe and Stable Families Program	93.556		192,103	11,823
Child Care and Development Block Grant	93.575		143,805	-
Head Start	93.600		2,844	-
Pass-Through Education Development Center Inc.		12555	19,696	-
Pass-Through Georgetown University		425119_GR424910-UMB	22,711	-
Total ALN 93.600 Head Start			45,251	-
Social Services Research and Demonstration	93.647		13,084	13,084
Pass-Through Child Trends		1602	57,208	-
Total ALN 93.647 Social Services Research and Demonstration			70,292	13,084
Child Abuse and Neglect Discretionary Activities	93.670		889,938	665,277
Medical Assistance Program	93.778		68,937	-
Opioid STR	93.788		5,841	-
COVID-19 Cardiovascular Diseases Research	93.837			
Pass-Through Mount Sinai		0255-A343-4605	51,370	-
Cardiovascular Diseases Research			10,090,827	676,281
Pass-Through Ann & Robert H. Lurie Children's Hospital of Chicago		901627UMD	153,129	-
Pass-Through Ann & Robert H. Lurie Children's Hospital of Chicago		901647-UMB	8,529	-
Pass-Through Beth Israel Deaconess Medical Center		2190008259	36,900	-
Pass-Through Duke University		303000729	93,683	-
Pass-Through Harvard T.H. Chan School of Public Health		1150275118851	135,869	-
Pass-Through Inova Health Care Services		U20-07-4182-UMD	18,590	-
Pass-Through Johns Hopkins University		2003783866	7,693	-
Pass-Through Johns Hopkins University		2005165716	19,707	-
Pass-Through Kennedy Krieger Institute		R01 HL138182-01A1	14,074	-
Pass-Through Mayo Clinic, Rochester		UMB-203880-02	14,689	-
Pass-Through Mayo Clinic, Rochester		UNI- 3303522	8,789	-
Pass-Through Medical College of Wisconsin		21126821	19,165	-
Pass-Through Mount Sinai		0255-3100-4605	31,248	-
Pass-Through Mount Sinai		0255-3106-4605	9,557	-
Pass-Through Mount Sinai		0255-A348-4605	17,701	-
Pass-Through Regents of The University of Michigan		SUBK00017352	10,742	-
Pass-Through Regents of The University of Michigan		SUBK0018056/Protocol P-ICECAP	403	-
Pass-Through The Ohio State University Research Found		5R01HL128857	728	-
Pass-Through The Ohio State University Research Found		GR122281 / SPC-1000004526	182,489	-
Pass-Through The Ohio State University Research Found		R01HL128857	7,043	-
Pass-Through University of Chicago		SUB00000252	27,424	-
Pass-Through University of Florida		SUB00002328	5,684	-
Pass-Through University of Louisville Research Foundation, Inc		ULRF_21-0603-01/ULRF_21-0603A	15,115	-
Pass-Through University of Washington		UWSC13962	17,796	-
Pass-Through Yale University		CON-80003544(GR115523)	18,137	-
Total ALN 93.837 Cardiovascular Diseases Research			11,017,081	676,281
Lung Diseases Research	93.838		4,040,642	91,172
Pass-Through The Board of Trustees of The Leland Stanford Junior University		62977268-131009	23,546	-
Pass-Through The Regents of the University of California - San Diego		Subaward No. PED-01-21	246,705	-

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
U.S. Department of Health and Human Services (continued)				
Lung Diseases Research (continued)	93.838			
Pass-Through The Regents of the University of California, San Francisco		14240sc	15,011	-
Pass-Through University of Alabama at Birmingham		000530409-SC009	46,419	-
Pass-Through University of Colorado Denver		FY22.1110.001/ 2-5-B0582	76,184	-
Pass-Through University of Pittsburgh		AWD00000797 (136391-1)	8,822	-
Pass-Through University of Pittsburgh		AWD00000797 (137876-1)	191,172	-
Total ALN 93.838 Lung Diseases Research			4,648,501	91,172
Blood Diseases and Resources Research	93.839		4,038,304	1,406,218
Pass-Through Duke University		2037978	72,786	-
Pass-Through Kennedy Krieger Institute		Signed on 11/28/2022	21,848	-
Pass-Through Lehigh University		543523-78001	5,209	-
Pass-Through The Ohio State University Research Found		GR124201 / SPC-1000005205	147,368	-
Pass-Through University of Colorado Denver		FY22.360.002	147,396	-
Pass-Through University of Colorado Denver		FY22.360.003	187,210	-
Total ALN 93.839 Blood Diseases and Resources Research			4,620,121	1,406,218
Translation and Implementation Science Research for Heart, Lung, Blood Diseases, and Sleep Disorders	93.840		460,234	14,595
Arthritis, Musculoskeletal and Skin Diseases Research	93.846		5,875,715	202,774
Pass-Through Albert Einstein School of Medicine		312009	87,179	-
Pass-Through Children's Hospital/Philadelphia		27007-3209440821	29,448	-
Pass-Through Dartmouth Hitchcock Clinic		GC10392-02-	21,533	-
Pass-Through Johns Hopkins University		2004479987	42,099	-
Pass-Through Johns Hopkins University		2004845693	26,720	-
Pass-Through University of Nevada School of Medicine		UNR-20-74	174,497	-
Pass-Through University of Pittsburgh		AWD00006473 (138826-2)	24,000	-
Total ALN 93.846 Arthritis, Musculoskeletal and Skin Diseases Research			6,281,191	202,774
Diabetes, Digestive, and Kidney Diseases Extramural Research	93.847		11,981,642	1,279,237
Pass-Through Augusta University Research Institute		35235-5	3,899	-
Pass-Through Boston Children's Hospital		GENFD0002080079	28,181	-
Pass-Through Boston Children's Hospital		GENFD0002259945	94,610	-
Pass-Through Broad Institute Inc.		5000472-5500001055	177,404	-
Pass-Through Case Western Reserve University		RES516479	7,535	-
Pass-Through Case Western Reserve University		RES600217	135,707	-
Pass-Through CoapTech, LLC		signed011720	259	-
Pass-Through Georgia State University		SP00013379-01	6,757	-
Pass-Through Georgia State University		SP00015474-03	97,698	-
Pass-Through Johns Hopkins University		2004033321	211,402	-
Pass-Through Johns Hopkins University		2004514688	109,222	-
Pass-Through Johns Hopkins University		2005282679	34,588	-
Pass-Through Johns Hopkins University		2005765316	30,977	-
Pass-Through Lankenau Institute for Medical Research		06306-3534	36,362	-
Pass-Through Northern California Institute for Research and Education		EST3059-01	595	-
Pass-Through Rutgers, the State University of New Jersey		5U01DK062431	920	-
Pass-Through The Regents of the University of California, San Francisco		11744sc	33,287	-
Pass-Through The Regents of the University of California, San Francisco		13708sc	20,262	-
Pass-Through Trustees of Columbia University in the City of New York		4(GG016477-10)	32,739	-
Pass-Through University of Chicago		FP068366-01 G	2,854	-
Pass-Through University of Chicago		FP068366-01G	211,619	-
Pass-Through University of Illinois at Chicago		17638	5,034	-
Pass-Through University of Pennsylvania		574566	7,202	-
Pass-Through University of Texas Southwestern Medical Center		GMO 220219	201,516	-
Pass-Through University of Utah		10055841-22-UM	35,469	-
Pass-Through University of Virginia		GB10708	417,118	-
Total ALN 93.847 Diabetes, Digestive, and Kidney Diseases Extramural Research			13,924,858	1,279,237

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
U.S. Department of Health and Human Services (continued)				
COVID-19 Extramural Research Programs in the Neurosciences and Neurological Disorders	93.853		64,131	-
Extramural Research Programs in the Neurosciences and Neurological Disorders			22,231,151	2,750,350
Pass-Through Childrens National Medical Center		30006196-01	55,806	-
Pass-Through Cleveland Clinic Lerner College of Medicine of CWRU		1481-SUB	58,506	-
Pass-Through Columbia University		1(GG012011-05)	1,249	-
Pass-Through Columbia University		6(GG011293-01)	25,907	-
Pass-Through Columbia University		GG015295-01 (19-	47,883	-
Pass-Through Dystonia Coalition		Signed 2/29/12	1,810	-
Pass-Through Johns Hopkins University		2005089582	43,243	-
Pass-Through Johns Hopkins University		2005402713	45,050	-
Pass-Through Massachusetts General Hospital		236574	124,055	-
Pass-Through Massachusetts General Hospital		241642	26,256	-
Pass-Through Mayo Clinic		UNI-187276-11	40,720	-
Pass-Through Mayo Clinic		UNI-187276-12	132,158	-
Pass-Through Mayo Clinic		UNI-263585-02	11,161	-
Pass-Through Mayo Clinic		UNI-263585-03	60,321	-
Pass-Through Mayo Clinic		UNI-290195	9,123	-
Pass-Through Mayo Clinic		UNI-290195-02 / PO	16,063	-
Pass-Through MedStar Research Institute		N/A-5U24NS107222	43,078	-
Pass-Through NextStep Robotics		5U44NS111076-03	20,953	-
Pass-Through Partners Healthcare		235400	119,875	-
Pass-Through Regents of The University Of Michigan		BOOST-3 MOP	8,212	-
Pass-Through Rush University Medical Center		20121005-Sub05	150,500	-
Pass-Through Temple University		266430UM	26,307	-
Pass-Through Temple University - Main Campus		SIREN_100CSPR #001	21,753	-
Pass-Through University of California Davis		A190478S001	38,858	-
Pass-Through University of California, Davis		A19-1004-S002	96,054	-
Pass-Through University of California, Davis		A19-1044-S002	4,011	-
Pass-Through University of Chicago		FP06221402PRB	13,467	-
Pass-Through University of Chicago		FP06621402PRB	123,597	-
Pass-Through University of Chicago		FP066221401PRA	291,009	-
Pass-Through University of Cincinnati		010785-136493	250	-
Pass-Through University of Cincinnati		011078-014	89,434	-
Pass-Through University of Cincinnati		011337-136493	10,144	-
Pass-Through University of Cincinnati		012044-136493	19	-
Pass-Through University of Cincinnati		013381-136493	10,665	-
Pass-Through University of Cincinnati		013382-00016	238	-
Pass-Through University of Cincinnati		013382-0012	12,332	-
Pass-Through University of North Carolina at Chapel Hill		5118021	111,751	-
Pass-Through University of North Carolina at Chapel Hill		5124705	52,441	-
Pass-Through Yale University		GR107538 (CON-80001928)	25,493	-
Total ALN 93.853 Extramural Research Programs in the Neurosciences and Neurological Disorders			24,265,034	2,750,350
COVID-19 Allergy and Infectious Diseases Research	93.855		8,225,507	832,297
Pass-Through Boston Children's Hospital		GENFD0002176608	2,834	-
Pass-Through Boston Children's Hospital		GENFD0002242200	49,934	-
Pass-Through Duke University		A035453	679,980	-
Pass-Through Emory University		A481967	48,058	-
Pass-Through Emory University		A601923	33,887	-
Pass-Through Emory University		A601926	279,154	-
Pass-Through Emory University		A633501	16,211	-
Pass-Through Emory University		A713197	12,408	-
Pass-Through Emory University		A718568	273,791	-
Pass-Through Fred Hutchinson Cancer Research Center		1062457	7,365	-
Pass-Through Mount Sinai		0258-A407-4609	120,109	-
Pass-Through Mount Sinai		0258-A705-4609	428,704	-

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
U.S. Department of Health and Human Services (continued)				
COVID-19 Allergy and Infectious Diseases Research (continued)	93.855			
Pass-Through Mount Sinai		0258-A716-4609	26,627	-
Pass-Through Mount Sinai		0258-A720-4609	18,935	-
Pass-Through The Scripps Research Institute		5-54820	106,026	-
Pass-Through The Scripps Research Institute		5-54830	40,671	-
Pass-Through Washington University		WU-23-0180	136,697	-
Allergy and Infectious Diseases Research			75,106,757	16,435,208
Pass-Through Benaroya Research Institute		FY22ITN415	82,085	-
Pass-Through Benaroya Research Institute		FY23ITN415	80,208	-
Pass-Through Boston University		4500003989	27,396	-
Pass-Through Centro Internacional de Entrenamiento e Investigaciones Medicas		117	3,184	-
Pass-Through Childrens Research Institute		30006674-04	59,346	-
Pass-Through Columbia University		5(GG014746-40)	62,465	-
Pass-Through Cornell University		138303-20986	67,154	-
Pass-Through Duke Clinical Research Institute		303000141	10,649	-
Pass-Through Duke Clinical Research Institute		303001642	38,550	-
Pass-Through Duke University		225440	6,271	-
Pass-Through Duke University		A031388	86,205	-
Pass-Through Duke University		A034672	251,706	-
Pass-Through Emmes Company, LLC		VRC612	169,457	-
Pass-Through Emory University		A289717	101,148	-
Pass-Through Emory University		A353273	121,178	-
Pass-Through Emory University		A508336	37,178	-
Pass-Through Emory University		A542102	27,912	-
Pass-Through Emory University		A609541	32,708	-
Pass-Through Emory University		A609601	51,689	-
Pass-Through Emory University		A754583 (formerly A609541)	86,848	-
Pass-Through FHI 360		PO211001105	13,203	-
Pass-Through FZata, Inc		Signed 10/27/2020	10,706	-
Pass-Through Geneva Foundation		S-11143-01	58,736	-
Pass-Through Geneva Foundation		S1057001	88,341	-
Pass-Through Harvard University		123842	334,302	-
Pass-Through Harvard University		151271.5120878.0002	44,368	-
Pass-Through Humanetics Corporation		52525	259,401	-
Pass-Through Icahn School of Medicine at Mount Sinai		inf	95,377	-
Pass-Through InfraTrac		22094700	33,034	-
Pass-Through Innovation Pathways LLC		Signed 11-11-2022	93,526	-
Pass-Through Integrated Bio Therapeutics		1R01AI126587-03A1	5,758	-
Pass-Through Integrated BioTherapeutics		R43ANTHRAX	2,632	-
Pass-Through Integrated BioTherapeutics		RO1126587UMD01	14,914	-
Pass-Through Intralytix		50400-NIH Shigella	415,742	-
Pass-Through Johns Hopkins University		2004782026	51,574	-
Pass-Through Johns Hopkins University		2005089759	38,645	-
Pass-Through Johns Hopkins University		2005470494	131,602	-
Pass-Through Johns Hopkins University		2005575253	37,257	-
Pass-Through Johns Hopkins University		2005737866	12,711	-
Pass-Through Massachusetts General Hospital		239761	4,299	-
Pass-Through Massachusetts General Hospital		240058	453,491	-
Pass-Through Michigan State University		5U01AI126610	10,378	-
Pass-Through Michigan State University		RC107329UMAR	76,411	-
Pass-Through Michigan State University		RC110323UMB	98,802	-
Pass-Through Mount Sinai		0255-A651-4609	201,132	-
Pass-Through New York Medical College		124540	1,693	-
Pass-Through New York Medical College		Subaward no#124541	35,594	-
Pass-Through New York University		19-A1-00-1002528	5,398	-
Pass-Through New York University		21-A1-00-1004803	42,767	-
Pass-Through Rutgers, the State University of New Jersey		Subaward 1602	189,437	-
Pass-Through Sanaria Incorporated		22020847	46,229	-
Pass-Through Sanaria Incorporated		Grant #1U01AI155356	72,577	-
Pass-Through Sanaria Incorporated		Signed on 10/19/2022	241,901	-

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
U.S. Department of Health and Human Services (continued)				
Allergy and Infectious Diseases Research (continued)	93.855			
Pass-Through The Regents of the University of California, San Francisco		9256sc	1,927	-
Pass-Through University of Alabama at Birmingham		000523949-SC001-Tet	64,245	-
Pass-Through University of Alabama at Birmingham		000535966-SC001	42,601	-
Pass-Through University of Alabama at Birmingham		Signed on 02/01/2023	66,479	-
Pass-Through University of Chicago		AWD100765	275,566	-
Pass-Through University of Colorado Denver		FY211043002	16,283	-
Pass-Through University of Massachusetts Medical School		OSP3129200	53,466	-
Pass-Through University of Michigan		SUBK00016289	181,346	-
Pass-Through University of Michigan		SUBK00016304	193,200	-
Pass-Through University of Michigan		SUBK00016304	39,175	-
Pass-Through University of Michigan		SUBK00018192	110,871	-
Pass-Through University of Michigan		SUBK00018192	12,882	-
Pass-Through University of Michigan		SUBK00019302	13,412	-
Pass-Through University of Michigan		SUBK00019302	17,667	-
Pass-Through University of Michigan		H0065874101	57,571	-
Pass-Through University Of Missouri		C00081949-2	10,376	-
Pass-Through University of North Carolina at Chapel Hill		5119263	94,734	-
Pass-Through University of North Carolina at Chapel Hill		5125065	424,913	-
Pass-Through University of North Carolina at Chapel Hill		5125067	170,903	-
Pass-Through University of North Carolina at Charlotte		20211125-04-UMD	16,994	-
Pass-Through University of Notre Dame		203504UMB	64,229	-
Pass-Through University of Notre Dame		204604UMB	17,506	-
Pass-Through University of Pittsburgh		AWD00002200	277,591	-
Pass-Through University of Pittsburgh		CNVA00062471	150,051	-
Pass-Through University of Sciences, Techniques and Technologies of Bamako, Mali		USTTB-UMB/5R01AI150534-02	15,183	-
Pass-Through University of Tennessee Health Science		22-2013-UMB	20,796	-
Pass-Through University of Tennessee Health Science		23-3371-UMB	4,952	-
Pass-Through University of Virginia		AWD-	30,058	-
Pass-Through University of Washington		UWSC14579	34,086	-
Pass-Through Upstate formally University of New York Buffalo		R1193050	192,044	-
Pass-Through Washington State University		140134 SPC004882	22,107	-
Pass-Through Washington University		WU-21-17-MOD3	390,897	-
Pass-Through Weill Medical College of Cornell University		214521-4	40,879	-
Pass-Through West Virginia University Research Corporation		18-543-UMB	126,071	-
Total ALN 93.855 Allergy and Infectious Diseases Research			93,489,991	17,267,505
Biomedical Research and Research Training	93.859		20,085,464	550,487
Pass-Through Amherst College		GRT00170UMD	153,016	-
Pass-Through Chesapeake Genomics, LLC		7R43GM137735-02	16,559	-
Pass-Through Chesapeake Genomics, LLC		Agreement Dated 12/2/2021	4,475	-
Pass-Through Johns Hopkins University		K12GM123914	29,540	-
Pass-Through Johns Hopkins University		2005398660	16,244	-
Pass-Through Johns Hopkins University		K12GM123914	41,689	-
Pass-Through Massachusetts Institute of Technology		S5482	146,251	-
Pass-Through Mayo Clinic, Rochester		212181-00002	4,368	-
Pass-Through Mayo Clinic, Rochester		UMD-248321-05	33,800	-
Pass-Through Texas A & M University		M2203112	125,814	-
Pass-Through The Ohio State University Research Found		GR110071 (60067256)	29,160	-
Pass-Through University of Michigan		3004636404	27,446	-
Pass-Through University of Michigan		3004754357 PO 3006663416	61,050	-
Pass-Through University of Michigan		3004764254 PO 3006662237	101,351	-
Pass-Through University of Michigan		SUBK00010313	6,728	-
Pass-Through Maryland Developmental Disabilities Council		22CS1	19,447	-
Total ALN 93.859 Biomedical Research and Research Training			20,902,402	550,487
COVID-19 Child Health and Human Development Extramural Research	93.865		13,721	13,721
Pass-Through Johns Hopkins University		2005724220	29,013	-

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
U.S. Department of Health and Human Services (continued)				
Child Health and Human Development Extramural Research	93.865		11,255,757	3,286,497
Pass-Through Carnegie Mellon University		1090713456153	18,714	-
Pass-Through Childrens National Medical Center		30006322-01	10,000	-
Pass-Through George Washington University		22-M01	27,832	-
Pass-Through Georgetown University		412428_GR412396-UMB	44,513	-
Pass-Through Institute of Human Virology, Nigeria		Signed 1/4/2023	11,921	-
Pass-Through Johns Hopkins University		2005513519	63,990	-
Pass-Through National Disease Research Interchange		141146	195,713	-
Pass-Through University of California Irvine		20173507	45,605	-
Pass-Through University of California Irvine		20201395	7,594	-
Pass-Through University of California, Davis		A20-0658-S001-A01	24,733	-
Pass-Through University of California, Davis		A20-0658-S001-A02	34,978	-
Pass-Through University of Houston		R190001	175,697	-
Pass-Through University of Illinois at Chicago		18157	20,668	-
Pass-Through University of Pennsylvania		579496	69	-
Pass-Through University of South Carolina		193838	311	-
Pass-Through University of Texas at Austin		UTAUS-SUB00000675	3,811	-
Pass-Through Washington University		PO ST00005764 / WU-22-0263	35,785	-
Pass-Through Washington University		WU-19-338-MOD-1	5,970	-
Pass-Through Washington University		WU-23-0312	28,294	-
Total ALN 93.865 Child Health and Human Development Extramural Research			12,054,689	3,300,218
COVID-19 Aging Research	93.866			
Pass-Through Virginia Commonwealth University		FP00015817_SA001	135,621	-
Aging Research			17,386,339	1,602,124
Pass-Through American Geriatrics Society		1R25AG071488-01-MD	11,714	-
Pass-Through Brown University		00001784	27,969	-
Pass-Through Brown University		00002127	131,599	6,536
Pass-Through Brown University		00002128	23,841	-
Pass-Through Cleveland Clinic Lerner College of Medicine		1472SUB	2,292	-
Pass-Through Cleveland Clinic Lerner College of Medicine		CCF21060423	18,654	-
Pass-Through Columbia University		6(GG014803-01)	23,419	-
Pass-Through Georgia State University		SP00015287-01	175,659	-
Pass-Through Indiana University		8546	125,627	-
Pass-Through Johns Hopkins University		2004166191	49,617	-
Pass-Through Johns Hopkins University		2004894866	13,510	-
Pass-Through Johns Hopkins University		2004469844	23,191	-
Pass-Through Johns Hopkins University		2004951349	48,372	-
Pass-Through Johns Hopkins University		2005138644	26,364	-
Pass-Through Johns Hopkins University		2005207243	96,211	-
Pass-Through Mass General Brigham Incorporated		119837	1,013	-
Pass-Through Montclair State University		1R01AG067836-UMB	283,338	-
Pass-Through Northern California Institute for Research and Education		STE2196-04	34,310	-
Pass-Through Ridgeline Therapeutics		U44AG074107	82,742	-
Pass-Through The Regents of the University of California, San Francisco		10479SC	21,414	-
Pass-Through University of Florida		SUB00003372	82,624	-
Pass-Through University of Florida		UFDSP00011997	204	-
Pass-Through University of Kansas Center for Research		FY2019-088-M3	22,695	-
Pass-Through University of Massachusetts Medical School		OSP 2018112 / PO WA01162604	19,356	-
Pass-Through University of Michigan		SUBK00010576	396	-
Pass-Through University of Pittsburgh		PO3005775330 AWD0001055 (134265-3)	30,981	-
Pass-Through University of Southern California		140893827	59,278	-
Pass-Through University of Wisconsin Medical School		0000002708	11,252	-
Pass-Through Wake Forest University Health Sciences		7763366411000000000	25,866	-
Pass-Through Wake Forest University Health Sciences		776101720336752	4,062	2,630
Pass-Through Wake Forrest University		7-101720-336752	6,317	-
Pass-Through Wake Forrest University		7-33664-11000001042	33,477	-
Pass-Through Washington University		WU-22-0334	6,317	-
Pass-Through Washington University		WU-22-0334-MOD-1/PO ST00010736	14,087	-

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
U.S. Department of Health and Human Services (continued)				
Aging Research (continued)	93.866			
Pass-Through Washington University		WU-22-0483	150,423	-
Pass-Through Washington University		WU-23-0551	39,861	-
Pass-Through Weill Cornell Medicine		225660-1	57,174	-
Pass-Through Wright State University		6713401	7,032	-
Total ALN 93.866 Aging Research			19,314,218	1,611,290
Vision Research	93.867		4,794,310	1,304,093
Pass-Through Brigham and Womens Hospital		126553	59,221	-
Pass-Through Georgia Tech Research Corporation		AWD-003315-S1	121,165	-
Pass-Through Johns Hopkins University		2003370123	12,184	-
Pass-Through Lerner Research Institute, Cleveland Clinic		CCF22588799	86,209	-
Pass-Through New York University		ZEDS CTA	1,200	-
Pass-Through New York Univ Grossman School of Medicine		ZEDS CTA	10,785	-
Pass-Through San Diego State University Research Foundation		D876804SA933A05A81 0A7803	26,809	-
Pass-Through University of California Irvine		20231881	45,985	-
Pass-Through University of Houston		R210001	153,408	-
Pass-Through University of North Carolina at Chapel Hill		5116337	28,370	-
Pass-Through Vasoptic Medical Inc.		1R43EY033847-01A1	25,593	-
Pass-Through Vasoptic Medical Inc.		signed 09232022	35,557	-
Pass-Through Yale University		GR107487CON800019 10	64,333	-
Total ALN 93.867 Vision Research			5,465,129	1,304,093
Medical Library Assistance	93.879		2,188,243	291,465
Pass-Through University of Pittsburgh		AWD00005658 (137513-3)	213,249	-
Total ALN 93.879 Medical Library Assistance			2,401,492	291,465
Special Projects of National Significance	93.928			
Pass-Through National Alliance of State and Territorial AIDS Directors		22-SA-3215-115-582	129,950	-
Block Grants for Prevention and Treatment of Substance Abuse	93.959			
Pass-Through Carroll County Health Department		02-F-17/18	11,514	-
PPHF Geriatric Education Centers	93.969			
Pass-Through Johns Hopkins University		2004416653	42,256	-
International Research and Research Training	93.989		1,625,543	732,757
Pass-Through Center for Bioethics and Research, Nigeria		Signed 09/30/2022	93,978	-
Pass-Through Center for Bioethics and Research, Nigeria		Signed 12-08-2021	14,933	-
Pass-Through Institute of Human Virology, Nigeria		Signed 09072022	58,843	-
Pass-Through Institute of Human Virology, Nigeria		Signed_02/24/2023	28,341	-
Total ALN 93.989 International Research and Research Training			1,821,638	732,757
Intergovernmental Personnel Act	93.IPA		18,384	-
COVID-19 Research and Development - U.S. Department of Health and Human Services	93.RD		192,743	-
Pass-Through Boston Children's Hospital		GENFD0001844800	7,200	-
Pass-Through Boston Children's Hospital		GENFD0001998517	30,435	-
Pass-Through Frederick National Laboratory for Cancer Research op. Leidos		AGREEMENT NO. 21CTA-DC0036	23,200	-
Pass-Through Icahn School of Medicine at Mount Sinai		25806864609	26,202	-
Pass-Through Mount Sinai		0258-0686-4609	14,363	-
Pass-Through Vysnova Partners, Inc.		SC-75D30120C08405	65,093	-
Research and Development - U.S. Department of Health and Human Services			13,099,702	294,714
Pass-Through Alliance for Clinical Trials in Oncology		A81801	810	-
Pass-Through Bayshore Community Counseling Services		21020825	138,691	-
Pass-Through Calla Health Foundation		22020580	24,110	-
Pass-Through Charles River Analytics		SC2025501	189,068	-
Pass-Through Geneva Foundation		V12VAXHFRS-03/V00479	209,055	-
Pass-Through Icahn School of Medicine at Mount Sinai		0258B5044609	285,338	-
Pass-Through Innovation Pathways LLC		HHSN272201800012C	251	-
Pass-Through Leidos, Inc		SA21009	1,819	-
Pass-Through Marinus Pharmaceuticals		1042-SE-3003	10,883	-
Pass-Through NRG Oncology Foundation Inc.		NRG-GY019	2,142	-

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS (CONTINUED)
YEAR ENDED JUNE 30, 2023

Federal Grantor/Program or Cluster Title	Federal Assistance Listing Number	Pass-Through Identifying Number	Federal Expenditures	Passed Through to Subrecipients
Research and Development Cluster (continued)				
U.S. Department of Health and Human Services (continued)				
Research and Development - U.S. Department of Health and Human Services (continued)	93.RD			
Pass-Through Pro-Change Behavior Systems, Inc.		22094308	169,840	-
Pass-Through Rutgers, the State University of New Jersey		1371579	114,342	-
Pass-Through SilcsBio LLC		2R44GM130198-02A1	309,352	-
Pass-Through Southwest Research Institute		N99006VE2	1,513	-
Pass-Through SRI International		62395	1,334,921	-
Pass-Through Thomas Jefferson University		080-03000-X158xx	276,205	-
Pass-Through University of California Los Angeles		1638PZA036	13,242	-
Pass-Through VLP Biotech, Inc.		5R44AI088919	153,679	-
Pass-Through Washington University		WU-22-0174 / PO ST00008120	19,300	-
Total ALN 93.RD Research and Development - U.S. Department of Health and Human Services			16,713,499	294,714
COVID-19 Contract/Other	93.999		54,527	-
Total U.S. Department of Health and Human Services			**375,250,753**	**50,981,837**
Executive Office of the President				
Research and Data Analysis	95.007		3,195,790	2,524,388
Total Executive Office of the President			**3,195,790**	**2,524,388**
Social Security Administration				
Social Security - Work Incentives Planning and Assistance Program	96.RD		23,329	-
Total Social Security Administration			**23,329**	**-**
U.S. Department of Homeland Security				
Citizenship Education and Training	97.010		17,026	-
Assistance to Firefighters Grant	97.044		56,036	-
Centers for Homeland Security	97.061		13	-
Homeland Security Grant Program	97.067			
Pass-Through Government of the District of Columbia Homeland Security		20UASI19001	350,000	-
Financial Assistance for Targeted Violence and Terrorism Prevention	97.132		126,293	-
Research and Development - U.S. Department of Homeland Security	97.RD			
Pass-Through Johns Hopkins University Applied Physics Laboratory		159838	99,620	-
Pass-Through RTI International		1312021828866615L	44,097	-
Total ALN 97.RD Research and Development - U.S. Department of Homeland Security			143,717	-
Contract/Other	97.999		12,134	-
Total U.S. Department of Homeland Security			**705,219**	**-**
U.S. Agency for International Development				
USAID Foreign Assistance for Programs Overseas	98.001		161,183	86,907
Pass-Through Eastern Virginia Medical School		No. UCC-21-007	55,222	-
Pass-Through International Institute of Tropical Agriculture		22010332	128,034	-
Pass-Through Kansas State University		A200163S017	40,414	-
Pass-Through Mississippi State University		19390031245515	32,684	-
Pass-Through The National Academies of Sciences, Engineering, and Medicine		20000010805	47,315	-
Total ALN 98.001 USAID Foreign Assistance for Programs Overseas			464,852	86,907
Total U.S. Agency for International Development			**464,852**	**86,907**
Total Research and Development Cluster			**933,616,427**	**153,226,293**
Total Expenditures of Federal Awards			**$ 23,052,880,229**	**$ 2,598,289,376**

See accompanying Notes to Schedule of Expenditures of Federal Awards.

STATE OF MARYLAND
NOTES TO SCHEDULE OF EXPENDITURES OF FEDERAL AWARDS
YEAR ENDED JUNE 30, 2023

NOTE 1 SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

The State of Maryland (the State) includes expenditures in its Schedule of Expenditures of Federal Awards (the Schedule or SEFA) for all federal programs administered by the funds, agencies, boards and commissions, including component units, included in the State's reporting entity used for its basic financial statements, including the component unit higher education funds—the University System of Maryland, the Baltimore City Community College, Morgan State University, and St. Mary's College of Maryland. However, the Schedule of Expenditures of Federal Awards excludes the Maryland Water Infrastructure Financing Administration and Maryland Transportation Authority. A separate single audit was conducted for these entities.

NOTE 2 BASIS OF ACCOUNTING

The accompanying SEFA has been presented on the accrual basis of accounting. Expenditures are recorded, accordingly, when incurred rather than when paid.

Expenditures reported on the SEFA are recognized following the cost principles contained in 2 *CFR* Part 200, *Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards* (Uniform Guidance) except for the expenditures for the Coronavirus Recovery Fund (CRF) and Coronavirus State and Local Recovery Fund (ALN 21.019 and 21.027, respectively). The expenditures are based on criteria determined by the U.S. Department of Treasury (the Treasury). The Treasury identified allowable cost and activities requirements and identified costs and activities that were unallowed.

Indirect Costs

The State has elected not to use the 10% de minimis indirect cost rate allowed under the Uniform Guidance.

NOTE 3 CATEGORIZATION OF EXPENDITURES

The accompanying Schedule of Expenditures of Federal Awards (SEFA) reflects Federal expenditures for all individual grants that were active during the year. The categorization of expenditures by programs included in the accompanying SEFA is based on Assistance Listings as maintained in the System for Award Management (SAM). In accordance with the State's policy, the accompanying SEFA for the year ended June 30, 2023 reflects Assistance Listing changes published in SAM through June 30, 2023.

Certain programs presented in the accompanying Schedule that have not been assigned an Assistance Listing number are reported by the respective federal agency and titled "999." Programs related to the Intergovernmental Personnel Act are labeled "IPA" and Research and Development programs that have not been assigned an Assistance Listing number are labeled "RD."

NOTE 4 NONMONETARY FEDERAL FINANCIAL ASSISTANCE

The State is the recipient of federal programs that do not result in cash receipts or disbursements. Nonmonetary awards included in the Schedule are as follows:

Program Name	Assistance Listing	Amount
COVID-19 Pandemic EBT Food Benefits	10.542	$ 172,283,068
Supplemental Nutrition Assistance Program	10.551	1,828,947,110
Emergency Food Assistance Program (Food Commodities)	10.569	17,510,094
Donation of Federal Surplus Personal Property	39.003	33,263,314
COVID-19 - Immunization Cooperative Agreements	93.268	15,945,956
Immunization Cooperative Agreements	93.268	3,902,245
Total		$ 2,071,851,787

NOTE 5 UNEMPLOYMENT INSURANCE

In accordance with the Department of Labor, Office of Inspector General instructions, the State recorded State Regular Unemployment Compensation (UC) benefits under Assistance Listing 17.225 on the accompanying Schedule. The individual state and federal portions are as follows:

State Regular UC Benefits	$ 317,663,483
Federal UC Benefits	4,315,236
COVID-19 Federal UC Benefits	51,372,235
COVID-19 Federal UC Administrative Costs	98,082,606
Federal UC Administrative Costs	24,666,685
Total Benefits	$ 496,100,245

NOTE 6 FEDERAL MORTGAGE PLANS

The State operates several programs that purchase federally guaranteed loans, primarily mortgages, from the originators. As the State has no responsibility for determining eligibility or compliance, these guarantees are not considered federal financial assistance for purposes of the single audit.

NOTE 7 LOAN PROGRAMS

The outstanding loan balances as of June 30, 2022, and loan expenditures for the year ended June 30, 2023, are considered current-year federal expenditures. These amounts are reported on the Schedule of Expenditures of Federal Awards.

University System of Maryland

The System administers the following Federal Student Financial Assistance Programs:

Assistance Listing		Outstanding Balance as of June 30, 2023
84.038	Perkins Loan Programs	$ 9,090,843
93.264	Nurse Student Loan Program	301,856
93.342	Health Professions Students, Including Primary Care Loans/Loans for Disadvantaged Students	6,562,754
	Total	$ 15,955,453

St. Mary's College of Maryland

The College administers the Federal Perkins Loan Program – Federal Capital Contributions (Assistance Listing Number 84.038). The College received no Federal funds under the Program for the fiscal year ended June 30, 2023. The outstanding loan balance of $103,616 as of June 30, 2022, and the outstanding loan balance of $96,990.35 for the fiscal year ended June 30, 2023, are not considered current year Federal expenditures. The College did not issue new loans during the fiscal year ended June 30, 2023.

During the fiscal year ended June 30, 2023, the College processed the following amount of new loans under the Federal Education Loan Program, which includes the Stafford Loan and PLUS Loan. Since this program is administered by outside financial institutions, new loans made during the fiscal year ended June 30, 2023, relating to this program are considered current-year Federal expenditures, whereas the outstanding loan balances are not. The new loans made during the fiscal year ended June 30, 2023, are reported in the Schedule of Expenditures of Federal Awards.

Assistance Listing		Outstanding Loan Balance as of June 30, 2023
84.032	Stafford Loan Program	$ 4,274,282
93.264	Nurse Student Loan Program	2,345,989
	Total	$ 6,620,271

NOTE 7 LOAN PROGRAMS (CONTINUED)

Morgan State University

The University administers the Federal Perkins Loan Program – Federal Capital Contributions (Assistance Listing Number 84.038). The outstanding loan balance of $2,583,593 as of June 30, 2022, less the Perkins Loan funds returned to the federal government of $128,276, netting to $2,455,317 are considered current-year Federal expenditures. These amounts are reported in summary in the Schedule of Expenditures of Federal Awards.

During the fiscal year ended June 30, 2023, the University processed $67,686,500 in new loans under the Federal Direct Loan Program (Assistance Listing Number 84.268). Since this program is administered by outside financial institutions, the new loans made in the fiscal year that ended June 30, 2023, relating to this program are considered current-year Federal expenditures, whereas the outstanding loan balances are not. The new loans made in the fiscal year that ended June 30, 2023, are reported in the Schedule of Expenditures of Federal Awards.

NOTE 8 DISASTER GRANTS – PUBLIC ASSISTANCE (ASSISTANCE LISTING 97.036)

After a presidentially declared disaster, the U.S. Federal Emergency Management Agency (FEMA) provides a public assistance grant to reimburse eligible costs associated with repair, replacement, or restoration of disaster-damaged facilities. The federal government reimburses in the form of cost-shared grants.

In fiscal year 2023, FEMA approved approximately $311,355,507 of eligible expenditures that were incurred in a prior year and are included in the Schedule.

NOTE 9 REBATES FROM THE SPECIAL SUPPLEMENTAL NUTRITION PROGRAM FOR WOMEN, INFANTS, AND CHILDREN (WIC)

During fiscal year 2023, the state received cash rebates from infant formula manufacturers in the amount of $28,836,758 based on the sale of formula to participants in the WIC program (Assistance Listing Number 10.557), which are netted against total expenditures included in the Schedule. Rebate contracts with infant formula manufacturers are authorized by Code of Federal Regulations, Title 7: Agriculture, Subtitle B, Chapter II, Subchapter A, Part 246.16a as a cost containment measure. Rebates represent a reduction of expenditures previously incurred for WIC food benefit costs. Applying the rebates received to such costs enabled the State to extend program benefits to more participants than could have been serviced this fiscal year in the absence of the rebate contract.

NOTE 10 CCDF CLUSTER (ASSISTANCE LISTINGS 93.575 AND 93.596)

Expenditures reported in the Schedule for the Childcare Development Fund (CCDF) Cluster include the following funding sources:

93.575	COVID-19 Child Care and Development Block Grant	$	76,925,332
93.575	Child Care and Development Block Grant		145,936,872
93.596	Child Care Mandatory and Matching Funds of the Child Care and Development Fund		101,947,320
	Total	$	324,809,524

NOTE 11 HOUSING CHOICE VOUCHER PROGRAM (ASSISTANCE LISTING 14.871)

In accordance with reporting requirements established by U.S. Department of Housing and Urban Development Notice PIH 2021-25 (HA), Section 8.k., the Schedule includes $1,185,723 in Emergency Housing Vouchers (EHV) funding issued under the American Rescue Plan Act of 2021.

STATE OF MARYLAND
SCHEDULE OF FINDINGS AND QUESTIONED COSTS
YEAR ENDED JUNE 30, 2023

Section I – Summary of Auditors' Results

Financial Statements

1. Type of auditors' report issued: Unmodified

2. Internal control over financial reporting:

   - Material weakness(es) identified? x yes _____ no
   - Significant deficiency(ies) identified? _____ yes x none reported

3. Noncompliance material to financial statements noted? _____ yes x no

Federal Awards

1. Internal control over major federal programs:

   - Material weakness(es) identified? x yes _____ no
   - Significant deficiency(ies) identified? x yes _____ none reported

2. Type of auditors' report issued on compliance for major federal programs: See Identification of Major Federal Programs Table Below

3. Any audit findings disclosed that are required to be reported in accordance with 2 CFR 200.516(a)? x yes _____ no

Dollar threshold used to distinguish between Type A and Type B programs: $ 34,579,320

Auditee qualified as low-risk auditee? _____ yes x no

Section I – Summary of Auditors' Results (Continued)

Identification of Major Federal Programs

Major Program	Assistance Listing Number	Opinion
Child Nutrition Cluster	10.553, 10.555, 10.556, 10.559, 10.582	Unmodified
WIC Special Supplemental Nutrition Program for Women, Infants, and Children	10.557	Unmodified
Section 8 Project Based Cluster	14.195, 14.856	Unmodified
COVID 19 - Emergency Rental Assistance Program	21.023	Qualified
COVID 19 - Homeowner Assistance Fund	21.026	Qualified
COVID 19 - Coronavirus State & Local Fiscal Recovery Funds	21.027	Qualified
Higher Education Institutional Aid	84.031	Qualified
COVID 19 - Education Stabilization Fund	84.425C, D F, J, R, U, V, W	Qualified
Temporary Assistance for Needy Families	93.558	Unmodified
Social Services Block Grant	93.667	Unmodified
Children's Health Insurance Program	93.767	Qualified
CCDF Cluster	93.596, 93.575	Unmodified
Medicaid Cluster	93.775, 93.777, 93.778	Qualified
Block Grants for Prevention and Treatment of Substance Abuse	93.959	Qualified
Disability Insurance/SSI Cluster	96.001, 96.006	Unmodified

Section II – Findings and Questioned Costs – Major Federal Programs (Continued)

Material Weakness

Finding 2023-001 – Department of Health – Inventory

Condition
The Department of Health (MDH) did not have adequate controls over the record keeping over inventory to properly account for purchases, transfers, and disbursements. In addition, a physical inventory count was not performed to reconcile the financial records to the inventory items on-hand.

Criteria
The State's Inventory Control Manual establishes policies and procedures for materials and supplies maintained in inventory that State Agencies are required to follow. Agency requirements related to record-keeping, physical inventory counts, and reconciliations for materials and supplies are described in Section II.05 of the manual.

In addition, COSO/Internal Control Framework defines control activities as "policies and procedures that help ensure management's directives are carried out." Management review controls are defined as, "the activities of a person, different than the preparer, through analyzing and performing oversight of activities performed, and is an integral part of any internal control structure."

Context
Our audit procedures detected several misstatements related to the various locations' inventory balances as of year-end.

Effect
Several locations' inventory purchases, transfers, and disposals activity was unable to be substantiated as a result of report limitations or lack of supporting documentation.

Cause
The Department of Health did not follow the State's internal control policies and procedures outlined in the Inventory Control Manual, which caused inventory to be improperly valued as of year-end.

Recommendation
We recommend that MDH reviews its policies and procedures that address the maintenance of adequate records of all inventory purchases, transfers, and disposals, as well as annual inventory counts, to ensure existence and proper valuation of inventory. These policies and procedures should include requirements that management review and verify the policies and procedures are followed effectively.

Management Response
There is no disagreement with the audit finding.

Section II – Findings and Questioned Costs – Major Federal Programs (Continued)

Material Weakness

Finding 2023-002 – Statewide – Agency Accounts Receivable, Deferred Inflow and Unearned Revenue

Condition
Several State departments and agencies recorded accounts or grant receivables inappropriately, resulting in improper classification, recognition, and derecognition concerns. A summary of these concerns is as follows -

- Negative receivable balances that management should record as unearned revenues.
- Receivables and the related deferred inflows were not subsequently adjusted when management received the payments; instead, management recognized cash and revenue.
- Management booked unclaimed receivables based on qualifying expenditures without appropriate grant support to justify the receivable.

The following departments contributed to this condition: the Department of Education, Department of Health, Department of Human Services, Department of Housing and Community Development, and Department of Emergency Management.

Criteria
COSO/Internal Control Framework defines control activities as “policies and procedures that help ensure management’s directives are carried out.” Management review controls are defined as, “the activities of a person, different than the preparer, through analyzing and performing oversight of activities performed, and is an integral part of any internal control structure.”

Context
Management made several material adjustments during the audit, and the auditor proposed and passed on several adjustments. The internal controls are not adequate to prevent possible material misstatements in the future.

Effect
Management recorded several material journal entries during the audit, with several more passed adjustments proposed by the auditor. These adjustments resulted from the ineffectiveness of the internal controls' ability to reduce the risk of accounting errors on a timely basis. Due to the decentralized processes that exist in the State, the entity's internal control environment may not mitigate possible misstatements in the financial statements in receivables, deferred inflows, and unearned revenues.

Cause
The General Accounting Division (GAD)assumes responsibility for compiling the information the departments and agencies provide to present the State's Annual Comprehensive Financial Report. The GAD designed policies and procedures to provide the financial information needed from each department and agency. However, departments and agencies present information inconsistent with policies and procedures, and the errors are not detected in a timely manner.

Section II – Findings and Questioned Costs – Major Federal Programs (Continued)

Recommendation

We recommend the State review, modify, and monitor their policies and procedures for recording accounts receivable and grants receivable to meet the financial reporting principles -

1. The State has the legal right to recognize accounts receivable at year end, and management did not receive the funds before the fiscal year's end.

2. The dollar amount of the receivables is accurate based on legal claims made to external parties.

3. Management records receivables, unearned revenues and deferred inflows in appropriate accounts based on government accounting standards and policies and procedures outlined by the Comptroller's office for financial closing packages.

Given the decentralized nature of the State, we recommend that a department or agency take responsibility for ensuring year-end receivables, unearned revenues, and deferred inflows meet the requirements for financial reporting purposes. Given the number of departments and agencies challenged by accounting for receivables, unearned revenues, and deferred inflows, the department or agency should enhance statewide policy and provide training to ensure appropriate recordkeeping. Additionally, the departments or agencies' leadership should take responsibility for the accuracy of the information reported to the GAD by ensuring management reviewed the information to comply with their policies and procedures.

Management Response

There is no disagreement with the audit finding.

Section II – Findings and Questioned Costs – Major Federal Programs (Continued)

Material Weakness

Finding 2023-003 – Statewide – Treatment of Interdepartmental Activity

Condition
For department and agencies accounted for in the general fund, interdepartmental receivables recorded by department or agencies in the ledger were not properly classified, which caused the year-end eliminations entry related to interdepartmental activity that is posted by the General Accounting Division (GAD) to be inaccurate. Additionally, there were several instances noted where reimbursement requests were not sent by the departments or agencies to the Department of Budget and Management (DBM) in a timely manner.

Criteria
COSO/Internal Control Framework defines control activities as "policies and procedures that help ensure management's directives are carried out." Management review controls are defined as, "the activities of a person, different than the preparer, through analyzing and performing oversight of activities performed, and is an integral part of any internal control structure."

Interdepartmental activities accounted for in the same fund must be eliminated for financial reporting purposes under general accepted accounting principles.

Context
Amounts due from other agencies that are reported within the general fund are recorded together in accounts receivable in R*STARS by all departments or agencies. They do not adequately identify, track, or reconcile the interdepartmental activity within the system. The responsibility falls to the GAD, who makes a top-level adjustment at year-end.

Additionally, we noted the following agencies did not submit reimbursement requests to the Department of Budget & Management (DBM) related to Coronavirus State & Local Fiscal Recovery Funds (ALN #21.027) in a timely manner:

- Department of Health (MDH)
- Department of Education (MSDE)
- Department of Housing and Community Development (DHCD)

Effect
Material corrections were required to be made to the financial statements to properly present the general fund interdepartmental activity.

Cause
The departments and agencies do not reconcile their year-end accounts receivable balances to properly identify or remove interdepartmental activity, which caused the year-end adjustment recorded by the GAD to be inaccurate and require subsequent material corrections.

Section II – Findings and Questioned Costs – Major Federal Programs (Continued)

Recommendation

We recommend that these year-end reconciliations and adjustments be performed by department or agency personnel that are familiar with the detail of the accounts, and that theybe responsible for the separate recording of accounts receivable and unearned revenue in R*STARS. We recommend that a separate account code for interdepartmental activity is utilized in R*STARS to assist the departments and agencies and GAD with year-end financial reporting over accounts receivable balances. Further, we recommend that departments and agencies submit interdepartmental requests for reimbursement in a timely manner.

Management Response

There is no disagreement with the audit finding.

Section II – Findings and Questioned Costs – Major Federal Programs (Continued)

Material Weakness

Finding 2023-004 – General Accounting Division – GASB Statement No. 96, *Subscription Based Information Technology Agreements (SBITA),* Implementation

Condition
Several errors were made by the General Accounting Division (GAD) during the implementation of Governmental Accounting Standards Board (GASB) Statement No. 96, *SBITA* that resulted in the subscription asset, corresponding liability, interest payable, interest expense, amortization expense, and accumulated amortization to be inaccurate.

Criteria
COSO/Internal Control Framework defines control activities as "policies and procedures that help ensure management's directives are carried out." Management review controls are defined as, "the activities of a person, different than the preparer, through analyzing and performing oversight of activities performed, and is an integral part of any internal control structure."

Effective July 1, 2022, the State adopted new accounting guidance for GASB 96, *SBITA*. The guidance requires entities to recognize a right-to-use subscription asset and corresponding subscription liability.

Context
Our audit procedures detected misstatements related to the implementation of GASB 96.

Effect
During our testing of the implementation of GASB 96, we identified a contract that was improperly excluded from the population that was evaluated by GAD, as well as a contract that was improperly included in the implementation. Additionally, we identified errors that caused the SBITA asset, SBITA liability, interest payable, interest expense, amortization expense, and accumulated amortization to be inaccurate. It was also noted that the State's policies and procedures were not updated to reflect changes related to the implementation of GASB 96.

Adjustments were subsequently made to the accounting records to properly state the subscription asset, subscription liability, interest payable, interest expense, amortization expense, and accumulated amortization balances related to the SBITA implementation.

Cause
The GAD's internal controls over the implementation of GASB Statement No. 96, *SBITA,* did not ensure completeness of the population of contracts evaluated, adequate retention of supporting documentation to be used in GAD's evaluation, decentralized nature of certain types of contracts held by the agencies, proper valuation of the various account balances affected by the implementation, or that the policy was updated to reflect the related changes.

Recommendation
We recommend that GAD strengthens its policies and procedures related to the implementation of new accounting pronouncements, as well as update the policies and procedures to properly address changes related to the implementation of GASB Statement No. 96, *SBITA*.

Management Response
There is no disagreement with the audit finding.

Section II – Findings and Questioned Costs – Major Federal Programs (Continued)

Material Weakness

Finding 2022-005 – Department of Health – Schedule of Expenditures of Federal Awards (SEFA)

Condition
The Schedule of Expenditures of Federal Awards (SEFA) contained numerous errors and required material edits in order to obtain a reliable SEFA for the major program risk assessment. During the audit we noted that the SEFA contained:

1. Negative federal expenditures and
2. Incorrect assistance listing numbers.

We identified a material SEFA error due to incorrect reporting of federal expenditures. The Department of Health (the Department) reported and certified negative federal expenditures, in the amount of ($127,140,490,.29), for the Epidemiology and Laboratory capacity for infectious disease (ELC). The negative program expenditures consisted of $67,724,611.87 FEMA expenditures, $76,527,850.41 reversal of prior year accrual, and $17,111,971.99 for current year expenditures. We noted that the FEMA expenditures were incorrectly reported as ELC program costs and the reversal of the prior year accrual was less than current year expenditures.

The General Accounting Department consulted with Department to “reasonably” determine the current year federal program expenditures. However, the Department incorrectly accounted for and reported the federal program expenditures as part of their closing reporting package.

Criteria
Per 2 CFR section 200.303(a), a non-Federal entity must: Establish and maintain effective internal control over the Federal award that provides reasonable assurance that the non-Federal entity is managing the Federal award in compliance with Federal statutes, regulations, and the terms and conditions of the Federal award. These internal controls should be in compliance with guidance in “Standards for Internal Control in the Federal Government” issued by the Comptroller General of the United States or the “Internal Control Integrated Framework,” issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

2 CFR, Part 200 – Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards, Subpart F, §200.510(b) requires that auditees prepare a schedule of expenditures of Federal awards for the period covered by the auditee's financial statements which must include the total Federal awards expended as determined in accordance with §200.502.

Effect
The SEFA was not prepared in accordance with OMB requirements which affects the major program risk assessment.

Cause
The incorrect reported information was due to an error.

Section II – Findings and Questioned Costs – Major Federal Programs (Continued)

Recommendation

We recommend that the Department work with GAD to determine procedures and processes for accounting and reconciling federal program expenditures to ensure that the reported information is accurate and reliable.

***Management Response*:** There is no disagreement with the audit finding.

Section III – Findings and Questioned Costs – Major Federal Programs

Summary of Federal Award Findings

			Internal Control			
Finding Number	**Assistance Listing #**	**Federal Program/ Cluster Name**	**Material Weakness**	**Significant Deficiency**	**Compliance**	**Compliance Requirement**
2023-006	14.195 14.856	Section 8 Project-Based Cluster		x	x	Reporting
2023-007	21.023	Emergency Rental Assistance		x	x	Reporting
2023-008	21.023 21.026	Emergency Rental Assistance Homeowner Assistance Fund	x		x	Eligibility
2023-009	21.023 21.026	Emergency Rental Assistance Homeowner Assistance Fund	x		x	Allowable Activities/Allowable Costs
2023-010	21.027	Coronavirus State and Local Fiscal Recovery Funds	x		x	Suspension and Debarment
2023-011	21.027 84.425 C, D, R, U, V, W	Coronavirus State and Local Fiscal Recovery Funds, Education Stabilization Fund	x		x	Subrecipient Monitoring
2023-012	84.031	Higher Education Institutional Aid	x		x	Allowable Activities/Allowable Costs - Payroll
2023-013	84.031	Higher Education Institutional Aid	x		x	Allowable Activities/Allowable Costs - Payroll
2023-014	84.031 84.425J	Higher Education Institutional Aid Education Stabilization Fund	x		x	SEFA Reporting
2023-015	84.031 84.425 F, J	Higher Education Institutional Aid Education Stabilization Fund		x		Suspension and Debarment
2023-016	84.425 C, D, R, U, V, W	Education Stabilization Fund		x	x	Reporting - Annual Reporting
2023-017	84.425F	Education Stabilizaton Fund		x	x	Cash Management
2023-018	93.558	Temporary Assistance for Needy Families		x	x	Reporting
2023-019	93.558	Temporary Assistance for Needy Families		x	x	Special Tests and Provisions - Child Support Non-Cooperation
2023-020	93.558	Temporary Assistance for Needy Families		x	x	Special Tests and Provisions - Penalty for Refusal to Work
2023-021	93.767, 93.775, 93.777, 93.778	Children's Health Insurance Program, Medicaid Cluster	x		x	Reporting - FFATA
2023-022	93.775, 93.777, 93.778	Medicaid Cluster		x	x	Special Tests and Provisions - Inpatient Hospital and Long-Term Care Facility Audits
2023-023	21.027	Coronavirus State and Local Fiscal Recovery Funds		x	x	Allowable Activities/Allowable Costs
2023-024	93.959	Block Grants for Prevention and Treatment of Substance Abuse	x		x	Reporting - FFATA
2023-025	93.959	Block Grants for Prevention and Treatment of Substance Abuse		x	x	Subrecipient Monitoring

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Reference Number:	2023-006
Prior Year Finding:	No
Federal Agency:	U.S. Department Housing and Urban Development
State Agency:	Department of Housing and Community Development
Federal Program:	Section 8 Project Based Cluster
Assistance Listing Number:	14.195, 14.856
Federal Award Identification Number and Year:	Performance-Based Annual Contributions Contract, As Amended by the Tenth Amendment and 2023
Compliance Requirement:	Reporting
Award Year	2023
Type of Finding:	Significant Deficiency in Internal Control over Compliance, Other Matters

Criteria or Specific Requirement:
Compliance- In lieu of the standard reports, the following reports are required on Section 8 project-based programs involving PHA/private-owners and HUD/PHA owners.

1. HUD-52663, Requisition for Partial Payment of Annual Contributions (OMB No. 2577-0169) – submitted quarterly.
2. HUD-52681, Voucher for Payment of Annual Contributions and Operating Statement (OMB No. 2577-0169) – submitted annually.

Internal Control: Per 2 CFR section 200.303(a), a non-Federal entity must: Establish and maintain effective internal control over the Federal award that provides reasonable assurance that the non-Federal entity is managing the Federal award in compliance with Federal statutes, regulations, and the terms and conditions of the Federal award. These internal controls should comply with guidance in "Standards for Internal Control in the Federal Government" issued by the Comptroller General of the United States or the "Internal Control Integrated Framework", issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

Condition:
The submitted reports contained errors. We noted the following errors:

1. HUD 52681-
    a. HUD52681 for MD901MR006
        i. The year ending date was reported as March 31, 2022, instead of June 30, 2023
        ii. Amount reported for lines 9,15, and 40, had immaterial difference from the support provided by the Department.
    b. HUD 52681 for MD901MR014
        i. Amount reported for lines 9,15, and 40, had immaterial difference from the support provided by the Department.

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c. HUD 52681 for MD901MR016
    i. The year ending date was not identified on the report. Should be for the year ending June 30, 2023
    ii. Amount reported for lines 9,15, 28 and 40, had immaterial difference from the support provided by the Department.
    iii. The total for line 42 was incorrectly reported as $115,475, should be 111,009.52.

2. HUD 52681
    a. Line 13, $238,753,262.80 did not agree to the general ledger expenditures of $255,491,149, a difference of $16,737,886.13.
    b. We did not obtain information to support review and approval of the report due to the report was not signed approving official.

Context:
Three of the three HUD 52681 reports selected for testing contains errors.
One of the one HUD 52663 report selected for testing contained errors or omitted information.

Cause:
The data used to compile the final report was not maintained by the Department. The approval for the final HUD 52663 report was not maintained by the Department.

Effect:
The Department is reporting inaccurate information to the grantor.

Questioned costs:
None

Recommendation:
We recommend that the Department review and enhance supervisor review and approval of reports to ensure that the information is correct, as well as correction are reported to the grantor in a timely manner.

Views of responsible officials:
There is no disagreement with the audit finding.

Section III – Findings and Questioned Costs – Major Federal Programs

Reference Number:	2023-007
Prior Year Finding:	No
Federal Agency:	U.S. Department of Treasury
State Agency:	Department of Housing and Community Development
Federal Program:	COVID-19 Emergency Rental Assistance (ERA)
Assistance Listing Number:	21.023
Federal Award Identification Number and Year:	None, 2021
Compliance Requirement:	Reporting
Award Year	2021
Type of Finding:	Significant Deficiency in Internal Control over Compliance, Other Matters

Criteria or Specific Requirement:
Compliance: Authoritative Requirement: 15 USC 9058c; 2 CFR 200.328 (Financial report); and 2 CFR 200.329 (Performance report) Report Corrections: The Office of Recovery Program's (ORP) reporting portal has built-in functionality to reopen a report and allow recipients to make edits after the reporting deadline. However, it is ORP's policy that recipients may only make revisions if authorized by Treasury staff for a period of up to 60 days after the reporting deadline. After the revision period ends, the report is final. A resubmitted report becomes a recipient's final report within ORP's reporting portal. Recipients can generate PDFs of these reports at any time.

Internal Control: Per 2 CFR section 200.303(a), a non-Federal entity must: Establish and maintain effective internal control over the Federal award that provides reasonable assurance that the non-Federal entity is managing the Federal award in compliance with Federal statutes, regulations, and the terms and conditions of the Federal award. These internal controls should comply with guidance in "Standards for Internal Control in the Federal Government" issued by the Comptroller General of the United States or the "Internal Control Integrated Framework", issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

Condition:
The final close out report for ERA 1 contained errors. The errors were identified by the Department prior to the audit but a revised report was not submitted to the grantor. ERA has procedures and a requirement for resubmitting corrected reports.

Context:
One of the Three report selected for testing contains errors.

Cause:
The corrected report was not resubmitted to the grantor due to an oversight.

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Effect:
The Department is reporting inaccurate information to the grantor.

Questioned costs:
None

Recommendation:
We recommend that the Department review and enhance supervisor review and approval of reports to ensure that the information is correct, as well as correction are reported to the grantor in a timely manner.

Views of responsible officials:
There is no disagreement with the audit finding.

Section III – Findings and Questioned Costs – Major Federal Programs

Reference Number:	2023-008
Prior Year Finding:	No
Federal Agency:	U.S. Department of Treasury
State Agency:	Department of Housing and Community Development
Federal Program:	COVID-19 Emergency Rental Assistance (ERA) COVID-19 Homeowner Assistance Fund (HAF)
Assistance Listing Number:	21.023 21.026
Federal Award Identification Number and Year:	HAF: November 1, 2021 - September 30, 2026 ERA: March 1, 2021- September 25, 2025
Compliance Requirement:	Eligibility
Award Year:	HAF: 2022 ERA: 2021
Type of Finding:	Material Weakness in Internal Control over Compliance, Material Non-Compliance

Criteria or specific requirement:

Internal Control – Per 2 CFR section 200.303(a), a non-Federal entity must: Establish and maintain effective internal control over the Federal award that provides reasonable assurance that the non-Federal entity is managing the Federal award in compliance with Federal statutes, regulations, and the terms and conditions of the Federal award. These internal controls should be in compliance with guidance in “Standards for Internal Control in the Federal Government” issued by the Comptroller General of the United States or the “Internal Control Integrated Framework”, issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

Compliance – Per 2 CFR 200, requires a non-federal entity to determine whether amounts provided to or on behalf of eligible participants or groups of participants were calculated in accordance with program requirements.

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Condition:
The Department did not consistently perform and document the ERA eligibility procedures. We noted the following;

1. Two ERA rental disbursements were incorrectly calculated.
2. The approval and certification for four rental disbursements issued in fiscal year 2022 was documented in February 2024.

The Department did not consistently perform and document the HAF eligibility procedures. We noted the following;

1. We did not receive support for grant disbursement of $9,311.84, of the total disbursement of $26,899.93.

Context:
ERA-

1. Two of the sixty ERA rental disbursements were incorrectly calculated.
2. Four of the sixty rental disbursements issued in FY 22 were certified and approved in February 2024.

HAF:

1. One of the sixty HAF disbursements were not supported by adequate documentation.

Cause:
ERA and HAF: was an oversight not identified by the Department and noticed as part of the review process.
.
Effect:
Expenditures may be incorrectly charged to the programs.

Questioned costs:
ERA

1. $6,875, represents overpaid ERA rental assistance due to the incorrect calculation.

HAF

2. $9,311.84, represents the unsupported disbursements.

Recommendation:
We recommend that the Department review and enhance supervisor review and approval of ERA and HAF eligibility and disbursements to ensure that the program requirements are met. This includes ensuring that the required documentation is obtained, the benefits are accurately determined and are within the allowable limits. Documentation to support compliance with the requirements should be maintained and readily available for review.

Views of responsible officials: There is no disagreement with the audit finding.

Section III – Findings and Questioned Costs – Major Federal Programs

Reference Number:	2023-009
Prior Year Finding:	No
Federal Agency:	U.S. Department of Treasury
State Agency:	Department of Housing and Community Development
Federal Program:	COVID-19 Emergency Rental Assistance (ERA) COVID-19 Homeowner Assistance Fund (HAF)
Assistance Listing Number:	21.023, 21.026
Federal Award Identification Number and Year:	HAF: November 1, 2021 - September 30, 2026 ERA: March 1, 2021- September 25, 2025
Compliance Requirement:	Allowable Activities/Allowable Costs
Award Year	HAF: 2022 ERA: 2021
Type of Finding:	Material Weakness in Internal Control over Compliance, Material Noncompliance

Criteria or Specific Requirement:
Compliance: ERA 1 and ERA 2 funds may be used for administrative expenses, housing stability services, and financial assistance on behalf of an eligible household, as defined in the Treasury guidance.

Administrative Expenses: The cost of a grantee contacting a landlord to encourage their participation and acceptance of ERA assistance is one of many examples of an eligible administrative cost.

Housing Stability Services: Under ERA 1, housing stability services includes case management and other services related to the COVID-19 outbreak intended to help keep households stably housed. Under ERA 2, housing stability services do not have to be related to the COVID-19 outbreak. For ERA 1 and ERA 2, housing stability services include those that enable households to maintain or obtain housing. Such services may include, among other things, eviction prevention and eviction diversion programs; mediation between landlords and tenants; housing counseling; fair housing counseling; housing navigators or promotors that help households access programs or find housing; case management related to housing stability; housing-related services for survivors of domestic abuse or human trafficking; legal services or attorney's fees related to eviction proceedings and maintaining housing stability; and specialized services for individuals with disabilities or seniors that support their ability to access or maintain housing (See FAQ 23).

Financial Assistance: Financial assistance to households includes payment of rent, rental arrears, utilities and home energy costs, utility and home energy costs arrears, and other expenses related to housing.

Examples of other costs for both ERA 1 and ERA 2 include relocation expenses (including prospective relocation expenses), rental security deposits, rental fees including application and screening fees, reasonable accrued late fees, Internet service to a given rental unit, and rental bonds where necessary to avoid an eviction order, as provided in the Treasury guidance and subject to certain conditions (for

Section III – Findings and Questioned Costs – Major Federal Programs

example, that Internet service expenses are eligible only if grantees establish policies governing the appropriate of use for this purpose).

HAF- Title 2, Code of Federal Regulations (2 CFR), Section 200.430, requires employees who are paid with federal funds to document their time and effort within the federal program. The federally funded portion of the employee salary must be reflective of the actual time and effort the individual has put forth for that federal program.

200.413 Direct Costs: The salaries of administrative and clerical staff should normally be treated as indirect (F&A) costs. Direct charging of these costs may be appropriate only if all of the following conditions are met:

(1) Administrative or clerical services are integral to a project or activity;
(2) Individuals involved can be specifically identified with the project or activity;
(3) Such costs are explicitly included in the budget or have the prior written approval of the Federal awarding agency; and
(4) The costs are not also recovered as indirect costs.

Internal Control: Per 2 CFR section 200.303(a), a non-Federal entity must: Establish and maintain effective internal control over the Federal award that provides reasonable assurance that the non-Federal entity is managing the Federal award in compliance with Federal statutes, regulations, and the terms and conditions of the Federal award. These internal controls should comply with guidance in "Standards for Internal Control in the Federal Government" issued by the Comptroller General of the United States or the "Internal Control Integrated Framework", issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

Condition:
The Department used funds to support repairs to a rental property which in an unallowed costs under ERA program requirements. ERA funds are used to assist the tenant will maintaining housing or relocation, and used to repair or maintain the landlord's property unless approved by the grantor.

The payroll costs supported by HAF were not adequately supported by documentation:
1. The employees' salary did not agree with the related time and effort certification.
2. Employee timesheets were not timely reviewed and approved.

Context:
ERA- one of the sixty general disbursements samples selected for tested was identified as unallowed.

HAF:
1. Time and certification did not support employee's allocation of salary charged to the grant for seven of the sixty payroll costs selected for testing.
2. Employee Timesheets:
    a. Late review and approval: seven of the sixty payroll costs selected for testing.

Cause:
ERA: The unallowed cost was an error that was not detected during the review process.
HAF: employee salary documentation was not maintained and readily available for the auditor's review.

Section III – Findings and Questioned Costs – Major Federal Programs

Effect:
Expenditures may be incorrectly charged to the programs.

Questioned costs:
$30,939.08, represents the unallowed ERA costs identified during testing.
$6,126.03, represents employees' salary incorrectly calculated and charged to the program.

Recommendation:
We recommend that the Department review the grant requirements for allowable costs and activities to ensure that program cost and activities are in accordance with the program requirements. The Department should request approval for costs not specifically addressed in the grant to ensure that the costs are allowable under the grant. All costs charged to the program should be supported by documentation maintained by the grantor in accordance with the grantor's retention policy. The documentation should be readily available for review upon request.

Views of responsible officials: There is no disagreement with the audit finding.

Section III – Findings and Questioned Costs – Major Federal Programs

Reference Number:	2023-010
Prior Year Finding:	2022-031
Federal Agency:	U.S Department of the Treasury
State Agency:	Department of Transportation
Federal Program:	COVID-19 – Coronavirus State and Local Fiscal Recovery Funds
Assistance Listing Number:	21.027
Federal Award Identification Number and Year:	None, 2020
Compliance Requirement:	Suspension and Debarment
Award Year	2020
Type of Finding:	Material Weakness in Internal Control Over Compliance, Material Noncompliance

Criteria or specific requirement:
Compliance: 2 CFR section 200.318, which include oversight of contractors' performance, maintaining written standards of conduct for employees involved in contracting, awarding contracts only to responsible contractors, and maintaining records to document history of procurements. 2 CFR 200.213 Suspension and Debarment restricts awards, subawards, and contracts with certain parties that are debarred, suspended, or otherwise excluded from or ineligible for participation in Federal assistance programs or activities.

2 CFR 180.300 states that an entity may determine suspension and debarment status by:
(a) Checking SAM Exclusions; or
(b) Collecting a certification from that person; or
(c) Adding a clause or condition to the covered transaction with that person.

Internal Control: Per 2 CFR section 200.303(a), a non-Federal entity must: Establish and maintain effective internal control over the Federal award that provides reasonable assurance that the non-Federal entity is managing the Federal award in compliance with Federal statutes, regulations, and the terms and conditions of the Federal award. These internal controls should comply with guidance in "Standards for Internal Control in the Federal Government" issued by the Comptroller General of the United States or the "Internal Control Integrated Framework", issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

Condition:
The documentation to support the vendor's suspension and debarment status was not readily available for review. States are required to develop and implement procurement procedures which includes maintaining documentation of the process. This is a repeat finding from FY 22.

Context:
Five of the Thirteen vendors selected for testing did not have evidence of the vendor's suspension and debarment process before the contract date.

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Cause:
MTA did not have the documentation readily available for review.

Effect:
The Department is unable to document compliance with the federal requirement of determining and vendor's eligibility to participant in a federal program before the contract date.

Questioned costs:
None noted.

Recommendation:
We recommend that the Department review and enhance current procedures and internal controls to ensure that the vendor's suspension and debarment status is documented. The Documentation is readily available for review upon request.

Views of responsible officials:
Management agrees with the finding.

Section III – Findings and Questioned Costs – Major Federal Programs

Reference Number:	2023-011
Prior Year Finding:	No
Federal Agency:	U.S. Department of Education U.S Department of the Treasury
State Agency:	Department of Education
Federal Program:	COVID-19 - Elementary and Secondary Education (ESSER or ESF) COVID-19 - Coronavirus State and Local Fiscal Recovery Funds
Assistance Listing Number:	84.425 C, D, R, U, V, W 21.027
Federal Award Identification Number and Year:	ESSER: S425C210002, 2021-2023 S425D210005, 2021-2023 S425R210006, 2021-2023 S425U210005, 2021-2023 S425V210006, 2022-2024 S425W210021, 2021-2024 S425U210005, 2021-2024 CSLFRF: none, 2021
Compliance Requirement:	Subrecipient Monitoring
Award Year	ESSER- 2021 and 2022 CSLFRF- 2021
Type of Finding:	Material Weakness in Internal Control Over Compliance, Material Noncompliance

Criteria or specific requirement:
Compliance: Per 2 CFR 200 section 200.332 (a)1 (ii) Ensure that every subaward is clearly identified to the subrecipient as a subaward and includes the following information at the time of the subaward and if any of these data elements change, include the changes in subsequent subaward modification. When some of this information is not available, the pass-through entity must provide the best information available to describe the Federal award and subaward. Required information includes: Subrecipient's unique entity identifier.

Per 2 CFR 200 section 200.332 (a)1(d) a non-Federal entity should monitor the activities of the subrecipient as necessary to ensure that the subaward is used for authorized purposes, in compliance with Federal statutes, regulations, and the terms and conditions of the subaward; and that subaward performance goals are achieved.

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Internal Control: Per 2 CFR section 200.303(a), a non-Federal entity must: Establish and maintain effective internal control over the Federal award that provides reasonable assurance that the non-Federal entity is managing the Federal award in compliance with Federal statutes, regulations, and the terms and conditions of the Federal award. These internal controls should comply with guidance in "Standards for Internal Control in the Federal Government" issued by the Comptroller General of the United States or the "Internal Control Integrated Framework", issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

Condition:
MSDE did not provide documentation to support monitoring over sub recipient's activities. MSDE issued ESSER and CSLFRF sub awards and is responsible for monitoring the sub recipient's activities as well as following up and ensuring that the subrecipient takes timely and appropriate action on all deficiencies. Subrecipient monitoring activities may include audits, on-site reviews, and written confirmation from the subrecipient, highlighting the status of actions planned or taken to address findings.

MSDE did not provide documentation of the subrecipient's unique entity identifier for two of the twenty subawards selected for testing. The subaward did not contain the required information nor did MSDE provide documentation of obtaining the information for the sub recipient.

Context:
Subrecipient monitoring activities were not provided for seven out of seven CSLFRF, and twenty out of twenty ESSER subrecipients selected for testing.

Subrecipient's unique entity identifier was not provide for two of the twenty subawards selected for testing.

Cause:
MSDE has been working on subrecipient monitoring tool since FY 22 and have not implemented the monitoring tool or alternative documented monitoring procedures during fiscal year 2023.

Subrecipient's unique entity identifier was not obtained by MSDE.

Effect:
MSDE is not in compliance with the grantor's reporting requirements.

Questioned costs:
None noted.

Recommendation:
We recommend that MSDE develop internal controls and procedures to ensure that sub recipient monitoring requirements are performed in a consistent and timely manner, and that the documentation supporting compliance is maintained and readily available for review. We also recommend that the subawards contain the required information.

Views of responsible officials:
Management agrees with the finding.

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Reference Number:	2023-012
Prior Year Finding:	No
Federal Agency:	U.S. Department of Education
State Agency:	Bowie State University (BSU)
Federal Program:	Higher Education Institutional Aid
Assistance Listing Number:	84.031
Federal Award Identification Number and Year:	P031B220039 (10/01/2022-09/30/2027) P031E200007-22 (10/1/2020-09/30/2025), P031K190021-22 (10/1/2019-9/30/2024)
Compliance Requirement:	Allowable Activities/Allowable Costs - Payroll
Award Year	July 1, 2022 – June 30, 2023
Type of Finding:	Material Weakness in Internal Control over Compliance, Material Noncompliance

Criteria or specific requirement:
Compliance: Per 2 CFR § 200.403, except where otherwise authorized by statute, costs must meet the following general criteria to be allowable under Federal awards: (a) Be necessary and reasonable for the performance of the Federal award to be allocable thereto under these principles. (b) Conform to any limitations or exclusions set forth in these principles or in the Federal award regarding types or amount of cost items. (c) Be consistent with policies and procedures that apply uniformly to both federally-financed and other activities of the non-Federal entity. (d) Be accorded consistent treatment. A cost may not be assigned to a Federal award as a direct cost if any other cost incurred for the same purpose in like circumstances has been allocated to the Federal award as an indirect cost. (e) Be determined in accordance with generally accepted accounting principles (GAAP), except for state and local governments and Indian tribes only, as otherwise provided for in this part. (f) Not be included as a cost or used to meet cost sharing or matching requirements of any other federally-financed program in either the current or a prior period. See also §200.306 Cost sharing or matching paragraph (b). (g) Be adequately documented. See also §§200.300 Statutory and national policy requirements through 200.309 Period of performance of this part.

Internal Control: Per 2 CFR section 200.303(a), a non-Federal entity must: Establish and maintain effective internal control over the Federal award that provides reasonable assurance that the non-Federal entity is managing the Federal award in compliance with Federal statutes, regulations, and the terms and conditions of the Federal award. These internal controls should comply with guidance in "Standards for Internal Control in the Federal Government" issued by the Comptroller General of the United States or the "Internal Control Integrated Framework", issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

Condition:
The Institution did not provide evidence of Time and Effort being documented.

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Context:
For eighteen out of the eighteen samples selected for testing, the institution was unable to provide Time and Effort documentation.

Cause: The transition to the new ERP system has been a significant undertaking, affecting various aspects of the reporting and operational processes, including the accurate and timely documentation of time and effort.

Effect:
Expenditures may be incorrectly charged to the program.

Questioned costs:
Known questioned costs of $26,396; Likely questioned costs of $2,910,860.

Recommendation:
We recommend that the Institution strengthen its internal controls to ensure that Time and Effort is documented, and expenditures are reviewed and adjusted for, if necessary, in a timely manner.

Views of responsible officials:
There is no disagreement with the audit finding.

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Reference Number:	2023-013
Prior Year Finding:	No
Federal Agency:	U.S. Department of Education
State Agency:	Coppin State University (CSU)
Federal Program:	Higher Education Institutional Aid
Assistance Listing Number:	84.031
Federal Award Identification Number and Year:	P031B220065 (10/1/2022-9/30/2027), P031E200078-22 (10/01/2020-9/30/2025)
Compliance Requirement:	Allowable Activities/Allowable Costs - Payroll
Award Year	July 1, 2022 – June 30, 2023
Type of Finding:	Material Weakness in Internal Control over Compliance, Material Noncompliance

Criteria or specific requirement:
Compliance: Per 2 CFR § 200.403, except where otherwise authorized by statute, costs must meet the following general criteria to be allowable under Federal awards: (a) Be necessary and reasonable for the performance of the Federal award to be allocable thereto under these principles. (b) Conform to any limitations or exclusions set forth in these principles or in the Federal award regarding types or amount of cost items. (c) Be consistent with policies and procedures that apply uniformly to both federally-financed and other activities of the non-Federal entity. (d) Be accorded consistent treatment. A cost may not be assigned to a Federal award as a direct cost if any other cost incurred for the same purpose in like circumstances has been allocated to the Federal award as an indirect cost. (e) Be determined in accordance with generally accepted accounting principles (GAAP), except for state and local governments and Indian tribes only, as otherwise provided for in this part. (f) Not be included as a cost or used to meet cost sharing or matching requirements of any other federally-financed program in either the current or a prior period. See also §200.306 Cost sharing or matching paragraph (b). (g) Be adequately documented. See also §§200.300 Statutory and national policy requirements through 200.309 Period of performance of this part.

Internal Control: Per 2 CFR section 200.303(a), a non-Federal entity must: Establish and maintain effective internal control over the Federal award that provides reasonable assurance that the non-Federal entity is managing the Federal award in compliance with Federal statutes, regulations, and the terms and conditions of the Federal award. These internal controls should comply with guidance in "Standards for Internal Control in the Federal Government" issued by the Comptroller General of the United States or the "Internal Control Integrated Framework", issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

Condition: The Institution did not adjust the employee's payroll costs to reflect the reported effort. We noted that the actual time and effort charged to the grant did not agree to the time and effort report.

Section III – Findings and Questioned Costs – Major Federal Programs

Context:
For two out of nine samples selected for testing, the payroll calculation did not agree to the employee's time and effort report.

Cause:
Regarding the two tested samples, the payroll calculation may not have agreed to the employee's Time and effort Report for several reasons, one being adjustments in salaries after a cola and or merit increase, and adjusted calculations not completed to mirror those increases.

Effect:
Expenditures may be incorrectly charged to the program.

Questioned costs:
None

Recommendation:
We recommend that the Institution consistently performed internal procedures to ensure that errors and irregularities are prevented and/or detected in a timely manner.

Views of responsible officials:
There is no disagreement with the audit finding.

Section III – Findings and Questioned Costs – Major Federal Programs

Reference Number:	2023-014
Prior Year Finding:	No
Federal Agency:	U.S. Department of Education
State Agency:	Morgan State University
Federal Program:	Higher Education Institutional Aid COVID-19 - Education Stabilization Fund (ESF)
Assistance Listing Number:	84.031, 84.425J
Federal Award Identification Number and Year:	84.031 - P031B220083 (10/01/2022-9/30/2027), P031E200073-22 (10/01/2020-09/30/2025), P031K190016-22 (10/1/2019-09/30/2024) 84.425J - P425J200037 (05/01/2020-6/30/2023)
Compliance Requirement:	SEFA Reporting
Award Year	July 1, 2022 – June 30, 2023
Type of Finding:	Material Weakness in Internal Control over Compliance, Material Noncompliance

Criteria or specific requirement:
Compliance: 2 CFR, Part 200 – Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards, Subpart F, §200.510(b) requires that auditees prepare a schedule of expenditures of Federal awards for the period covered by the auditee's financial statements which must include the total Federal awards expended as determined in accordance with §200.502.

Internal Control: Per 2 CFR section 200.303(a), a non-Federal entity must: Establish and maintain effective internal control over the Federal award that provides reasonable assurance that the non-Federal entity is managing the Federal award in compliance with Federal statutes, regulations, and the terms and conditions of the Federal award. These internal controls should comply with guidance in "Standards for Internal Control in the Federal Government" issued by the Comptroller General of the United States or the "Internal Control Integrated Framework", issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

Condition:
The Schedule of Expenditures of Federal Awards (SEFA) contained an error of an incorrect ALN which could potentially impact major program determination.

Context:
The following SEFA errors was noted:

- Amounts provided by MSU incorrectly reported $18,526,604 in Higher Education Institutional Aid Program (ALN 84.031) that should have been classified as expenditures for the HEERF Program (ALN 84.425J).

Section III – Findings and Questioned Costs – Major Federal Programs

Cause:
The attribution of HEERF II HBCU funds to ALN 84.031 in place of 84.425J was a manual clerical error and was missed during the review process.

Effect:
The SEFA was not prepared in accordance with OMB requirements which affects the major program risk assessment.

Questioned costs:
None noted as the reporting requirement does not affect the allowability of costs and/or activities.

Recommendation:
We recommend that the institution review its current reporting procedures, management review requirements, and communications with the State to ensure that the reported information is accurate and reliable.

Views of responsible officials:
There is no disagreement with the audit finding.

Section III – Findings and Questioned Costs – Major Federal Programs

Reference Number:	2023-015
Prior Year Finding:	2022-009
Federal Agency:	U.S. Department of Education
State Agency:	Coppin State University (CSU), Bowie State University (BSU), University of Maryland Eastern Shore (UMES)
Federal Program:	Higher Education Institutional Aid COVID-19 - Education Stabilization Fund (ESF)
Assistance Listing Number:	84.031, 84.425F, J
Federal Award Identification Number and Year:	84.031 - P031B220083 (10/01/2022-9/30/2027), BSU - P425F200656 (05/04/2020 –06/30/2024), P425J200103 (05/01/2020-05/11/2023), P031B220039 (10/01/2022-09/30/2027), P031E200007-22 (10/1/2020-09/30/2025), P031K190021-22 (10/1/2019-9/30/2024) CSU - P425J200107 (05/21/2020-6/30/2023), P031B220065 (10/1/2022-9/30/2027), P031E200078-22 (10/01/2020-9/30/2025) UMES - P425F202240 (05/07/2020-6/30/2024), P425J200121 (6/1/2020-6/30/2024), P031B220031 (10/1/2022-9/30/2027), P031E200003-22 (10/1/2020-9/30/2025), P031K190004-21 (10/1/2019-9/30/2024)
Compliance Requirement:	Suspension and Debarment
Award Year	July 1, 2022 – June 30, 2023
Type of Finding:	Significant Deficiency in Internal Control over Compliance

Criteria or specific requirement:
Internal Control: Per 2 CFR 200.213 Suspension and Debarment restricts awards, subawards, and contracts with certain parties that are debarred, suspended, or otherwise excluded from or ineligible for participation in Federal assistance programs or activities.

2 CFR 180.300 states that an entity may determine suspension and debarment status by:
(a) Checking SAM Exclusions; or
(b) Collecting a certification from that person; or
(c) Adding a clause or condition to the covered transaction with that person.

Section III – Findings and Questioned Costs – Major Federal Programs

Per 2 CFR section 200.303(a), a non-Federal entity must: Establish and maintain effective internal control over the Federal award that provides reasonable assurance that the non-Federal entity is managing the Federal award in compliance with Federal statutes, regulations, and the terms and conditions of the Federal award. These internal controls should comply with guidance in "Standards for Internal Control in the Federal Government" issued by the Comptroller General of the United States or the "Internal Control Integrated Framework", issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

Condition:
The institutions listed above did not determine the suspension and debarment status on vendors with expenditures exceeding $25,000 during the fiscal year as required by federal regulations.

Context:
ALN 84.425 - The suspension and debarment status of the following vendors was not provided:

- Bowie State University – Five out of five
- Coppin State University – Four out of four
- University of Maryland, Eastern Shore - Two out of four

ALN 84.031 - The suspension and debarment status of the following vendors was not provided:

- Bowie State University – Six out of six
- Coppin State University – Two out of two
- University of Maryland Eastern Shore - Two out of two

Cause:

- UMES - The procurement department did not have an internal policy to check suspension and debarment for procurements using federal funds.
- Coppin - Finding recurrence is due to timing of issuance of report in March 2023. Coppin State did not procure any new contracts over $25,000 from the time the report was issued to policy implementation in May 2023. Coppin State did go back to test the sample selected by CLA for the audit period to ensure a SAMs.gov check was performed and maintained this documentation with no issues noted.
- Bowie - A misinterpretation of Maryland's State Disbarment Listing and process, which includes checking SAM.gov.

Effect:
Federal funds may be paid to parties that are ineligible to participate in a federal program.

Questioned costs:
None.

Recommendation:
We recommend the institution evaluate its policies procedures to ensure that suspension and debarment requirements are being met prior to entering into transactions with vendors. Policies and procedures should reiterate the three options for determining suspension and debarment status listed in 2 CFR 180.300.

Views of responsible officials:
There is no disagreement with the audit finding.

Section III – Findings and Questioned Costs – Major Federal Programs

Reference Number:	2023-016
Prior Year Finding:	No
Federal Agency:	U.S. Department of Education
State Agency:	Department of Education
Federal Program:	COVID-19 – Education Stabilization Fund
Assistance Listing Number:	84.425 C, D, R, U, V, W
Federal Award Identification Number and Year:	S425C210002, 2021-2023 S425D210005, 2021-2023 S425R210006, 2021-2023 S425U210005, 2021-2023 S425V210006, 2022-2024 S425W210021, 2021-2024 S425U210005, 2021-2024
Compliance Requirement:	Reporting – Annual Reporting
Award Year	2021 and 2022
Type of Finding:	Significant Deficiency in Internal Control over Compliance, Other Matters

Criteria or specific requirement:
Compliance: Annual Reporting: (OMB No. 1810-0749 for ESSER; 1810-0748 for GEER; and 1810-0765 for EANS) with data on expenditures, planned expenditures, subrecipients, and uses of funds, including for mandatory reservations. LEAs/subrecipients submit data to the SEA/Governor for the SEA's/Governor's report. The annual performance reports can be found on the Grantee Help page of ED's ESF Transparency Portal.

Internal Control: Per 2 CFR section 200.303(a), a non-Federal entity must: Establish and maintain effective internal control over the Federal award that provides reasonable assurance that the non-Federal entity is managing the Federal award in compliance with Federal statutes, regulations, and the terms and conditions of the Federal award. These internal controls should comply with guidance in "Standards for Internal Control in the Federal Government" issued by the Comptroller General of the United States or the "Internal Control Integrated Framework", issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

Condition:
The data schedules provided to support annual report was not in a format that we could audit, as a result we were unable to test MSDE's accuracy of the report key line items. The data was in the prescribed format for compilation and transmission to USDE which was not identifiable by the auditor.

MSDE did not provide documentation to support submission of the annual report.

Context:
We are unable to test the accuracy of the information submitted in the annual report.

Section III – Findings and Questioned Costs – Major Federal Programs

Cause:
MSDE did not provide the requested documentation in a timely manner in order for the auditors to test compliance with the federal requirement.

Effect:
MSDE was not able to support compliance with the grantor's reporting requirements.

Questioned costs:
None noted.

Recommendation:
We recommend that MSDE develop internal controls and procedures to ensure that all reporting requirements are performed in a consistent and timely manner, and that the documentation supporting compliance is maintained and readily available for review.

Views of responsible officials:
Management agrees with the finding.

Section III – Findings and Questioned Costs – Major Federal Programs

Reference Number:	2023-017
Prior Year Finding:	No
Federal Agency:	U.S. Department of Education
State Agency:	Bowie State University
Federal Program:	COVID-19 – Education Stabilization Fund (ESF)
Assistance Listing Number:	84.425F
Federal Award Identification Number and Year:	P425F200656 (05/04/2020 – 06/30/2024)
Compliance Requirement:	Cash Management
Award Year	July 1, 2022 – June 30, 2023
Type of Finding:	Significant Deficiency in Internal Control over Compliance, Other Matters

Criteria or specific requirement:
Compliance: Per 2 CFR 200.302, non-Federal entity's financial management systems, including records documenting compliance with Federal statutes, regulations, and the terms and conditions of the Federal award, must be sufficient to permit the preparation of reports required by general and program-specific terms and conditions; and the tracing of funds to a level of expenditures adequate to establish that such funds have been used according to the Federal statutes, regulations, and the terms and conditions of the Federal award.

Internal Control: Per 2 CFR section 200.303(a), a non-Federal entity must: Establish and maintain effective internal control over the Federal award that provides reasonable assurance that the non-Federal entity is managing the Federal award in compliance with Federal statutes, regulations, and the terms and conditions of the Federal award. These internal controls should comply with guidance in "Standards for Internal Control in the Federal Government" issued by the Comptroller General of the United States or the "Internal Control Integrated Framework", issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

Condition:
The institution was not able to support the amount it had drawn down for the program was accurate and was supported by expenditures recorded in its accounting system. The amount drawn down was based on an erroneous report.

Context:
The institution drew down funds for the institutional portion in excess of expenditures incurred. The amount the institution overdrew totaled $2,009,452.

Section III – Findings and Questioned Costs – Major Federal Programs

Cause:
On July 1, 2022, Bowie State University (BSU) transitioned its accounting system from People Soft to Oracle Cloud. In PeopleSoft, query reports were used to determine the weekly cash needs for drawdowns or grant invoicing. The reports compared all the expenditures versus cash receipts for the period and for the life of the grant. The reports were used to determine the BSU cash needs for reimbursement.

After converting to Oracle, the same report process was created in determining the cash needs for BSU. However, the query report created in Oracle provided the actual cash receipts, disbursements, and encumbrances. Also, the report did not include a trial balance for life-to-date cash balance because it was not available during this time. The cash needs were overstated because encumbrances were included with the actual expenditures.

Effect:
Federal funds may be overdrawn.

Questioned costs:
$2,009,452

Recommendation:
We recommend the institution review and enhance their internal controls and procedures over cash management so that expenditures are being properly tracked and reconciled by program to ensure awarded funds are not overdrawn in the future.

Views of responsible officials and planned corrective actions:
There is no disagreement with the audit finding.

Section III – Findings and Questioned Costs – Major Federal Programs

Reference Number:	2023-018
Prior Year Finding:	No
Federal Agency:	U.S. Department of Health and Human Services
State Agency:	Department of Social Services
Federal Program:	Temporary Assistance for Needy Families
Assistance Listing Number:	93.558
Federal Award Identification Number and Year:	2021G990228, 2021G9915TC and 2021 2022G996155, 2022G9915TC and 2022 2301MDTANF-11 and 2023
Compliance Requirement:	Reporting – ACF-199 and 209
Award Year	2021, 2022 and 2023
Type of Finding:	Significant Deficiency in Internal Control Over Compliance, Other Matters

Criteria or specific requirement:
Compliance: ACF 199 TANF Data Report: State agencies must meet or exceed their minimum annual work participation rates. The minimum work participation rates are 50 percent for the overall rate and 90 percent for the two-parent rate. A state's minimum work participation rate may be reduced by its caseload reduction credit. HHS may penalize the state by an amount of up to 21 percent of the SFAG for violation of this provision (42 USC 609(a)(4); 45 CFR section 262.1(a)(4)).

ACF 209, SSP-MOE Data Report: This report is submitted quarterly and requires testing of key line items.

Internal Control: Per 2 CFR section 200.303(a), a non-Federal entity must: Establish and maintain effective internal control over the Federal award that provides reasonable assurance that the non-Federal entity is managing the Federal award in compliance with Federal statutes, regulations, and the terms and conditions of the Federal award. These internal controls should comply with guidance in "Standards for Internal Control in the Federal Government" issued by the Comptroller General of the United States or the "Internal Control Integrated Framework", issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

Condition:
The ACF 199 and 209 data submitted to the Administration for Children and families (ACF) was incorrect. We identified the following errors:

1. Families with over 60 countable months continued to receive benefits and was incorrectly reported as not exempt. Families with over 60 countable months are required to have time-limit exemptions in order to continue receiving assistance, which did not happen.
2. The countable months toward the federal time-limit reported to ACF did not match the customer's case file. DSS did not correct the countable months and resubmit the accurate information to ACF.

Section III – Findings and Questioned Costs – Major Federal Programs

3. Closed customer cases were incorrectly reported to ACF as active and receiving benefits. The case was closed before reporting period but was incorrectly included in the active population.
4. DSS reported the incorrect work participation to ACF. ACF's report code 19 was incorrectly reported instead of code 18. Code 19 identifies the customer as countable towards the federal time limit and is required to participate in the work program. Code 18 identifies the participant as not countable but still required to participate in the work program. DSS corrected the codes after submission to ACF but did not resubmit the updated information to ACF.

Context:

1. Families with over 60 countable months continued to receive benefits and was incorrectly reported as not exempt for 1 of the 40 reported customers selected for testing.
2. The countable months toward the federal time-limit reported to ACF did not match the customer's case file for 35 of the 40 reported customers selected for testing.
3. Closed customer cases were incorrectly reported to ACF as active and receiving benefits. for 4 of the 40 reported customers selected for testing.
4. DSS reported the incorrect work participation to ACF. ACF's report code 19 was incorrectly reported instead of code 18 for 2 of the 40 reported customers selected for testing.

Cause:
The incorrect data was due to errors related to implementation of the new case file system.

Effect:
Data transferred to ACF was incorrect and did not present the correct results of State's TANF work participation program.

Questioned costs:
Undetermined, due to the numerous errors we could not determine if the customer 's benefits were affected.

Recommendation:
We recommend that DSS develop internal controls and procedures to ensure that customer data is accurate, and subsequent changes is reported to ACF in a timely manner.

Views of responsible officials:
Management agrees with the finding.

Section III – Findings and Questioned Costs – Major Federal Programs

Reference Number:	2023-019
Prior Year Finding:	No
Federal Agency:	U.S. Department of Health and Human Services
State Agency:	Department of Social Services
Federal Program:	Temporary Assistance for Needy Families
Assistance Listing Number:	93.558
Federal Award Identification Number and Year:	2021G990228, 2021G9915TC and 2021 2022G996155, 2022G9915TC and 2022 2301MDTANF-11 and 2023
Compliance Requirement:	Special Tests and Provisions - Child Support Non-Cooperation
Award Year	2021, 2022 and 2023
Type of Finding:	Significant Deficiency in Internal Control Over Compliance, Other Matters

Criteria or specific requirement:
Compliance: Under Title IV-D of the Social Security Act determines that an individual is not cooperating with the state in establishing paternity, or in establishing, modifying or enforcing a support order with respect to a child of the individual, and reports that information to the state agency responsible for TANF, the state TANF agency must

(1) deduct an amount equal to not less than 25 percent from the TANF assistance that would otherwise be provided to the family of the individual, and
(2) may deny the family any TANF assistance. HHS may penalize a state for up to 5 percent of the SFAG for failure to substantially comply with this required state child support program (42 USC 608(a)(2) and 609(a)(8); 45 CFR sections 264.30 and 264.31).

Internal Control: Per 2 CFR section 200.303(a), a non-Federal entity must: Establish and maintain effective internal control over the Federal award that provides reasonable assurance that the non-Federal entity is managing the Federal award in compliance with Federal statutes, regulations, and the terms and conditions of the Federal award. These internal controls should comply with guidance in "Standards for Internal Control in the Federal Government" issued by the Comptroller General of the United States or the "Internal Control Integrated Framework", issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

Condition:
A participant's benefits wase not correctly reduced as a result of noncooperation with child support. We identified one participant whose benefits was reduced less than 25%, due to a system error. We noted that the July 2022 benefits of $480 were decrease to $432 ($48 or 10%) August 1, 2022.

Context:
We noted that the reduced benefits were incorrectly calculated for one of the forty non-cooperative customers selected for testing.

Section III – Findings and Questioned Costs – Major Federal Programs

Cause:
The incorrect calculation was due to errors that were not detected during the internal review process.

Effect:
Customer's benefit sanctions were incorrectly determined.

Questioned costs:
None noted.

Recommendation:
We recommend that DSS develop internal controls and procedures to ensure that customer sanctions are correctly calculated.

Views of responsible officials:
Management agrees with the finding.

Section III – Findings and Questioned Costs – Major Federal Programs

Reference Number:	2023-020
Prior Year Finding:	No
Federal Agency:	U.S. Department of Health and Human Services
State Agency:	Department of Social Services
Federal Program:	Temporary Assistance for Needy Families
Assistance Listing Number:	93.558
Federal Award Identification Number and Year:	2021G990228, 2021G9915TC and 2021 2022G996155, 2022G9915TC and 2022 2301MDTANF-11 and 2023
Compliance Requirement:	Special Tests and Provisions - Penalty for Refusal to Work
Award Year	2021, 2022 and 2023
Type of Finding:	Significant Deficiency in Internal Control Over Compliance, Other Matters

Criteria or specific requirement:
Compliance: State agency must reduce or terminate the assistance payable to the family if an individual in a family receiving assistance refuses to work, subject to any good cause or other exemptions established by the state. HHS may penalize the state by an amount not less than 1 percent and not more than 5 percent of the SFAG for violation of this provision (42 USC 609(a)(14); 45 CFR sections 261.14, 261.16, and 261.54).

Internal Control: Per 2 CFR section 200.303(a), a non-Federal entity must: Establish and maintain effective internal control over the Federal award that provides reasonable assurance that the non-Federal entity is managing the Federal award in compliance with Federal statutes, regulations, and the terms and conditions of the Federal award. These internal controls should comply with guidance in "Standards for Internal Control in the Federal Government" issued by the Comptroller General of the United States or the "Internal Control Integrated Framework", issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

Condition:
The customer's benefits were not reduced in a timely manner as a result of noncooperation with the work program. The customer was non-compliant in February 2023, benefits were scheduled for reduction beginning March 2023, benefits were not actually reduced until June 2023. DSS experienced problems with the benefit system and was not able to implement the sanction until June 2023. DSS did not recoup the overpaid benefits from the client.

Context:
We noted that for one of the forty non-cooperative customers selected for testing, benefits were not reduced in a timely manner.

Section III – Findings and Questioned Costs – Major Federal Programs

Cause:
DSS experienced problems with the benefit system and was not able to implement the sanction until June 2023

Effect:
Customer incorrectly received full benefits for three months.

Questioned costs:
$227.25 ($75.75) is the maximum sanction to be imposed for the three months in which the benefits were not reduced.

Recommendation:
We recommend that DSS develop internal controls and procedures to ensure that customer sanctions are imposed in a timely manner or retroactively recouped, if necessary.

Views of responsible officials:
Management agrees with the finding.

Section III – Findings and Questioned Costs – Major Federal Programs

Reference Number:	2023-021
Prior Year Finding:	2022-028
Federal Agency:	U.S. Department of Health and Human Services
State Agency:	Department of Health
Federal Program:	Medicaid Cluster, COVID-19 – Medicaid Cluster Child Health Insurance Program (CHIP)
Assistance Listing Number:	93.775, 93.777, 93.778, 93.767
Federal Award Identification Number and Year:	Medicaid: 2205MD5MAP (7/1/2022 – 9/30/2022), 2305MD5ADM (10/1/2022 – 12/31/2022), 2305MD5MAP (1/1/2023 – 3/31/2023), 2305MD5ADM (4/1/2023 - 6/30/2023) CHIP: 2205MD5021 (10/1/2021 – 9/30/2023), 2305MD5021 (10/1/2022 – 9/30/2024)
Compliance Requirement:	Reporting – Federal Funding Accountability and Transparency Act (FFATA)
Award Year	July 1, 2022 – June 30, 2023
Type of Finding:	Material Weakness in Internal Control Over Compliance, Material Noncompliance

Criteria or specific requirement:
Compliance: Per the Federal Funding Accountability and Transparency Act (FFATA), prime (direct) recipients of grants or cooperative agreements are required to report first-tier subawards of $30,000 or more to the Federal Funding Accountability and Transparency Act Subaward Reporting System (FSRS). Reports must be filed in FSRS by the end of the month following the month in which the prime recipient awards any sub-grant greater than or equal to $30,000. If the initial award is below $30,000 but subsequent grant modifications result in a total award equal to or over $30,000, the award will be subject to the reporting requirements as of the date the award exceeds $30,000. If the initial award equals or exceeds $30,000 but funding is subsequently de-obligated such that the total award amount falls below $30,000, the award continues to be subject to FFATA reporting requirements.

Internal Control: Per 2 CFR section 200.303(a), a non-Federal entity must: Establish and maintain effective internal control over the Federal award that provides reasonable assurance that the non-Federal entity is managing the Federal award in compliance with Federal statutes, regulations, and the terms and conditions of the Federal award. These internal controls should comply with guidance in "Standards for Internal Control in the Federal Government" issued by the Comptroller General of the United States or the "Internal Control Integrated Framework", issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

Section III – Findings and Questioned Costs – Major Federal Programs

Condition:
The Department of Health (Department) did not report subaward information to Federal Funding Accountability and Transparency Act Subaward Reporting system (FSRS) in accordance with the Federal Funding Accountability and Transparency Act (FFATA),

Context:
Medicaid: During Fiscal year 2023, subawards were obligated on July 1, 2022, should have been reported to FSRS by August 30, 2022. Eight of the eight subawards selected for testing were not reported to FSRS during fiscal year 2023.

Transactions Tested	Subaward not reported	Report not timely	Subaward amount incorrect	Subaward missing key elements
8	8	0	0	0
Dollar Amount of Tested Transactions	**Subaward not reported**	**Report not timely**	**Subaward amount incorrect**	**Subaward missing key elements**
$8,663,337	$8,663,337	$0	$0	$0

CHIP: During Fiscal year 2023, subawards were obligated on July 1, 2022, should have been reported to FSRS by August 30, 2022. Eight of the eight subawards selected for testing were not reported to FSRS during fiscal year 2023.

Transactions Tested	Subaward not reported	Report not timely	Subaward amount incorrect	Subaward missing key elements
8	8	0	0	0
Dollar Amount of Tested Transactions	**Subaward not reported**	**Report not timely**	**Subaward amount incorrect**	**Subaward missing key elements**
$2,704,309	$2,704,309	$0	$0	$0

Cause:
The Department has not developed procedures and internal control to ensure that subawards are reported in accordance with FFATA.

Effect:
The Department is not in compliance with FFATA reporting requirements.

Questioned costs:
None noted.

Recommendation:
We recommend that the Department develop internal controls and procedures to ensure that all required subawards are reported to FSRS in accordance with FFATA reporting requirements.

Section III – Findings and Questioned Costs – Major Federal Programs

Views of responsible officials:
Management agrees with the finding.

Section III – Findings and Questioned Costs – Major Federal Programs

Reference Number:	2023-022
Prior Year Finding:	2022-025
Federal Agency:	U.S. Department of Health and Human Services
State Agency:	Department of Health
Federal Program:	Medicaid Cluster, COVID-19 – Medicaid Cluster
Assistance Listing Number:	93.775, 93.777, 93.778
Federal Award Identification Number and Year:	Medicaid: 2205MD5MAP (7/1/2022 – 9/30/2022), 2305MD5ADM (10/1/2022 – 12/31/2022), 2305MD5MAP (1/1/2023 – 3/31/2023), 2305MD5ADM (4/1/2023 - 6/30/2023)
Compliance Requirement:	Special Tests and Provisions - Inpatient Hospital and Long-Term Care Facility Audits
Award Year	July 1, 2022 – June 30, 2023
Type of Finding:	Significant Deficiency in Internal Control Over Compliance, Other Matters

Criteria or specific requirement:
Compliance: The State Medicaid Agency (SMA) pays for inpatient hospital services and long-term care facility services through the use of rates that are economic and efficient and are in accordance with the state plan. To the extent the state pays reconciled costs, the SMA must provide for the filing of uniform cost reports for each participating provider in order to establish payment rates. The SMA must provide for the periodic audits of financial and statistical records of participating providers. The specific audit requirements will be established by the State plan (42 CFR 447.253).

Additionally, in accordance with COMAR 10.09.10.09b the State must rebase the cost center prices every 2 and 4 rate years.

Internal Control: Per 2 CFR section 200.303(a), a non-Federal entity must: Establish and maintain effective internal control over the Federal award that provides reasonable assurance that the non-Federal entity is managing the Federal award in compliance with Federal statutes, regulations, and the terms and conditions of the Federal award. These internal controls should comply with guidance in "Standards for Internal Control in the Federal Government" issued by the Comptroller General of the United States or the "Internal Control Integrated Framework", issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

Condition:
The Department of Health (Department) did not maintain or provide documentation to support monitoring activities over hospitals not selected for periodic audits. The state plan does not provide specific guidance on the monitoring of hospitals; however, there state is responsible for the Medicaid activities supported by federal funds. As such the Department's internal controls over, allowable costs should ensure that all federal expenditures are subject to review.

Section III – Findings and Questioned Costs – Major Federal Programs

Context:
CLA selected a sample sixty in-patient and long-term care facilities (hospitals (20) nursing home facilities (40)) for testing.

- For five of the twenty hospitals selected for testing were not selected for audit since the inception of the contract in 2019. The Department provided guidance that the 5 hospitals were periodically audited by the Health Services Cost review commission (HSCRC) but did not provide documentation to support any monitoring review of the hospitals' activities.

Cause:
There is no written requirement for all hospitals to have an audit, the Department relies on the annual risk assessment to determine which hospitals are audited. The Department has not implemented any procedures for hospitals that are not selected for audit.

Effect:
The risk of unallowed costs and/or activities is increased due to lack of monitoring activities.

Questioned costs:
N/A

Recommendation:
We recommend that the Department review and enhance current procedures and internal controls to develop procedures to address the risk of hospitals not internally reviewed.

Views of responsible officials:
Management agrees with the finding.

Section III – Findings and Questioned Costs – Major Federal Programs

Reference Number:	2023-023
Prior Year Finding:	No
Federal Agency:	U.S. Department of Treasury
State Agency:	Maryland Department of Health
Federal Program:	COVID-19 – Coronavirus State and Local Fiscal Relief Funds (CSLRF)
Assistance Listing Number:	21.027
Federal Award Identification Number and Year:	None, 2023
Compliance Requirement:	Allowable Activities/Allowable Costs
Award Year	July 1, 2022 – June 30, 2023
Type of Finding:	Significant Deficiency in Internal Control over Compliance, Other Matters

Criteria or specific requirement:
Compliance: Under OMB guidance, Public Law (Pub. L.) No. 107-300, the Improper Payments information Act of 2002 , as amended by Pub. L. No. 111-204, the Improper Payments Elimination and Recovery Act, Executive Order 13520 on reducing improper payments, and the June 18, 2010 – Any payments that should not have been made or that was made in an incorrect amount, including an overpayment or underpayment, under a statutory, contractual, administrative, or other legally applicable requirement; and included – (i) any payment to an ineligible recipient; (ii) any payment for an ineligible good or service; (iii) any duplicate payment; (iv) any payment for a good or service not received, except for those payments where authorized by law; and (v) any payment that does not account for credit for applicable discounts.

Internal Control: Per 2 CFR section 200.303(a), a non-Federal entity must: Establish and maintain effective internal control over the Federal award that provides reasonable assurance that the non-Federal entity is managing the Federal award in compliance with Federal statutes, regulations, and the terms and conditions of the Federal award. These internal controls should comply with guidance in "Standards for Internal Control in the Federal Government" issued by the Comptroller General of the United States or the "Internal Control Integrated Framework", issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

Condition:
The department incorrectly charged the grant for a subaward that was less than the amount posted to the ledger.

Context:
One out of sixty samples was incorrectly recorded in the ledger. The subaward sent to the recipient totaled $496,384.50 and the amount posted to the ledger was $498,384.50.

Section III – Findings and Questioned Costs – Major Federal Programs

Cause:
The department miss-keyed the subaward before the award was paid in full to the recipient.

Effect:
Expenditures may be incorrectly charged to the programs.

Questioned costs:
$2,000

Recommendation:
We recommend that MDH consistently perform its internal review process to ensure that program costs are accurately presented on reports and funding requests.

Views of responsible officials:
There is no disagreement with the audit finding.

Section III – Findings and Questioned Costs – Major Federal Programs

Reference Number:	2023-024
Prior Year Finding:	No
Federal Agency:	U.S. Department of Health and Human Services
State Agency:	Department of Health
Federal Program:	Block Grants for Prevention and Treatment of Substance Abuse
Assistance Listing Number:	93.959
Federal Award Identification Number and Year:	None, 2022 and 2023
Compliance Requirement:	Reporting – Federal Funding Accountability and Transparency Act (FFATA)
Award Year	2022 and 2023
Type of Finding:	Material Weakness in Internal Control Over Compliance, Material Noncompliance

Criteria or specific requirement:
Compliance: Per the Federal Funding Accountability and Transparency Act (FFATA), prime (direct) recipients of grants or cooperative agreements are required to report first-tier subawards of $30,000 or more to the Federal Funding Accountability and Transparency Act Subaward Reporting System (FSRS). Reports must be filed in FSRS by the end of the month following the month in which the prime recipient awards any sub-grant greater than or equal to $30,000. If the initial award is below $30,000 but subsequent grant modifications result in a total award equal to or over $30,000, the award will be subject to the reporting requirements as of the date the award exceeds $30,000. If the initial award equals or exceeds $30,000 but funding is subsequently de-obligated such that the total award amount falls below $30,000, the award continues to be subject to FFATA reporting requirements.

Internal Control: Per 2 CFR section 200.303(a), a non-Federal entity must: Establish and maintain effective internal control over the Federal award that provides reasonable assurance that the non-Federal entity is managing the Federal award in compliance with Federal statutes, regulations, and the terms and conditions of the Federal award. These internal controls should comply with guidance in "Standards for Internal Control in the Federal Government" issued by the Comptroller General of the United States or the "Internal Control Integrated Framework", issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

Condition:
The Department did not report subaward information to Federal Funding Accountability and Transparency Act Subaward Reporting system (FSRS) in accordance with the Federal Funding Accountability and Transparency Act (FFATA).

Section III – Findings and Questioned Costs – Major Federal Programs

Context:
During Fiscal year 2023, subawards were obligated on July 1, 2022, should have been reported to FSRS by August 30, 2022. Eight of the eight subawards selected for testing were not reported to FSRS during fiscal year 2023.

Transactions Tested	Subaward not reported	Report not timely	Subaward amount incorrect	Subaward missing key elements
7	7	0	0	0
Dollar Amount of Tested Transactions	**Subaward not reported**	**Report not timely**	**Subaward amount incorrect**	**Subaward missing key elements**
$6,075,334	$6,075,334	$0	$0	$0

Cause:
The Department is in the process of completing required reporting.

Effect:
The Department is not in compliance with FFATA reporting requirements.

Questioned costs:
None noted.

Recommendation:
We recommend that the Department develop internal controls and procedures to ensure that all required subawards are reported to FSRS in accordance with FFATA reporting requirements.

Views of responsible officials:
Management agrees with the finding.

Section III – Findings and Questioned Costs – Major Federal Programs

Reference Number:	2023-025
Prior Year Finding:	No
Federal Agency:	U.S. Department of Health and Human Services
State Agency:	Department of Health
Federal Program:	Block Grants for Prevention and Treatment of Substance Abuse
Assistance Listing Number:	93.959
Federal Award Identification Number and Year:	None, 2022 and 2023
Compliance Requirement:	Subrecipient Monitoring
Award Year	July 1, 2022 – June 30, 2023
Type of Finding:	Significant Deficiency in Internal Control Over Compliance, Other Matters

Criteria or specific requirement:
Compliance: 2 CFR section 200.332-Requirements for Pass-Through Entities states, in part, that all pass-through entities must:

(a) Ensure that every subaward is clearly identified to the subrecipient as a subaward and includes information at the time of the subaward and if any of these data elements change, include the changes in subsequent subaward modification. When some of this information is not available, the pass-through entity must provide the best information available to describe the Federal award and subaward.

Control: Per 2 CFR section 200.303(a), a non-Federal entity must: Establish and maintain effective internal control over the Federal award that provides reasonable assurance that the non-Federal entity is managing the Federal award in compliance with Federal statutes, regulations, and the terms and conditions of the Federal award. These internal controls should comply with guidance in "Standards for Internal Control in the Federal Government" issued by the Comptroller General of the United States or the "Internal Control Integrated Framework", issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

Condition:
The Department's subaward agreements did not consistently contain all required federal information. The subaward agreements were missing:

1. Subrecipient's unique entity identifier;
2. Federal Award Identification Number (FAIN)
3. Amount of Federal Funds Obligated by this action by the pass-through entity to the subrecipient
4. Total Amount of Federal Funds Obligated to the subrecipient by the pass-through entity including the current financial obligation
5. Total Amount of the Federal Award committed to the subrecipient by the pass-through entity;

Section III – Findings and Questioned Costs – Major Federal Programs

6. Federal award project description, as required to be responsive to the Federal Funding Accountability and Transparency Act (FFATA)
7. Identification of whether the award is R&D
8. Indirect cost rate for the Federal award (including if the de minimis rate is charged per § 200.414 Indirect (F&A) costs).

We noted that the subaward agreements was not consistently accompanied with the standard memorandum of understanding, conditions of award and the local health department budget package (if included) which contained some of the missing subaward information.

Context:
Eight subawards were selected for testing and the following exceptions were noted:

- For 8 of 8 subawards selected for testing, the Department was unable to provide documentation that it had obtained the subrecipient's Unique Entity Identifier (UEI) at the time of subaward issuance.
- For 6 of 8 subawards selected for testing, the Federal Award Identification Number (FAIN) and Federal Award Date were not provided to the subrecipient.
- For 8 of 8 subawards selected for testing, the Department was unable to provide documentation that the amount of federal funds obligated by this action by the pass-through entity to the subrecipient, total amount of federal funds obligated to the subrecipient by the pass-through entity including the current financial obligation and total amount of the federal award committed to the subrecipient by the pass-through entity was communicated to the sub awardee.
- For 2 of 8 subawards selected for testing, the Federal award project description, as required to be responsive to the Federal Funding Accountability and Transparency Act (FFATA) was not identified.
- For 2 of 8 subawards selected for testing, the Identification of whether the award is R&D was not identified.
- For 6 of 8 subawards selected for testing, the Indirect cost rate for the Federal award (including if the de minimis rate is charged per § 200.414 Indirect (F&A) costs) was not identified.

Questioned costs:
None

Cause:
The Department's procedures and were not consistently performed to ensure that all the required information was communicated to the sub awardee.

Effect:
Excluding the required federal grant award information at the time of the subaward may cause subrecipients and their auditors to be uninformed about specific program and other regulations that apply to the funds they receive. There is also the potential for subrecipients to have incomplete Schedules of Expenditures of Federal Awards (SEFA) in their Single Audit reports, and federal funds may not be properly audited at the subrecipient level in accordance with the Uniform Guidance.

Recommendation:
The Department should review and enhance internal controls and procedures to ensure that all required information is included in all subawards.

Section III – Findings and Questioned Costs – Major Federal Programs

Views of responsible officials:
Management agrees with the finding.



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17 - RI-04

Organization/Institution Submitting Proposal:
Chicot Insights, LLC

Project Title:
Utilization of Precision Agricultural Technology Along with Machine Learning to Optimize Fertility Applications While Improving Soybean Productivity and Profitability at the Field Scale.

Project Type:
Research

Name of Project Manager:
Zach Reynolds

Name of Project Team Member 1:
Jason Krutz

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
With fertilizer at record-high prices, it is imperative for growers to be most efficient with their resources. The aim of this project is to examine soil fertility, inputs, and yield to determine if there are diminishing responses from fertilizer applications across differing environments. These data will be analyzed through machine learning and spatial statistics to help identify any potential “plateaus” in responses from fertilizer applications or if we are potentially under-fertilizing in any cases.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
This project will be executed by partnering with growers and consultants that are willing to share on-farm geospatial soil, yield, and application data throughout Arkansas in 2026, 2027, and 2028. Soil fertility metrics (e.g., N, P, K, S) will be included as fixed-effect covariates, enabling us to quantify their relationship with yield response and assess potential nutrient co-limitations consistent with Liebig’s Law.

BUDGET

Amount of Funding Needed for Project:
$38,320.60

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Utilization of Precision Agricultural Technology Along with Machine Learning to Optimize Fertility Applications While Improving Soybean Productivity and Profitability at the Field Scale.

Lead Investigators: Zach Reynolds, Ph.D.

Co-Investigators: L. Jason Krutz, Ph.D.

Status and Duration of Funding: New, Year 1 of 3

Research Areas: Soil Fertility, Precision Agriculture

Stated Goal: Arkansas soybean growers are constantly feeling the effects of budgetary constraints from all inputs, especially fertilizer in preparation for the 2026 growing season. With fertilizer and other inputs at record-high prices, it is imperative for growers to be most efficient with their resources. Fertilizer is among the leading costs per acre of soybean production. There are so many messages and opinions about fertility programs, growers and consultants alike can feel overwhelmed when it comes to going with a certain plan. Common questions are, should we zone or grid sample? Should we variable rate or straight rate? Is chicken litter or mixed fertilizer more economical or efficient? These are all very valid questions, but before we move forward with applying any strategy, we first need to discern in what situations we are most likely to elicit a positive response. What this project proposes is to examine soil fertility levels (from soil samples), inputs, and yield to determine if there are diminishing responses from fertilizer applications as fertility levels change across differing environments. This will be executed by partnering with growers and consultants that are willing to share on-farm geospatial soil, yield, and application data. These data will be analyzed through machine learning and spatial statistics to help identify any potential "plateaus" in responses from fertilizer applications or if we are potentially under-fertilizing in any cases. To avoid asking growers to do anything out of their normal production practices, we will independently take samples when needed, collect geospatial data, and make additional applications of fertilizer to capture the appropriate amount of data needed to answer these questions. The current fertility program a grower uses will not affect the project since there is inherit field variability across environments which is crucial to answer such questions.

There are many strategies for fertility management in soybean production, but most are centered around only testing and accounting for levels of P, K, pH, etc. Using K as an example, a soil sample is taken then a lab uses some extraction method to determine how much plant available K is present in a soil. The recommended amount of K_2O to apply is *generally* based solely on the amount of soil K (and CEC), regardless of other nutrient levels. While previous research has been performed to validate how many pounds of a certain nutrient is required to make a bushel of a given crop, growers often wonder if they are getting a response from an application. This type of question is difficult to answer without overlaying multiple layers of site-specific data and using machine learning. These techniques allow us to look at specific known locations (where samples were pulled) to examine fertility levels, fertilizer applications, and yield to determine if response from fertilizer applications (for instance K) are being influenced by other factors such as micro-nutrient level, soil texture, relative elevation, etc. This type of analysis also will help us determine if there are any patterns related to successful responses within fertility levels. Said in other words, "Do we more consistently get a positive response from fertilizer when fertility levels are very low-low vs medium-high; and/or are there other factors limiting

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the yield response from these applications." This may sound like a simple question since fertilizer recommendations obviously call for less fertilizer as soil fertility level increases. However, it is still unclear if the benefit from those applications has the same ROI across fertility levels or if recommendations should be adjusted based on other nutrient levels that could be limiting success from the application in question.

Specific Objectives: Objective 1: Partner with Arkansas soybean growers that are willing to share on-farm, site-specific machine data for the purpose of examining inputs, soil samples, field variability, yield data, etc. to determine if there is a point of diminishing return from fertilizer applications across fertility levels and/or are there other factors limiting the yield response from these applications.
Objective 2: When needed, create variable rate prescriptions to apply by ground or air to capture more application data across environments and variability.

Methods: Most growers now are utilizing some platform for on-farm geospatial data collection, oftentimes online. We propose to align with growers that are collecting this type of data and willing to share. Grower data will be kept confidential and is not shared unless initiated or approved by the grower. We plan to look at yield history over time, soil data, and any other layers the growers are comfortable with sharing. Along with the data, being able to discuss historic performance with a grower and/or their trusted advisor is invaluable. These conversations along with data analysis will allow us to account for as many factors as possible.

We will use the Chicot Insights' method for overlaying and "wrangling" all these layers of data so accurate statistical analyses can be performed. The programs we use to standardize and analyze data are Ag Leader SMS, ArcGIS, Python, and SAS. After data is collected, stored, cleaned, and queued, it will be analyzed using a linear mixed effects modeling framework. This approach allows us to account for the hierarchical structure of the data, with location treated as a random effect to capture baseline differences in yield potential across sites. Soil fertility metrics (e.g., P, K, S) will be included as fixed-effect covariates, enabling us to quantify their relationship with yield response and assess potential nutrient co-limitations consistent with Liebig's Law. Depending on initial results from analysis, we will implement future treatments with different rates of fertilizer at the field scale.

For an analysis such as this to be successful, lots of variability must be captured. This means the more data collected, the better chance of noting any trends. Even with lots of grower participation, there may be some cases where fertility applications or strategies may have homogeneity from farm to farm. In cases such as this, there could be a need to make additional applications of fertilizer to ensure we are finding the "point past ROI." This of course would be approved by the grower, but we can design variable rate prescriptions to be applied by ground or air to target specific situations. A prescription would be written with replicated blocks, strips, etc. in a completely randomized design based on what nutrient was in question and the soil sample results. These treatments would be focused around soil point locations and subject to the same analyses as stated in Objective 1.

Planned Milestones:

The value in a project such as this is collecting large quantities of data across multiple years capturing different weather patterns, input soybean changes, and various management programs. To show the

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value of this type of analysis, a 3-year timeline is being proposed, but this is something that growers can benefit from year to year and the power of the data increases with each added year. The timeline laid out below will be roughly the same from year to year, so no significant differences based upon year.

January-March

- Identify participating growers that are willing to share geospatial data.
- Ingest or "wrangle" grower data from various platforms.
- Examine previous or historical data to determine focus areas.

April-June

- Create and apply additional fertilizer through prescriptions if needed.
- Collect as-applied planting, and application data from various platforms.
    - Wrangle data and prepare for harvest data.

July-September

- Begin harvest data onboard from various platforms.
- Identify growers/areas that may need directed soil samples taken.
- Begin to overlay and standardize all layers of grower data for analysis.
- Begin to provide producers with preliminary data to potentially adjust fertilizer recommendations for the next year.

October-December

- Finish harvest data onboard and standardization.
- Analyze data and prepare in a way that relates to Arkansas growers.
    - Sit down with participating growers along with other growers that Chicot Insights consults with to discuss findings.
- Create and apply additional fertilizer through prescriptions if needed.
- Present these findings at professional meetings such as: Cotton and Rice Conference and any state level meetings in Arkansas as requested.

Value to Soybean Industry: The goal is to perform this analysis on differing management types, fertility philosophies, and yield potential to see which environments are most likely to reveal a positive return. While fertility applications (primarily phosphorus (P) and potassium (K)) are often a grower's focus, and for good reason, micronutrient levels or other environmental factors are often overlooked and may possibly lead to unresponsive applications due to logic from Liebig's Law. A fertility validation approach such as this makes sense due to Liebig's Law, however, little research has been done on a large-scale using grower data analyzed through machine learning. Validation of this type will give Arkansas soybean growers confidence to make economic decisions when it comes to managing fertility and the likelihood of a response from a given application. Results will be conveyed to producers as soon as possible and will include education on the likelihood of a response in a given environment.

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Budget

Personnel Salaries and Wages		
1.	Postdoctoral Associates	
2.	Other Professionals (RA's, etc.)	$9,600
3.	Graduate Assistants	
4.	Student Workers	$5,000
5.	Contingent Employees/Transients	
Subtotal Salaries and Wages		$14,600
Fringe Benefits		$3,360
Regular Employees		$0
Graduate Assistants		$0
Contingent Employee/Transients		$0
Subtotal Fringe Benefits		$3,360
Total Salaries, Wages and Fringe		$17,960
Travel	(Domestic - Continental US only)	$5,060.60
Supplies		$10,050
Operating Services		$2,250
Other Charges (consulting)		$3,000
Total Costs		**$38,320.60**

Budget Justifications/Explanation of Travel and Direct Costs:

Budget Justification ($38,320.60):

Other Professionals ($12,960): A Chicot Insights professional will spend a portion of their time helping collect data and ensure soil samples and/or supplemental fertilizer applications are executed properly. ($30/hr x 320 hours = $9,600 + Fringe: $9,600* 0.35 = $3,360) **($12,960)**

Student Worker ($5,000): A Chicot Insights student worker/intern will spend a portion of their time working with the Specialist to help procure and store data. ($15/hr x 333.3 hours = **$5,000**)

Travel ($5,060.60): Travel is requested for PI and other project support to meet with growers, install sensors, collect data, assist with irrigation management, and attend meetings. This amount is based on trips from Starkville, MS (office of PIs) to West Memphis, AR which is a central location estimate of the project. The government rate of $0.70/mile was used to calculate milage rates. (Quarters 1&4: 10 total trips x 388-mile roundtrip = 3,880 miles * $0.70 = **$2,716**; Quarters 2 & 3: 6 total trips x 388-mile roundtrip = 2,328 miles * $0.70 = **$1,629.60**; Cotton and Rice meeting in Memphis, TN-378-mile roundtrip x $0.70 = **$265**; Cotton and Rice meeting in Memphis, TN Hotel room for PI- 2 nights @ $225/night = **$450; Total of $5,060.60.**

Supplies ($10,050): Supplies requested for this project are to go towards additional fertilizer applications and soil samples. Average rates (and current prices) of 100lbs/ac of PK on 150 acres were used to calculate amounts along with a soil sample grid size of 2.5-acre on 150 acres. (100 lb/ac TSP x

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150 acres = 7.5 tons * $790/ton = **$5,925**; 100 lb/ac Potash x 150 acres = 7.5 tons * $470/ton = **$3,525**; 150 acres/2.5 = 60 samples * $10/sample = **$600** (Waters Lab)). **$10,050.**

Operating Services ($2,250): Operating services are requested for fertilizer application costs made from either air or ground machinery (150 acres x $15/ac application fee = **$2,250**).

Other Charges ($3,000): Due to the unique nature of this project, a statistical consultant will be hired that specializes in analyzing large datasets and spatial statistics. (100/hr * 30 hours = **$3,000**).

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17 - RI-05

Organization/Institution Submitting Proposal:
Chicot Insights, LLC

Project Title:
Developing Overhead Irrigation Recommendations for Arkansas Soybean Production

Project Type:
Research

Name of Project Manager:
L. Jason Krutz

Name of Project Team Member 1:
L. Jason Krutz

Name of Project Team Member 2:
Zach Reynolds

Statement of Justification or Purpose of the Project (75 word maximum):
Regional research indicates that furrow irrigators produce greater soybean yields with similar water use compared to those that employ overhead irrigation. Our preliminary data demonstrates that the yield lag of overhead-irrigated systems is partially due to producers applying the wrong amount of irrigation at the wrong time. The aim of this proposal is to close the yield gap between furrow and overhead-irrigated soybean with appropriate irrigation scheduling techniques while also improving profitability and sustainability.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Crop productivity, water use, and net returns above irrigation costs will be monitored at 20 pivot sites in Arkansas annually from 2026-2028. An analysis of covariance (ANCOVA) will be conducted to evaluate the effects of soil moisture deficit, soil texture, and gpm/acre on soybean grain yield and net returns above irrigation costs. This approach will delineate how to optimize crop productivity and profitability as a function of soil texture, gpm/acre, irrigation threshold, and their interactions.

BUDGET

Amount of Funding Needed for Project:
$41,020.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board: 2026-2027 Proposal

Title: Developing Overhead Irrigation Recommendations for Arkansas Soybean Production

Lead Investigators: L. Jason Krutz, Ph.D.

Co-Investigators: Zach Reynolds, Ph.D.

Status and Duration of Funding: New, Year 1 of 3

Research Areas: Irrigation

Stated Goal: Inefficient use of water resources via untimely irrigation reduces economic stability and threatens the sustainability of long-term irrigated agriculture. It is commonly held that overhead irrigation is more efficient than furrow irrigation; however, large-scale research and monitoring by the USDA and regional scientists suggests that furrow irrigators in Arkansas and the Lower Mississippi River Basin (LMRB) produce greater soybean grain yields with similar water use compared to producers employing overhead irrigation (Massey et al., 2017; USDA-NASS, 2024, 2019). Substantial efforts have focused on developing furrow irrigation recommendations for soybean production in the LMRB, yet there are few guidelines for overhead irrigators. Our preliminary data demonstrate that the yield lag of overhead-irrigated soybean systems is at least partially due to irrigation management. Commonly, overhead irrigation is applied at inappropriate times and in inadequate quantities in the LMRB, which can result in soybean grain yield declines up to 8 bushels acre^{-1} relative to optimally managed overhead systems. What is not known is whether overhead irrigations should be initiated at a threshold similar to furrow irrigation, nor the appropriate application volume to maximize yield and reduce water use. Therefore, there is a *critical need* to develop irrigation recommendations for overhead irrigation management in the midsouthern USA. Without this information, unnecessary exploitation of water resources will persist, and the economic potential of overhead-irrigated soybean production systems will be unrealized, contributing to decreased quality of life in rural areas of Arkansas. Thus, our *long-term goal* is to reduce consumptive water use in row crop agriculture while improving the socioeconomic wellbeing of communities in the LMRB.

Specific Objectives: The *overall objective* for this project, which is the next step toward our long-term goal, is to develop overhead irrigation recommendations that maximize soybean grain yield and profitability. Our *central hypothesis* is that irrigation timing and application volume can be manipulated to improve yield, maintain or increase water use efficiency, and increase net returns. We formulated this hypothesis based on our preliminary data which suggests that irrigation scheduling and application volumes can be manipulated to improve soybean grain yield up to 8 bushels acre^{-1} relative to typical overhead irrigation management.

Methods: On-farm research will be conducted across the LMRB region of Arkansas in 2026, 2027, and 2028 and will comprise two related experiments. For the first experiment, Drs. Krutz and Reynolds will manage five overhead irrigation systems per year on cooperating growers' farms and compare soybean grain yield, water use, and estimated net returns with paired overhead irrigation systems managed by the cooperator. Each pair of irrigation systems will be seeded to the same soybean cultivar, on the same date, with equivalent agronomic practices and similar soils and overhead irrigation system design. For the irrigation systems managed by Drs. Krutz and Reynolds, irrigations will be scheduled via soil moisture sensors equipped with telemetry (Bryant et al., 2023). Cooperating growers will manage their respective systems according to their own standard practices, while soil moisture sensors will still be installed to

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record soil water status throughout the growing season. Water use will be quantified with in-line flow meters and soybean grain yield will be determined by calibrated yield monitors on commercial combines (Bryant et al., 2017; Spencer et al., 2019). The experiment will be designed as a randomized complete block, with the overhead irrigation system serving as the experimental unit and each pair of on-farm systems serving as a block (r=5). An analysis of variance (ANOVA) will be conducted to evaluate the effects of soil-moisture-sensor-based irrigation scheduling and application depth on soybean grain yield, water use, and net returns.

For the second experiment, 10 additional soil moisture sensors each year will be deployed on grower-managed, overhead-irrigated soybean fields across the LMRB region of Arkansas to investigate whether soil texture (clay, mixed, or light) or pumping capacity (system gpm $acre^{-1}$) effect irrigation thresholds or optimum application volumes. The second experiment will follow a completely randomized design, with the overhead irrigation system serving as the experimental unit. Additionally, the locations from the first experiment will be included in this analysis, so that the number of observations will be 20 per year. An analysis of covariance (ANCOVA) will be conducted to evaluate the effects of soil moisture deficit, soil texture, and pumping capacity on soybean grain yield. The model will include soil texture as a fixed effect, with both maximum soil moisture deficit and pumping capacity as covariates. This approach will allow us to quantify how water use and crop yield vary as functions of crop type, soil texture, well density, and their interactions.

Planned Milestones:

Figure 1. Planned milestones for the proposal entitled "Developing Overhead Irrigation Recommendations for Arkansas Soybean Production".

	2026				2027				2028			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
Order Equipment	■	■			■	■			■	■		
Identify Project Locations	■	■			■	■			■	■		
Complete Field Preparations		■				■				■		
Research Sites Active		■	■			■	■			■	■	
Water Use Measurements		■	■			■	■			■	■	
Grain Yield Determination			■	■			■	■			■	■
Economic Analysis				■				■				■
Delivery of Final Report				■				■				■

Value to Soybean Industry: This project is *innovative* because it proposes to solve Arkansas' productivity gap between furrow-irrigated and overhead-irrigated soybean while minimizing crop production's strain on water resources. Specifically, this approach is expected to provide several positive outcomes. First, we will demonstrate that scientific irrigation scheduling can close the yield gap between overhead- and furrow-irrigated soybean, while increasing farm-scale profitability and minimizing water use. This is essential as producers will only implement an approach if they perceive that the agroeconomic risks are minimal. Second, we will refine recommendations for overhead irrigation according to soil texture and pumping capacity. This is critical to ensure results benefit all overhead irrigators, as soil textures and irrigation system pumping capacities vary across Arkansas. Collectively, these outcomes will establish how

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to increase overhead-irrigated soybean productivity and profitability while minimizing reliance on water resources.

References:

Bryant, C.J., L.J. Krutz, D.M. Dodds, M.T. Plumblee, G.D. Spencer. 2023. Development of a soil moisture sensor-based irrigation scheduling program for the Mid-Southern USA. Crop, Forage, and Turfgrass Management. DOI:10.1002/cft2.20217.

Bryant, C.J., L.J. Krutz, L. Falconer, J.T. Irby, C.G. Henry, H.C. Pringle III, M.E. Henry, D.P Roach, D. M. Pickelmann, R.L. Atwill, C.W. Wood. 2017. Irrigation water management practices that reduce water requirements for Mid-South furrow-irrigated soybean. Crop, Forage and Turfgrass Management. 3:1-6.

Massey, J.H., M.C. Styles, J.W. Epting, S.R. Powers, D.B. Kelley, T.H. Bowling, J. C. Leighton, D.A. Pennington. 2017. Long-term measurements of agronomic crop irrigation made in the Mississippi delta portion of the lower Mississippi River Valley. Irrigation Science 35:297-313.

Spencer, G.D., L.J. Krutz, L. Falconer, W.B. Henry, C.G. Henry, E.J. Larson, H.C. Pringle III, C.J. Bryant, and R.L. Atwill. 2019. Irrigation water management technologies for furrow-irrigated corn that decrease water use and improve yield and on-farm profitability. Crop, Forage and Turf grass Management. 5:180100.doi:10.2134/cftm2018.12.0100.

U.S. Department of Agriculture, National Agricultural Statistics Service (NASS). 2024. 2023 Irrigation and Water Management Survey. Available at https://www.nass.usda.gov/Publications/AgCensus/2022/Online_Resources/Farm_and_Ranch_Irrigation_Survey/index.php.

U.S. Department of Agriculture, National Agricultural Statistics Service (NASS). 2019. 2018 Irrigation and Water Management Survey. Available at https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/Farm_and_Ranch_Irrigation_Survey/index.php.

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Budget:

Personnel Salaries and Wages		
1.	Postdoctoral Associates	
2.	Other Professionals (RA's, etc.)	$9,600
3.	Graduate Assistants	
4.	Student Workers	$5,000
5.	Contingent Employees/Transients	
Subtotal Salaries and Wages		$14,600
Fringe Benefits		$3,360
Regular Employees		$0
Graduate Assistants		$0
Contingent Employee/Transients		$0
Subtotal Fringe Benefits		$3,360
Total Salaries, Wages and Fringe		$17,960
Travel	(Domestic - Continental US only)	$5,060
Supplies		$0
Operating Services (Sensor Renal)		$15,000
Other Charges (Consulting)		$3,000
Total Costs		$41,020

Budget Justifications/Explanation of Travel and Direct Costs:

Budget Justification ($41,020):

Other Professionals ($12,960): A Chicot Insights Irrigation Specialist will spend a portion of their time installing sensors and collecting agroeconomic data, ($30.00/hr x 320 hours = **$9,600) (**Fringe rate of 0.35 x $9,600 = $**3,360**)

Student Worker ($5,000): A Chicot Insights student worker/intern will spend a portion of their time working with the Specialist to help procure and store data. ($15/hr x 333.3 hours = **$5,000**)

Travel ($5,060): Travel is requested for PI and other project support to meet with growers, install sensors, collect data, assist with irrigation management, and attend meetings. This amount is based on trips from Starkville, MS (office of PIs) to West Memphis, AR which is a central location estimate of the project. The government rate of $0.70/mile was used to calculate milage rates. (Quarters 1&4: 10 total trips x 388-mile roundtrip = 3,880 miles * $0.70 = $2,716; Quarters 2 & 3: 6 total trips x 388-mile roundtrip = 2,328 miles * $0.70 = $1,629.60; Cotton and Rice meeting in Memphis, TN-378-mile roundtrip x $0.70 = $265; Cotton and Rice meeting in Memphis, TN Hotel room for PI- 2 nights @ $225/night = $450; Total of $**5,060.60**.

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Operating Services ($15,000): Requesting to rent 20 Sentek soil moisture sensor units per year which includes telemetry/cellular subscription fees ($750 x 20 subscriptions = **$15,000**).

Other Charges ($3,000): Due to the unique nature of this project, a statistical consultant will be hired that specializes in analyzing large datasets and spatial statistics. (100/hr * 30 hours = **$3,000)**

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17 - RI-06

Organization/Institution Submitting Proposal:
Chicot Insights, LLC

Project Title:
Automated Irrigation Technologies that Improve Soybean Productivity, Profitability, and Aquifer Stability

Project Type:
Research

Name of Project Manager:
Zach Reynolds

Name of Project Team Member 1:
Zach Reynolds

Name of Project Team Member 2:
Zach Reynolds

Statement of Justification or Purpose of the Project (75 word maximum):
Labor shortages and aquifer decline are significant threats to agriculture in Arkansas. Row-crop producers maintain that coordinating irrigation management amongst laborers is the most dreaded aspect of their farm operation. Preliminary data denote that automation technologies may alleviate labor and groundwater problems plaguing Arkansas producers. The aim of this project is, therefore, to quantify the effects of irrigation automation technologies on crop productivity, profitability, and aquifer sustainability.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
We will conduct research from 2026-2028 at four on-farm locations in the LMRB of Arkansas. Each location will consist of paired irrigation systems (conventional furrow irrigation or automated furrow irrigation) with the same soil texture, cultivar, and planting date. Total water applied and grain yield will be quantified as described in our previous work. Analysis of variance and mean separation will be performed for grain yield, total water applied, and net returns above irrigation costs.

BUDGET

Amount of Funding Needed for Project:
$60,992.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board: 2026-2027 Proposal

Title: Automated Irrigation Technologies that Improve Soybean Productivity, Profitability, and Aquifer Stability

Lead Investigators: L. Jason Krutz, Ph.D.

Co-Investigators: Zach Reynolds, Ph.D.

Status and Duration of Funding: New, Year 1 of 3

Research Areas: Irrigation

Stated Goal: Labor shortages and aquifer decline are significant threats to agriculture in Arkansas. Row-crop producers in the Lower Mississippi River Basin (LMRB) have long maintained that coordinating irrigation management amongst laborers is the most dreaded aspect of their farm operation. Preliminary data denote that automation technologies may alleviate the labor and groundwater problems plaguing Arkansas producers. Our previous research and modeling efforts indicate that crop productivity, profitability, and aquifer stability are optimized by integrating well automation into furrow-irrigation systems that contain no more than two irrigation sets. What is not known, however, is whether additional costs associated with automation technologies are offset by changes in crop productivity, fuel consumption, and labor costs. There is, therefore, a *critical need* to quantify the effects of automating furrow irrigation on soybean grain yield, net returns above irrigation costs, and water use over a range of environments in the LMRB region of Arkansas. In the absence of this information, labor and water management problems will proliferate, producer frustrations will escalate, and the agroeconomic stability of the region will deteriorate. Our *long-term goal* is to enhance agricultural resilience in the Lower Mississippi River Basin (LMRB) by developing innovative tools, technologies, and approaches that lead to profitable production systems with positive environmental footprints that producers will adopt.

Specific Objectives: The *overall objective* for this project is to identify irrigation automation technologies that improve agroeconomic vitality and aquifer stability. The *central hypothesis* for this project is that incorporating automation technologies into furrow irrigation systems with two or less irrigation sets will reduce labor and fuel costs while, concurrently, improving soybean productivity and profitability. We formulated this hypothesis based on strong preliminary findings which indicate that automating furrow irrigation systems that have sufficient capacity reduces labor and pumpage costs up to 50%, while maintaining or improving soybean productivity up to 5%.

Methods: We will conduct research from 2026-2028 at four on-farm locations in the LMRB of Arkansas. Each location will consist of paired irrigation systems with the same soil texture, cultivar, and planting date. Total water applied and grain yield will be quantified as reported in our previous work (Bryant et al. 2017; Spencer et al. 2019). The paired systems are as follows:

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1. **Conventional furrow irrigation:** Producer irrigates according to their standard irrigation methodology.

2. **Automated furrow irrigation**: Irrigation systems will be instrumented with a tee valve and a Crop Link-automated, two-way valve. Irrigation delivery and irrigation timing will be optimized with computerized hole selection and soil moisture sensor technologies, respectively (Bryant et al. 2017; Bryant et al. 2023; Spencer et al. 2019; Wood et al. 2020).

Statistical analyses will be performed similarly to Spencer et al. (2019). Analysis of variance and mean separation will be performed for grain yield, total water applied, and net returns above irrigation costs using the MIXED procedure of SAS (Statistical Analytical System Release 9.4; SAS Institute Inc., Cary, North Carolina), with year and location(year) as random effects.

Planned Milestones:

Figure 1. Planned milestones for the proposal entitled "Structural Irrigation Strategies that Improve Soybean Productivity, Profitability, and Aquifer Stability".

	2026				2027				2028			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
Order Equipment	■	■			■	■			■	■		
Identify Project Locations	■	■			■	■			■	■		
Complete Field Preparations		■				■				■		
Research Sites Active		■	■	■		■	■	■		■	■	■
Water Use Measurements		■	■	■		■	■	■		■	■	■
Grain Yield Determination				■				■				■
Economic Analysis				■				■				■
Delivery of Final Report				■				■				■

Value to Soybean Industry: This project is *innovative* because it proposes to solve Arkansas' labor and aquifer sustainability problems by demonstrating that irrigation automation technologies deployed in appropriate environments reduce labor dependency, labor costs, and pumpage costs while, concurrently, decreasing agricultural demands for groundwater. Specifically, this approach is expected to provide several positive outcomes. First, we will identify the price point whereby automation technologies improve net returns in furrow-irrigated environments. This is essential as producers will only implement a novel approach if they perceive that the agroeconomic risks are minimal. Second, we will demonstrate with farm-scale data that automating wells with adequate gpm/acre reduces aquifer withdrawal by 50%. This information is required to request that USDA-NRCS expand support for well automation under their Environmental Quality Incentives Program. Collectively, these outcomes will establish how to economically incorporate automation into furrow-irrigated environments so that irrigation efficiency and aquifer sustainability are improved for soybean producers in Arkansas.

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References:

Bryant, C.J., L.J. Krutz, D.M. Dodds, M.T. Plumblee, G.D. Spencer. 2023. Development of a soil moisture sensor-based irrigation scheduling program for the Mid-Southern USA. Crop, Forage, and Turfgrass Management. DOI:10.1002/cft2.20217.

Bryant, C.J., L.J. Krutz, L. Falconer, J.T. Irby, C.G. Henry, H.C. Pringle III, M.E. Henry, D.P Roach, D. M. Pickelmann, R.L. Atwill, C.W. Wood. 2017. Irrigation water management practices that reduce water requirements for Mid-South furrow-irrigated soybean. Crop, Forage and Turfgrass Management. 3:1-6.

Spencer, G.D., L.J. Krutz, L. Falconer, W.B. Henry, C.G. Henry, E.J. Larson, H.C. Pringle III, C.J. Bryant, and R.L. Atwill. 2019. Irrigation water management technologies for furrow-irrigated corn that decrease water use and improve yield and on-farm profitability. Crop, Forage and Turf grass Management. 5:180100.doi:10.2134/cftm2018.12.0100.

Wood, C.W., L.J. Krutz, J.T. Irby, B. Henry, J. Orlowski, C.J. Bryant, G.D. Spencer, and B.E. Mills. 2020. Developing sensor-based irrigation scheduling that maximizes soybean grain yield, irrigation water use efficiency, and returns above irrigation costs. Crop, Forage and Turfgrass Management DOI:10.1002cft2.20029.

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Budget:

Personnel Salaries and Wages		
1.	Postdoctoral Associates	
2.	Other Professionals (RA's, etc.)	$9,600
3.	Graduate Assistants	
4.	Student Workers	$5,000
5.	Contingent Employees/Transients	
Subtotal Salaries and Wages		$14,600
Fringe Benefits		$3,360
Regular Employees		$0
Graduate Assistants		$0
Contingent Employee/Transients		$0
Subtotal Fringe Benefits		$3,360
Total Salaries, Wages and Fringe		$17,960
Travel	(Domestic - Continental US only)	$5,060
Supplies		$33,172
Operating Services		$1,800
Other Charges (consulting)		$3,000
Total Costs		$60,992

Budget Justifications/Explanation of Travel and Direct Costs:

Budget Justification ($60,992):

Other Professionals ($12,960): A Chicot Insights Irrigation Specialist will spend a portion of their time installing sensors and collecting agroeconomic data, ($30.00/hr x 320 hours = **$9,600) (**Fringe rate of 0.35 x $9,600 = $**3,360**)

Student Worker ($5,000): A Chicot Insights student worker/intern will spend a portion of their time working with the Specialist to help procure and store data. ($15/hr x 333.3 hours = **$5,000**)

Travel ($5,060): Travel is requested for PI and other project support to meet with growers, install sensors, collect data, assist with irrigation management, and attend meetings. This amount is based on trips from Starkville, MS (office of PIs) to West Memphis, AR which is a central location estimate of the project. The government rate of $0.70/mile was used to calculate milage rates. (Quarters 1&4: 10 total trips x 388-mile roundtrip = 3,880 miles * $0.70 = $2,716; Quarters 2 & 3: 6 total trips x 388-mile roundtrip = 2,328 miles * $0.70 = $1,629.60; Cotton and Rice meeting in Memphis, TN-378-mile roundtrip x $0.70 = $265; Cotton and Rice meeting in Memphis, TN Hotel room for PI- 2 nights @ $225/night = $450; Total of **$5,060.60**.

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<u>Supplies ($33,172):</u> Supplies requested for this project are to go towards eight in-line flow meters at $2,200 each, four crop link controllers at $1183 each, four tee valves at $2450 each, and eight clamps at $130 each.

Operating Services ($1,800): Operating services are requested for 12 crop link subscriptions at $150 each.

Other Charges ($3,000): Due to the unique nature of this project, a statistical consultant will be hired that specializes in analyzing large datasets and spatial statistics. (100/hr * 30 hours = $3,000)

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17 - RI-07

Organization/Institution Submitting Proposal:
Chicot Insights, LLC

Project Title:
Structural Irrigation Strategies that Improve Soybean Productivity, Profitability, and Aquifer Stability

Project Type:
Research

Name of Project Manager:
Jason Krutz

Name of Project Team Member 1:
L. Krutz

Name of Project Team Member 2:
Zach Reynolds

Statement of Justification or Purpose of the Project (75 word maximum):
Overuse of groundwater is the primary threat to sustainable, irrigated agriculture in Arkansas. Our preliminary data indicate that increasing gpm/acre improves crop productivity and profitability while also decreasing aquifer demand by 50%. The aim of the proposed work is, therefore, to quantify the gpm/acre needed to optimize corn productivity and profitability while, concurrently, minimizing the irrigation demand on the aquifer. These data can be used to petition USDA-NRCS to include well augmentation in their programs.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
On-farm research will be conducted across the LMRV region of Arkansas n 2026, 2027, and 2028 on 20, 40, and 60 furrow irrigation systems, respectively. Water use and crop grain yield will be determined via standard methods. An analysis of covariance (ANCOVA) will be conducted to quantify how water use and corn grain yield vary as functions of soil texture, well density, and their interactions.

BUDGET

Amount of Funding Needed for Project:
$70,020.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board: 2026-2027 Proposal

Title: Structural Irrigation Strategies that Improve Soybean Productivity, Profitability, and Aquifer Stability

Lead Investigators: L. Jason Krutz, Ph.D.

Co-Investigators: Zach Reynolds, Ph.D.

Status and Duration of Funding: New, Year 1 of 3

Research Areas: Irrigation

Stated Goal: Overuse of groundwater is the primary threat to sustainable, irrigated agriculture in Arkansas. It is widely held that the principal reason for aquifer decline is the excessive number of groundwater wells installed for row-crop irrigation. Our preliminary data contradict this long-held belief. Previous research and current modeling efforts indicate that reducing the time needed to apply water to fields in furrow irrigation systems improves crop productivity and profitability while, concurrently, reducing aquifer withdrawal and acre-inches of water applied to the crop. Ironically, increasing gpm/acre by installing additional groundwater wells is a structural management strategy that reduces the time required to apply the correct depth of water to irrigation sets. What is not known, however, is the irrigation capacity per acre needed to appropriately irrigate soybean as a function of well capacity (gpm), irrigation set size (acres), soil texture, and field slope. There is, therefore, a ***critical need*** to quantify ground water use, crop productivity, and profitability for soybean over a range of environments when furrow irrigation delivery and timing are optimized. In the absence of this information, aquifer decline will escalate, on-farm profitability will degenerate, and the socioeconomic well-being of farming communities in the rural row-crop regions of Arkansas will deteriorate. Consequently, our ***long-term goal*** is to enhance agricultural resilience in the Lower Mississippi River Basin (LMRB) by developing innovative tools, technologies, and approaches that lead to profitable production systems with positive environmental footprints that producers will adopt.

Specific Objectives: The ***overall objective*** for this project, which is the next step toward our long-term goal, is to determine how to improve furrow irrigation efficiency in soybean production systems commonly deployed by Arkansas producers. The ***central hypothesis*** for this project is that decreasing the time required to apply the appropriate depth of water to fields in furrow irrigation systems reduces aquifer withdrawal while, concurrently, optimizing soybean productivity and profitability. We formulated this hypothesis based on strong preliminary findings which indicate that increasing well density (i.e., gpm/acre) positively affects agroeconomic vitality and aquifer stability.

Methods: On-farm research will be conducted across the LMRV region of Arkansas in 2026, 2027, and 2028 on 20, 40, and 60 furrow irrigation systems, respectively. At all locations, Drs. Krutz and Reynolds will optimize furrow irrigation delivery and timing for soybean fields using PipePlanner and soil-moisture-sensor scheduling technologies, respectively (Bryant et al. 2017;

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Bryant et al. 2023; Spencer et al. 2019; Wood et al. 2020). Groundwater extraction and well capacity will be quantified with in-line flow meters (Massey et al. 2017). Irrigation set size and furrow lengths will be computed with PipePlanner. Field slopes will be determined by Global Positioning Systems, and soil texture will be estimated via web soil survey. Crop grain yield will be quantified using commercial combines equipped with on-board calibrated yield monitors (Bryant et al. 2017; Spencer et al. 2019).

The experiment will follow a completely randomized design, with the furrow irrigation system – defined as all irrigation sets connected to a single well – serving as the experimental unit. An analysis of covariance (ANCOVA) will be conducted to evaluate the effects of soil texture (clay, mixed, or light) and well density – defined as well capacity divided by irrigation set size – on water use and grain yield. The model will include soil texture as a fixed effect, with well density as a covariate. Additionally, longitudinal field slope will be evaluated as a potential covariate influencing water use. This approach will allow us to quantify how water use and crop yield vary as functions of crop type, soil texture, well density, and their interactions.

Planned Milestones:

Figure 1. Planned milestones for the proposal entitled "Structural Irrigation Strategies that Improve Soybean Productivity, Profitability, and Aquifer Stability".

	2026				2027				2028			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
Order Equipment	■	■			■	■			■	■		
Identify Project Locations	■	■			■	■			■	■		
Complete Field Preparations		■				■				■		
Research Sites Active		■	■	■		■	■	■		■	■	■
Water Use Measurements		■	■	■		■	■	■		■	■	■
Grain Yield Determination				■				■				■
Economic Analysis				■				■				■
Delivery of Final Report				■				■				■

Value to Soybean Industry: This project is *innovative* because it proposes to solve Arkansas' primary aquifer sustainability problem by demonstrating that, counterintuitively, well density must be increased to reduce groundwater decline and improve soybean productivity. Specifically, this approach is expected to provide several positive outcomes. First, we will identify the gpm/acre for optimum soybean productivity and profitability as a function of soil texture. This is essential as producers will only implement a novel approach if they perceive that the agroeconomic risks are minimal. Second, we will demonstrate with farm-scale data that increasing gpm/acre reduces aquifer withdrawal by 50%. This information is required to request that USDA-NRCS include well augmentation as a cost share option under their Environmental Quality Incentives Program. Collectively, these outcomes will establish how to economically

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manipulate well density across the landscape so that irrigation efficiency and aquifer sustainability are improved for soybean producers in Arkansas.

References:

Bryant, C.J., L.J. Krutz, D.M. Dodds, M.T. Plumblee, G.D. Spencer. 2023. Development of a soil moisture sensor-based irrigation scheduling program for the Mid-Southern USA. Crop, Forage, and Turfgrass Management. DOI:10.1002/cft2.20217.

Bryant, C.J., L.J. Krutz, L. Falconer, J.T. Irby, C.G. Henry, H.C. Pringle III, M.E. Henry, D.P Roach, D. M. Pickelmann, R.L. Atwill, C.W. Wood. 2017. Irrigation water management practices that reduce water requirements for Mid-South furrow-irrigated soybean. Crop, Forage and Turfgrass Management. 3:1-6.

Massey, J.H., M.C. Styles, J.W. Epting, S.R. Powers, D.B. Kelley, T.H. Bowling, J. C. Leighton, D.A. Pennington. 2017. Long-term measurements of agronomic crop irrigation made in the Mississippi delta portion of the lower Mississippi River Valley. Irrigation Science 35:297-313.

Spencer, G.D., L.J. Krutz, L. Falconer, W.B. Henry, C.G. Henry, E.J. Larson, H.C. Pringle III, C.J. Bryant, and R.L. Atwill. 2019. Irrigation water management technologies for furrow-irrigated corn that decrease water use and improve yield and on-farm profitability. Crop, Forage and Turf grass Management. 5:180100.doi:10.2134/cftm2018.12.0100.

Wood, C.W., L.J. Krutz, J.T. Irby, B. Henry, J. Orlowski, C.J. Bryant, G.D. Spencer, and B.E. Mills. 2020. Developing sensor-based irrigation scheduling that maximizes soybean grain yield, irrigation water use efficiency, and returns above irrigation costs. Crop, Forage and Turfgrass Management DOI:10.1002cft2.20029.

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Budget:

Personnel Salaries and Wages		
1.	Postdoctoral Associates	
2.	Other Professionals (RA's, etc.)	$9,600
3.	Graduate Assistants	
4.	Student Workers	$5,000
5.	Contingent Employees/Transients	
Subtotal Salaries and Wages		$14,600
Fringe Benefits		$3,360
Regular Employees		$0
Graduate Assistants		$0
Contingent Employee/Transients		$0
Subtotal Fringe Benefits		$3,360
Total Salaries, Wages and Fringe		$17,960
Travel	(Domestic - Continental US only)	$5,060
Supplies		$44,000
Operating Services		$0
Other Charges (consulting)		$3,000
Total Costs		$70,020

Budget Justifications/Explanation of Travel and Direct Costs:

Budget Justification ($70,020):

Other Professionals ($12,960): A Chicot Insights Irrigation Specialist will spend a portion of their time installing sensors and collecting agroeconomic data, ($30.00/hr x 320 hours = **$9,600) (**Fringe rate of 0.35 x $9,600 = $**3,360**)

Student Worker ($5,000): A Chicot Insights student worker/intern will spend a portion of their time working with the Specialist to help procure and store data. ($15/hr x 333.3 hours = **$5,000**)

Travel ($5,060): Travel is requested for PI and other project support to meet with growers, install sensors, collect data, assist with irrigation management, and attend meetings. This amount is based on trips from Starkville, MS (office of PIs) to West Memphis, AR which is a central location estimate of the project. The government rate of $0.70/mile was used to calculate milage rates. (Quarters 1&4: 10 total trips x 388-mile roundtrip = 3,880 miles * $0.70 = $2,716; Quarters 2 & 3: 6 total trips x 388-mile roundtrip = 2,328 miles * $0.70 = $1,629.60; Cotton and Rice meeting in Memphis, TN-378-mile roundtrip x $0.70 = $265; Cotton and Rice meeting in Memphis, TN Hotel room for PI- 2 nights @ $225/night = $450; Total of $**5,060.60**.

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<u>Supplies ($44,000)</u>: Supplies requested for this project are to go towards in-line flow meters, 20 flowmeters/year at $2,200 per flow meter.

<u>Other Charges ($3,000):</u> Due to the unique nature of this project, a statistical consultant will be hired that specializes in analyzing large datasets and spatial statistics. (100/hr * 30 hours = **$3,000)**

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Organization/Institution Submitting Proposal:
Mid-South Soybean Board

Project Title:
Coordination of Regional Soybean Research

Project Type:
Research

Name of Project Manager:
Dawn Howe

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Requesting funding from AR, MS, LA, MO, TX, OK for joint soybean research projects. All admin fees are paid by the United Soybean Board

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
16 projects submitted to the Mid-South Soybean Board selected by the board of directors to be funded by the QSSB's of AR, OK, MS, MO, LA, TX.

BUDGET

Amount of Funding Needed for Project:
$155,916.75

Contribution Amount (from organization or sponsor):
$368,832.00

2026 MID SOUTH SOYBEAN BOARD
18 - RI-08

Project Title	Beating the Rot: Improving Soybean Resistance to Phytophthora Root and Stem Rot in the Mid-South		
PI's Name	Mandy Bish	E-mail	bishm@missouri.edu
PI's Title	Assistant Professor and State Extension Pathologist	Institution:	The Curators of the University of Missouri
Mailing Address	University of Missouri; 108 Waters Hall		
City/State/Zip	Columbia/MO/65211		
Phone number	573-882-9878		
Additional PIs For this project	Feng Lin, Peng Tian, Jessica Argenta		
Research locations (states involved)	Missouri		

Timeline: Current Year - FY26		**Multi-Year Project Information** (if applicable)		
		Year 1	Year 2	Year 3
Start Date		10/1/2025	10/1/2026	10/1/2027
End Date		9/30/2026	9/30/2027	9/30/2028
Funds Requested		$65,825	$70,000	$70,000

Program Area: Insect Management/Control, Research Validation or Demonstration

Other related funding:	N/A
Objectives:	Characterize *Phytophthora* isolates collected from mid-South soybean fields and screen soybean lines and germplasm for new sources of *Phytophthora* resistance.
Justification:	*Phytophthora* root and stem rot is a destructive soilborne disease of soybean. We have relied on the same genetic sources of resistance for three decades and the pathogen is overcoming those sources of resistance.
Exp Setup:	Field soil sampling in farmer fields across the mid-south United States. Samples will be characterized and confirmed at the MU Plant Diagostic Clinic. Isolates will be further characterized for virulence at greenhouses in Portageville, Missouri, where they will be used to screen soybean for new resistance.
Summary:	This project will address gaps in our understanding of how *Phytopthora* field isolates are adapting to mid-South soybean production practices and provide opportunity to identify new genetic sources of resistance.
Benefit to Midsouth Farmers:	Preserve yield potential in *Phytopthora*-disease prone areas; develop a stronger breeding pipeline for the Mid-South region; and highlight support of the Mid-South Soybean Board at field days and extension meetings by sharing insights into this research.
Progress Made:	We have used isolates from the North Central U.S. to develop the work flow and methods for *Phytophthora* isolation, confirmation, characterization, and screening of resistance.

Signature of Principal Investigator:	Date:
Mandy Bish	7/15/2025

2026 Midsouth Soybean Board

PROPOSAL TITLE: Beating the Rot: Improving Soybean Resistance to Phytophthora Root and Stem Rot in the Mid-South

INVESTIGATORS

- PI: Mandy Bish, Assistant Professor and State Extension Crop Pathologist, University of Missouri, 573-882-9878, bishm@missouri.edu
- Co-I: Feng Lin, Assistant Professor of Soybean Breeding, University of Missouri, 573-379-5431, flbn7@missouri.edu
- Co-I: Peng Tian, Assistant Extension Professor and Director of MU Plant Diagnostic Clinic, University of Missouri, 573-882-3019, tianp@missouri.edu
- Co-I: Jessica Argenta, Research Scientist, University of Missouri, 573-379-5431, japmb@missouri.edu

PROGRAM AREA (check all that apply):

___ New Uses of Soybean
___ Soybean Oil or Soybean Meal Uses
___ Food Grade Soybean
___ Soybean Fuel
___ Soybean Breeding and Genetics
___ Weed Management
___ Irrigation/Water Management
___ Seed Quality
_X_ Disease Management and Control
___ Fertility Management
___ Insect Management/Control
___ Harvest aids
___ Nematode Management/Control
___ Rotations using soybeans
___ Research Validation or Demonstration
___ Producer Communications
___ Variety Trials
___ Economics
___ Other (*Identify*)_____

PROJECT STATUS:

New __X_(1 of 3 years)_ Expected research length (yr)____3_____

Renewal ____ (Year ____ of ____) Remember if you are presenting a renewal, your writing should speak mostly about what you are doing in the following year. You should not be re-requesting money for year one goals. Make sure it is clearly demonstrating progress; have a clear intention of your expected outcomes in the current year, not just over the program life.

Stand alone __X_ or cross-commodity ___ (*additional funding from other sources? Name all other sources and amounts co-funded.* _____

2026 TOTAL FUNDING REQUEST $ __65,825_____

2026 MSSB RESEARCH PROJECT PROPOSED BUDGET			
CATEGORY		**ORIGINAL**	
A.	**Personnel**		
	1. Salaries (0.125 FTE Senior Research Specialist)	8,750	
	2. Wages Part-time Tech (200 hours; $15/hour) Diagnostic Tech (200 hours; $20/hour) Undergraduate students (3 students; $15/hour; 500 total hours)	14,500	
	3. GRA 0.25 FTE Stipend ($13,330) 0.25 Tuition ($6,340) 0.25 Medial insurance ($1,303)	20,973	
B.	**Fringe Benefits** 0.125 FTE Senior Specialist x 36.53% Diagnostic Tech @ 7.65%	3,502	
C.	**Travel** *(See Appendix A)*	6,000	
D.	**Contractual Services** *Disease diagnostic services*	4,600	
E.	**Subcontracts**	0	
F.	**Commodities**	0	
G.	**Publication Costs**	0	
H.	Other Costs *(See Appendix A)*	7,500	
TOTAL COST		65,825	

TECHNICAL SUMMARY

Phytophthora root and stem rot (PRR), caused by *Phytophthora sojae*, is a destructive soilborne disease of soybean. Yield losses from PRR can reach 100% in favorable environments[1]. However, PRR can often fly under the radar, because we've benefited from very good soybean genetic resistance over the last three decades. As we have learned with other pests, relying on the same management practice over and over, in this case genetic resistance, leads to one outcome: the pest adapts. *P. sojae* is adapting and gaining the ability to overcome the resistance genes commonly used in most soybean varieties. Recent studies have focused on characterizing *Phytophthora* populations in the north central US and successfully demonstrated how *P. sojae* has changed over time[2]. However, we have very limited data on the current status of the disease in the Mid-South such as which races are present and how diverse and aggressive they may be. This information is critical if we want to stay ahead of the disease and maintain effective genetic resistance. It is worth nothing that this pathogen belongs to the same genus as the organism responsible for the Irish potato famine and we need to ensure we have management options available. We've seen what happens when resistance breaks down and we do not have new tools readily available. We do not want to be in a position to play catch-up with PRR.

This project will address gaps in our understanding by characterizing *P. sojae* populations collected from mid-South soybean fields and screening soybean lines and germplasms for new sources of resistance. The long-term goal is to integrate strong resistance sources into the University of Missouri soybean breeding pipeline.

Technical Summary Literature Cited:

[1]Lopez-Nicroa H (2024) An Overview of Phytophthora Root and Stem Rot. Crop Protection Network. CPN-1021, DOI: doi.org/10.31274/cpn-20240503-0

[2]McCoy et al. (2023) A global-temporal analysis on *Phytopthora* sojae resistance-gene efficacy. Nature Communications 14, 6043

OUTLINE OF RESEARCH

RATIONALE/JUSTIFICATION FOR RESEARCH: Funding is needed to characterize the *P. sojae* populations that impact Mid-South soybean production; identify new sources of genetic resistance; and integrate those sources into the University of Missouri breeding programs. This work will fill a knowledge gap and support development of soybean varieties better adapted to pathogen pressures in the region.

OBJECTIVES: This project aims to mitigate PRR-related yield loss by:

1. Collecting soil and symptomatic plant samples.
2. *Isolating Phytopthora* from symptomatic plants and characterizing isolates with molecular tools.
3. Assessing aggressiveness and virulence profiles of *Phytopthora* isolates.
4. Screening advanced breeding lines and germplasm for resistance.

These efforts directly benefit the Mid-South soybean industry by identifying new genetic resistance solutions and delivering tools that support yield stability under increasing PRR pressure.

APPROACH AND EXPERIMENT CONDUCT:

Soil and plant sampling will begin in the 2026 growing season. Isolates will be recovered and rapidly confirmed through established baiting and ELISA-based methods. DNA analyses will be used to validate the identification. Greenhouse trials will be used for virulence profiling assays. Resistance screening will be conducted at the Fisher Delta Research, Extension & Education Center. Results will be communicated through field days, digital media, and direct outreach to soybean producers. This project links current field-level disease challenges with long-term breeding solutions to help safeguard soybean yields in Mid-South production systems. Additionally, it offers training opportunities for students in plant pathology and breeding, which supports development of future soybean researchers.

Objective 1: Soil and Plant Sample Collection: Soil and symptomatic soybean plants will be collected from soybean fields in 2026. The PI and co-I's already have the required USDA APHIS

permits in place for interstate movement of this pathogen. Sampling will target fields in the Mid-South with known or suspected PRR incidence. The PI will utilize existing collaborative relationships with state extension pathologists in mid-south states to identify problematic fields for sampling. These collaborations with State Extension Crop Pathologists from the mid-south, MU Extension specialists, industry agronomists, and growers will guide field selection.

Objective 2: Isolation of Phytophthora spp. from Soil and Plant Samples: Two baiting methods will be used to isolate Phytophthora from soil samples: seedling baiting and the leaf disc method. Symptomatic seedlings will be transferred to selective media. From plant tissues, Phytophthora will be confirmed using ELISA-based immunostrips. Positive samples will be plated on fresh media for purification. DNA extractions and analysis will be used to confirm successful purification of the isolates. Expected outcome: A collection of purified Phytophthora-like isolates from the Mid-South. This objective will begin as samples arrive to the MU Plant Diagnostic Clinic in the summer of 2026.

Objective 3: Pathotype Testing of Isolates: Once isolates are identified by morphological traits and confirmed by DNA analysis, the isolates will be propagated on Lima Bean Agar and sent to the Fisher Delta Research, Extension & Education Center (FD-REEC) for virulence and aggressiveness of each isolate through pathotype testing. Expected outcome: A detailed dataset describing the identity, diversity, and virulence of P. sojae populations in the mid-South US. This objective will be initiated as samples are isolated in objective 2.

Objective 4: Resistance Screening and Breeding Integration: Approximately 200 advanced breeding lines and ~200 diverse germplasm lines will be screened at FD-REEC using the characterized isolates. Lines demonstrating broad-spectrum resistance will be used in crossing blocks to create mapping and breeding populations for gene discovery and trait integration.
Expected outcome: Identification of new, effective resistance sources and initiation of breeding lines for future variety release. This is a long-term, multi-year objective.

PROJECTED IMPACT OF RESULTS ON MID-SOUTH SOYBEAN PRODUCTION

This project represents a systematic effort to document the current distribution, diversity, or virulence of *P. sojae* populations in the mid-South. By identifying local *P. sojae* populations, evaluating their aggressiveness, and screening soybean lines for resistance, this work will directly inform breeding efforts to develop more resilient soybean varieties. Impacts on Mid-South production systems include:

Reduced Yield Loss: The ability to deploy new resistance genes in Mid-South soybean varieties before current genes are completely overcome can minimize PRR-related yield losses by preserving yield potential in disease-prone areas.

Cost-Effective Disease Management: Genetic resistance remains the most practical, economical, and environmentally sustainable strategy for managing PRR in high-risk environments.

Stronger Breeding Pipelines: New resistance sources identified through this project will be integrated into the University of Missouri's soybean breeding program, accelerating the development of varieties better suited for Mid-South conditions.

Research-Extension-Education Integration: Results will be shared with stakeholders through field days, digital outreach, and direct communication. The project also provides hands-on training for undergraduate and graduate students in diagnostics, resistance screening, and applied research.

In summary, this project provides a timely and region-specific response to a growing disease threat. It combines field research, molecular diagnostics, breeding, and farmer outreach to deliver real-world solutions that can save soybean growers in the Mid-South millions of dollars in yield losses while strengthening the regional research capacity for long-term disease resilience.

EXPECTED END PRODUCT(S)

1) Peer-reviewed journal publication detailing the characterization of *Phytophthora* isolates from the

Mid-South. Targeted venue: Plant Disease

2) Scientific presentation (oral or poster) on characterization of these *Phytophthora* isolates. Targeted venue: Southern Soybean Disease Workers Annual Meeting or the American Phytopathological Society Annual Meeting

3) Extension article summarizing key findings from the *Phytophthora* characterization efforts. Target venue: Mizzou Crop & Pest News (distributed to ~1,750 subscribers)

4) Extension presentations that communicate major outcomes to stakeholders. Target venues: Winter meetings and field days in the Mid-South.

5) Curated *Phytophthora* collection that can be made available for future research endeavors. Target venue: Researchers working on *Phytophthora* species.

6) Potential discovery of new resistance genes and release of soybean varieties with resistance to *Phytophthora*. Note: The resulting intellectual property will be shared between the Mid-South Soybean Association and the University of Missouri.

Appendix A. Budget Justification

A and B. Personnel and Fringe Benefits: $47,495

Bish ($17,946): Funds of $8,750 and $3,196 are requested for 1.5 months of a senior research specialist salary and fringe benefits. The specialist will coordinate collection of samples from farmer fields and travel to fields for collections. She will also utilize these field visits to train MU Crop Pathology undergraduate and graduate students on proper collection of samples, assist with Phytophthora isolations as needed, and assist with extension presentations and deliverables as needed. Funds of $6,000 are requested for two undergraduates to assist with collecting samples (200 hours x 2 students x $15/hour).

Lin and Argenta ($23,743): Funds of $13,330; $1,303; and $6,340 are requested for 0.25 FTE stipend, medical insurance, and tuition for a graduate student. Funds of $3,000 are requested for the

salary and benefit of a part-time (200 hours) technician who will assist the co-I and graduate student to conduct the designed work.

Tian ($5,806): Funds of $4,000 and $306 are requested for a part-time diagnostic technician to assist with identification and isolation of samples (200 hours at $20/hour with benefit rates at 7.65%). Funds of $1,500 are requested for an undergraduate assistant to assist in the clinic (100 hours at $15/hour).

C. Travel: $6,000

Bish: Funds of $4,000 are requested for travel to soybean field sites to collect samples; to attend meetings with Co-I's; and to present information on the project at field days and farmer meetings to generate awareness of the problem and identify fields for samples collections.

Lin/Argenta: Funds of $1,000 are requested to support travel for regular meetings with other Co-I's and for field site visits.

Tian: Funds of $1,000 are requested for travel to field plots and to meetings with Co-I.

D. Contractual Services: $4,600

Tian: Funds of $4,600 are requested for the MU Plant Diagnostic Clinic Services for plant and soil samples ($3,600), and gene-sequencing and bioinformatics analyses ($1,000).

H. Other Costs: $7,500

Supplies funding of $6,500 will be used for field collection materials, greenhouse materials, DNA extraction kit, sterile petri dishes, Agar media, antibiotics, ELISA kits, and PCR reagent vermiculites, pots, trays, envelopes, labels, tags, and stakes. An additional $500 is requested for shipping cost of soil samples, seeds, isolates, and plates. Funds of $500 are requested to generate field day materials that will generate awareness of the problem and of this project.

2026 MID SOUTH SOYBEAN BOARD
18 - RI-09

Project Title	**Novel Genetic Resources to Improve Soybean Seed Quality**		
PI's Name	Dr. Burt Bluhm	E-mail	bbluhm@uark.edu
PI's Title	Professor	Institution:	Univ. of Arkansas Division of Agriculture
Mailing Address	1371 W. Altheimer Dr.		
City/State/Zip	Fayetteville, AR 72704		
Phone number	479-422-4544		
Additional PIs	N/A		
Research locations (states involved)	Arkansas (Year 1; field testing of transgenic soybean lines will potentially involve other states in future years)		

Timeline:		**Multi-Year Project Information** (if applicable)		
Current Year - FY26		Year 1	Year 2	Year 3
Start Date	5/1/2026	5/1/2026	5/1/2027	5/1/2028
End Date	4/30/2027	4/30/2027	4/30/2028	4/30/2029
Funds Requested	$33,816	$33,816	$34,000	$35,000

Program Areas: Breeding/Genetics, Seed Quality, Disease Control, Research Validation, Biotechnology

Other related funding:	Kona Swift (the PhD student performing the work) has partial GRA support from a separate Arkansas Soybean Promotion Board project
Objectives:	1. Design and create novel transgenes that specifically target the causal agents of Phomopsis seed decay and purple seed stain 2. Evaluate transgenes to identify the most effective examples & best combinations for gene pyramiding 3. Create and publicly distribute advanced breeding lines of soybean containing novel transgenes targeting pathogens responsible for reducing soybean seed quality
Justification:	Soybean seed quality issues are a persistent problem in the Mid-South, and transgenic resistance to pathogens provides the quickest, most sustainable remedy
Exp Setup:	We will create, evaluate, and deploy transgenes that target the most problematic soybean seed diseases (Phomopsis seed decay and purple seed stain)
Summary:	The early soybean production system has many benefits for soybean producers in the Mid-South. However, adverse weather (heat, excessive rain) during seed set and harvest often leads to reduced seed quality, primarily due to fungal pathogens. Control options are currently limited. This project will build on years of previous work to create novel transgenic control of soybean seed pathogens. Transgenic control is the quickest, most effective option to address seed quality. All information, transgenes, and transgenic soybean lines from this project will be publicly available.
Benefit to Midsouth Farmers:	Seed quality issues can lead to significant buyer's discounts or outright rejection of loads. Grain buyers face reduced profits and increased efforts when marketing soybean with quality issues. Transgenic control of soybean seed diseases will help protect growers' profits and mitigate risks associated with unpredictable/unfavorable late-season weather.
Progress:	This is a new (Year 1 of 3) project

Signature of Principle Investigator:	Date:
Burt Bluhm	7/21/2025

2026 Midsouth Soybean Board

PROPOSAL TITLE: Novel Genetic Resources to Improve Soybean Seed Quality

INVESTIGATORS:

Dr. Burt Bluhm, Professor, University of Arkansas Division of Agriculture
479-422-4544
bbluhm@uark.edu

PROGRAM AREA (check all that apply):

___ New Uses of Soybean
___ Soybean Oil or Soybean Meal Uses
___ Food Grade Soybean
___ Soybean Fuel
_X_ Soybean Breeding and Genetics
___ Weed Management
___ Irrigation/Water Management
_X_ Seed Quality
_X_ Disease Management and Control
___ Fertility Management
___ Insect Management/Control
___ Harvest aids
___ Nematode Management/Control
___ Rotations using soybeans
_X_ Research Validation or Demonstration
___ Producer Communications
___ Variety Trials
___ Economics
_X_ Other (*Identify*)____Biotechnology_____

PROJECT STATUS:

New _X__ Expected research length (yr)___3 years_____

Renewal _____ (Year _____ of _____)

Stand alone _X__ or cross-commodity ___

2026 TOTAL FUNDING REQUEST_____$33,816_____

2026 MSSB RESEARCH PROJECT PROPOSED BUDGET			
CATEGORY *(see below for guidelines)*		**ORIGINAL**	
A.	**Personnel** (No Permanent Salaries)		
	1. Salaries (See Addendum B)		
	2. Wages (hourly workers)		
	3. GRA (include tuition)	$19,000	
B.	**Fringe Benefits** (% *used to calculate*)	$816	
C.	**Travel**	$2,000	
D.	**Contractual Services**		
E.	**Subcontracts**		
F.	**Commodities**	$12,000	
G.	**Publication Costs**		
H.	Other Costs *(Define)*		
TOTAL COST		$33,816	

Budget Justification

Personnel*: Funds are requested for 50% effort of a GRA (Kona Swift) ($16,000) and tuition ($3000). Kona is a graduate student working on related research for her PhD, and this project will comprise part of her dissertation. She is on schedule to finish her degree in approximately 3 years. PI Bluhm will work actively on this project (bioinformatics, DNA cloning, etc.). No funds are requested for Bluhm (he is covered by permanent salary from UADA).*

Fringe Benefits: *GRA fringe rate (UADA) is 5.10% in 2025. Amount listed is calculated as 5.10% of $16,000 salary*

Travel*: $2,000 is requested to attend the 2026 Plant Health conference in Providence, RI*

Commodities*: $12,000 is requested for supplies pertaining to molecular biology and genetics experiments, creating DNA constructs, culturing fungi, and greenhouse activities (screening transgenes for efficacy)*

Technical Summary

Soybean seed quality is a persistent concern in Mid-South production systems. Excessive heat and humidity during seed set can negatively affect seed quality, which can be harmed even further when harvesting is delayed by rainfall or other factors. Planting early-maturing soybean varieties as early as possible in the Mid-South can also affect seed quality. Environmental stresses such as excessive heat, humidity, rainfall, and flooding are more common as plants mature in late summer, which induces susceptibility to diseases such as Phomopsis seed decay and purple seed stain. These diseases are two of the major factors that reduce seed quality in Mid-South soybean production systems.

The overarching goal of this study is to create a package of novel transgenes that convey resistance to fungal pathogens associated with reduced seed quality in the Mid-South. The specific research objectives are to:

1. Design and create novel transgenes that specifically target the causal agents of Phomopsis seed decay (*Phomopsis longicolla*) and purple seed stain/Cercospora leaf blight (*C. flagellaris* and closely related species)
2. Evaluate transgenes to identify the most effective examples & best combinations for gene pyramiding
3. Create and publicly distribute advanced breeding lines of soybean containing novel transgenes targeting pathogens responsible for reducing soybean seed quality

This project will build on extensive preliminary data generated by the Bluhm lab that 1) identified pathogen gene targets for transgenic control via host-induced gene silencing (HIGS), 2) optimized workflows for creating HIGS-based transgenes, and 3) developed rapid systems to evaluate transgene efficacy. We believe the deployment of transgenic disease resistance in advanced breeding lines provides the quickest means of relief for Mid-South growers facing soybean seed quality issues due to adverse environmental conditions.

Outline of Research

Rationale/Justification

In the Mid-South, unfavorable weather during soybean maturity and/or harvest can substantially reduce soybean seed quality. When late-season rainfall and heat are excessive, soybean seed quality declines, in large part due to biotic factors (e.g., diseases such as Phomopsis seed decay, purple seed stain, and other molds). Wet conditions persisting through soybean seed maturity can delay harvest, further exacerbating damage to seed. In recent years, atypical weather patterns associated with large rainfall events and prolonged heat have become more frequent in the Mid-South. The preference of some growers to plant early-maturing soybean varieties (MG III, MG IV) as early as possible has, in some years and locations, led to overlap between soybean maturity and harvest with late-summer heat spells and increased precipitation events. Recent examples of untimely, excessive precipitation include the effects of Hurricane Helene in 2024 and an entrenched, stationary upper-level trough over the South in 2022, both of which caused serious economic losses due to diminished soybean seed quality. Long-term weather prediction models suggest such late-season large-scale precipitation events will become increasingly common in upcoming decades.

Currently, there are no commercially available tools to mitigate late-season fungal diseases that decrease soybean seed quality. Genetic resistance would provide the most sustainable solution but has not been widely deployed in commercial soybean varieties. Resistance to Phomopsis seed decay and purple seed stain has been identified in a limited number of soybean PIs, but introgression of these traits into soybean varieties suitable for the Mid-South will require extensive breeding efforts.

Recently, host-induced gene silencing (HIGS) has emerged as a novel way to augment host resistance to plant pathogenic fungi. In HIGS, hairpin RNA (hpRNA) expressed in transgenic plants targets specific fungal genes. During fungal infection, small interfering RNAs derived from hpRNAs move from plants into the fungus, leading to down-regulation of fungal

target genes. HIGS has been demonstrated to be effective against several species of plant pathogenic fungi, but has not yet been utilized to target fungi that negatively affect soybean seed quality.

PI Bluhm has over 20 years' experience studying pathogens that attack soybean seeds. These efforts have led to the creation of novel resources and information, including the first (and most complete) genome sequences of *P. longicolla* and *C. flagellaris*, identification of numerous fungal genes responsible for pathogenesis, the creation of novel tools to study and genetically manipulate these and other soybean pathogens, and the establishment of high-throughput workflows to create and test transgenes utilizing HIGS for disease control. In this project, we will capitalize on these advancements to create HIGS-based transgenes that target pathogens responsible for reduced soybean seed quality.

Objectives

The overarching goal of this project is to provide novel genetic resources to control fungal pathogens that commonly reduce soybean seed quality in the Mid-South. These transgenes can be developed and deployed quickly in advanced breeding material and potentially directly into existing commercial varieties. Control of these pathogens is anticipated to have widespread benefit to Mid-South soybean growers and the industry as a whole by enhancing grain value and mitigating risks associated with unpredictable weather events.

To reach this goal, the following specific research objectives are proposed:

1. Design and create novel transgenes that specifically target the causal agents of Phomopsis seed decay (*Phomopsis longicolla*) and purple seed stain/Cercospora leaf blight (*Cercospora flagellaris* and closely related species)
2. Evaluate transgenes to identify the most effective examples & best combinations for gene pyramiding

3. Create, evaluate, and publicly distribute advanced soybean breeding lines containing novel transgenes targeting pathogens responsible for reduced soybean seed quality

Experimental Approach

Objective 1. In previous work, we identified numerous genes to target for silencing in *P. longicolla* and *C. flagellaris* via HIGS. These genes are required for the pathogens to infect and/or grow in soybean seeds. In *C. flagellaris*, we have identified the genes responsible for making the purple pigment associated with purple seed stain and will target them for silencing as well. We have optimized workflows to rapidly create DNA constructs that produce hpRNAs targeting fungal genes. We will prioritize 10-12 genes of each pathogen for targeting via HIGS. Highest priority will be given to genes that have been functionally demonstrated in our program to be required for pathogenesis and/or growth on soybean seeds.

Objective 2. Creating transgenic soybean takes considerable time and effort, so we will pre-screen transgenes for their effectiveness in proxy systems. The same isolates of *C. flagellaris* that infect soybean seeds are also able to infect Arabidopsis, a model plant that is very easy and inexpensive to transform. Thus, we will evaluate transgenes targeting *C. flagellaris* first in Arabidopsis to determine which specific transgenes are most effective. For *P. longicolla*, we will utilize a modified virus-induced gene silencing (VIGS) approach for transient expression of transgenes in soybean, followed by greenhouse inoculations with the pathogen. This will allow rapid evaluation of transgenes before committing to transformation of soybean.

Objective 3. We will create a set of transgenic soybean lines that contain various combinations of the most effective transgenes (identified in Obj. 2). Transgenes will be pyramided in individual lines to target both pathogens. We will increase seed and perform field testing with transgenic lines (inoculated, in disease-conducive environments) to evaluate transgene effectiveness in preserving seed quality. We will initially transform Williams-82, a soybean variety that is amenable to genetic transformation. We will also coordinate with public

breeding programs in the Mid-South to transform public, regionally adapted varieties so that transgenes can be deployed to help growers as quickly as possible. All materials and transgenic soybean lines will be made publicly available.

Projected Impact of Results on Mid-South Soybean Production

This project will directly benefit Mid-South soybean producers by providing sustainable control of diseases that negatively impact soybean seed quality. Discount schedules due to damaged kernels vary, but discounts can exceed $1/bushel and loads above ~8-10% damage may be rejected outright. In years when damage is widespread due to adverse weather, discounts can increase substantially and without notice. Grain buyers will also benefit from this project, as lower-grade soybeans can be burdensome to market and move through the supply chain. The transgenes targeting *C. flagellaris* may also convey resistance to Cercospora leaf blight, which would decrease costs associated with fungicides and other disease management inputs. Thus, this project will benefit the entire Mid-South soybean industry.

Expected End Products

The key end products of this project are the transgenes targeting soybean seed pathogens and the transgenic soybean lines, all of which will be publicly available. We will also present relevant findings in peer-reviewed research articles, extension publications, scientific conferences, and at growers' meetings in the Mid-South. This work will comprise part of a PhD student's research, which will be documented in a publicly accessible dissertation. We see this project as complementary to conventional breeding efforts designed to augment soybean seed quality in Mid-South production conditions. In fact, the transgenes to be created in this project could be incorporated directly into stress-resistant commercial soybean varieties to provide an extra layer of protection against seed quality issues associated with adverse weather conditions.

2026 MID SOUTH SOYBEAN BOARD
18 - RI-10

Project Title	Spray application of double stranded RNA for simultaneous management of multiple soybean fungal and insect diseases		
PI's Name	Zhi-Yuan Chen	E-mail	zchen@agcenter.lsu.edu
PI's Title	Professor	Institution:	Louisiana State Univ. AgCenter
Mailing Address	302 Life Sciences Building, Dept of Plant Pathology and Crop Physiology Louisiana State University		
City/State/Zip	Baton Rouge, LA, 70803		
Phone number	225-578-7850		
Additional PIs For this project			
Research locations (states involved)	Ben Hur Research Station, LSU AgCenter, Baton Rouge, LA		

Timeline: **Current Year - FY26**		**Multi-Year Project Information** (if applicable)		
		Year 1	Year 2	Year 3
Start Date		**04/01/2026**		
End Date		**03/31/2027**		
Funds Requested	$	$47,824	$	$

Program Area: weed, disease and pest sciences (management of soybean diseases through dsRNA)

Other related funding:	N/A
Objectives:	The overall goal is to enhance the uptake and stability of foliar applied dsRNA under field conditions for practical management of soybean fungal diseases. Specific objectives include: 1. Examine the effect of different nanomaterials (NM) in protecting the dsRNA; 2) Examine different dsRNA+NM on reducing FLS disease under field conditions; and 3) Evaluate the formulations with the best adjuvant and nanomaterial in effective management of FLS, CLB, and PSS under field conditions.
Justification:	Soybean fungal diseases cause significant yield losses annually and there are very limited number of management choices. Foliar applied dsRNA can reduce fungal infection and disease symptoms. However, it is still not as cost effective to replace fungicides for our farmers to manage these soybean diseases and reduce yield losses.
Exp Setup:	We will examine different nanoparticles and adjuvants in reducing the amount of dsRNAs needed to achieve a successful suppression of ASR in greenhouse and FLS/CLB/PSS under field conditions both individually and in combination.
Summary:	This proposed study will further enhance the efficacy of foliar applied dsRNA in suppressing FLS/CLB/PSS in the field by enhancing its uptake and stability under the field conditions through the incorporation of different adjuvants and nanomaterials.
Benefit to Midsouth Farmers:	This RNAi base soybean disease management can reduce our reliance on toxic chemicals-based fungicides/pesticides, reduce the pollution to our natural environ-ment, and increase yield and sustainability of soybean production in the long run.
Progress Made:	Two adjuvants were found very effective in enhancing dsRNA uptake in last year's small scale field trial. We are repeating this field trial this year. We are also testing two different nanomaterials for dsRNA protection in the field conditions.

Signature of Principle Investigator:	Date: 07/14/2025
Zhiyuan Chen	

This document should remain as a SINGLE PAGE for the BOARD MEMBER'S QUICK REFERENCE. Email form (no pdf) to midsouthsoybean@gmail.com and swsoy@aristotle.net.

2026 Midsouth Soybean Board

PROPOSAL TEMPLATE *(Limit the final document to 8 pages)*

PROPOSAL TITLE: Spray application of double stranded RNA for simultaneous management of multiple soybean fungal and insect diseases

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INVESTIGATORS: *Zhi-Yuan Chen, Professor, Department of Plant Pathology and Crop Physiology, Louisiana University Agricultural Center, Baton Rouge, Tel 225-578-7850; email: zchen@agcenter.lsu.edu*

PROGRAM AREA (check all that apply):

___ New Uses of Soybean
___ Soybean Oil or Soybean Meal Uses
___ Food Grade Soybean
___ Soybean Fuel
___ Soybean Breeding and Genetics
___ Weed Management
___ Irrigation/Water Management
___ Seed Quality
_X__ Disease Management and Control
___ Fertility Management
_X__ Insect Management/Control
___ Harvest aids
_X__ Nematode Management/Control
___ Rotations using soybeans
___ Research Validation or Demonstration
___ Producer Communications
___ Variety Trials
___ Economics
___ Other (*Identify*)_____

PROJECT STATUS:

New ____ *(Indicate planned length of project–1 of 2, 1 of 3, etc. Note that projects are only approved on a yearly basis.)* Expected research length (yr)_____

Renewal __X__ (Year ____ of ____) Remember if you are presenting a renewal, your writing should speak mostly about what you are doing in the following year. You should not be re-requesting money for year one goals. Make sure it is clearly demonstrating progress; have a clear intention of your expected outcomes in the current year, not just over the program life.

Stand alone _X__ or cross-commodity ___ (*additional funding from other sources? Name all other sources and amounts co-funded.* _____

2026 TOTAL FUNDING REQUEST
$ ___$47,824_____

2026 MSSB RESEARCH PROJECT PROPOSED BUDGET			
CATEGORY *(see below for guidelines)*		**ORIGINAL**	
A.	**Personnel** (No Permanent Salaries)		
	1. Salaries (See Addendum B)	$20,800 ($20hr for 20 hr/wk)	
	2. Wages (hourly workers)		
	3. GRA (include tuition)		
B.	**Fringe Benefits** (53% *used to calculate*)	$11,024	
C.	**Travel**	$3,500	
D.	**Contractual Services**		
E.	**Subcontracts**		
F.	**Commodities**	$11,000	
G.	**Publication Costs**	$1,500	
H.	Other Costs *(Define)*		
TOTAL COST		$47,824	
(MSSB does not allow indirect costs/overhead charges)			

***Personnel**: Show number of hours x hourly rate for each category. GRA cost to include tuition and books. MSSB does not pay salaries of principal investigators or cooperating scientists (USB Compliance Manual, Sect. 17, Part 2-D).*
***Fringe Benefits:** Amount and rate for indicated salaries, wages, and GRAs must be shown.*
***Travel**: Out-of-pocket and per diem expenses (hotel and meals) for site visits, travel to and from meetings (e.g. airfare, vehicle mileage not to exceed the IRS rate), etc.*
***Contractual Services**: External lab fees, consultants, etc.*
***Commodities**: Expenses related to the conduct of the project (e.g., seed, fertilizers, pesticides, lab supplies).*
***Additional Details**: Provide for each budget category in addendum if necessary.*
***Reminder**: All payments for project activities are on a reimbursable basis based on an itemized invoice submitted to MSSB each quarter along with a progress report.*
***Budget Transfers**: The MSSB follows USB guidelines, which state "The PI may transfer funds amongst budget categories only with MSSB's prior written consent if (i) the amount transferred exceeds 10% of any one general budget category (per annual period) or (ii) the funds transferred are travel related. PI shall request permission from MSSB for all budget reallocations and account for them in his/her financial report."*
***Additional Instructions:** See Addendum B.*

TECHNICAL SUMMARY

Soybean production in the southern U.S. faces some unique and potentially devastating diseases caused by several species of Cercospora fungi, such as cercospora leaf blight (CLB), purple seed stain (PSS), and frogeye leaf spot (FLS). Losses caused by these diseases can reach as high as 30% on susceptible varieties and our soybean farmers are faced with limited choices of varieties and the lack of effective fungicides. With funding support from MSSB in the past several years, our laboratory has identified several dsRNAs that not only can effectively reduce FLS in growth chamber and greenhouse studies, but also effectively reduced FLS severity in the small-scale field trial conducted last year. We also identified two adjuvants that can enhance the effect of dsRNA in suppressing the *C. sojina* growth and FLS disease development in the field study, which is being repeated this year. In addition, several nanomaterials have been reported to protect the dsRNA and extend its effectiveness. Building upon these progresses, the PI attempts to move this dsRNA-based approach one step closer for practical soybean disease management through incorporating nanomaterials into our current adjuvant-based formulations to further protect foliar applied dsRNAs under harsh field conditions. The specific objectives of this proposal are to: 1. Examine the effect of different nanomaterials (NM) in protecting the dsRNA; 2) Examine different dsRNA+NM on reducing FLS disease under field conditions; and 3) Evaluate the formulations with the best adjuvant and NM in reducing dsRNA concentration required for effective management of FLS, CLB, and PSS under field conditions. The long-term goal is to eventually achieve a simultaneous management of various soybean diseases through this dsRNA-based approach, which will increase the sustainability of soybean production in the southern U.S., and greatly reduce environmental pollution associated with fungicide and pesticide applications.

OUTLINE OF RESEARCH

RATIONALE/JUSTIFICATION FOR RESEARCH:

Soybean production in the southern US is under the constant threats of various fungal pathogens, such as *Cercospora* cf. *flagellaris,* a close relative of *C. kikuchii* and the causal agent of Cercospora leaf blight (CLB) and purple seed stains (PSS), *C. sojina*, causal agent of frogeye leaf spot (FLS). CLB and FLS were the top ranked soybean diseases southern US (Bradley et al., 2021). In addition, Asian soybean rust (ASR) caused by *Phakopsora pachyrhizi* can also cause serious yield losses if we have continuous mild winters. However, our farmers lack effective options to manage these diseases.

Recent published studies conducted under laboratory or greenhouse conditions from other research groups and ours have demonstrated that foliar application of dsRNAs targeting key fungal genes significantly reduced Fusarium disease symptoms on the barley leaves (Koch et al., 2016), white stem rot symptoms in canola by *Sclerotinia sclerotiorum* (McLoughlin et al., 2018), ASR and CLB on soybean by suppressing the expression of an ACE gene from *P. pachyrhizi* and that of the Avr4 effector gene from *C.* cf. *flagellaris*, respectively (Hu et al., 2020; Rezende et al., 2020). We also found that the dsRNAs that were effective against CLB can also offer cross protection against frogeye leaf spot (FLS) caused by *C. sojina* due to its genome sequence similarity to *C.* cf. *flagellaris*. This approach utilizes the genetic information carried in the dsRNA sequences instead of toxic chemicals of conventional fungicides to achieve disease management, which can significantly reduce the environmental pollution and toxic side effects to human and other non-targeted organisms. However, the major obstacle in using dsRNA for plant disease management is the lack of stability due to strong UV radiation and the ubiquitous presence of RNases and the poor uptake of dsRNA by plants (Bachman *et al.*, 2020). This proposal is trying to address both challenges. Recently, FeMg layered double hydroxides (LDH) was found to protect the dsRNA from UV damage and extend its effectiveness from 5 days to about 20 days (Mitter *et al.*, 2017). We also found mixing dsRNA with certain adjuvants or coating these dsRNAs onto FeMg based nanoparticles can further enhance the effectiveness of these dsRNAs in reducing disease symptoms or extend the protection against fungal

infection under growth chamber studies or small-scale field trials. The goal of this project is to develop an effective, affordable and practical dsRNA-based formulation with nanomaterials and adjuvants for sustainable management of major soybean fungal diseases.

OBJECTIVE(S):

The specific objectives for this proposal are to: 1) Examine the effect of different nanomaterials in protecting the dsRNA from UV radiation and RNase degradation; 2) Examine different dsRNA+NM combinations on reducing soybean frogeye leaf spot (FLS) disease under field conditions; and 3) Evaluate the formulations with the best adjuvant and nanomaterial in reducing dsRNA concentration required for effective management of FLS, CLB, and PSS under field conditions.

APPROACH AND EXPERIMENT CONDUCT:

Experiment (i): Examine the effect of different nanomaterials (NMs) in protecting the dsRNA from RNase degradation and UV radiation. *A. Synthesizing different nanomaterials and loading them with dsRNA.* The synthesis of MgFe layered double hydroxide (LDH) follows the protocol outlined by Ren et al. (2019). The final concentration of the resulting Mg-Fe-LDH suspension will be adjusted to 4 mg/mL. The protocol described by Delgado-Marin et al. (2022) will be used to synthesize the quantum carbon dots. The poly-lysine analog nanomaterial will be provided by my collaborator Dr. Zhang's lab at LSU Chemistry Department. These NMs will be coated with either Avr4 or ACE dsRNA at 150 µg (total RNA)/mg NM. *B. Examine the potential of different NMs on protecting the dsRNA from RNase degradation.* These dsRNA coated NMs will be used for *in vitro* treatment with RNase. Basically, 150 µg dsRNA or dsRNA +NM will be added to a 0.5 mL Eppendorf tube that contains 10 unit of RNase in a total volume of 50 µL and inoculated at 37 ˚C. Five µL of the reaction mixture will be taken out after incubating for 1, 2 and 4 hrs to check the integrity of the dsRNA through gel electrophoresis and compare to the non-coated dsRNA treated with RNase to determine whether the NM protects the dsRNA from RNase degradation and which NM is the best if yes. *C. Evaluate*

different NMs on protecting the dsRNA from UV damage. The Avr4 or ACE dsRNA coated NMs will be sprayed onto soybean leaves (at V5 for Avr4 and R1 for ACE) at 150 µg dsRNA/plant. These soybean plants are then exposed to UV-B light at 60-100 µmole /m^2.sec for 1, 3, 5, or 7 days in the greenhouse before the plants are spray-inoculated with *C. sojina* (for plants treated with Avr4 dsRNA coated NMs) or *P. pachyrhizi* (for plants treated with ACE dsRNA coated NMs). The soybean plants sprayed with non-coated dsRNAs and exposed to the same UV treatment as the NM coated plants before being inoculated with the pathogens will be used as controls. All of the inoculated plants are then maintained under regular lights in the greenhouse for two more weeks before the disease symptoms and fungal growth are quantified by ImageJ and qPCR, respectively, to see whether the NM coating protects the dsRNA from UV damage and thus extends its effectiveness.

Experiment (ii): Examine different dsRNA+NM on reducing soybean frogeye leaf spot (FLS) disease under field conditions. Avr4 dsRNA was effective in reducing soybean FLS symptoms in our field trial last year. An outdoor study with eight treatments (Avr4 dsRNA alone, Avr4 dsRNA+LDH, Avr4 dsRNA+quantum dots, Avr4 dsRNA+poly Lys, LDH alone, quantum dots alone, poly Lys alone, and dsRNA targeting a green fluorescent protein (GFP) from jelly fish as another control) will be conducted with 4 pots or 8 plants per treatment to determine whether NM can either enhance dsRNA delivery or extend its protection against FLS. Each soybean plant at V4-5 stage will be sprayed with either 1 ml of Avr4 dsRNA (300 µg/ml) mixed with 2 ml of water (Avr4 dsRNA alone), 1 ml dsRNA combined with 2 ml nanoparticles (dsRNA+NM), 2 ml NM + 1 ml of water (NM alone), or GFP dsRNA in 3 ml of water (control). These treated soybean plants will be exposed to outdoor sunlight for 5 days before being moved back to greenhouse and spray-inoculate with *C. sojina* (1 x 10^5 spores/mL in sterile water containing 0.05% Tween 20). FLS symptom severity will be visually assessed two weeks after the inoculation. Fungal growth will be quantified through real time PCR and compared to the controls to determine whether coating Avr4 dsRNA with NM can extend its protection of soybean plants against *C. sojina* infection. If yes, which NM is the best. This same study will be repeated two

more times with the plants being exposed to direct sunlight for 10 (second set) and 15 (third set) days before moving them back to greenhouse to inoculate and evaluate as described above. This study will tell us which NM is the best and how long this NM can protect the dsRNA from UV damage.

Experiment (iii). Evaluate formulations with the best adjuvant and nanomaterial for effective management of FLS, CLB, and PSS under field conditions. For this study, two dsRNAs, and the best adjuvant and nanomaterial identified in our previous study and the studies in the above Exp I and II will be used. The experimental design is shown in Table 1 below. For each treatment, four randomized plots of 3 rows x 20 ft soybean plants each will be treated at R2 or when the FLS or CLB symptoms start to appear on soybean leaves. Each plot will be treated three times at 10 days apart in between the same treatments. Soybean leaf samples will be collected at day 0, 10, 20, and 30 for assessing disease severity using ImageJ and fungal biomass quantification using qPCR. This study will be repeated one more time in a later planted soybean field to ensure the reproducibility of our field studies. The goal of this proposal is to develop a new dsRNA formulation to further reduce the amount of dsRNA (thus the cost) required for successful management of FLS, CLB and PSS under field conditions.

Table 1. Experimental design for examining the best formulation for soybean disease management with foliar applied dsRNAs.

Treatments*	1	2	3	4	5	6	7	8	9	10	11	12[$]
dsRNA 1	x	x	x	x		x	x			GFP	H_2O	H_2O
dsRNA 2	x	x	x		x			x	x			
Adj. A	x	x		x	x	x		x		x	x	
Nm_A	x		x	x	x		x		x	x	x	

*: Adj. A is the best adjuvant previously identified in our repeated field studies that can boost dsRNA uptake; Nm_A is the best nanomaterial we will identify in Experiment II. [$]: soybean plants treated with water only will also be included as another control.

PROJECTED IMPACT OF RESULTS ON MID-SOUTH SOYBEAN PRODUCTION

In completing these proposed studies, we expect to develop a safer, more practical, sustainable, and cheaper dsRNA-based formulation to manage major soybean fungal diseases in the mid-South. This approach can also be used to manage soybean nematode and insect diseases with different dsRNAs. In addition, it allows our farmers to manage multiple diseases in one application. This RNAi based soybean disease management reduces our reliance on toxic fungicides/pesticides, reduces pollution to our natural environment, and increases yield and sustainability of soybean production in the long run. This novel RNAi based approach can also effectively reduce the pathogen/pest populations that are resistant toward the existing fungicides/pesticides, which can further enhance the effectiveness of the existing pesticides and reduce the soybean production cost. Therefore, this will increase the sustainability of soybean production in the mid-south areas, and hence our farmers' profitability. The long-term monetary impact to our region can be very significant.

EXPECTED END PRODUCT(S)

The expected end products of this proposed study will include: 1) identification of nanoparticle materials that can protect the dsRNA from UV degradation and extend the effectiveness of dsRNA; 2) development of a formulation that can make this dsRNA based soybean disease management approach more economically feasible; 3) presentations at national scientific or commodity meetings or publications at scientific journals to share our findings on the potential of this novel approach for soybean disease management ; 4) filing intellectual property disclosures on the new formulations in soybean disease management; 5) leveraging additional funding support from national (USB) or federal funding agencies (such as USDA-NIFA) with the data collected through this support, and 7) developing a path to commercialization of the new formulation through establishing possible industrial partnerships. The PI is in communication with Greenlight Bioscience on the potential to synthesize dsRNA in large quantities using their cell-free system to further reduce the cost in dsRNA production.

APPENDICES *(Add as needed)*

A. Explanation/justification of budget categories - where needed for clarification or detail.
An $20,800/year salary fund is requested. A research associate or visiting scientist with MS or Ph D degree will be recruited and assigned to work on this project half-time (20h/week at $20/hour) to produce high quality dsRNA in large quantities.

A $3500 for travel is budgeted to allow the PI and/or the RA to attend one regional and one national meeting to present our research updates to stakeholders and the scientific community.

A $11, 500 for supply fund is requested to purchase airbrushes, air compressors, medium for dsRNA productions, and chemicals for dsRNA purification and formulation.

A $1,500 is requested for publishing a manuscript in scientific journal to share our findings in using dsRNA for soybean disease management.

B. Special considerations–*items not covered in prior sections.*

2026 MID SOUTH SOYBEAN BOARD
18 - RI-11

Project Title	Evaluating early soybean for productivity and herbicide efficacy		
PI's Name	Josh Lofton	E-mail	Josh.lofton@okstate.edu
PI's Title	Associate Professor	Institution:	Oklahoma State University
Mailing Address	320 Agricultural Hall		
City/State/Zip	Stillwater, Oklahoma 74078		
Phone number	(405) 744-6130		
Research locations (states involved)	Oklahoma (on-farm)		

Timeline: Current Year - FY26		**Multi-Year Project Information** (if applicable)		
		Year 1	Year 2	Year 3
Start Date	4/26/2026			
End Date	4/25/2027			
Funds Requested	$15,077	$	$	$

Program Area:

Other related funding:	None currently
Objectives:	Evaluate the productivity and variety performance on early planted soybean production. Determine the efficacy and phytotoxicity on pre-emergent herbicides in early planted soybean production
Justification:	On the western side of the Mid-South region, specifically Oklahoma, planting dates and conditions can influence soybean yield potential. Timely planting usually yields the best results and reduces the risk of crop failure in July and August. Planting earlier can improve yield prospects. However, planting during this earlier period presents unique challenges. It's also recommended that earlier planting is combined with a shorter maturity group to ensure the crop matures before the most difficult summer months. Most earlier maturity cultivars are not well suited for the region. Additionally, slower growth and environmental stress can affect the effectiveness and phytotoxicity of pre-emergence herbicides.
Exp Setup:	Treatments evaluated will be planting date, maturity group, and herbicide treatment. Three seeding rates will be tested, including ultra-early, early, and timely. Four herbicide patterns will be evaluated: three will involve traditional herbicide mixes and products used in soybean systems, with a fourth testing a "delayed residual" approach, where residuals are not applied before planting but during the season. Data collected will include in-season stands, phytotoxicity, and weed control evaluation. Species will be categorized based on the common species present at the location. Yield will be measured at the end of the season.
Summary:	In western Oklahoma, soybean yield potential is influenced by planting dates, with earlier planting generally improving yield but also presenting unique challenges. To mitigate summer stress, earlier planting is best paired with shorter maturity groups, although most early cultivars are not ideal for the region. Environmental stress can also affect the performance and safety of pre-emergence herbicides. The study will evaluate planting date, maturity group, and herbicide treatment across three seeding rates and four herbicide strategies, including a delayed residual approach. Data collected will include stand counts, phytotoxicity, weed control, species identification, and final yield.
Benefit to Midsouth Farmers:	Knowledge gained from the system and determining challenges that will need to be addressed in a larger evaluation will be foundational information gained.
Progress Made:	New project

Signature of Principle Investigator:	Date:
Josh Lofton (Aug 13, 2025 10:58:02 CDT)	08/13/2025

This document should remain as a SINGLE PAGE for the BOARD MEMBER'S QUICK REFERENCE. Email form (no pdf) to midsouthsoybean@gmail.com and swsoy@aristotle.net.

2026 Midsouth Soybean Board

PROPOSAL TEMPLATE *(Limit the final document to 8 pages)*

PROPOSAL TITLE: Evaluating early soybean for productivity and herbicide efficacy.

INVESTIGATORS: *(List names, titles, institutions, phone and email contacts of Principal Investigator (PI) and cooperators. If the first listed participant is not the PI for this project (e.g., a graduate student), then please indicate the actual investigator serving as the PI.)*
Josh Lofton

PROGRAM AREA (check all that apply):

___ New Uses of Soybean
___ Soybean Oil or Soybean Meal Uses
___ Food Grade Soybean
___ Soybean Fuel
___ Soybean Breeding and Genetics
_X__ Weed Management
___ Irrigation/Water Management
___ Seed Quality
___ Disease Management and Control
___ Fertility Management
___ Insect Management/Control
___ Harvest aids
___ Nematode Management/Control
___ Rotations using soybeans
_X__ Research Validation or Demonstration
___ Producer Communications
___ Variety Trials
___ Economics
__X_ Other (*Identify*) Agronomy and Crop Production

PROJECT STATUS:

New __X__ *(Indicate planned length of project–1 of 2, 1 of 3, etc. Note that projects are only approved on a yearly basis.)* Expected research length (yr)_1 year

Renewal ____ (Year ____ of ____) Remember if you are presenting a renewal, your writing should speak mostly about what you are doing in the following year. You should not be re-requesting money for year one goals. Make sure it is clearly demonstrating progress; have a clear intention of your expected outcomes in the current year, not just over the program life.

Stand alone _X__ or cross-commodity ___ (*additional funding from other sources? Name all other sources and amounts co-funded.* _____

2026 TOTAL FUNDING REQUEST $ _15,077_____

2026 MSSB RESEARCH PROJECT PROPOSED BUDGET			
CATEGORY *(see below for guidelines)*		**ORIGINAL**	
A.	**Personnel** (No Permanent Salaries)		
	1. Salaries (See Addendum B)	-	
	2. Wages (hourly workers)	-	
	3. GRA (include tuition)	$10,712	
B.	**Fringe Benefits** (9.41%)	$850	
C.	**Travel**	$2,500	
D.	**Contractual Services**	-	
E.	**Subcontracts**	-	
F.	**Commodities**	$1,015	
G.	**Publication Costs**	-	
H.	Other Costs *(Define)*	-	
TOTAL COST		$15,077	
(MSSB does not allow indirect costs/overhead charges)			

***Personnel**: Show number of hours x hourly rate for each category. GRA cost to include tuition and books. MSSB does not pay salaries of principal investigators or cooperating scientists (USB Compliance Manual, Sect. 17, Part 2-D).*
***Fringe Benefits:** Amount and rate for indicated salaries, wages, and GRAs must be shown.*
***Travel**: Out-of-pocket and per diem expenses (hotel and meals) for site visits, travel to and from meetings (e.g. airfare, vehicle mileage not to exceed the IRS rate), etc.*
***Contractual Services**: External lab fees, consultants, etc.*
***Commodities**: Expenses related to the conduct of the project (e.g., seed, fertilizers, pesticides, lab supplies).*
***Additional Details**: Provide for each budget category in addendum if necessary.*
***Reminder**: All payments for project activities are on a reimbursable basis based on an itemized invoice submitted to MSSB each quarter along with a progress report.*
***Budget Transfers**: The MSSB follows USB guidelines, which state "The PI may transfer funds amongst budget categories only with MSSB's prior written consent if (i) the amount transferred exceeds 10% of any one general budget category (per annual period) or (ii) the funds transferred are travel related. PI shall request permission from MSSB for all budget reallocations and account for them in his/her financial report."*
***Additional Instructions:** See Addendum B.*

TECHNICAL SUMMARY

This study aims to assess the impact of early and ultra-early planting dates on soybean productivity, cultivar performance, and pre-emergent herbicide efficacy in Oklahoma, where planting timing significantly influences yield due to mid-summer environmental stress. Previous research supports early planting for increased yield and reduced environmental impact, but challenges such as poor emergence, early-season disease, and herbicide phytotoxicity exist under cooler, wetter conditions. A split-plot design will be implemented in a grower-managed field near Miami, OK, with three planting dates (ultra-early, early, timely) as main plots and a factorial combination of four herbicide programs and two maturity groups (later Group IV and Group V) as sub-plots. Herbicide treatments include three standard systems and a “delayed residual” approach, where residuals are applied in-season rather than at planting. Data collection will include stand counts, weed control ratings, species identification, phytotoxicity assessment, yield, and seed composition analysis (protein and oil content via NIR).

OUTLINE OF RESEARCH

Justification:

On the western side of the Mid-South region, specifically Oklahoma, planting dates and conditions can influence soybean yield potential. Many planting considerations are prompted by the knowledge that the most environmentally challenging conditions for summer crop production are the last three weeks of July and the first two weeks of August. This has resulted in most recommendations for soybean planting being from mid-April through the mid-May. This will result in the most consistent yields and reduce the risk of crop failure due to the unfavorable conditions experienced later in the summer. Additionally, work by Chiesa et al. (2024) noted that earlier planted soybean with longer growth periods can result in decreased greenhouse gas emissions and potentially a lower environmental footprint.

Earlier planting or even “ultra-early” planting is not without challenges. Cooler and wetter conditions will often result in increased risk delayed or incomplete germination (resulting in lower stands), slower early growth, and increased risk of early-season disease (Kannberg et al., 2024; Conley et al., 2022). While these exist, a recent study throughout eastern soybean growing region funded by United Soybean Board (Conley et al., 2022) highlighted that most of these challenges can be overcome with careful planning and knowledge of what challenges are present. They also highlighted that taking advantage of early planting can result in early yield due to an extended soybean vegetative window. Higher potential growth will typically result in higher yields, as long as resources are available, which is often not a problem if maturing before those critical weeks later into the summer months. A lot of work that has shown early or ultra-early planting negatively impacted soybean yields were in northern US, where early spring conditions were not adequate. In Oklahoma, this challenge does not often exist.

One management consideration that exists is to utilize lower maturity groups for earlier planting compared to timely planting. In previous work in Oklahoma, maturity group focus has been on early group IV and group III. While these may be able to take advantage of conditions earlier in the season, they are often not well adapted for conditions later in the season and higher heat can result in diminished yield potential, negating the potential benefit of the earlier planting dates. Therefore, our study would like to evaluate more traditional later group IV and group V soybean viability for early planting systems.

The other management challenge to highlight is weed management. This is often the most challenging and costly input for soybean production across the United States. However, less information is currently available on how earlier planting conditions impact herbicide management. Critical soybean pre-plant and pre-emergence herbicide management systems include terminating weeds that have already emerged and inhibiting germination and emergence of other weeds before herbicide is degraded or moved from the germination zone in the soybean. Conditions during earlier

growth may not be adequate for this interaction. However, growers may not need as many residual herbicide systems at the stage compared to saving more costly residual herbicides later in the season. Additionally, some phytotoxicity already exists under certain environmental conditions. Slower growth, cooler conditions, and higher chance of heavy rainfall are conditions that can increase these phytotoxicity symptoms, which are all conditions that exist in earlier planting systems. Due to the critical nature of weed management in soybean systems, these earlier planting conditions should be evaluated with potential changes in standard weed management systems. Knowledge of how standard practices may need to shift under these systems will be important.

Objective:

Evaluate the productivity and variety performance on early planted soybean production. Determine the efficacy and phytotoxicity on pre-emergent herbicides in early planted soybean production.mM

Materials and Methods:

Trials will be set up in collaboration with growers Brent Rendel near Miami, Oklahoma. This will be important to enable the ability to utilize growers field and equipment. With a component being weed management, having larger plots with more diverse weed populations will be important. Treatments will be arranged in a split-plot design. As we will be utilize grower equipment, we will have large than normal plots. Plots will be 20-foot wide and 50-foot in length, with four replications.

The main plot will be seeding date, with the sub-plot being a 2-way factorial of herbicide and maturity group. This sub-plot will be arranged in a RCBD. Three seeding dates will be tested, including ultra-early, early, and timely. In Oklahoma, ultra-early will be during the first three weeks of March. Early planting will be the last week of March through the first two weeks of April, with timely being during the last two weeks in April and the first 10 days of May. The range of these dates are due to certain conditions not being adequate for in-field activities may inhibit planting practices. The individual

planting dates will try to be three weeks apart as a means to ensure differences in planting conditions and growth. Four different herbicide patterns will be evaluated: three will involve traditional herbicide mixes and products used in soybean systems. A fourth testing will include a “delayed residual” approach, where residuals are not applied before planting but during the season. We will work with growers to establish what products will be suited based on weed populations.

Data will be collected throughout the season evaluating both the soybean plant and weed population. On days following planting, soybean stands will be collected. Raw plant counts will be used to determine the percentage of planted seed emerged. Weed ratings will be done for 7 days, 2 weeks, and one month following application. Even in the delayed residual application, early weed counts (i.e. before application) will be determined as well as following the in-season application. Species will be categorized based on the common species present at location. The two to three most dominate weeds will be separated as well as percent broadleaf and grassy weeds. At the end of the year, yield will be collected. As the small-plot combines only harvest two rows, we will collect two different passes and average weight between the plots. Sub-samples will be collected and analyzed using NIR for both protein and oil.

PROJECTED IMPACT OF RESULTS ON MID-SOUTH SOYBEAN PRODUCTION

The benefits will likely fall into one of two categories. If this system proves successful, it would give growers more flexibility to adapt to environmental conditions and spread their risk across various soybean production systems. Additionally, information from this study will help inform future management decisions, especially regarding herbicide use on early-planted systems. If the system fails, it could still provide growers and researchers with insights into whether some modifications could make it viable or if a shift in the industry, such as changes in varietals, is necessary for this approach to succeed on the western side of the Mid-South.

EXPECTED END PRODUCT(S)

As this is a one-year request, value information will be developed this one year in the hopes to start to make recommendations for producers. Additionally, we are hoping this will be a foundational point for a larger, multi-state project request in the coming years.

APPENDICES

A. Explanation/justification of budget categories

Personnel: Approximately 291.2 hours x $31.01/hour plus tuition remission (18.63% of GRA salary). Assistantship appointments are usually half-time (50%). The tuition remission rate is charged in proportion to the amount of effort the graduate student will work on the project. OSU's rate for FY26 is 18.63%.

Fringe Benefits: Fringe benefits are for health care and other benefits for the employees, faculty, and students. Fringe benefit rates are negotiated annually with the Office of Naval Research and will be adjusted accordingly. The following is the current approved rates for OSU – Agricultural Sciences for FY26: 9.41% (graduate students).

Travel: Travel to trial locations. This travel will include trips to establish trial (3 trips), trips to establish herbicide treatments (3 trips), trips to evaluate/collect data, and harvest. Trial location will be on Brent Rendels farm in Miami, Oklahoma. Vehicle mileage and per diems will not exceed the allowable rates.

Commodities: Supplies for establishment, maintenance, data collection, and harvest. This will include but not limited to seed, flags, stakes, chemical, fertilizer, application costs, harvest costs, bags, labels, and storage.

18 - RI-12

2023 Midsouth Soybean Board ***PROPOSAL TEMPLATE (Please limit the final document to 8 pages)***

PROPOSAL TITLE: Unlocking novel genetic pathways involved in syncytia development for durable soybean cyst nematode resistance

INVESTIGATORS:

Gunvant B. Patil (PI), Assistant Professor, Texas Tech University; Phone: 806-834-1064; E-mail: gunvant.patil@ttu.edu

Fiona L. Goggin (Co-PI), Professor and Provost's Fellow for Faculty Mentoring, University of Arkansas; Phone: 479-575-6751; E-mail: fgoggin@uark.edu

PROGRAM AREA (check all that apply):

___ New Uses of Soybean
___ Food Grade Soybean
___ Soybean Fuel
__ Soybean Breeding and Genetics
___ Weed Management
__ Irrigation/Water Management
___ Seed Quality
__X_ Disease Management and Control
___ Fertility Management
___ Insect Management/Control
___ Harvest aids
__X_ Nematode Management/Control
___ Rotations using soybean
__ Research Validation or Demonstration
___ Producer Communications
___ Variety Trials
___ Economics
___ Other (*Identify*)

PROJECT STATUS:

New _√___ *3 Years*

Renewal ____ (Year ____ of ____)

Stand alone _√__ or cross-commodity ___ (*additional funding from other sources? Name all other sources and amounts co-funded.*)

2023 TOTAL FUNDING REQUEST $54,176 (first year)

2026 MSSB RESEARCH PROJECT PROPOSED BUDGET

CATEGORY *(see below for guidelines)*		**ORIGINAL**	
A.	**Personnel** (No Permanent Salaries)		
	1. Salaries (See Addendum B)	17,354	
	2. Wages (hourly workers)		
	3. GRA (include tuition)		
B.	**Fringe Benefits** (% *used to calculate*)	6,680	
C.	**Travel**	1,000	
D.	**Contractual Services**		
E.	**Subcontracts** *University of Arkansas*	23,642	
F.	**Commodities**		
G.	**Publication Costs**		
H.	Other Costs *(Consumables, supplies- $8,500)* *(greenhouse rental - $3,000)*	4,000 1,500	
TOTAL COST		54,176	

(MSSB does not allow indirect costs/overhead charges)

Personnel*: Postdoc researchers will be recruited for 3.5 months ($4,958/mo).*
Fringe Benefits: *Postdoc fringe benefits ($1,909/mo).*

Travel*: $1,000 requested to cover partial amount for conference registration (Plant and Animal Genome), airfare and hotel accommodation.*

Subcontracts: *University of Arkansas requested $23,642 to cover the cost related to postdoc associate salary ($11,386), fringe benefits ($3,143), Travel ($1,000), Supplies ($2,000) and greenhouse and growth chamber rentals ($6,000)*

Contractual Services*: N/A*
Commodities*: N/A*

Additional Details*: $4,500 requested to cover the consumables, tissue culture experiments, DNA isolation kits, and plasticware. Additionally $1,500 requested to cover bench space and consumables for greenhouse work.*

TECHNICAL SUMMARY:

Justification and Rationale: Soybean cyst nematode (SCN, *Heterodera glycines*) is the most economically devastating pathogen of soybean, and responsible for significant yield losses across the United States and worldwide. The widespread deployment of commercial cultivars with resistance derived primarily from the PI 88788 and Peking sources has led to the selection of virulent SCN populations. This escalating challenge highlights the urgent need to discover alternative sources of durable SCN resistance. Leveraging recent advances in gene expression analysis and gene editing, we are assembling a pipeline to discover new sources of genetic resistance (Figure 1) and propose to apply it to characterize two novel candidate genes, *RBRa* and *RBRc*. Using single-cell RNA sequencing (snRNAseq), we have established that *RBRa* and *RBRc* expression is induced by SCN on PI 437654, a soybean accession with broader, more durable SCN resistance than PI 88788 and Peking. Based on their relatedness to known Retinoblastoma-Related (RBR) proteins that suppress cell cycle progression and endoreduplication, we hypothesize that *RBRa* and *RBRc* block the development of the multinucleate feeding sites (syncytia) that SCN need to survive.

Objectives and Approach: To test whether *RBRa* and/or *RBRc* influence SCN infection, 1) the Patil lab will engineer roots with suppressed or enhanced expression of these candidate genes using overexpression and a CRISPR-mediated gene-knockout technique; and 2) the Goggin lab will test the effects of these modifications on SCN infection in laboratory and greenhouse assays.

Expected Results: If *RBRa* and/or *RBRc* contribute to nematode resistance, we anticipate that enhancing their expression in susceptible cultivars would decrease SCN infection, whereas if they facilitate syncytium establishment, knocking them out could help suppress SCN infection. In either case, longer-term, modification of these genes could be incorporated into the Mid-South breeding programs via conventional and biotechnological methods to enhance SCN resistance. Another anticipated outcome of the proposed project is to provide proof-of-concept for our gene discovery pipeline, which can be used to explore additional candidate genes. These outcomes will address the urgent need for alternative resistance sources and support the long-term productivity and profitability

of soybean cultivation in the Mid-South and beyond.

OUTLINE OF RESEARCH

RATIONALE/JUSTIFICATION FOR RESEARCH: SCN causes up to 30% reduction in grain yield, resulting in nearly $32 billion loss from 1996 through 2016, or more than $1.5 billion annually in the United States alone (Bandara et al., 2020; Tylka & Marett, 2025). SCN is managed primarily through the use of hundreds of commercial SCN-resistant soybean varieties derived from only two sources of genetic resistance: PI 88788 carrying the *rhg1* resistance locus (95% of modern varieties) and Peking carrying *Rhg4* (3%) (Bent, 2022a; Cook et al., 2012). Prolonged reliance on these two genetic sources has led to the emergence and proliferation of virulent SCN strains, demonstrating the urgent need for new sources of resistance (Bent, 2022; Patil et al., 2019). To identify alternative sources of resistance, we are studying transcriptional responses (Figure 1 A-C) to SCN infection in PI 437654, a resistant genotype that blocks SCN earlier in infection process than PI 88788 and is effective against many SCN populations that can overcome PI 88788 or Peking (Patil et al., 2019). We hypothesize that genes upregulated by SCN in PI 437654 contribute to resistance in this unique germplasm and could be utilized for crop improvement. Alternatively, transcript profiling can also identify so-called "susceptibility

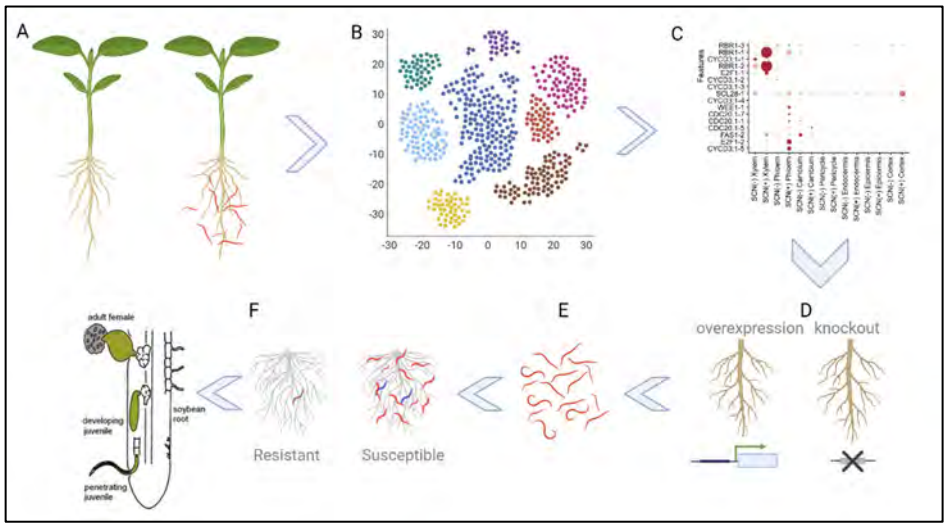


Figure 1. Pipeline for Identifying New Genetic Sources of SCN Resistance. Gene expression was compared in **(A)** PI 437654 with and without SCN using **(B)** single cell RNA sequencing, and **(C)** this data was used to identify cell-type-specific genes responsive to SCN, including *RBRa* and *RBRc*. **(D)** To test these and other promising candidate genes, overexpression and CRISPR mediated gene-knockout will be used to enhance or suppress expression, and the genetically modified root system **(E-F)** will be challenged with SCN to determine if the candidate gene alters any stage of SCN infection**.** SCN infection can be suppressed by increasing the expression of resistance factors OR suppressing the expression of susceptibility factors that normally facilitate the infection process.

factors” in the plant that aid SCN infection, and that could be eliminated through breeding or genetic engineering to enhance resistance. To explore the functional significance of genes identified by transcript profiling (i.e. candidate genes) and identify useful resistance- and susceptibility factors, we propose to use genetic engineering to modify candidate gene expression and test the effects on SCN infection (Figure D-F).

Our first choice of candidate genes for functional analysis are *RBRa* and *RBRc*, first of all because they are more strongly induced by SCN attack than other candidate genes, and secondly because their putative functions suggest a role in limiting the formation of the nematode feeding site. In plants, retinoblastoma-related proteins (RBRs) are functional homologs of the animal retinoblastoma tumor suppressor and are pivotal regulators of the cell cycle (Ahlander & Bosco, 2009). They act as negative regulators of cell cycle progression and limit endoreduplication, a cellular process that SCN exploit to establish nutrient-rich feeding sites. By limiting endoreduplication and abnormal cell cycle progression, RBRs may help curtail the expansion and maintenance of the feeding structures that nematodes need to develop and reproduce. Thus, targeting RBR-mediated pathways could represent an innovative and durable approach to enhance SCN resistance, moving beyond the traditional reliance on *rhg1* and *Rhg4* loci.

OBJECTIVE(S):

1. Develop roots with suppressed or enhanced *RBRa* and *RBRc* expression
2. Test the effects of *RBRa* and *RBRc* expression on SCN survival and syncytia development

APPROACH AND EXPERIMENT CONDUCT:

Objective 1: Develop roots with suppressed or enhanced *RBRa* and *RBRc* expression using:

a. <u>CRISPR/Cas9-mediated gene editing in the resistant genotype:</u> To directly assess the role of RBRa and RBRc in SCN resistance, we will employ CRISPR/Cas9 gene editing to generate targeted knockouts in resistant soybean genotypes (e.g., PI 88788 or PI 437654). A dual guide RNA strategy as described in (Devkar et al., 2025) will be used to ensure efficient and specific disruption of both RBR genes. The resulting binary vector encoding AtCas9, guide RNAs, and the visible marker

(RUBY or GFP) will be introduced into *Agrobacterium rhizogenes* strain K599. Soybean seedlings will be transformed to produce composite plants with transgenic hairy roots. After approximately three weeks, robust transgenic roots expressing the reporter gene will be retained, while non-transgenic roots will be removed to maximize the proportion of edited tissue.

b. Root-specific overexpression in susceptible genotype: To determine whether increased expression of *RBRa* and *RBRc* can confer resistance to SCN in a susceptible background, we will generate transgenic hairy roots in the Williams 82 soybean variety. *RBRa* and *RBRc* coding sequences will be cloned under the control of root-specific promoters. These overexpression constructs will be introduced via *A. rhizogenes*-mediated transformation and screened as described above.

Objective 2: Test the effects of *RBRa* and *RBRc* expression on SCN survival and syncytia development. The composite plants and hairy root cultures developed in Objectives 1a and b will be challenged with SCN (*Heterodera glycines* races 3 and 5) at the University of Arkansas in greenhouse and laboratory assays, respectively. The impact of RBR gene knockout on syncytia formation and SCN susceptibility will be evaluated by comparing nematode development and syncytia morphology in edited compared to non-transgenic controls. To elucidate the cellular mechanisms by which RBR proteins regulate cell cycle progression and endoreduplication during nematode infection, root samples will also be harvested at key time points post-infection from 10 and 14 days, to capture both early and established stages of syncytia development. fixed, stained, and observed by bright-field and fluorescence microscopy as previously described (Habash et al., 2017). This integrated approach will provide comprehensive mechanistic insights into how RBR proteins influence cell cycle dynamics and endoreduplication during SCN-induced syncytia formation in soybean roots.

PROJECTED IMPACT OF RESULTS ON MID-SOUTH SOYBEAN PRODUCTION

This study will deliver transformative benefits for soybean breeders, researchers, and farmers by uncovering novel genetic mechanisms that can be harnessed to combat the persistent threat of SCN in the Mid-South production area. For breeders, the identification and functional validation of RBR-mediated resistance pathways will provide new molecular targets for marker-assisted selection and

the development of soybean varieties with durable, broad-spectrum SCN resistance. By moving beyond the overused rhg1 and Rhg4 sources, this research will help diversify the genetic toolbox available to breeding programs, reducing the risk of resistance breakdown and supporting the long-term sustainability of soybean production. In the long term, farmers will ultimately benefit from the deployment of new, robust SCN-resistant soybean varieties, which will help safeguard yields, reduce reliance on chemical nematicides, and enhance profitability. By addressing a critical gap in current SCN management strategies, this project has the potential to secure the productivity and economic resilience of soybean farming across the U.S. and beyond.

EXPECTED END PRODUCT(S)

1. A streamlined pipeline for functional validation of genes and molecular marker identification
2. Characterization of two potential sources of SCN resistance
3. Foundation for trait introgression via conventional breeding and genetic engineering
4. Intellectual property rights and one or more peer-reviewed publications
5. Oral and poster presentations at one or more scientific meetings per year
6. One or more student theses, including undergraduate Honors theses
7. Quarterly, annual, and final reports as required by MSSB

References cited:

Ahlander, J., & Bosco, G. (2009). The RB/E2F pathway and regulation of RNA processing. *Biochemical and biophysical research communications*, *384*(3), 280-283.

Bandara, A. Y., Weerasooriya, D. K., Murillo‐Williams, A., White, C. M., Collins, A. A., Bell, T. H., & Esker, P. D. (2020). Relationship between soybean yield from high and low yielding field sites and selected soil characteristics. *Agrosystems, Geosciences & Environment*, *3*(1), e20126.

Bent, A. F. (2022). Exploring soybean resistance to soybean cyst nematode. *Annual Review of Phytopathology*, *60*(1), 379-409.

Cook, D. E., Lee, T. G., Guo, X., Melito, S., Wang, K., Bayless, A. M., Wang, J., Hughes, T. J., Willis, D. K., & Clemente, T. E. (2012). Copy number variation of multiple genes at Rhg1 mediates nematode resistance in soybean. *Science*, *338*(6111), 1206-1209.

Devkar, V., D'Agostino, L., Kshetry, A. O., Chen, Y., Ghose, K., Lenin, Y.-V., Nadaf, A. B., Thirumalaikumar, V., Skirycz, A., & Sonah, H. (2025). Cell-type-specific response to silicon treatment in soybean leaves revealed by single-nucleus RNA sequencing and targeted gene editing. *The Plant journal: for cell and molecular biology*, *123*(1), e70309.

Habash, S. S., Sobczak, M., Siddique, S., Voigt, B., Elashry, A., & Grundler, F. M. (2017). Identification and characterization of a putative protein disulfide isomerase (HsPDI) as an alleged effector of Heterodera schachtii. *Scientific Reports*, *7*(1), 13536.

Patil, G. B., Lakhssassi, N., Wan, J., Song, L., Zhou, Z., Klepadlo, M., Vuong, T. D., Stec, A. O., Kahil, S. S., & Colantonio, V. (2019). Whole‐genome re‐sequencing reveals the impact of the interaction of copy number variants of the rhg1 and Rhg4 genes on broad‐based resistance to soybean cyst nematode. *Plant Biotechnology Journal*, *17*(8), 1595-1611.

Tylka, G. L., & Marett, C. C. (2025). Known distribution of the soybean cyst nematode, Heterodera glycines, in the United States and Canada through 2023. *Plant Health Progress*, *26*(1), 51-53.

2026 MID SOUTH SOYBEAN BOARD
18 - RI-13

Project Title	**Modernizing Phosphorus and Potassium Recommendations and Improving Return on Investment for Climate-Smart Corn – Cover Crop – Soybean Cropping System**		
PI's Name	**Md. Rasel Parvej**	E-mail	mrparvej@missouri.edu
PI's Title	Assist. Prof. & Director of Soil Testing	Institution:	The Curators of the Univ of Missouri
Mailing Address	601 Turner Avenue, Turner Avenue Garage, Rm. 201		
City/State/Zip	Columbia/MO/65211		
Phone number	479-387-2988		
Additional PIs For this project	Kelly Nelson (nelsonKe@missouri.edu), Gurbir Singh (singhgu@missouri.edu), Jennifer Miller (millerjl@missouri.edu), Aaron Brandt (ab55nd@missouri.edu), Gerson Drescher (gldresch@uark.edu)		
Research locations (states involved)	Missouri (2026-2029) & Arkansas (potential location)		

Timeline: Current Year - FY26		**Multi-Year Project Information** (if applicable)		
		Year 1	Year 2	Year 3
Start Date		**April 1, 2026**	**April 1, 2027**	**April 1, 2028**
End Date		**March 31, 2027**	**March 31, 2028**	**March 31, 2028**
Funds Requested	$	$ 60,000	$ 60,000	$ 60,000

Program Area: Fertility needs (especially P and K) for optimum fertilizer rate and economical yield	
Other related funding:	N/A
Objectives:	1) Evaluate the impact of cereal rye cover crop on P and K availability during soybean growing season; 2) Evaluate the effects of P and K fertilizer application time (fall vs. spring) on soybean yields and soil nutrient concentrations; and 3) Determine optimal P and K rates tailored for P and K fertilizer application timing and cover crop-soybean cropping systems.
Justification:	Missouri farmers are increasingly adopting cover crops, especially cereal rye, to address soil erosion, nutrient loss, and weather-driven variability in corn–soybean systems. However, current fertilizer guidelines do not reflect the nutrient cycling benefits of cover crops, leading to potential under- or over-application of P and K. Additionally, misconceptions about fall fertilizer timing and solubility contribute to inefficiencies. This project will evaluate P and K fertilizer timing and rates across soil types and cover crop systems in Missouri and Arkansas.
Exp Setup:	This project will be conducted in cover crop–soybean systems across four major soybean-producing regions in Missouri: Southeast (Portageville), Central (Columbia), Northeast (Novelty), and Northwest (Albany), and in Arkansas. Each experiment will follow a strip-split plot design with cover crop treatments as strips, fertilizer timing as the split factor, and fertilizer rate as a randomized subplot factor. Each treatment will be replicated 4–5 times per location.
Summary:	This project will generate field data from four key Missouri regions to assess how cover crop presence and fertilizer timing affect soil P and K availability, nutrient cycling, and yield in corn–soybean systems. It will compare fall vs. spring application of five fertilizer rates with and without cover crops. Findings will support region-specific updates to P & K management recommendations, helping producers reduce nutrient losses, improve profitability, and enhance long-term soil and environmental health.
Benefit to Midsouth Farmers:	Improved P and K management through optimized rates, better timing, and accounting for cover crop effects could boost soybean yields by 4–10%, translating to 2.1–5.2 million additional bushels on just 10% of Missouri's soybean acres. At $10.00-12.50 per bushel, this equates to $26–65 million in added value. Combined with potential fertilizer savings of $5–13 million, the total annual economic benefit could exceed $70 million for Missouri producers, with similar gains likely across the Mid-South.
Progress Made:	The project will start on Sep. 1, 2026, after the corn harvest. We are developing protocols.
Signature of Principle Investigator:	Date: 7/16/2025

2026 Midsouth Soybean Board
REQUEST FOR FUNDING OF RESEARCH FOR 2026 FUNDING CYCLE

PROPOSAL TITLE: **Modernizing Phosphorus and Potassium Recommendations and Improving Return on Investment for Climate-Smart Corn – Cover Crop – Soybean Cropping System**

INVESTIGATORS:

Md. Rasel Parvej (PI), Assistant Professor & Director of Soil Testing Facilities, University of Missouri, Columbia, MO. Phone: 479-387-2988, Email: mrparvej@missouri.edu

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Aaron Brandt (Co-PI), Director of Fisher Delta Research, Extension, and Education Center, University of Missouri, Portageville, MO. Phone: 573-379-4029, Email: ab55nd@missouri.edu

Gerson L. Drescher (Co-PI), Assistant Professor, University of Arkansas System Division of Agriculture, Fayetteville, AR 72704. Phone: (479) 575-3912. E-mail: gldresch@uark.edu

PROGRAM AREA (check all that apply):
___ New Uses of Soybean
___ Soybean Oil or Soybean Meal Uses
___ Food Grade Soybean
___ Soybean Fuel
___ Soybean Breeding and Genetics
___ Weed Management
___ Irrigation/Water Management
___ Seed Quality
___ Disease Management and Control
_X_ Fertility Management
___ Insect Management/Control
___ Harvest aids
___ Nematode Management/Control
___ Rotations using soybeans
___ Research Validation or Demonstration
_X_ Producer Communications
___ Variety Trials
___ Economics
___ Other (*Identify*)_____

PROJECT STATUS:
New __1 of 4__ *(Indicate planned length of project–1 of 2, 1 of 3, etc.)*
Expected research length (yr)_4__
Renewal _____ (Year _____ of _____)
Stand alone _X__ or cross-commodity ___ (*additional funding from other sources?*

2026 TOTAL FUNDING REQUEST $ __60,000_____

2026 MSSB RESEARCH PROJECT PROPOSED BUDGET			
CATEGORY *(see below for guidelines)*		**ORIGINAL**	
A.	**Personnel** (No Permanent Salaries)		
	1. Salaries (See Addendum B)		
	2. Wages (hourly workers)		
	3. GRA (include tuition)	$ 42,285	
B.	**Fringe Benefits** (% *used to calculate*)		
C.	**Travel**	$ 2,915	
D.	**Contractual Services**		
E.	**Subcontracts**		
F.	**Commodities**	$ 2,000	
G.	**Publication Costs**		
H.	Other Costs *(Soil Analysis)*	$ 12,800	
TOTAL COST		**$ 60,000**	
(MSSB does not allow indirect costs/overhead charges)			

Personnel*: Show number of hours x hourly rate for each category. GRA cost to include tuition and books. MSSB does not pay salaries of principal investigators or cooperating scientists (USB Compliance Manual, Sect. 17, Part 2-D).*
Fringe Benefits: *Amount and rate for indicated salaries, wages, and GRAs must be shown.*
Travel*: Out-of-pocket and per diem expenses (hotel and meals) for site visits, travel to and from meetings (e.g. airfare, vehicle mileage not to exceed the IRS rate), etc.*
Contractual Services*: External lab fees, consultants, etc.*
Commodities*: Expenses related to the conduct of the project (e.g., seed, fertilizers, pesticides, lab supplies).*
Additional Details*: Provide for each budget category in addendum if necessary.*
Reminder*: All payments for project activities are on a reimbursable basis based on an itemized invoice submitted to MSSB each quarter along with a progress report.*
Budget Transfers*: The MSSB follows USB guidelines, which state "The PI may transfer funds amongst budget categories only with MSSB's prior written consent if (i) the amount transferred exceeds 10% of any one general budget category (per annual period) or (ii) the funds transferred are travel related. PI shall request permission from MSSB for all budget reallocations and account for them in his/her financial report."*
Additional Instructions: *See Addendum B.*

TECHNICAL SUMMARY

Missouri producers are increasingly adopting cover crops to improve soil health, reduce erosion, and enhance nutrient use efficiency. While cover crops like cereal rye and rye–vetch mixtures offer numerous benefits, including phosphorus (P) and potassium (K) retention, improved nutrient cycling, and climate resilience, current P and K fertilizer recommendations in Missouri do not reflect

the influence of cover crops on nutrient availability. This creates a critical knowledge gap, especially in the context of fertilizer timing and environmental stewardship.

Conventional P and K fertilization in Missouri relies heavily on fall applications of triple superphosphate (TSP) and muriate of potash (MOP), partly based on misconceptions about solubility. However, these fertilizers are highly water-soluble and do not require long pre-plant intervals to become plant-available. Recent studies in similar agroecosystems show significant yield advantages with spring applications, but little region-specific data exists for Missouri.

Furthermore, fall-applied nutrients not taken up by crops are susceptible to loss through leaching or runoff, especially in coarse-textured or low-organic matter soils. Cover crops mitigate this loss by capturing and recycling nutrients, releasing them during decomposition. Yet, Missouri's P and K guidelines remain based on conventional systems that ignore these dynamics, risking under- or over-fertilization and missed opportunities for improved efficiency.

This project aims to generate field-based data across four key Missouri regions (southeast, central, northeast, northwest) and potentially in eastern Arkansas to evaluate the interaction of cover crop presence and fertilizer timing on soil P and K availability, nutrient cycling, and yield performance in corn–soybean systems. A strip-split plot design will test fall vs. spring application of five fertilizer rates (0 to 160 lb P_2O_5 or K_2O per acre) with and without cover crops. Results will directly inform updated, regionally adapted nutrient management recommendations.

By aligning P and K fertilization strategies with the realities of cover crop use and soil conditions, this research will reduce nutrient loss risks, improve profitability, and promote long-term soil and environmental health for Mid-South soybean producers.

OUTLINE OF RESEARCH

RATIONALE/JUSTIFICATION FOR RESEARCH:

Missouri farmers are increasingly incorporating cover crops into their corn–soybean rotations to address ongoing concerns around soil erosion, declining soil health, nutrient losses, and production variability caused by extreme weather. Among the cover crop species commonly used, cereal rye has

proven particularly effective at stabilizing soils, improving water infiltration, and promoting nutrient retention. In particular, these systems hold promise for capturing residual P and K left in the soil after corn harvest and cycling these nutrients for the benefit of subsequent soybean crops.

Despite these well-documented benefits, current fertilizer guidelines in Missouri are based on conventional systems that do not account for the nutrient scavenging and recycling capacity of cover crops. Existing recommendations treat soils as static reservoirs and do not incorporate biological nutrient cycling dynamics or seasonal nutrient fluxes driven by cover crop decomposition. As a result, soybean producers lack evidence-based, regionally relevant guidance for adjusting fertilizer practices in systems that include cover crops. This gap leads to either under-application, which limits yield potential, or over-application, which wastes resources and contributes to environmental degradation through nutrient runoff and leaching, especially when fertilizers are applied to bare soils in fall.

Compounding this challenge is a widespread misconception about the solubility of commonly used fertilizers. Many producers in Missouri apply triple superphosphate (TSP; 0-46-0) and muriate of potash (MOP; 0-0-60) in the fall due to field logistics or the belief that these materials require several months to become plant-available. However, both fertilizers are highly water-soluble and can provide available nutrients quickly under adequate moisture conditions. Research from similar agroecological regions, such as Louisiana, suggests that spring applications can lead to notable yield improvements, especially on soils prone to nutrient losses or with low holding capacity. Yet, these findings have not been thoroughly tested or validated under Missouri's diverse soil conditions, which range from highly weathered claypan soils in the northeast to sandy or low-organic matter soils in the southeast.

This project is designed to fill that knowledge gap. It will generate robust field data from four representative regions of Missouri and potentially eastern Arkansas, covering a wide range of soil types and management conditions, to evaluate how cover crops interact with P and K fertilizer timing and rates. By implementing a strip-split plot design that compares fall and spring fertilizer applications across five fertilizer rates (0 to 160 lb P_2O_5 or K_2O per acre) and two cover crop treatments (with and without), we will assess the effect on nutrient availability, soybean uptake, and final yield. These results will inform science-based updates to soil fertility recommendations that are more aligned with

climate-smart, modern conservation practices.

Ultimately, this research will equip producers in Missouri and across the Mid-South with practical, region-specific guidance that improves nutrient use efficiency, enhances profitability, and supports long-term soil and environmental stewardship. The outcomes will help producers make more informed decisions about when and how much fertilizer to apply in cover crop–soybean systems, ensuring agronomic and environmental sustainability under increasingly variable climate conditions.

OBJECTIVE(S):

1. Evaluate the impact of cereal rye cover crop on P and K availability during soybean growing season.
2. Evaluate the effects of P and K fertilizer application time (fall vs. spring) on soybean yields and soil nutrient concentrations.
3. Determine optimal P and K rates tailored for P and K fertilizer application timing and cover crop-soybean cropping systems in Missouri and Arkansas.

APPROACH AND EXPERIMENT CONDUCT:

This project will generate region-specific data to improve P and K management in cover crop–soybean systems across four major soybean-producing regions in Missouri: Southeast (Portageville), Central (Columbia), Northeast (Novelty), and Northwest (Albany), and potentially in eastern Arkansas. The dominant soil series at each site includes Sharkey clay (Southeast), Mexico silt loam (Central), Putnam silt loam (Northeast), and Marshall silty clay loam (Northwest). Each experiment will follow a strip-split plot design with cover crop treatments as strips, fertilizer timing as the split factor, and fertilizer rate as a randomized subplot factor. Each treatment will be replicated 4–5 times per location.

Objective 1: To assess nutrient dynamics in the presence of cover crops, cereal rye (*Secale cereale*) will be planted in the fall following corn harvest and terminated in early spring prior to soybean planting. This will be compared to a fallow (no cover crop) control. Soil samples will be collected at key timepoints: post-cover crop termination, mid-season (R2-3), and at harvest to monitor P and K concentrations. Plant tissue samples will also be analyzed for P and K uptake.

Cover crops are expected to enhance nutrient retention and availability by scavenging P and K

and reducing overwinter losses. By comparing nutrient concentrations over time between rye and fallow plots, we will quantify the nutrient contribution and cycling benefits of the cover crop.

Objective 2: Fertilizer treatments will include two application timings, fall (prior to winter cover crop establishment or winter fallow) and spring (pre-plant). Fertilizer will be broadcast using triple superphosphate (0-46-0) and muriate of potash (0-0-60). Soil samples will be collected prior to application, at planting, mid-season, and after harvest to track nutrient availability and dynamics.

Soybean yield and yield components will be measured at the end of the season. These data will allow us to evaluate whether spring applications better align with soybean nutrient uptake, especially in systems with cover crops that retain fall-applied nutrients.

Objective 3: Five P and K fertilizer rates 0, 40, 80, 120, and 160 lb P_2O_5 or K_2O per acre, will be randomized within each timing and cover crop treatment. These rates will be evaluated across the four locations and soil types to assess yield response, nutrient uptake, and post-harvest soil fertility.

By integrating cover crop effects, timing of application, and soil characteristics, this objective will help refine region-specific rate recommendations that enhance fertilizer use efficiency while maintaining or improving soybean productivity.

This project takes a comprehensive, systems-based approach to optimize P and K management in soybean systems that include cover crops. The combination of cover crop treatments, fertilizer timing, and nutrient rate response across diverse regions and soil types will generate actionable insights for Missouri producers. Results will support the development of improved, soil-test-based recommendations tailored to modern conservation practices, helping reduce input costs, minimize environmental loss, and improve soybean productivity across the Mid-South.

PROJECTED IMPACT OF RESULTS ON MID-SOUTH SOYBEAN PRODUCTION

Upon successful completion, this project is expected to generate region-specific P and K fertilizer management recommendations tailored to cover crop–soybean systems across Missouri and the broader Mid-South region. These updated guidelines will significantly improve nutrient use efficiency, reduce unnecessary input costs, and enhance soybean yield potential under variable soil

and climate conditions.

Direct Benefits: Improved P and K management based on fertilizer timing, cover crop effects, and optimized rates could conservatively increase soybean yields by 4–10%, based on preliminary results from related studies in the southern U.S. Applying this yield gain to just 10% of Missouri's 5.2 million soybean acres (i.e., ~520,000 acres) would result in additional production of 2.1–5.2 million bushels. At a market price of $ 10.00 - 12.50 per bushel, this represents a potential annual economic benefit of $26–65 million to Missouri producers alone.

In addition, more precise fertilizer recommendations could reduce input costs by $10–25 per acre, translating to $5–13 million in savings annually across the same 520,000 acres. Combined, the direct economic benefit of improved yield and reduced input costs could exceed $70 million annually for Missouri producers, with similar benefits expected across the Mid-South where cover crop adoption is increasing.

Indirect Benefits: The adoption of improved fertilizer timing and rate recommendations will contribute to reduced nutrient runoff and leaching, improving water quality in regional watersheds such as the Missouri and Mississippi Rivers. Enhanced nutrient cycling through cover crop use also reduces dependence on synthetic fertilizers, decreasing the carbon footprint and energy input associated with fertilizer production and application.

Long-term improvements in soil health, through increased organic matter, improved structure, and better water retention, will enhance field resilience to extreme weather events, stabilize yields, and support sustainable production. These outcomes contribute to improved farm profitability and environmental stewardship, aligning with both state and national conservation goals.

Broader Regional Impact: Because the corn–cover crop–soybean rotation is common throughout the Mid-South, the findings from this research will have applicability well beyond Missouri. Extension and outreach efforts will translate findings into practical tools and guidelines that can benefit producers in Arkansas, Missouri, Mississippi, Louisiana, and surrounding states. The project's regionally adapted data will support scalable recommendations and decision-making frameworks across diverse soil types and climatic conditions in the Mid-South.

EXPECTED END PRODUCT(S)

At the conclusion of this project, the following end-products are planned to ensure effective dissemination of results and knowledge transfer to Mid-South soybean producers, researchers, and stakeholders:

1. **Peer-Reviewed Journal Publication:** A manuscript summarizing key findings will be submitted to a high-impact, peer-reviewed journal such as *Agronomy Journal* or *Soil Science Society of America Journal*. The paper will focus on the interaction between cover crops, fertilizer timing, and nutrient rate on P and K availability and soybean yield in Missouri.
2. **Extension Article / Research Report:** A producer-focused extension article or research report will be published through the University of Missouri Extension. This document will provide practical, science-based fertilizer management guidelines tailored for cover crop–soybean systems.
3. **Presentation:** A PowerPoint presentation summarizing project goals, methodology, results, and recommendations will be developed and presented at the Mid-South Soybean Board annual research meeting, ASA–CSSA–SSSA Annual Meeting, and field day events.
4. **Executive Summary for MSSB and National Database:** An executive summary suitable for posting on midsouthsoybeans.com and the database will be published in the USDA Ag Data Commons. The summary will be written in accessible language for farmers and stakeholders and include key takeaways and management recommendations.
5. **Graduate Thesis or Dissertation:** A Ph.D. dissertation will be produced and made electronically accessible via the University of Missouri's institutional repository. An executive summary of the thesis/dissertation will also be provided to MSSB.
6. **Media Outreach:** Short-form outreach materials, including articles for *Missouri Soybean Farmer* magazine, MU Extension newsletters, and online media platforms, will be developed to ensure broad access to the findings.

These deliverables will ensure that both scientific and producer communities benefit from this research and that the findings directly inform sustainable nutrient management practices in Mid-South soybean production systems.

APPENDICES *(Add as needed)*

A. Explanation/justification of budget categories - where needed for clarification or detail.

Explanation/justification of budget categories for clarification or detail.

A. Salary

- *GRA – Stipend (PhD) ($2,250 x 12) = $27,000*
- *GRA – Tuition & CAFNR Course Fees ($1,056.66 x 12) = $12,680*
- *GRA – Medical Insurance ($217.08 x 12) = $2,605*
- ***Total Salaries: $42,285***

C. Travel

- *Travel to research sites (fuel, meal, lodging) = $1,520*
- *Travel to meetings = $1,395*
- ***Total lab supplies: $2,915***

F. Commodities (Lab supplies)

- *AMS Soil Probe & Fertilizers: = $1,000*
- *Seed (Cover Crop & Soybean) = $1,000*
- ***Total lab supplies: $2,000***

H. Other Costs (Soil and plant analysis)

- *Soil analysis: 4 sites x 2 nutrients x 2 application times x 2 cover crops x 5 treatments x 4 reps 2 times (fall & mid-season) = 1280 samples*
  - *1280 samples x $10 Basic Soil Diagnostic Package (pH, Mehlich 3 extractable P, K, Ca, Mg, Na, S, Fe, Mn, Zn, Cu, B) = $12,800*
- ***Total soil and plant analysis: $12,800***

2026 MID SOUTH SOYBEAN BOARD
18 - RI-14

Project Title	Porous soy proteins for the delivery of vitamins		
PI's Name	Ali Ubeyitogullari	E-mail	uali@uark.edu
PI's Title	Assistant Professor	Institution:	University of Arkansas System Division of Agriculture
Mailing Address	2650 N Young Ave, Room N205		
City/State/Zip	Fayetteville/AR/72704		
Phone number	479-575-3183		
Additional PIs For this project	-		
Research locations (states involved)	AR		

Timeline: Current Year - FY26		**Multi-Year Project Information** (if applicable)		
		Year 1	Year 2	Year 3
Start Date		**04/01/2026**	**04/01/2027**	**04/01/2028**
End Date		**03/31/2027**	**03/31/2028**	**03/31/2029**
Funds Requested	$	$42,395	$42,395	$42,395

Program Area: New Uses of Soybean/ Soybean Oil or Soybean Meal Uses/ Food Grade Soybean

Other related funding:	None.
Objectives:	**(1)** Develop and optimize the generation of soy protein aerogels using supercritical carbon dioxide (SC-CO_2) from soybeans and soy meal, **(2)** Encapsulate vitamin B12 into the soy protein aerogels during gel formation, and **(3)** Determine storage stability and bioaccessibility of vitamin B12 using a sequential simulated oral, gastric, and intestinal digestion.
Justification:	Soy proteins are underutilized, and thus, this research will add value to soy proteins by generating porous soy proteins for the delivery of nutrients. This research will enable new soy protein applications in the growing vitamins/supplements market.
Exp Setup:	This project will investigate the generation of porous soy proteins (i.e., aerogels) using supercritical carbon dioxide and their applications in delivery of vitamin B12.
Summary:	The goal of this project is to upcycle soy proteins to develop a novel, sustainable approach based on nanoscale science and engineering and supercritical carbon dioxide (SC-CO_2) technology to encapsulate vitamins to enhance their stability and bioavailability.
Benefit to Midsouth Farmers:	The proposed approach generates novel nanoporous structures from soy proteins and increases the stability and bioaccessibility of vitamins. This project will add value to soybeans, create new avenues for soy proteins in the food and pharmaceutical industries with higher prices, and, in turn, increase the profitability of soybean growers in the mid-southern states.
Progress Made:	Not applicable.

Signature of Principle Investigator:	Date:
	7/18/2025

This document should remain as a SINGLE PAGE for the BOARD MEMBER'S QUICK REFERENCE. Email form (no pdf) to midsouthsoybean@gmail.com and swsoy@aristotle.net.

2026 Midsouth Soybean Board

PROPOSAL TITLE: Porous soy proteins for the delivery of vitamins

INVESTIGATORS: **PI:** Ali Ubeyitogullari, Ph.D., Assistant Professor, University of Arkansas System Division of Agriculture, 479-575-3183, uali@uark.edu

PROGRAM AREA (check all that apply):

_X_ New Uses of Soybean
_X_ Soybean Oil or Soybean Meal Uses
_X_ Food Grade Soybean
___ Soybean Fuel
___ Soybean Breeding and Genetics
___ Weed Management
___ Irrigation/Water Management
___ Seed Quality
___ Disease Management and Control
___ Fertility Management
___ Insect Management/Control
___ Harvest aids
___ Nematode Management/Control
___ Rotations using soybeans
___ Research Validation or Demonstration
___ Producer Communications
___ Variety Trials
___ Economics
___ Other (*Identify*)_____

PROJECT STATUS:

New _1 of 3___
Expected research length (yr)__3_____
Renewal _____ (Year _____ of _____)
Stand alone __x_ or cross-commodity ___

2026 TOTAL FUNDING REQUEST: $42,395

2026 MSSB RESEARCH PROJECT PROPOSED BUDGET			
CATEGORY *(see below for guidelines)*		**ORIGINAL**	
A.	**Personnel** (No Permanent Salaries)		
	1. Salaries (See Addendum B)	$0	
	2. Wages (hourly workers)	$0	
	3. GRA (include tuition)	$31,795	
B.	**Fringe Benefits** (*% used to calculate*)	$1,600 (6.40%)	
C.	**Travel**	$3,000	
D.	**Contractual Services**	$1,000	
E.	**Subcontracts**	$0	
F.	**Commodities**	$5,000	
G.	**Publication Costs**	$0	
H.	Other Costs *(Define)*	$0	
TOTAL COST		$42,395	
(MSSB does not allow indirect costs/overhead charges)			

***Personnel**: Show number of hours x hourly rate for each category. GRA cost to include tuition and books. MSSB does not pay salaries of principal investigators or cooperating scientists (USB Compliance Manual, Sect. 17, Part 2-D).*
***Fringe Benefits:** Amount and rate for indicated salaries, wages, and GRAs must be shown.*
***Travel**: Out-of-pocket and per diem expenses (hotel and meals) for site visits, travel to and from meetings (e.g. airfare, vehicle mileage not to exceed the IRS rate), etc.*
***Contractual Services**: External lab fees, consultants, etc.*
***Commodities**: Expenses related to the conduct of the project (e.g., seed, fertilizers, pesticides, lab supplies).*
***Additional Details**: Provide for each budget category in addendum if necessary.*
***Reminder**: All payments for project activities are on a reimbursable basis based on an itemized invoice submitted to MSSB each quarter along with a progress report.*
***Budget Transfers**: The MSSB follows USB guidelines, which state "The PI may transfer funds amongst budget categories only with MSSB's prior written consent if (i) the amount transferred exceeds 10% of any one general budget category (per annual period) or (ii) the funds transferred are travel related. PI shall request permission from MSSB for all budget reallocations and account for them in his/her financial report."*
***Additional Instructions:** See Addendum B.*

TECHNICAL SUMMARY

Soybeans have an exceptionally high amount of proteins (40-41%) with a unique chemical composition including all essential amino acids. However, soy proteins are mostly utilized as poultry and livestock feed (97%), while only a small fraction (3%) of soy proteins is being used for human consumption, underestimating their full value. Soy proteins are abundant and inexpensive, and have several health-promoting activities, including reducing the risk of cancer and cardiovascular diseases. Therefore, they are great candidates to meet the increasing demand for plant proteins to develop functional foods with health benefits. Thus, the goal of this project is to upcycle soy proteins to develop a novel, sustainable approach based on nanoscale science and engineering and supercritical carbon dioxide (SC-CO_2) technology to encapsulate vitamins to enhance their stability and bioavailability. Specific objectives are to (1) Develop and optimize the generation of soy protein aerogels using SC-CO_2 from soybeans and soy meal, (2) Encapsulate vitamin B12 into the soy protein aerogels during gel formation, and (3) Determine storage stability and bioaccessibility of vitamin B12 using a sequential simulated oral, gastric, and intestinal digestion. No existing study reports the use of soy protein aerogels for the delivery of vitamins. The proposed approach generates ovel nanoporous structures from soy proteins and increases the stability and bioaccessibility of vitamins. This project will add value to soybeans, create new avenues for soy proteins in the food and pharmaceutical industries with higher prices, and, in turn, increase the profitability of soybean growers in the mid-southern states.

OUTLINE OF RESEARCH

RATIONALE/JUSTIFICATION FOR RESEARCH:

Introduction. Soybean, a vital legume crop, has received great attention due to its protein (40-41%) and oil (20-24%) composition [1]. Soybeans are mainly utilized as animal feed (~78%) and food for human consumption (~15%) in the U.S., where 84% of the soybean fraction used for human consumption is soybean oil. In addition, 97% of soy proteins are fed to poultry/livestock while only 3% of soy proteins are being utilized for human consumption [2], underestimating the value of soy proteins.

Poor bioaccessibility and bioavailability of vitamins limit their health-promoting activities, including reducing the risk of cancer, diabetes, and cardiovascular disease [3-5]. Many of the bioactive food compounds, i.e., vitamins, possess challenging physicochemical properties that limit absorption, including low water solubility, and poor chemical stability due to environmental stresses like light, oxygen, pH, and heat. The bioaccessibility of vitamin B12 [6] are only in the range of 9-10%. Each of the current formulation strategies comes with its own limitations, such as (i) use of non-food grade surfactants and toxic organic solvents, (ii) chemical and physical instability during storage, (iii) poor encapsulation efficiencies and capacities, and/or (iv) limited improvement in bioavailability. There is, therefore, a *critical need* to establish a novel, sustainable encapsulation technique to enhance the stability and bioavailability of vitamins while enabling their food and pharmaceutical applications.

Aerogels are nanoporous materials with high surface area, lightweight, and ultra-low thermal conductivity. They are known as the lowest-density solids on Earth. *SC-CO_2 drying* is employed to generate aerogels with outstanding textural properties (i.e., high surface area with nanoporous structure). SC-CO_2 drying is known to be the best method, compared to air and freeze-drying, to dry materials without destroying the internal structure. Soy proteins are novel, sustainable sources for the generation of high-value materials for the delivery of vitamins.

Rationale and Significance. The current uses of soy proteins in the food and pharmaceutical industries are limited to a few products. The proposed SC-CO_2-based approach allows us to generate nanoporous soy protein aerogels with a clean neutral flavor and enhanced digestibility. Vitamins have poor chemical stability and bioavailability; thus, they need to be protected during encapsulation, processing, and storage while bioavailability is enhanced. Current encapsulation methods for vitamins have major impediments to their widespread adaptation. We plan to develop a platform technology using soy proteins to improve the stability and bioavailability of vitamins. Here, we will specifically work with vitamin B12 as it is crucial for several vital bodily functions, including DNA synthesis, nerve function, red blood cell formation and energy production, which will also fortify plant-based formulations. *The*

proposed research is thus significant as it, ***for the first time,*** *introduces a soy protein aerogels encapsulation approach that is scalable and safe for food and pharmaceutical applications*. This project is also expected to lead to new innovative, interdisciplinary research directions to targeted "personalized" nutritional, nutraceutical, and pharmaceutical products to further promote human health.

OBJECTIVE(S):

The *overall goal* of this project is to upcycle soy proteins to develop a novel, sustainable approach based on nanoscale science and engineering and supercritical carbon dioxide (SC-CO_2) technology to encapsulate vitamins to enhance their stability and bioavailability. Specific objectives are:

1. Develop and optimize the generation of soy protein aerogels using SC-CO_2 from soybeans and soy meal,

2. Encapsulate vitamin B12 into the soy protein aerogels during gel formation, and

3. Determine storage stability and bioaccessibility of vitamin B12 using a sequential simulated oral, gastric, and intestinal digestion.

This project, for the first time, will generate a novel application of soy proteins for the delivery of nutrients/vitamins/drugs. Therefore, it is expected to add value to soy proteins and increase its demand by the business with favorable market potential and thus benefit soybean growers. This new use will ultimately help farmers to fetch higher prices for soybeans. This same technology can be extended to other suitable soybeans grown in Mid-South for value addition. This new use of soy proteins for generating nanoporous materials can also result in invention disclosures and benefit the Mid-South soybean industry by licensing opportunities in this region.

APPROACH AND EXPERIMENT CONDUCT:

This project will consist of three objectives, including the formation of soy protein aerogels and its optimization to obtain highest surface area, encapsulation of vitamin B12 as a model compound, and assessment of the stability and digestibility of the soy protein aerogels.

Objective 1 (Year 1). Soybeans and soy meals will be obtained from Riceland Foods (AR, USA).

The samples will be defatted using hexane. Next, soy proteins will be extracted from defatted soybean flour and soy meal using a conventional protein extraction method [7]. Finally, the nitrogen content will be measured according to AOAC 968.06-1969 and converted into crude protein content by a conversion factor of 6.25 to determine the purity of protein fractions.

Next, the extracted proteins will be used for aerogel formation, which will consist of three stages, hydrogel formation, solvent exchange, and supercritical carbon dioxide (SC-CO_2) drying. Protein suspensions (5-20% concentration) will be prepared at different pHs 6.0-10.0, and heated at 85 °C for 20 min in a water bath to form hydrogels. Hydrogels will be cut into 1-2 cm pieces and immersed sequentially in ethanol/water mixtures (30, 50, 70, and 100% ethanol, v/v) for 1 h each, followed by 24 h in 100% ethanol to produce alcogels. Finally, alcogels will be dried using a lab-scale SC-CO_2 system (SFT-120, Supercritical Fluid Technologies Inc., DE, USA) to generate the aerogels. The generated aerogels will be characterized for textural properties, morphology, crystallinity, chemical structure, rheological properties, hardness, thermal stability, and solubility.

Objective 2 (Year 2). Vitamin B12 will be encapsulated into the porous structure of soy protein aerogels during the gel formation. Briefly, as described above, the proteins will be extracted and used for aerogel formation. During the hydrogel formation step, vitamin B12 (5-20 mg/mL) will be added into the gel mixture before the solvent exchange step. This will enable even distribution of the vitamin in the porous gel structure. Next, the hydrogels loaded with vitamin B12 will be subjected to the solvent exchange step as described above. Finally, the alcogels will be dried using a lab-scale SC-CO_2 system at 10 MPa and 40 °C for 4 h, with a CO_2 flow rate of 1.0 L/min (measured at ambient conditions of 23 ℃ and 0.1 MPa). The vitamin B12-loaded soy protein aerogels will be characterized to determine the encapsulation capacity and efficiency. Briefly, encapsulation capacity and efficiency of vitamin B12 will be determined using an HPLC (SPD-20AV, Shimadzu, Japan). The encapsulation capacity will be assessed by the ratio of vitamin B12 in the aerogels to the total weight of the loaded aerogel sample. The encapsulation efficiency will be determined by the proportion of vitamin B12 contained in the core

relative to the overall vitamin B12 content present in both the surface and core of the aerogel sample. The vitamin distribution within the encapsulation matrix will be analyzed using scanning electron microscopy, and confocal laser scanning microscopy. The crystallinity of vitamin before and after encapsulation will be determined using an x-ray diffraction method.

Objective 3 (Year 3). The storage stability of the soy protein aerogels loaded with vitamin B12 will be determined at two temperatures: 25 °C to mimic typical shelf conditions and 50 °C to simulate accelerated storage and potential food processing environments, both at 30% relative humidity. The vitamin concentration will be quantified over a 21-day period. Next, simulated digestion will be carried out following our previous method, where the vitamin B12-loaded soy protein aerogels will be subjected to oral, gastric, and intestinal digestions with simulated fluids and digestion enzymes [8]. The digested samples will be then subjected to centrifugation at 4000 rpm for 90 min at 4 °C using a refrigerated centrifuge to isolate the bioaccessible fraction.

PROJECTED IMPACT OF RESULTS ON MID-SOUTH SOYBEAN PRODUCTION

Soybean yields in the mid-southern states have equaled or exceeded the national average in recent years [9]. Soybean production in the member states (AR, LA, MS, MO, and TX, and now OK) of the Mid-South Soybean Board (MSSB) corresponded to about 15% (~600 Million Bushels) of the total soybean production in the U.S. in 2020 [10]. In addition, soybean grown in the mid-southern states has a relatively higher protein content than the soybean from northern states [1]. Therefore, adding value to soy protein can increase the profitability of soybean growers in the mid-southern states. Moreover, the global vitamins and supplements market size is expected to grow from $146.1 billion in 2023 to $250.8 billion by 2032 [11]. To this end, the proposed research will add value to soy proteins and provide a novel application in the vitamin delivery industry. ***Thus, this research will open new promising avenues for mid-southern soybean growers to make higher profits from soybean farming.***

EXPECTED END PRODUCT(S)

The success of the project will be measured by completing the goal and objectives on time and within

the budget, the number of publications in peer-reviewed journals, training of graduate students, developing collaborative research proposals, and creating new innovative, interdisciplinary research directions. This research could potentially trigger new research directions, applications, and collaborations for the utilization of soy proteins. The expected end products of the proposed research include:

- Soy protein aerogels for the enhanced stability and bioaccessibility of vitamins,
- Three peer-reviewed journal publications (*e.g.,* J. of Food Engineering, J. of Supercritical Fluids, Food Research International) to disseminate research results, and
- Three oral/poster presentations at national conferences (*e.g.,* Institute of Food Technologists (IFT), Conference of Food Engineering (CoFE)) to share research findings with the scientific community.

REFERENCES

[1] Medic J, Atkinson C, Hurburgh CR. (2014). Current knowledge in soybean composition. J Am Oil Chem Soc. 91:363-84. 10.1007/s11746-013-2407-9

[2] USB. (2020). Food and Fuel. Retrieved July 10, 2021, from https://www.themiraclebean.com/wp-content/uploads/2020/08/Anatomy-of-Soybean-Flyer.pdf

[3] Kris-Etherton PM, Hecker KD, Bonanome A, Coval SM, Binkoski AE, Hilpert KF, Griel AE, Etherton TD. (2002). Bioactive compounds in foods: their role in the prevention of cardiovascular disease and cancer. American Journal of Medicine. 113:71-88. https://doi.org/10.1016/S0002-9343(01)00995-0

[4] Liu RH. (2013). Dietary bioactive compounds and their health implications. J Food Sci. 78:A18-A25. 10.1111/1750-3841.12101

[5] Câmara JS, Albuquerque BR, Aguiar J, Corrêa RCG, Gonçalves JL, Granato D, Pereira JAM, Barros L, Ferreira ICFR. (2021). Food bioactive compounds and emerging techniques for their extraction: polyphenols as a case study. Foods. 10. 10.3390/foods10010037

[6] Ramalho MJ, Loureiro JA, Pereira MC. (2021). Poly(lactic-co-glycolic acid) Nanoparticles for the Encapsulation and Gastrointestinal Release of Vitamin B9 and Vitamin B12. ACS Applied Nano Materials. 4:6881-92. 10.1021/acsanm.1c00954

[7] Huang L, Ding X, Dai C, Ma H. (2017). Changes in the structure and dissociation of soybean protein isolate induced by ultrasound-assisted acid pretreatment. Food Chem. 232:727-32. https://doi.org/10.1016/j.foodchem.2017.04.077

[8] Ahmadzadeh S, Barekat S, Ubeyitogullari A. (2025). Enhancing lutein and anthocyanins stability and bioaccessibility through simultaneous encapsulation using coaxial 3D food printing. npj Science of Food. 9:96. 10.1038/s41538-025-00439-2

[9] Heatherly LG. (2020). Midsouth and US Soybean Yields 2016-2020. Retrieved July 8, 2021, from https://www.mssoy.org/article/midsouth-and-us-soybean-yields-2016-2020

[10] ASA. (2020). U.S. Yield & Production: Production by State. Retrieved July 8, 2021, from http://soystats.com/u-s-yield-production-production-by-state/

[11] Fortune. (2025). Vitamins and Supplements Market Size, Share & Industry Analysis. Retrieved July 15, 2025, from https://www.fortunebusinessinsights.com/vitamins-and-supplements-market-104051

APPENDICES

A. Explanation/justification of budget categories

Personnel

Graduate Research Assistant: Funds are requested to support one PhD student per year, totaling $25,000.

Fringe Benefits

Fringe benefits are budgeted in accordance with university policy outlined in a memorandum dated July 1, 2024: 6.40% for the graduate research assistant ($1,600 in total).

Travel

Domestic travel ($3,000 in total) is requested to present findings at professional conferences: Institute of Food Technologists (IFT) Annual Meeting & Food Expo, and Conference of Food Engineering (CoFE). The travel expenses include conference registration fees, lodging, and flight tickets.

Contractual Services

Funds ($1,000) are requested for utilizing University Core Facilities, including Arkansas Nano & Bio Materials Characterization Facility to use scanning electron microscopy (SEM), surface area analysis, and x-ray diffractometer (XRD).

Subcontracts – None.

Commodities

Funds ($5,000) are requested for research materials and supplies that are specific to the tasks in the proposed project, including fittings, chemicals, glassware, solvents, gas supplies, and sample collection and storage tools (such as pipettes, pipette tips, disposable gloves, etc.).

Publication Costs – None.

Other Costs – Tuition. ($6,795 Year 1) – Tuition is based on 15 hours per student at $453/hour.

Indirect Costs – None.

Total Funds Requested: $42,395

2026 MID SOUTH SOYBEAN BOARD
18 - RI-15

Project Title	Characterizing Soybean Genotypes for Phosphorus Efficiency		
PI's Name	Caio Canella Vieira	E-mail	caioc@uark.edu
PI's Title	Assistant Professor	Institution:	University of Arkansas
Mailing Address	495 N Campus Walk, Office 105		
City/State/Zip	Fayetteville, Arkansas, 72701		
Phone number	573-825-1795		
Additional PIs For this project	Trent Roberts, Professor of Soil Fertility/Soil Testing, University of Arkansas, 479-575-6752, tlrobert@uark.edu. Dongho Lee, Research Associate, University of Arkansas, 573-703-3054, donghol@uark.edu		
Research locations (states involved)	Arkansas: Fayetteville		

Timeline: Current Year - FY26		**Multi-Year Project Information** (if applicable)		
		Year 1	Year 2	Year 3
Start Date	April 1, 2026			
End Date	March 31, 2027			
Funds Requested	$57,012	$	$	$

Program Area: Soybean Breeding and Genetics

Other related funding:	
Objectives:	The objectives of this proposal include 1) screening genetically diverse soybean accessions and high-yielding cultivars for phosphorus efficiency under different phosphorus conditions, and 2) characterizing the genetic architecture of phosphorus efficiency to support breeding activities.
Justification:	Many arable regions in the U.S. mid-South are inherently deficient in phosphorus. The efficiency of phosphorus fertilizer is significantly restricted, with only 10-20% of the applied phosphorus being utilized by soybeans.
Exp Setup:	Greenhouse screening will be conducted to identify genetic variation for phosphorus efficiency (phosphorus acquisition and utilization) and select desirable germplasms. Association studies will be conducted to identify genomic regions.
Summary:	This proposal aims to identify genetic variation for phosphorus efficiency in soybean. Genomic regions associated with phosphorus efficiency will be characterized to support breeding efforts, addressing the low phosphorus availability in U.S. mid-South soils.
Benefit to Midsouth Farmers:	The Midsouth farmers will be able to maintain soybean yield while reducing the input costs for phosphorus fertilizer. It will also promote agricultural and environmental sustainability.
Progress Made:	New project

Signature of Principle Investigator: **Caio Canella Vieira**	Date: 7/19/2025

This document should remain as a SINGLE PAGE for the BOARD MEMBER'S QUICK REFERENCE. Email form (no pdf) to midsouthsoybean@gmail.com and swsoy@aristotle.net.

2026 Midsouth Soybean Board

PROPOSAL TEMPLATE *(Limit the final document to 8 pages)*

PROPOSAL TITLE: **Characterizing Soybean Genotypes for Phosphorus Efficiency**

INVESTIGATORS:

PI: Caio Canella Vieira, Assistant Professor of Soybean Breeding, University of Arkansas, 573-825-1795, caioc@uark.edu.

Co-PI: Trent Roberts, Professor of Soil Fertility/Soil Testing, University of Arkansas, 479-575-6752, tlrobert@uark.edu.

Co-PI: Dongho Lee, Research Associate, University of Arkansas, 573-703-3054, donghol@uark.edu

PROGRAM AREA (check all that apply):

___ New Uses of Soybean
___ Soybean Oil or Soybean Meal Uses
___ Food Grade Soybean
___ Soybean Fuel
_X_ Soybean Breeding and Genetics
___ Weed Management
___ Irrigation/Water Management
___ Seed Quality
___ Disease Management and Control
_X_ Fertility Management
___ Insect Management/Control
___ Harvest aids
___ Nematode Management/Control
___ Rotations using soybeans
___ Research Validation or Demonstration
___ Producer Communications
___ Variety Trials
___ Economics
_X_ Other (*Identify*)_Agricultural sustainability

PROJECT STATUS:

New **1 of 3**. Expected research length (yr) **3 years**

Renewal ____ (Year ____ of ____) Remember if you are presenting a renewal, your writing should speak mostly about what you are doing in the following year. You should not be re-requesting money for year one goals. Make sure it is clearly demonstrating progress; have a clear intention of your expected outcomes in the current year, not just over the program life.

Stand alone _**X**_

2026 TOTAL FUNDING REQUEST $57,012

2026 MSSB RESEARCH PROJECT PROPOSED BUDGET			
CATEGORY *(see below for guidelines)*		**ORIGINAL**	
A.	**Personnel** (No Permanent Salaries)		
	1. Salaries (See Addendum B)	$21,000	$1,750/Month @12 Months
	2. Wages (hourly workers)		
	3. GRA (include tuition)	$7,248	$453/Credit @16 Credits
B.	**Fringe Benefits** (% *used to calculate*)	$1,344	6.4%
C.	**Travel**		
D.	**Contractual Services**	$24,000 (Acid Digestion)	$10/sample @2,400 samples
E.	**Subcontracts**		
F.	**Commodities**	$1,920 (Greenhouse)	$1.2/Sq.ft/month @200 Sq.ft, 8 months
G.	**Publication Costs**		
H.	Other Costs *(Define)*	$1,500	Greenhouse supplies
TOTAL COST		$57,012	
(MSSB does not allow indirect costs/overhead charges)			

Personnel*: Show number of hours x hourly rate for each category. GRA cost to include tuition and books. MSSB does not pay salaries of principal investigators or cooperating scientists (USB Compliance Manual, Sect. 17, Part 2-D).*
Fringe Benefits: *Amount and rate for indicated salaries, wages, and GRAs must be shown.*
Travel*: Out-of-pocket and per diem expenses (hotel and meals) for site visits, travel to and from meetings (e.g. airfare, vehicle mileage not to exceed the IRS rate), etc.*
Contractual Services*: External lab fees, coacidnsultants, etc.*
Commodities*: Expenses related to the conduct of the project (e.g., seed, fertilizers, pesticides, lab supplies).*
Additional Details*: Provide for each budget category in addendum if necessary.*
Reminder*: All payments for project activities are on a reimbursable basis based on an itemized invoice submitted to MSSB each quarter along with a progress report.*
Budget Transfers*: The MSSB follows USB guidelines, which state "The PI may transfer funds amongst budget categories only with MSSB's prior written consent if (i) the amount transferred exceeds 10% of any one general budget category (per annual period) or (ii) the funds transferred are travel related. PI shall request permission from MSSB for all budget reallocations and account for them in his/her financial report."*
Additional Instructions: *See Addendum B.*

TECHNICAL SUMMARY

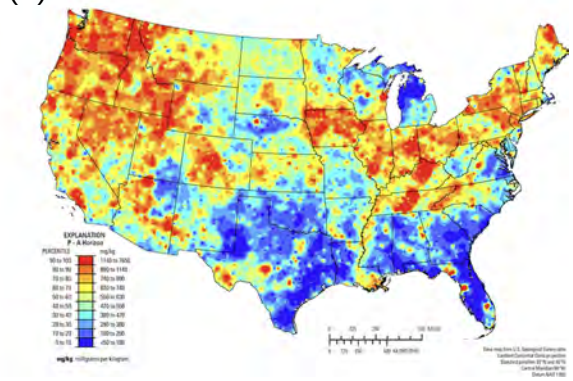
Phosphorus (P) is one of the key macronutrients to maximize soybean (*Glycine max*. L) production. The deficiency of P in the U.S. mid-South has been tackled through historical reliance on direct P fertilizer applications. Due to the low uptake efficiency of the fertilizer and concerns about environmental sustainability and potential P shortage, efforts have been made to improve its efficiency through agronomic practices. However, genetic improvement for P efficiency in soybean remains largely unexplored. To date, limited understanding exists regarding the genetic architecture controlling P efficiency. Therefore, this proposal aims to evaluate genetically diverse soybean accessions under varying P conditions to better characterize P fertilizer efficiency and its genetic basis. Phosphorus efficiency will be determined based on the root system architecture (P acquisition efficiency) and P concentration of upper biomass (P utilization efficiency) at early vegetative growth stages. Leaf index will be measured to compare overall plant growth under different P conditions. Using multi-layer phenotypic data and high-density genetic markers, the genetic architecture of P efficiency will be characterized through genome-wide association studies. Resulting genetic resources, including P-efficient accessions and molecular markers, will be shared with the soybean breeding community to accelerate the development of soybean cultivars with improved P efficiency and yield potential. By targeting P efficiency, an underutilized yet potentially impactful trait, this work may enable a novel path to increase intrinsic soybean yield potential while reducing input costs and promoting the long-term sustainability of soybean production in the U.S. mid-South.

OUTLINE OF RESEARCH

RATIONALE/JUSTIFICATION FOR RESEARCH: Soybean is one of the most economically important crops due to its nutritional value for human and animal consumption in the U.S. However, many arable regions in the U.S. mid-South are inherently deficient in P, which is one of the primary macronutrients for plant growth and development (Fig. 1A). This requires soil testing to recommend the optimal amount of P fertilizer, thereby reducing the factors that hinder soybean yield potential. However, due to the

chemical complexity of P binding with other soil components (Fe, Mg, Ca, Al, etc.), the efficiency of P fertilizer is significantly restricted, with only 10-20% of the applied P being utilized by soybeans. The low efficiency of P fertilizers often leads to overuse on farms, of which the excessive P bound to other soil components is washed off during heavy rains or irrigation, causing potential environmental problems, including water pollution and harmful algal blooms. There have been tremendous efforts, such as '4R Nutrient Stewardship', to improve the efficiency of P application by adopting the best practices for agricultural and environmental sustainability. However, in many cases, the genetic variation of soybean for P efficiency has been overlooked. Studies have demonstrated that genetic variations for P efficiency in soybean exist (Fig. 1B); however, limited progress has been achieved in further characterizing the genetic basis of these traits. As previously mentioned, concerns over P availability, potential negative environmental impacts, and high input costs reinforce the need for further understanding and exploring genetic variability for P efficiency in soybeans.

(A)



(B)



Fig. 1. A. Plant-accessible P availability in the U.S., where red is high and blue is low. The mid-South is predominantly low in plant-available P (USGS, 2017). **B.** In-field genetic variations for P efficiency in soybeans (Wang et al., 2010).

OBJECTIVE(S): The objectives of this proposal include 1) screening genetically diverse soybean accessions and high-yielding cultivars in maturity group (MG) 4 for P efficiency under different P conditions, and 2) characterizing the genetic architecture of P efficiency to support breeding activities.

APPROACH AND EXPERIMENT CONDUCT:

Objective 1: Screening genetically diverse soybean accessions and high-yielding cultivars in MG 4 for P efficiency under different P conditions. Roughly 200 genetically diverse soybean accessions, including landraces, wild soybeans, and elite breeding lines in MG 4, will be screened for P efficiency. The diverse panel will be tested under two different P conditions (low vs. recommended) in the greenhouse. The detailed concentrations of different P conditions will be determined based on the soil testing results from the Soil Fertility/Testing Laboratory. The soil to be used in the greenhouse will be sourced from the Pine Tree Research Station at the University of Arkansas, as the region has consistently shown soil testing results indicating P deficiency. It will be used for the low P condition, while the recommended P condition will be achieved by adding P fertilizer as recommended based on soil test values. The traits of interest will be root system architecture, tissue P concentration, and leaf index. Root system architecture, including total root length, root volume, root surface area, and the number of root tips and forks, will be measured at V6 using digital root analysis software (WinRhizo) as it is relevant to P acquisition efficiency. The upper biomass will be dried, weighed, and analyzed to measure P concentration using the Acid Digestion method at the Soil Fertility/Testing Laboratory, as it is relevant to P utilization efficiency. The experiment will be conducted in two batches with three replications.

Objective 2: Characterizing the genetic architecture of P efficiency to support breeding activities. Phenotypic data obtained in Objective 1 will be used in combination with high-density molecular markers (Soy50KSNP) to identify genomic regions regulating P efficiency in soybean. In addition, the multi-layer phenotypic data will allow us to broadly understand P efficiency through root architecture and nutrient allocation, as well as the genetic correlation among these traits. Pending results of the genetic architecture, either molecular markers or genomic prediction models will be developed and validated to support breeding activities for improved P efficiency. Given that breeding is a lengthy process and the genetic basis of P efficiency is unknown, we decided not to overpromise the delivery of any improved

germplasm within the first three years of the project. However, as a soybean breeding program, we are committed to the development of improved cultivars and may restructure the second or third year of this proposal once we have preliminary results.

PROJECTED IMPACT OF RESULTS ON MID-SOUTH SOYBEAN PRODUCTION

Phosphorus deficiency is prevalent in soybean growing areas in the U.S. mid-South. While P fertilizer application remains necessary to sustain yield, it increases input costs and raises environmental concerns. Additionally, the market price of P fertilizer has become more volatile due to limited phosphate rock supplies, rising mining costs, global conflicts, and changing trade policies. Identifying soybean genotypes with high P efficiency and understanding the genetic basis of this trait offers a promising opportunity to support more sustainable agricultural practices, enhance the economic resilience of soybean growers, and ensure the long-term sustainability of soybean production in the U.S. mid-South.

EXPECTED END PRODUCT(S)

For the first three years of this project, the expected products include i) Identification of soybean materials with high P efficiency, ii) understanding of the genetic architecture underlying P efficiency in soybean, and iii) development of molecular markers and/or genomic prediction models for high P efficiency in soybeans. Pending screening results and the complexity of genetic architecture, expected end products may be adjusted to include improved germplasm.

2026 MID SOUTH SOYBEAN BOARD
18 - RI-16

Project Title	Screening elite soybean lines for drought tolerance and developing high-throughput drought screening methodologies for the Mid-South		
PI's Name	Dr Feng Lin	E-mail	flbn7@missouri.edu
PI's Title	Assistant Professor	Institution:	The Curators of the Univ of Missouri
Mailing Address	Sponsored Programs Administration, 601 Turner Avenue, Turner Avenue Garage, Room 201		
City/State/Zip	Columbia, MO 65211-0001		
Phone number	573-822-7560		
Additional PIs For this project	Dr Caio Canella Vieira (Co-PI), Assistant Professor, University of Arkansas; Dr Moseley David (Co-PI), Assistant Professor, Louisianna State University; Dr Waltram Ravelombola (Co-PI), Assistant Professor, Texas A and M; Dr Francia Ravelombola (Co-PI), University of Missouri		
Research locations (states involved)	MO, AR, LA, TX		

Timeline: Current Year - FY26		**Multi-Year Project Information** (if applicable)		
		Year 1	Year 2	Year 3
Start Date		**4/1/2026**		
End Date		**3/31/2027**		
Funds Requested	$	$65,000		

Program Area:	
Other related funding:	
Objectives:	1. Screen elite soybean line for drought tolerance across multiple Mid-South environments under irrigated and non-irrigated conditions in Missouri, Arkansas, Louisianna, and Texas. 2. Develop and then validate high-throughput screening tools using drone-based and physiological data to identify traits associated with drought resilience.
Justification:	Drought limits soybean yield in the Mid-South due to rising summer temperatures and unpredictable rainfall. There is a pressing need to identify drought-tolerant lines and create reliable, cost-effective ways to select them.
Exp Setup:	Field trials including both irrigated and non-irrigated conditions in 4 states. Drones will collect data during key growth stages. Seed yield, seed weight, other agronomic traits will be recorded to compare performance and assess the drought tolerance of each line
Summary:	This project will help identify soybean lines that hold up better under drought. It will also create tools that breeders can use to identify drought tolerant lines. It is a collaborative work across different states using real farming conditions to ensure the results are practical and useful.
Benefit to Midsouth Farmers:	This project will lead to drought-tolerant lines that perform well under water-limited environments. It will also provide low-cost, fast ways to check for drought stress in the field, The results can help farmers grow more reliable crop, reduce water use, and improve profit during dry years.
Progress Made:	Define sites have been already identified. 10 elite lines have been tested in Vernon, TX this year for preliminary test.

Signature of Principle Investigator/Authorized Signer:	Date:
C. Megan Faulkner	7-12-2025

This document should remain as a SINGLE PAGE for the BOARD MEMBER'S QUICK REFERENCE. Email form (no pdf) to midsouthsoybean@gmail.com and swsoy@aristotle.net.

2026 Midsouth Soybean Board

PROPOSAL TITLE: Screening elite soybean lines for drought tolerance and developing high-throughput drought screening methodologies for the Mid-South

INVESTIGATORS:

- ***Dr Feng Lin (Lead PI),*** *Assistant Professor, University of Missouri Portageville Fisher Delta Research, Education, Extension, and Center, flbn7@missouri.edu, 573-379-5431 ext 229*
- ***Dr Caio Canella Vieira (Co-PI),*** *Assistant Professor, University of Arkansas, caioc@uark.edu, 573-825-1795*
- ***Dr Moseley David (Co-PI),*** *Assistant Professor, Louisianna State University AgCenter, DMoseley@agcenter.lsu.edu, 479-466-0457*
- ***Dr Waltram Ravelombola (Co-PI),*** *Assistant Professor, Texas A&M AgriLife, waltram.ravelombola@ag.tamu.edu, 662-684-9739*
- ***Dr Francia Ravelombola (Co-PI),*** *Research Scientist, University of Missouri, Portageville, srnmv@missouri.edu, 479-316-1060*

PROGRAM AREA (check all that apply):

___ New Uses of Soybean
___ Soybean Oil or Soybean Meal Uses
___ Food Grade Soybean
___ Soybean Fuel
_✓_Soybean Breeding and Genetics
___ Weed Management
_✓_Irrigation/Water Management
___ Seed Quality
___ Disease Management and Control
___ Fertility Management
___ Insect Management/Control
___ Harvest aids
___ Nematode Management/Control
___ Rotations using soybeans
___ Research Validation or Demonstration
___ Producer Communications
___ Variety Trials
___ Economics
___ Other (*Identify*)_____

PROJECT STATUS:

New **1** (*Indicate planned length of project–1 of 2, 1 of 3, etc. Note that projects are only approved on a yearly basis.)* Expected research length (yr) **5**

Renewal (Year of) Remember if you are presenting a renewal, your writing should speak mostly about what you are doing in the following year. You should not be re-requesting money for year one goals. Make sure it is clearly demonstrating progress; have a clear intention of your expected outcomes in the current year, not just over the program life.

Stand alone ___ or cross-commodity ___ (*additional funding from other sources? Name all other sources and amounts co-funded.* _____

2026 TOTAL FUNDING REQUEST $ 65,000_____

2026 MSSB RESEARCH PROJECT PROPOSED BUDGET			
CATEGORY *(see below for guidelines)*		**ORIGINAL**	
A.	**Personnel** (No Permanent Salaries)		
	1. Salaries (See Addendum B)	$15,000	
	2. Wages (hourly workers)		
	3. GRA (include tuition)		
B.	**Fringe Benefits** (36.53%)	$5,480	
C.	**Travel**	$4,000	
D.	**Contractual Services**		
E.	**Subcontracts**	$40,000	
F.	**Commodities**		
G.	**Publication Costs**		
H.	**Other Costs** *(Materials and Supplies)*	$520	
TOTAL COST		$65,000	
(MSSB does not allow indirect costs/overhead charges)			

Personnel*: Show number of hours x hourly rate for each category. GRA cost to include tuition and books. MSSB does not pay salaries of principal investigators or cooperating scientists (USB Compliance Manual, Sect. 17, Part 2-D).*
Fringe Benefits: *Amount and rate for indicated salaries, wages, and GRAs must be shown.*
Travel*: Out-of-pocket and per diem expenses (hotel and meals) for site visits, travel to and from meetings (e.g. airfare, vehicle mileage not to exceed the IRS rate), etc.*
Contractual Services*: External lab fees, consultants, etc.*
Commodities*: Expenses related to the conduct of the project (e.g., seed, fertilizers, pesticides, lab supplies).*
Additional Details*: Provide for each budget category in addendum if necessary.*
Reminder*: All payments for project activities are on a reimbursable basis based on an itemized invoice submitted to MSSB each quarter along with a progress report.*
Budget Transfers*: The MSSB follows USB guidelines, which state "The PI may transfer funds amongst budget categories only with MSSB's prior written consent if (i) the amount transferred exceeds 10% of any one general budget category (per annual period) or (ii) the funds transferred are travel related. PI shall request permission from MSSB for all budget reallocations and account for them in his/her financial report."*
Additional Instructions: *See Addendum B.*

TECHNICAL SUMMARY

Drought stress is a major limiting factor for soybean production across the Mid-South, where inconsistent rainfall patterns and high summer temperatures increasingly threaten seed yield stability. As these conditions become more frequent, there is a pressing need to develop drought-tolerant soybean varieties. Despite ongoing breeding efforts, there is still limited information on how to properly select elite high-yielding lines that perform best under drought conditions across Mid-South environments. This proposal aims to (1) develop and validate high-throughput, drought phenotyping tools using drone-based imagery and (2)screen elite soybean lines for drought tolerance across key environments in the Mid-South. The study will be conducted collaboratively between the University of Missouri, Arkansas, Louisiana, and Texas A&M AgriLife. A combination of irrigated and rainfed field trials will be used to assess drought tolerance under real-world conditions. Multiple drone-derived imaging features will be explored to estimate seed yield loss and physiological measurements that can be detected earlier in the season. This integrated approach will enable the identification of drought-tolerant soybean lines and establish reproducible methods for rapid screening, ultimately improving seed yield stability and reducing soybean production losses across the Mid-South.

OUTLINE OF RESEARCH

RATIONALE/JUSTIFICATION FOR RESEARCH:

The Mid-South region produces soybeans on over eight million acres, with a large portion managed under irrigation. However, the increasing frequency of drought, extreme heat, and groundwater depletion threatens the long-term sustainability of soybean production. In addition, Mid-South farmers relying on rainfed systems are especially vulnerable to yield losses under drought conditions. Current commercial soybean varieties have not been specifically developed for resilience to drought conditions, particularly the Mid-South's unique drought and heat stress patterns. National efforts have been made to understand drought response, including United Soybean Board (USB) initiatives focusing primarily on traits like canopy wilting. However, current phenotyping methods are based on

subjective visual ratings, making them inconsistent, labor-intensive, and not reproducible. It remains a critical gap in developing standardized, high-throughput screening methods that can efficiently identify drought-tolerant lines suited for the Mid-South. This proposal addresses these gaps by testing elite soybean lines with high-throughput phenotyping methods using drones. By screening under both irrigated and rainfed field conditions, we aim to identify soybean lines that have minimal yield loss under drought conditions while maintaining high yield potential under irrigation. The economic importance of this work is further highlighted by the potential for the resilient cultivars to reduce irrigation needs, and extend soybean production into marginal areas.

OBJECTIVE(S):

1) Develop and then validate high-throughput screening tools using drone-based and physiological data to identify traits associated with drought tolerant These tools will facilitate selection processes and improve the efficiency of breeding programs focused on developing drought-tolerant cultivars.
2) Screen elite soybean lines for drought tolerance across multiple Mid-South environments under irrigated and rainfed conditions in Missouri, Arkansas, Louisiana, and Texas. This screening will help identify genotypes with high yield and stable performance, and minimal yield loss under drought conditions.

APPROACH AND EXPERIMENT CONDUCT:

Objective 1:

We will conduct standardized drone flights at all field sites between 11:00 AM to 2:00 PM on non-cloudy days to ensure consistent lighting conditions and minimize data variability. Flights will occur at both vegetative and reproductive growth stages. Images during the vegetative stage can detect early canopy and water use efficiency, while pod retention and stress impact during grain fill at the reproductive stage. Drones will be equipped with multispectral cameras, which provide NDVI and red-edge reflectance that are sensitive indicators of water status and photosynthetic capacity. These

indicators allow early detection of stress responses prior to visible symptoms and are essential for identifying drought-tolerant genotypes. Multispectral imagery will be validated using ground-based physiological measurement with the MultispeQ device. This tool (non-destructive) will measure canopy traits and proxies of photosynthetic activity. These measurements will support the identification of traits associated with drought tolerance other than canopy wilting.

Objective 2:

We will evaluate approximately 60 elite soybean (MG 4 and MG 5) lines from ongoing breeding programs at the University of Missouri and Arkansas. Multi-environment trials will be conducted in Missouri (Portageville), Arkansas (Stuttgart), Louisiana (Red River Research Station, Bossier City), and Texas (Vernon). Each site will include both irrigated and non-irrigated treatments to assess drought responses. Experiments will be arranged in a randomized complete block design with three replications per treatment. Field sites will cover key Mid-South soil types, silt loam (Portageville), loam (Stuttgart), sandy (Bossier City), sandy loam (Vernon). Agronomic traits such as seed yield, seed size, maturity, lodging, and plant height will be collected at each site. Seed yield loss will be evaluated, and a stability analysis will be conducted to identify genotypes best suited for non-irrigated conditions. Environmental data, including daily precipitation and minimum and maximum temperatures, will be recorded from planting to harvest. This data will be used to characterize drought stress patterns and support genotype-by-environment interaction.

PROJECTED IMPACT OF RESULTS ON MID-SOUTH SOYBEAN PRODUCTION

This project will establish a practical, high-throughput screening methodology to detect and combine drought tolerant traits beyond canopy witling. While genetics gain take years, this approach addresses the Mid-South pressing need: rainfed field face yield penalties that farmers cannot afford. The region has over eight million acres with a large portion managed under irrigation. A moderate 10% loss yield loss under drought that typically produce 50 bu/ac can result an estimated ~$ 400 million in lost revenue (at $10.27/bu). Developping drought tolerant varieties could potentially mitigate a fraction of

these loss in the the future, translation into meaningful economic impact and enhanced resilience even if irrigation remains widely used. The development of drone-based screening tools will make drought tolerance assessment more efficient, scalable, and reproducible for public breeding programs. These tools will accelerate the development of tolerant varieties, with downstream benefits for Mid-South growers. The research will also enable producers in rainfed areas, especially those farming marginal upland soils, to reduce production losses by adopting improved drought tolerant soybean varieties.

EXPECTED END PRODUCT(S)

The outcome of this project is to develop a standardized, drone-based throughput phenotyping protocol for drought screening using multispectral imaging, a breeding focused selection guide to support tolerant variety development in the mid-South. Results will be shared to the research and grower community through peer-reviewed publications, scientific presentations, meetings, and field days.

BUDGET JUSTIFICATION

A total of $25,000 is requested per year to conduct activities at the University of Missouri. $20,480 is requested to support 4 months of a research specialist ($45,000 base plus 36.53% fringe) that will coordinate the planting, maintenance, and harvesting of field trials, as well as data collection and analysis. Travel is requested for in-state plot installment and maintenance ($4,000). A total of $520 is requested for materials and supplies including but not limited to planting boxes, stakes, flags, envelopes, and mash bags. A total of $40,000 is requested to conduct activities at the University of Arkansas ($20,000), University of Louisiana ($10,000), and Texas A and M ($10,000).

18 - RI-17

Project Title	Initiative of a Soybean Mutation Breeding Pipeline: Creation of Superior Traits Towards Quick Releasing Improved Soybean Varieties		
PI's Name	Feng Lin	E-mail	Flbn7@missouri.edu
PI's Title	Assistant Professor	Institution:	The Curators of the Univ of MO
Mailing Address	Sponsored Programs Administration, 601 Turner Avenue, Turner Avenue Garage, Room 201		
City/State/Zip	Columbia, MO 65211-0001		
Phone number	(573) 882-7560		
Additional PIs For this project	Cheryl Adeva		
Research locations (states involved)	Missouri		

Timeline: Current Year - FY26		**Multi-Year Project Information** (if applicable)		
		Year 1	Year 2	Year 3
Start Date		**04/01/2026**		
End Date		**03/31/2027**		
Funds Requested	$	$15,000	$	$

Program Area:	
Other related funding:	NA
Objectives:	Establish a stable soybean mutation breeding pipeline at the Fisher Delta Research, Extension, and Education Center (MU-FDREEC) to quickly develop and introduce beneficial mutations into elite soybean background towards fast releasing new and improved varieties, through the deployment of fast neutron mutagenesis.
Justification:	We could accelerate the development of a new improved soybean cultivar which provides a more efficient alternative to conventional breeding methods.
Exp Setup:	Development and selection of superior mutated progenies for desirable agronomic (maturity, high yield) and seed composition traits (high oil, high protein). Yield trials and agronomic performance evaluation.
Summary:	We will apply the high-efficient fast neutron mutagenesis on elite soybean cultivars most recently released by the MU-FDREEC soybean breeding program, to select for superior mutated progenies that keep most of the superior traits of the parent, while also outperform their elite parent in one or more traits (such as seed composition, stress resilience, and yield) which can be quickly released as new and improved soybean varieties through a few more years' validation and tests.
Benefit to Midsouth Farmers:	The success of this project is anticipated to provide several economically important traits, such as high protein, high oil, and high yielding, and can quickly release superior soybean lines compared to conventional breeding pipelines. The improved novel soybean varieties can significantly increase farmers' premium income.
Progress Made:	Selection of two elite soybean varieties were exposed to fast neutron mutagenesis and the M0 seeds are currently planted and grown at the Lee Farm, Portageville for field evaluation and selection.

Signature of Principle Investigator/Authorized Signer for SPA:	Date:
	7/1/2025

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2026 Midsouth Soybean Board

PROPOSAL TEMPLATE *(Limit the final document to 8 pages)*

PROPOSAL TITLE: Initiative of a Soybean Mutation Breeding Pipeline: Creation of Superior Traits Towards Quick Releasing Improved Soybean Varieties

INVESTIGATORS:
PI: Feng Lin, Assistant Professor, University of Missouri-Fisher Delta Research, Extension, and Education Center, Phone No.: 573-379-5431 ext 229, Email: flbn7@missouri.edu

Co-PI: Cheryl Adeva, Post Doctoral Fellow, University of Missouri-Fisher Delta Research, Extension, and Education Center, Phone No.: 573-391-0990, Email: cakmy@missouri.edu

PROGRAM AREA (check all that apply):

___ New Uses of Soybean
___ Soybean Oil or Soybean Meal Uses
___ Food Grade Soybean
___ Soybean Fuel
_✓_ Soybean Breeding and Genetics
___ Weed Management
___ Irrigation/Water Management
___ Seed Quality
___ Disease Management and Control
___ Fertility Management
___ Insect Management/Control
___ Harvest aids
___ Nematode Management/Control
___ Rotations using soybeans
___ Research Validation or Demonstration
___ Producer Communications
___ Variety Trials
___ Economics
___ Other (*Identify*)_____

PROJECT STATUS:

New ✓ *(Indicate planned length of project–1 of 2, 1 of 3, etc. Note that projects are only approved on a yearly basis.)* Expected research length (yr) 5

Renewal ____ (Year ____ of ___) Remember if you are presenting a renewal, your writing should speak mostly about what you are doing in the following year. You should not be re-requesting money for year one goals. Make sure it is clearly demonstrating progress; have a clear intention of your expected outcomes in the current year, not just over the program life.
Stand alone ___ or cross-commodity ___ (*additional funding from other sources? Name all other sources and amounts co-funded.* _____

2026 TOTAL FUNDING REQUEST $ 15,000.00

2026 MSSB RESEARCH PROJECT PROPOSED BUDGET			
CATEGORY *(see below for guidelines)*		**ORIGINAL**	
A.	**Personnel** (No Permanent Salaries)		
	1. Salaries (See Addendum B)		
	2. Wages (hourly workers)	$3,000.00	
	3. GRA (include tuition)		
B.	**Fringe Benefits** (% *used to calculate*)	$230.00	
C.	**Travel (**Domestic**)**	$2,800.00	
D.	**Contractual Services**		
E.	**Subcontracts**		
F.	**Commodities**		
G.	**Publication Costs**		
H.	Other Costs		
	Fast Neutron Radiation Service	$4,500.00	
	Research Plot Fee and Field Supplies	$870.00	
	Seed Composition Analysis	$2,000.00	
	Winter Nursery Service	$1,600.00	
TOTAL COST		**$15,000.00**	
(MSSB does not allow indirect costs/overhead charges)			

Personnel*: Show number of hours x hourly rate for each category. GRA cost to include tuition and books. MSSB does not pay salaries of principal investigators or cooperating scientists (USB Compliance Manual, Sect. 17, Part 2-D).*
Fringe Benefits: *Amount and rate for indicated salaries, wages, and GRAs must be shown.*
Travel*: Out-of-pocket and per diem expenses (hotel and meals) for site visits, travel to and from meetings (e.g. airfare, vehicle mileage not to exceed the IRS rate), etc.*
Contractual Services*: External lab fees, consultants, etc.*
Commodities*: Expenses related to the conduct of the project (e.g., seed, fertilizers, pesticides, lab supplies).*
Additional Details*: Provide for each budget category in addendum if necessary.*
Reminder*: All payments for project activities are on a reimbursable basis based on an itemized invoice submitted to MSSB each quarter along with a progress report.*
Budget Transfers*: The MSSB follows USB guidelines, which state "The PI may transfer funds amongst budget categories only with MSSB's prior written consent if (i) the amount transferred exceeds 10% of any one general budget category (per annual period) or (ii) the funds transferred are travel related. PI shall request permission from MSSB for all budget reallocations and account for them in his/her financial report."*
Additional Instructions: *See Addendum B.*

TECHNICAL SUMMARY

The major goal of this project is to establish a stable soybean mutation breeding pipeline to quickly create and introduce beneficial mutations into elite soybean background towards fast releasing new and improved varieties, through the deployment of fast neutron mutagenesis. To date, mutation breeding has been successfully used in crop breeding by identifying beneficial mutations that can improve important agronomic traits. In soybean, beneficial mutations have been reported on seed composition, gnarled trichomes, seed coat color, and dwarfed plants. To induce mutations in plants, multiple chemical and physical mutagens can be used, such as neutrons, beta particles, X-rays, gamma rays, and alkylating agents, yet the most successful mutagen is the fast neutron mutagenesis, due to its high efficiency to create multiple types of mutations, such as single nucleotide changes, deletions, duplications, inversions, and translocations. However, to date, most of the mutation studies have been carried out using germplasm and are focused on expanding genetic diversity, discovering new traits, and dissecting the genetic components of the mutated loci, yet little effort has been made to integrate the creation of mutations into soybean breeding pipeline. As such, in this project, we will apply the high-efficient fast neutron mutagenesis on elite soybean cultivars most recently released by the University of Missouri-Fisher Delta Research, Extension, and Education Center (MU-FDREEC) soybean breeding program, to select for superior mutated progenies that keep most of the superior traits of the parent, while also outperform their elite parent in one or more traits (such as seed composition, stress resilience, and yield), which can be quickly released as new and improved soybean varieties through a few more years' validation and tests. We aim to establish a steady mutation breeding pipeline at the MU-FDREEC soybean breeding program as a complementary methodology in addition to the current conventional breeding pipeline.

OUTLINE OF RESEARCH

RATIONALE/JUSTIFICATION FOR RESEARCH:

OBJECTIVE(S): The long-term goal of our proposed project is to develop, select, and release mutant

lines with elite background while improved in one or more traits, such as yield, oil, protein, and fatty acids. To achieve this goal, we proposed the following objectives for the first year of this project:

1. Create soybean mutation populations using fast neutron radiation mutagenesis.
2. Screen soybean mutation progeny M1 plants for field performance, select for desirable agronomic (maturity, yield) and seed composition traits (high oil, high protein), and propagate selected M1 plants to M2 progeny seeds in winter nursery.
3. Establish a steady soybean mutation breeding pipeline at the MU-FDREEC.

APPROACH AND EXPERIMENT CONDUCT:

Objective 1

During the initial year (YEAR 1) of the proposed project, a total of 10,000 seeds (5,000 seeds of S19-10701 and 5,000 seeds of S19-12537) were selected and subjected to a controlled exposure of fast neutron irradiation at a dosage of 30 Gray (Gy) units to generate mutant populations (Figure 1). The two lines were selected because of their elite background such as high yielding, high stability, and resilience to stress and diseases.



Figure 1. Seeds of two elite soybean lines along with their mutants generated through controlled exposure to fast neutron irradiation at a dosage of 30 Gray units.

Objective 2

Following this exposure, the 10,000 M0 seeds are currently planted and grown at the Lee Farm, Portageville, Missouri in a single row for field evaluation and selection. At this stage, it is expected that about 5% of the M0 lines, totaling 500 plants, will be selected based on field observations. M2 seeds will be harvested from each individual M1 plant following the Single Seed Descent (SSD) technique. During this period, various seed quality tests will be performed including 100-seed weight and seed composition analysis of fatty acid, protein, and oil content. Approximately 500 M2:1 lines will be selected based on these quality tests and yield performance. Subsequently, the 500 M2:2 seeds harvested from M2:1 plants will be sent to a winter nursery in Costa Rica for one generation of seed increase to achieve M2:3 seeds. Within the same year, another set of soybean seeds that were released in the prior year will be exposed to fast neutron radiation for the purpose of mutagenesis.

In YEAR 2, Costa Rica will send the M2:3 seeds, harvested from individual M2:2 plants after one generation of increase, back to the MU-FDREEC before planting season. Approximately 400 M2:3 lines will be planted and grown in a single row at the Lee Farm in Portageville, Missouri. In this generation, M2:4 seeds will be harvested from approximately selected 100 M2:3 lines.

In YEAR 3, a mutation preliminary yield trial (MPYT) for approximately 100 M2:4 lines will be conducted at the Lee Farm in Portageville, Missouri with three replications. The M2:5 seeds will be harvested from the M2:4 plants. At this stage, seed quality tests will be carried out on the M2:5 seeds to confirm the levels of fatty acids, protein, oil, and 100-seed weight and will be compared with the original elite background lines, S19-10701 and S19-12537. Approximately, 20 M2:5 lines will be selected based on the results of the seed quality tests and yield performance.

After achieving a successful MPYT, the mutation advanced yield trial (MAYT) will be performed from the selected 20 M2:5 lines at the MU-FDREEC and other selected locations with two or three replications in YEAR 4. The selected 20 M2:5 lines will also be tested under flood and drought conditions. Disease resistance will also be taken into consideration with the utilization of selection markers for

disease evaluation. After the trial, M2:6 seeds will be harvested from M2:5 plants. At this stage, seed quality tests will be carried out once more on the M2:6 seeds to confirm the levels of fatty acids, protein, oil, and 100-seed weight and will be compared again with the original elite background lines. Whole genome resequencing (WGS) will be carried out comparing the mutant lines with the original elite background lines.

In YEAR 5, after achieving a successful MAYT and mutant selection, approximately 2-3 mutant lines with outperformed yield performance or other traits will be selected for potential release. This selection will also consider other desirable traits in seed composition such as high oleic and low linolenic, high protein, high oil, high stearic, high amino acids, and high sugar content. In this proposed project, regional trials will be optional, as the mutant lines originate from elite soybean lines.

Objective 3

Mutation breeding has a well-recognized history in the advancement of soybean varieties. This approach not only aids in the identification of new beneficial genes but also reduces the time required to develop new varieties with improved traits. The Soybean Breeding Group at the MU-FDREEC plays an important role in advancing research in the field of soybean. Our program aims on establishing a steady soybean mutation breeding pipeline by deploying the fast neutron mutagenesis technique, with a long-term goal of developing, selecting, and releasing mutant soybean lines that possess elite genetic backgrounds. Figure 2 provides an overview of the soybean mutation breeding pipeline for this proposed project.

PROJECTED IMPACT OF RESULTS ON MID-SOUTH SOYBEAN PRODUCTION

The success of this project is anticipated to yield several economically important traits, such as high protein, high oil, and high yielding, and can quickly release superior lines compared to conventional breeding pipelines. The project has the potential to give U.S. soybean farmers an increase in their income by offering new improved soybean lines with high protein, high oil, and high yield.

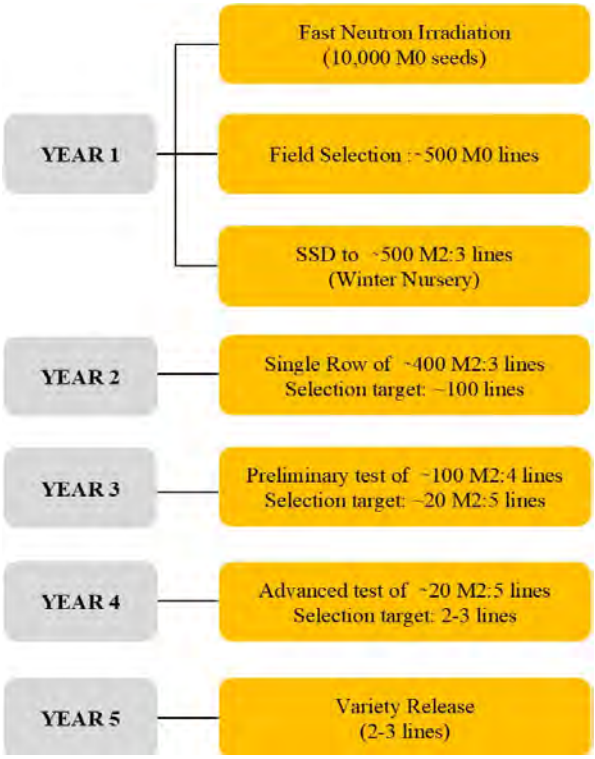


Figure 2. Overview of the proposed soybean mutation breeding pipeline

EXPECTED END PRODUCT(S)

The expected end products from this project include: (1) release of new improved soybean varieties which keep most of the superior traits of the parent, while also outperform their elite parent in one or more traits (such as seed composition, stress resilience, and yield); and (2) establishment of a steady soybean mutation breeding pipeline at the MU-FDREEC as a complementary methodology in addition to the current conventional breeding pipeline.

APPENDIX A
Explanation/Justification of Budget Categories

Personnel ($3,000)

Funds are requested for a part-time research technician to conduct proposed research activities at the University of Missouri-Fisher Delta Research, Extension, and Education Center in Portageville under the supervision of Feng Lin. The salary of the part-time research technician is for 200 hours at $15 hourly rate.

Fringe ($230)

Employee benefits are estimates using the composite rates agreed upon by the University of Missouri. The benefit rate is 7.65% (FICA Only) for the part-time research technician.

Travel ($2,800)

Funds in the amount of $2,800 ($.655 cents per mile for an estimated 4,275 miles) are requested for mileage for plot visit, harvest, and management.

Other Direct Costs ($8,970)

Budget in the amount of $4,500 is requested for Fast Neutron Radiation Service to generate our mutant populations. Budget in the amount of $870 is requested for research plot fee paid to the Delta Center for the land use for field experiments and for field supplies. Budget in the amount of $2,000 is requested for seed composition analysis of the generated mutant lines. Budget in the amount of $1,600 is requested for winter nursery service to advance our breeding materials in Costa Rica.

2026 MID SOUTH SOYBEAN BOARD

19 - RI-18

Project Title	Foliar boron application to minimize flowers abortion and improve yield in soybean under drought/rainfed conditions		
PI's Name	Avat Shekoofa	E-mail	ashekoof@utk.edu
PI's Title	Associate Professor	Institution:	The University of Tennessee (UT)
Mailing Address	605 Airways Blvd		
City/State/Zip	Jackson, TN 38301		
Phone number	731-425-4704 cell#: 919-758-4972		
Additional PIs For this project	Nazir Ahmad (Postdoc), UT; Nutifafa Adotey, Assistant Professor, (UT); Caio Canella Vieira, Assistant Professor of Soybean, Univ. of AR		
Research locations (states involved)	Tennessee		

Timeline: Current Year - FY26		**Multi-Year Project Information** (if applicable)		
		Year 1	Year 2	Year 3
Start Date	**April 1, 2026**			
End Date	**March 31,2027**			
Funds Requested	$39,868			

Program Area: Fertility management, irrigation/water management, flowers retention, research validation or demonstration, economics

Objectives:	To identify the optimum foliar boron (B) rate and application stage to reduce flowers abortion and improve pod setting in soybean under drought/rainfed conditions using physiological, biochemical, and reproductive/yield metrics. Year 1 will focus on greenhouse optimization; Year 2 will validate the strategy in the field.
Justification:	Soybeans are a boron-immobile species with limited internal boron redistribution under drought. Boron is essential for pollen tube growth and fertilization, directly influencing flowers retention, pods number, and yield. This research focus on a critical area in optimizing micronutrient fertility under dryland conditions, particularly during the reproductive period for the Mid-South.
Exp Setup:	The project includes two phases: (1) a greenhouse study with multiple foliar B rates and application stages under controlled drought stress conditions using high- and low-flowers abortion genotypes; (2) fields validation study at the rainfed/rainout shelter research site at UT in Jackson, TN. Replicated RCBD designs will be used.
Summary:	This project addresses yield loss due to flowers abortion in drought-prone environments; by identifying B application strategies, reducing flowers loss, and improving pod setting. The project supports cost-effective fertility management recommendations for Mid-South soybean growers.
Benefit to Midsouth Farmers:	The project will deliver practical guidance on when and how much boron to apply to help with reproductive stress periods. Farmers will benefit from reduced flowers abortion, improved pod set, and better drought resilience, contributing to more stable yields and return on investment.
Progress Made:	Preliminary physiological screening under drought has shown significant variation in flowers abortion between soybean genotypes. The experimental design and lab procedures are ready to be implemented pending funding.
Signature of Principle Investigator:	Date: Avat Shekoofa 07/14/2025

2026 Midsouth Soybean Board

PROPOSAL APPENDICES

PROPOSAL TITLE: *Foliar boron application to minimize flowers abortion and improve yield in soybean under drought/rainfed conditions*

Appendix A: Budget Narrative

A.Senior/Key Personnel

None requested.

B. Other Personnel - $37,468

The salary and fringe benefit (35.2%) of a postdoc (anticipated Nazir Ahmad) who will be spending a portion of his time on this project. Effort at 51.25% on this project.

C. Equipment

None requested.

D. Travel - $800

Travel for sharing results in a national conference.

E. Participant/Trainee Support Costs

None requested.

F. Other Direct Costs - $1,600

West Tennessee Research and Education Center (WTREC) experimental site costs - $500

Chemical, controlled environmental supplies and management during study - $1,100

G. Total Direct Costs - $39,868

H. Indirect Costs

None requested.

Total Direct and Indirect Costs are $39,868

2026 MID SOUTH SOYBEAN BOARD

ONE PAGE SUMMARY

Project Title	Genetic Approaches for Enhancing Salt Tolerance in Soybean		
PI's Name	Caio Canella Vieira	E-mail	caioc@uark.edu
PI's Title	Assistant Professor	Institution:	University of Arkansas
Mailing Address	495 N Campus Walk, Office 105		
City/State/Zip	Fayetteville, Arkansas, 72701		
Phone number	573-825-1795		
Additional PIs For this project	Trent Roberts, Professor of Soil Fertility/Soil Testing, University of Arkansas, 479-575-6752, tlrobert@uark.edu. Laavanya Rayaprolu, Post-doctoral Fellow, University of Arkansas, 479-575-2354, lr141@uark.edu.		
Research locations (states involved)	Arkansas: Fayetteville and Rohwer		

Timeline: Current Year - FY26		**Multi-Year Project Information** (if applicable)		
		Year 1	Year 2	Year 3
Start Date	April 1, 2026 March 31, 2027			
End Date				
Funds Requested	$53,512	$	$	$

Program Area:	
Other related funding:	
Objectives:	The objectives of this proposal include i) characterize the genetic architecture of diverse soybean genotypes under different chloride concentrations, and ii) develop breeding populations with chloride tolerance suitable for production in the U.S. mid-South.
Justification:	Soil salinity significantly reduces soybean yield and quality, with sodium and chloride toxicity posing major challenges in arid and semi-arid regions. This project aims to assess soybean genotypes from vegetative to maturity stages to identify key mechanisms of chloride tolerance, thereby guiding the development of chloride-excluding cultivars for Mid-South production systems.
Exp Setup:	Trials will be conducted to assess a diverse soybean population to different chloride concentrations, perform mapping studies, and eventually select advanced breeding materials with improved chloride tolerance.
Summary:	Diverse genotypes may respond differently to chloride stress. Structural traits associated with chloride uptake and exclusion will help identify genotypes with improved physiological responses. The inclusion of genotype and phenotype data will help accelerate the breeding of chloride-excluding cultivars for the U.S. Mid-South.
Benefit to Midsouth Farmers:	This project will develop chloride-excluding soybean cultivars to enhance productivity on salt-affected soils in the U.S. Mid-South, providing tools, data, and germplasm that improve sustainability and profitability.
Progress Made:	New project

Signature of Principle Investigator: **Caio Canella Vieira**	Date: 7/15/2024

This document should remain as a SINGLE PAGE for the BOARD MEMBER'S QUICK REFERENCE. Email form (no pdf) to midsouthsoybean@gmail.com and swsoy@aristotle.net.

18 - RI-19

2026 Midsouth Soybean Board

PROPOSAL TEMPLATE *(Limit the final document to 8 pages)*

PROPOSAL TITLE: **Genetic Approaches for Enhancing Salt Tolerance in Soybean**

INVESTIGATORS:

PI: Caio Canella Vieira, Assistant Professor of Soybean Breeding, University of Arkansas, 573-825-1795, caioc@uark.edu.

Co-PI: Trent Roberts, Professor of Soil Fertility/Soil Testing, University of Arkansas, 479-575-6752, tlrobert@uark.edu.

Co-PI: Laavanya Rayaprolu, Post-doctoral Fellow, University of Arkansas, 479-575-2354, lr141@uark.edu.

PROGRAM AREA (check all that apply):

___ New Uses of Soybean
___ Soybean Oil or Soybean Meal Uses
___ Food Grade Soybean
___ Soybean Fuel
_X_ Soybean Breeding and Genetics
___ Weed Management
___ Irrigation/Water Management
___ Seed Quality
___ Disease Management and Control
___ Fertility Management
___ Insect Management/Control
___ Harvest aids
___ Nematode Management/Control
___ Rotations using soybeans
___ Research Validation or Demonstration
___ Producer Communications
___ Variety Trials
___ Economics
_X_ Other (*Identify*): Soil management

PROJECT STATUS:

New **X**, Expected research length (yr) **3 years**

Stand-alone **X**

2026 TOTAL FUNDING REQUEST $ 53,239

2026 MSSB RESEARCH PROJECT PROPOSED BUDGET

CATEGORY *(see below for guidelines)*		**ORIGINAL**	
A.	**Personnel** (No Permanent Salaries)		
	1. Salaries (See Addendum B)	$21,000	$1,750 for 12 months
	2. Wages (hourly workers)		
	3. GRA (include tuition)	$7,248	$453 for each credit Total 16 credits
B.	**Fringe Benefits** (% *used to calculate*)	$1,344	6.40%
C.	**Travel**		
D.	**Contractual Services**	$20,000	$12.50 per sample; total 1600 samples Soil fertility/testing
E.	**Subcontracts**	$1,920	Greenhouse space
F.	**Commodities**	$2,000	Greenhouse supplies and software purchases
G.	**Publication Costs**		
H.	Other Costs *(Define)*		
TOTAL COST			$53,512

(MSSB does not allow indirect costs/overhead charges)

Personnel*: Show number of hours x hourly rate for each category. GRA cost to include tuition and books. MSSB does not pay salaries of principal investigators or cooperating scientists (USB Compliance Manual, Sect. 17, Part 2-D).*
Fringe Benefits: *Amount and rate for indicated salaries, wages, and GRAs must be shown.*
Travel*: Out-of-pocket and per diem expenses (hotel and meals) for site visits, travel to and from meetings (e.g. airfare, vehicle mileage not to exceed the IRS rate), etc.*
Contractual Services*: External lab fees, consultants, etc.*
Commodities*: Expenses related to the conduct of the project (e.g., seed, fertilizers, pesticides, lab supplies).*
Additional Details*: Provide for each budget category in addendum if necessary.*
Reminder*: All payments for project activities are on a reimbursable basis based on an itemized invoice submitted to MSSB each quarter along with a progress report.*
Budget Transfers*: The MSSB follows USB guidelines, which state "The PI may transfer funds amongst budget categories only with MSSB's prior written consent if (i) the amount transferred exceeds 10% of any one general budget category (per annual period) or (ii) the funds transferred are travel related. PI shall request permission from MSSB for all budget reallocations and account for them in his/her financial report."*
Additional Instructions: *See Addendum B.*

TECHNICAL SUMMARY

Soybean (*Glycine max* L. Merrill) is one of the world's most widely cultivated leguminous crops. As a major source of protein and oil for both domestic use and export, it plays a vital role in global food systems and U.S. trade. However, soil salinity has emerged as a growing threat to sustainable soybean production. In the U.S. mid-South, particularly in areas of poor drainage and groundwater with high electrical conductivity, soil salinity presents a significant challenge. Salt stress impairs germination, limits nutrient uptake, stunts vegetative growth, and reduces yield, putting both profitability and long-term productivity at risk. As part of an integrated management approach, the deployment of chloride-excluding soybean varieties is a major strategy to mitigate this condition. Despite significant advancements in identifying major genomic regions and candidate genes associated with salt tolerance, a significant portion of the observed phenotypic variation remains unexplained, a phenomenon known as missing heritability. Therefore, this proposal aims to further characterize the genetic architecture of salt tolerance in soybean using advanced genomics and phenomics tools, thus supporting the development of chloride-excluding cultivars adapted to the U.S. mid-South.

In the first year of the project, greenhouse studies will be conducted to screen genetically diverse soybean genotypes for their response to chloride under two treatments: a no-chloride control and one elevated chloride concentration designed to simulate mild and moderate stress levels. Traits such as germination rate**,** early seedling vigor**,** and root system architecture will be evaluated**.** High-throughput root phenotyping will be used to assess structural traits associated with chloride uptake and exclusion, such as root length, branching patterns, and root-to-shoot ratios. These measurements will help identify genotypes with improved physiological responses to high chloride during early developmental stages and provide foundational data for advancing chloride tolerance in breeding pipelines. High-density genotypic data, in combination with multi-layer phenotypic data, will be used to uncover significant marker-trait associations of various chloride tolerance traits. This will allow us to understand tolerance from multiple angles, thus accounting for the mentioned missing heritability. These findings will not only

enhance our understanding of the genetic architecture of chloride tolerance but also provide molecular markers to accelerate selection and introgression of favourable alleles in ongoing breeding programs in the U.S. mid-South.

OUTLINE OF RESEARCH

RATIONALE/JUSTIFICATION FOR RESEARCH. Soil salinity, a growing global issue, poses a significant threat to agricultural productivity, particularly in arid and semi-arid regions with low annual rainfall, including the United States. The Food and Agriculture Organization (FAO) reports that salinity affects 6 to 8% of the global land surface, covering approximately 800 million hectares. Soil salinity results from the accumulation of soluble salt ions, with sodium (Na^+) and chloride (Cl^-) being the most prevalent and harmful to plant growth (Munns and Tester, 2008).

Salinity has a profound impact on the growth, development, and productivity of soybeans, with both yield and agronomic quality being significantly compromised. A study by Chang et al. (1994) found that soybean cultivars grown in high salt concentration soils (14–15 dS/m) experienced a decrease in yield of up to 47.5%. High salinity reduces plant height, biomass, branch and pod number, seed weight, and nitrogen fixation efficiency, impacting final yield and key traits in soybean-based cropping systems (Abel & MacKenzie, 1964; Singleton & Bohlool, 1984; Delgado et al., 1994).

Previous work from Valencia et al. (2008) reported a major QTL for salt tolerance, named S-100, accounting for a large share of the phenotypic variance. A single dominant gene for salt tolerance was fine-mapped in soybean cultivar ‘Tiefeng 8’ to the same region as the previously described S-100 QTL (Guan et al, 2014). While previous studies have primarily focused on the germination and early seedling stages, our approach aims to evaluate plant genotypes through the vegetative stage in greenhouse conditions and up to maturity in field trials throughout the duration of this project (Years 2-3). This comprehensive assessment will provide deeper insights into the mechanisms of chloride uptake and tolerance across critical stages of plant development, thus helping to account for the so-called missing

heritability. Together, these findings highlight the need for targeted breeding efforts that enhance chloride tolerance across multiple developmental stages and preserve both yield potential and functional quality traits in soybeans.

OBJECTIVE(S): The objectives of this proposal are to i) characterize the genetic architecture of diverse soybean genotypes under different chloride conditions, and ii) develop breeding populations with chloride tolerance suitable for production in the U.S. mid-South.

APPROACH AND EXPERIMENT CONDUCT:

Objective 1: Characterize the genetic architecture of diverse soybean genotypes under different saline conditions and quantify the chloride in the plant tissue. This objective aims to evaluate a wide range of genetically diverse soybean accessions (~200 lines), including elite cultivars, landraces, and wild relatives, evaluated in greenhouse trials under two chloride treatments: control and moderate. Salinity concentrations in the greenhouse experiment will be calibrated to reflect the soil salinity profiles observed at the Rohwer Research Station, Arkansas. The experiment will be conducted in two batches with three replications. Traits measured include germination rate, seedling vigor, and seedling root architecture (via high-throughput imaging). Physiological assays, including chlorophyll content, will also be used to assess stress responses. The root and above soil biomass samples will be collected, dried, weighed, ground, and analysed using a water extraction method at the Soil Fertility/Testing Laboratory for chloride quantification.

Genome-wide association studies (GWAS) will be performed to identify significant marker-trait associations linked to chloride tolerance using multiple traits. Significant markers from GWAS will be used to guide marker-assisted selection (MAS) to improve populations for favorable alleles (Objective 2).

Objective 2: Develop breeding populations with chloride tolerance suitable for production in the U.S. mid-South. Breeding populations will be developed each year using at least one chloride-

excluding parental line identified in Objective 1. Populations will be advanced in an off-season nursery to reach homozygosity and evaluated in Arkansas and other mid-South locations for seed yield and agronomic traits. Molecular markers identified in Objective 1 will support the selection of chloride-excluding genotypes. Throughout the duration of the project, it is expected that highly adapted germplasm will be developed. In addition, as part of the Arkansas Soybean Breeding program (aaes.uada.edu/soybean), advanced and pre-commercial high-yielding materials with chloride-excluding phenotype will be commercially available with both conventional and herbicide-resistant (Enlist-E3 and XtendFlex) backgrounds. These will be available through the Arkansas Foundation Seed program (aaes.uada.edu/row-crops/seed) as well as licensing to local seed dealers.

PROJECTED IMPACT OF RESULTS ON MID-SOUTH SOYBEAN PRODUCTION

This project aims to address the increasingly prevalent soil salinity issue in the U.S. mid-South by developing and deploying chloride-excluding soybean cultivars. Enabling farmers to maintain high productivity on marginal, salt-affected soils is key to improving sustainability and profitability in the region. In the short term, this project will expand the knowledge base on chloride tolerance mechanisms in soybean, while providing public and private breeding programs with the tools needed to further develop improved chloride-excluding materials.

Ultimately, the impact of this work is expected to increase profitability, improve resource-use efficiency, and promote overall sustainability of soybean production in the U.S. mid-South. The tools, data, and germplasm generated will also serve as a national resource for addressing similar challenges in other salt-affected U.S. soybean-growing regions.

EXPECTED END PRODUCT(S)

End products of the project include i) germplasm and cultivars with enhanced chloride tolerance; ii) molecular markers associated with chloride tolerance traits; iii) peer-reviewed publications and methodologies for incorporation into public and private soybean breeding programs.

2026 MID SOUTH SOYBEAN BOARD

18 - RA-01

Project Title	Expanding Potential Market Demand for and Access to Whole Soy Foods through Nutrition Education		
PI's Name	Leigh Ann Bullington	E-mail	lbullington@uada.edu
PI's Title	Instructor- Family and Consumer Sciences Educator	Institution:	University of Arkansas Division of Agriculture
Mailing Address	502 N 3rd St.		
City/State/Zip	Augusta, AR 72006		
Phone number	(870)919-6109		
Additional PIs For this project	Sarah Wood - Assistant Extension Professor - State Nutrition Specialist University of Missouri		
Research locations (states involved)	Arkansas and Missouri – multiple counties in each state		

Timeline: Current Year - FY26		**Multi-Year Project Information** (if applicable)		
		Year 1	Year 2	Year 3
Start Date	4-1-2026	**4-1-2025**	**4-1-2026**	**4-1-2027**
End Date	3-31-2027	**3-31-2026**	**3-31-2027**	**3-31-2028**
Funds Requested	$46,245	$33,245	$46,245	$59,245

Program Area: Food Grade Soybeans, Research Validation and Demonstration, Producer Communications, Nutrition Education and Curriculum development.	
Other related funding:	None at the present time.
Objectives:	1. Increase awareness about soy foods in school and early childcare centers through an intervention involving taste tests and work with educational influencers. 2. Improve access to soy milk and whole/minimally processed soy foods in school and early childcare centers. 3. Increase the availability of soy foods in local food systems while exploring viable connections between producers and consumers. 4. Increase appeal and demand for soy foods through education that includes local demonstrations for consumers and producers.
Justification:	Consumers lack the nutritional knowledge of the value of including whole and minimally processed soy foods in a healthy diet.
Exp Setup:	April 1, 2025
Summary:	Cooperative Extension has the outreach expertise and experience to provide nutritional education on the benefits of including whole soy foods in the diet to a variety of consumers and to link producers with the market. Nutrition education is essential to increase the market demand for the inclusion of food-grade soybeans.
Benefit to Midsouth Farmers:	This project will potentially increase the use of soy as a staple of a healthy diet and in so doing increase the demand and income for food-grade soybean farmers.
Progress Made:	Nutrition education on the inclusion of whole minimally processed soy foods in consumer diets is currently being used through the Soy Chef sub grant. The AR /MO MSSB grant work is just beginning.

Signature of Principle Investigator:	Date:
Leigh Ann Bullington	7-21-2025

2026 Midsouth Soybean Board

PROPOSAL TEMPLATE *(Limit the final document to 8 pages)*

PROPOSAL TITLE: Expanding Potential Market Demand for and Access to Whole Soy Foods through Nutrition Education_____

INVESTIGATORS: Leigh Ann Bullington, Instructor – State FCS Educator, University of Arkansas Division of Agriculture (UADA) (870)919-6109 lbullington@uada.edu ; Keith Stathan-Cleek, Instructor – State FCS Educator, UADA (901)268-5046, kcleek@uada.edu ; Amber Hairston, Couty Extension Agent (CEA) Family and Consumer Sciences (FCS) – Ashely County, UADA, (870)853-2080 ahairston@uada.edu ; Christie Wagley, CEA-FCS Poinsett County, UADA, (870)578-4490, cwagley@uada.edu ; Julian Carpenter, CEA-FCS Independence County, UADA, (870)793-8840, jmcarpenter@uada.edu ; Dr. Lida Araghi, Assistant Professor Nutrition Family and Consumer Sciences UADA laraghi@uada.edu@uada.edu ; Sarah Wood, Assistant Extension Professor - State Nutrition Specialist, University of Missouri (MU), (573)882-6432, woodsarah@health.missouri.edu ; Hannah Whittaker, - MU Field Specialist in Nutrition and Health, 417-345-7551, hwhittaker@missouri.edu Rachel Livesay, MU Field Specialist in Nutrition and Health, 816-324-3147, rachellivesay@missouri.edu, Evan Holley - MU Field Specialist in Nutrition and Health, 573-663-7343, evanholley@missouri.edu,___

_____

PROGRAM AREA (check all that apply):

___ New Uses of Soybean
___ Soybean Oil or Soybean Meal Uses
_X_ Food Grade Soybean
___ Soybean Fuel
___ Soybean Breeding and Genetics
___ Weed Management
___ Irrigation/Water Management
___ Seed Quality
___ Disease Management and Control
___ Fertility Management
___ Insect Management/Control
___ Harvest aids
___ Nematode Management/Control
___ Rotations using soybeans
_X_ Research Validation or Demonstration
_X Producer Communications
___ Variety Trials
___ Economics
_X_ Other (*Identify*)_ Soy nutrition education curriculum development and increasing access to and demand for whole soy foods_____

PROJECT STATUS:

New ____ *(Indicate planned length of project–1 of 2, 1 of 3, etc. Note that projects are only approved on a yearly basis.)* Expected research length (yr)_____3 years_____

Renewal __X_ (Year _2_ of __3__) Remember if you are presenting a renewal, your writing should speak mostly about what you are doing in the following year. You should not be re-requesting money for year one goals. Make sure it is clearly demonstrating progress; have a clear intention of your expected outcomes in the current year, not just over the program life.

Stand alone _X_ or cross-commodity ___ (*additional funding from other sources? Name all other sources and amounts co-funded.* _____

2026 TOTAL FUNDING REQUEST $ ____30,000_____

2026 MSSB RESEARCH PROJECT PROPOSED BUDGET			
CATEGORY *(see below for guidelines)*		**ORIGINAL**	
A.	**Personnel** (No Permanent Salaries)		
	1. Salaries (See Addendum B)	$7500	
	2. Wages (hourly workers)		
	3. GRA (include tuition)		
B.	**Fringe Benefits** (% *used to calculate*)	$2145	
C.	**Travel**		
D.	**Contractual Services**		
E.	**Subcontracts**	$6500	
F.	**Commodities**		
G.	**Publication Costs**	$2500	
H.	Other Costs *(Define)*		
TOTAL COST		$5355	
(MSSB does not allow indirect costs/overhead charges)			

***Personnel**: Show number of hours x hourly rate for each category. GRA cost to include tuition and books. MSSB does not pay salaries of principal investigators or cooperating scientists (USB Compliance Manual, Sect. 17, Part 2-D).*
***Fringe Benefits:** Amount and rate for indicated salaries, wages, and GRAs must be shown.*
***Travel**: Out-of-pocket and per diem expenses (hotel and meals) for site visits, travel to and from meetings (e.g. airfare, vehicle mileage not to exceed the IRS rate), etc.*
***Contractual Services**: External lab fees, consultants, etc.*
***Commodities**: Expenses related to the conduct of the project (e.g., seed, fertilizers, pesticides, lab supplies).*
***Additional Details**: Provide for each budget category in addendum if necessary.*
***Reminder**: All payments for project activities are on a reimbursable basis based on an itemized invoice submitted to MSSB each quarter along with a progress report.*
***Budget Transfers**: The MSSB follows USB guidelines, which state "The PI may transfer funds amongst budget categories only with MSSB's prior written consent if (i) the amount transferred exceeds 10% of any one general budget category (per annual period) or (ii) the funds transferred are travel related. PI shall request permission from MSSB for all budget reallocations and account for them in his/her financial report."*
***Additional Instructions:** See Addendum B.*

TECHNICAL SUMMARY

Soybean farmers are uniquely poised to provide for – and profit from – the growing number of Americans turning to plant-based foods. The reasons for this dietary trend are numerous and not necessarily motivated by traditional reasons for avoiding meat. For example, Alpha-gal syndrome, a tick-borne disease that can cause allergies to milk and certain meats, is increasing by about 15,000 cases yearly with Arkansas, Missouri, and Kentucky leading in new infections (Ref 1). This emerging problem, combined with food allergies, lactose intolerance, and increased interest in the health benefits of plant-forward diets is likely to drive consumer demand for meat and dairy alternatives among people who would not otherwise choose a plant-based diet.

Fortunately, soybean farmers can offer a solution. Foods like soy milk, tofu, food-grade soybeans, and other soy foods provide an ideal alternative to animal protein, yet many Americans are unaware of the many flavors and recipes in which soy can be used. Whole soy foods remain drastically underutilized, with very few acres in the United States dedicated to food-grade soybeans. This systemic problem may present a competitive edge for farmers of food-grade soy, as specialty varieties of soybeans can be especially lucrative (Ref 2) and food-grade soybeans continue to sell at premium prices.

This proposed research aims to expand the market for soybean crops, beginning the process of integrating minimally processed soy foods into food culture in the Midsouth. The research will further the success of the multi-state *Soy Chef* collaboration and build on the contributions of B & B Legacy Farms.

Through education, outreach, and connecting new consumers to the market, this project aims to increase use of soy as a staple of a healthy and delicious diet, ultimately driving demand and income for food-grade soybean farmers.

OUTLINE OF RESEARCH

RATIONALE/JUSTIFICATION FOR RESEARCH:

Expanding the previous work done by Dr. Karen Ballard of B & B Legacy Farms, this project will increase the appeal of, access to, and demand for regionally grown, food-grade soybeans as a nutritious, delicious addition to a healthy diet through a multi-system approach that includes consumer research and education about the benefits of soy. The first year of this grant is centered on expanding partnerships, developing additional ones, and preparing materials to be used with those partners during the remainder of the grant and beyond.

OBJECTIVE(S), APPROACH AND EXPERIMENT CONDUCT:

Objective 1. Increase awareness about soy milk and whole / minimally processed (w/mp) soy foods in school and early childcare centers through a multipronged intervention involving taste tests and work with educational influencers.

Approach: To increase awareness of soy milk and (w/mp) soy foods as choices within the National School Lunch Program and for early childcare centers and expand knowledge about the use of soy as a healthy alternative for youth with allergies, lactose intolerance, or those who choose plant-based diets, the team will offer soy milk and (m/wp) soy food tastings within schools. These tastings will also provide an experiential learning opportunity regarding (w/mp) soy foods and soy milk's flavor profile and versatility. The team will explore options to provide resources and continuing education to school personnel and early childcare providers. Explore how Policy, Systems, and Environmental Change (PSE)) can remove barriers to accessing healthy food options.

Objective 2. Improve access to soy milk and (w/mp) soy foods in school and early childcare centers.

Approach: Work with schools and childcare centers to ensure compliance and availability of soy milk as an option for children who need or choose an alternative to dairy milk. Provide education, recipes

and help connect to sources to gain access to whole soy foods to potentially include in the school or center menus.

Objective 3. Increase the availability of soy foods in local food systems while exploring viable connections between producers and consumers.

Approach: Research strategies and opportunities to increase access to food-grade whole soybeans through local food systems including but not limited to small-scale growers, hobbyists, current soybean farmers, community gardens, and community-supported agriculture (CSA) programs. This will help expand market entrepreneurship opportunities for small and mid-sized soybean farmers and expand markets for large soybean growers in the Midsouth. Educational materials will be developed and provided to educators working with local farmers markets. Work with Extension agriculture educators holding educational sessions for local growers to learn about growing soybeans to sell at farmers markets or local grocery stores.

Objective 4. Increase appeal and demand for soy foods through education that includes local demonstrations for consumers and producers.

Approach: Building upon the successful Soy Chef grant, each year of the project will include unique education opportunities for consumers and producers. Extension educators will provide demonstrations, presentations, and taste tests of soy recipes accompanied by research-based health and nutrition information about the benefits of soy. The team will explore interest in integrating edible soybean gardening and other hands-on classroom experiences into already used curricula and develop new educational materials for audiences across the lifespan. Educational materials will focus on soy as a significant but overlooked source of a “complete protein” that contains plant-based nutrients important to biological functions and health maintenance. Activities will include education and outreach tailored to the interests of midsouth households and farmers in soybean-producing

counties. Existing partnerships and programs facilitated by local Extension educators will be leveraged for maximum reach and impact.

Summary: Cooperative Extension has the outreach expertise and experience to provide nutritional education on the benefits of including whole soy foods in the diet to a variety of consumers and to link producers with the market. Nutrition education is essential to increase the market demand for the inclusion of food-grade soybeans in food systems such as farmers markets and school lunch programs. The project aims to increase the use of soy as a staple of a healthy and delicious diet, ultimately driving demand – and income -- for food-grade soybean farmers. The project will include parallel processes targeting multiple audiences, educators, and influencers in groups of multiple market gatekeepers.

PROJECTED IMPACT OF RESULTS ON MID-SOUTH SOYBEAN PRODUCTION

Increased knowledge and access to regionally grown soybeans to consumers across the lifespan will support the bridge to market for regionally grown, food-grade soybeans. The impact of food demonstrations and tastings will increase the appeal and acceptance of soy milk and soy foods in the school lunch program. Acceptance in the school lunch program has the potential to increase the demand for food-grade soybeans exponentially not only across the mid-south but possibly across the nation. Local food systems such as farmers markets could be a viable market option for small-scale producers in the mid-south. Connecting consumers and producers through education to this market source will increase the production needs of regionally grown food-grade soybeans.

EXPECTED END PRODUCT(S)

Possible End Products suitable for posting on midsouthsoybeans.com or the national website:

- Fact sheets
- Educational Materials
- Recipes

Possible Conference Presentations, Posters, and Staffed Educational Exhibits:

- The 29th Annual National Conservation Systems Cotton & Rice Conference, the Southern Soybean & Corn Conference, the Southern Precision Ag Conference and the Delta States Irrigation Conference – February 5-6, 2026, Jonesboro AR
- National Extension Association of Family and Consumer Sciences (NEAFCS) – Sept. 28 - Oct.1, 2026 Knoxville TN or Sept. 13-16, 2027 Fort Lauderdale FL
- Society for Nutrition Education and Behavior - 2026 or 2027
- National Health Outreach and Engagement Conference - 2026 or 2027
- American Association of Family and Consumer Sciences
- Mid-South Farm and Gin Show
- Commodity Classic
- Arkansas Farm Bureau State Conference / Missouri Farm Bureau State Conference
- Arkansas Women in Ag Conference / MO Women in Agriculture Regional Events
- Arkansas Farm Bureau Women's Leadership Conference
- MO State Fair
- Missouri Soybean Festival
- Great Plains Growers Conference
- University of Missouri Extension and Engagement Week Conference

Possible Journal Articles:

- Journal of Nutrition Education and Behavior
- Journal of Extension
- Journal of NEAFCS

Educational Materials and additions to current curricula:

- High School Family and Consumer Sciences Teacher Lessons
- Soybean Nutrition Lesson for current gardening lessons
- Soy Nutrition lesson for Current Soybean Science Challenge Curricula
- Extension Homemakers Leader Guides
- Master Gardener Lesson

APPENDICES *(Add as needed)*

Appendix A

Budget Justification

A. Personnel: Salaried Worker **Wages Subtotal = $7,500**

Personnel budget justification: Personnel costs were calculated for a part-time data management assistant who will assist with project coordination including planning and scheduling, correspondence and follow-up, educational product development, data entry, and management of data for the meta-analysis, project accounting, record keeping, sub-contractor communication, and reporting.

15% FTE ($50,000 salary base) = $7,500

B. Fringe **Subtotal = $ 2,145**

Fringe budget justification: Fringe was calculated at 28.6% of wages

C. Travel: **AR Subtotal = $ 6,000**

Travel: Out-of-pocket expenses, per diem expenses (hotel and meals) and mileage for travel for PI and grant collaborators across the Mid-South in support of project planning and management, testing, education, and meetings. (e.g., including vehicle mileage not to exceed the IRS rate), etc. Two – three to attend the 28th Annual National Conservation Systems Cotton & Rice Conference, the Southern Soybean & Corn Conference, the Southern Precision Ag Conference and the Delta States Irrigation Conference – January / February 2027

D. Contractual - NA

E. Subcontracts

University of Missouri: **Subtotal: $6,500**

1. **Travel:** $1000 - Calculated at $0.65/mile, plus per diem costs as needed for driving to events throughout the state in support of Experiential education with consumers.

2. **Publications:** $500 - Handouts, recipes, and promotional flyers to be used for presentations.
3. **Project Supplies:** $1500 – Food tasting supplies including ingredients and serving items needed for tastings.
4. **Other Costs Defined:** $3500 – Conference booth fees - $3000 and Awards for Soybean Festival Soy Science Fair - $500

F. Commodities – NA

G. Publication Costs

Project Publications/Printing **AR Subtotal=$2,500**

- Publications for Target Audiences including Department of Education, School Nutrition Directors and Personnel, Farmers / Producers, FCS Agents, Consumers, and Students
- Publications may include promotional flyers, recipes, lesson guides, and handouts.

H. Other Costs Defined: **AR Subtotal=$4,855**

1. Project Supplies:

Food Product Supplies $2500

Including: soy milk, fruit, seasoning and flavoring, bottled water, and other ingredients

Food Service / Tasting Supplies $300

Including plastic plates and utensils, tasting cups and lids, serving dishes and utensils, paper goods, cleaning, and sanitizing items

Small Appliance - Heavy Duty Blenders $300

To be used for making smoothies for tastings.

Project Management Supplies $55

Including postage, paper, and toner cartridges.

2. **Conference Fees and/or Booth Space $1000**

   To secure partnerships and engagement from various essential organizations and audiences such as educators, consumers, and producers.

3. **Video Production $1000**

   Filming and editing instructional videos on whole soy foods cooking methods. Social media graphics and other visuals that could be housed or linked to the Midsouth Soybean Board website. These may be used as training resources.

Appendix B

Planned and Current Activities

AR Planned Activities

Objective #1 - Increase awareness about soy milk and whole / minimally processed (w/mp) soy foods in school and early childcare centers through a multipronged intervention involving taste tests and work with educational influencers.

Current 2024: Soy Milk and Soy Food Tasting in schools 3 districts in 3 counties

Year 1 – target 6 different districts in 6 different counties tasting activities

Policy System Environmental (PSE) -work with school wellness committees to ensure compliance and awareness about soy milk as an alternative for children who need or choose an alternative to dairy milk and the nutritional value of adding soy food options to the school lunch menu.

Year 2 – 11 districts in 11 additional counties tasting activities

Incorporate soy nutrition lessons and tastings into the BestCare curriculum teaching early childhood providers the importance of soy in the diet.

Year 3 – additional districts added to current counties with the option of adding more counties and districts if interest is shown in tasting activities.

Each year can add additional school districts in previous counties and/or a possible breakfast alternative of soy smoothie using shelf-stable soy milk, ice, and fruit as a follow-up and continued outreach to the school districts that have tasted the soy milk the previous year.

Objective 2. Improve access to soy milk and (soy foods in school and early childcare centers.

Year 1 – Policy System Environmental (PSE) -explore working with early childhood childcare providers to ensure compliance and awareness about soy milk as an alternative for children who need or choose an alternative to dairy milk and the nutritional value of adding soy foods options to menus.

Year 2 - Incorporate soy nutrition lessons and tastings into the BestCare curriculum, teaching early childhood providers the importance of soy in the diet.

Objective 3. Increase the availability of soy foods in local food systems while exploring viable connections between producers and consumers.

Provide educational information and exhibit and tasting to the Arkansas Farmers Market Association

Provide Farmer's Market tool kit to Extension Educators to work with local farmer's markets.

Objective 4. Increase appeal and demand for soy foods through education that includes local demonstrations for consumers and producers.

Field days/production meeting education to be expanded to more counties. Staffed display, educational material development and tasting depending on the location to be used.

Currently 3 counties

Expand to
Year 1 - 9 field days

Year 2 – 18 field days

Year 3 – have updated material for all

Years 1-3 Educational experiences for consumers and producers including conference presentations and staffed educational exhibits. (Including, Annual National Conservation Systems Cotton & Rice Conference, the Southern Soybean & Corn Conference, the Southern Precision Ag Conference and the Delta States Irrigation Conference, NEAFCS, Master Gardener Conferences, Child Nutrition Directors, Area Educational Cooperatives, Arkansas Farm Bureau State Meeting Others?)

Year 2 - Create soy nutrition lessons for FACS teachers to include in their curriculum and in the current Arkansas Soybean Science Challenge Curriculum

MO Planned Activities

Objective 3. Increase the availability of soy foods in local food systems while exploring viable connections between producers and consumers.

Years 1-3: Work with MU Extension ag business and horticulture specialists to hold educational sessions for growers to learn about growing soybeans for the intended purpose of selling them at farmers' markets.

Years 1-3: Develop a soybean education track for producers to attend during the Great Plains Growers Conference. Participants will receive education and encouragement to grow food-grade soybeans and will learn avenues for getting them to paying customers.

Objective 4. Increase appeal and demand for soy foods through education that includes local demonstrations for consumers and producers.

Years 1-3: Educational and tasting experiences at the following events:

- Norborne, Missouri Soybean Festival – Cooking demonstrations with tastings, activities for

kids, education for growers, soy science fair for teens

- Missouri State Fair – Soy Cooking Challenge and Demonstration
- Missouri Extension research farm field days
- Women in Agriculture regional events

Years 1-3: Make recipes that feature w/mp soy foods and soybeans available for the following existing University of Missouri Extension curricula and programs:

- Master Gardener lessons
- Community gardens

Years 1-3: Educational experiences at conference presentations and staffed educational exhibits. (Including Missouri Academy of Nutrition and Dietetics, National Association of Extension Family and Consumer Sciences, Great Plains Growers Conference, Missouri Farm Bureau Commodity Conference, Missouri Organic Association's Mid-America Organic Conference, National Health Outreach and Engagement Conference, University of Missouri Extension and Engagement Week Conference, University of Missouri Extension Health and Human Sciences Conference)

Years 1-3: Provide roasted soy nuts as an option for our annual Missouri Crunch Off Challenge. The Crunch Off Challenge is meant to encourage people to enjoy Missouri-grown produce. Extension nutrition educators organize "Crunches" in their classes, in their communities, or at large events like football games providing samples of food and education about Missouri-grown produce. We will now make roasted soy nuts an option.

Year 1: Develop produce education toolkit to be used at farmers markets. The toolkit will include a lesson on soybeans.

Year 2 : Share the current Arkansas Soybean Science Challenge Curriculum with high school teachers and work with Arkansas to create new soy nutrition lessons

2026 MID SOUTH SOYBEAN BOARD
18 - RA-02

Project Title	Leveraging Photosynthetic Efficiency traits for improving soybean productivity in the Mid-South		
PI's Name	Dr Feng Lin	E-mail	flbn7@missouri.edu
PI's Title	Assistant Professor	Institution:	The Curators of the University of Missouri
Mailing Address	Sponsored Programs Admin., 601 Turner Avenue, Turner Avenue Garage, Room 201		
City/State/Zip	Columbia, MO 65211-0001		
Phone number	573-379-5431		
Additional PIs For this project	*Dr Francia Ravelombola (Co-PI), Research Scientist, University of Missouri, Portageville, srnmv@missouri.edu, 479-316-1060* *Harmeet Singh (Co-PI), PhD Student, University of Missouri, Portageville, hsmyz@missouri.edu, 573-639-7456*		
Research locations (states involved)	MO		

Timeline: Current Year - FY26		**Multi-Year Project Information** (if applicable)		
		Year 1	Year 2	Year 3
Start Date		**4/1/2026**		
End Date		**3/31/2027**		
Funds Requested	$	$30,000	$	$

Program Area:	
Other related funding:	NA
Objectives:	1. Identify photosynthesis (PS) traits strongly correlated with higher seed yield in soybean 2. Identify candidate genes for photosynthetic efficiency traits correlated with high seed yield 3. Develop a predictive breeding pipeline using photosynthetic efficiency to release soybean varieties with high yield potential
Justification:	Soybean is a major U.S. crop, providing >60% of the global vegetable oil and protein supply. While photosynthesis is central to crop productivity, its potential remains underutilized in soybean breeding. Recent studies have shown that enhancing photosynthetic efficiency can significantly improve yield potential. This project fills this gap by identifying key PS-traits and genes linked to yield, enabling trait-based selection for development of high-yielding, resilient soybean varieties.
Exp Setup:	In the 2nd year, we are conducting multi-environment field trials using a panel of over 100 advanced breeding lines & 250 diverse genotypes across key locations in SE-Missouri. PS-traits are being measured at reproductive stage using MultispeQ sensors with agronomic data collection. We are recording environments variables to enable G×E analysis and integration with phenotypic datasets.
Summary:	This project aims to improve soybean yield potential by identifying PS-traits and genes associated with high productivity under field conditions. Using advanced phenotyping and GWAS, we are evaluating diverse soybean lines across multiple environments in the U.S. Mid-South. The goal is to integrate key PS- traits into breeding pipelines to enhance selection accuracy. Outcomes will support the development of high-yielding, stress-resilient soybean varieties tailored to regional growing conditions.
Benefit to Midsouth Farmers:	This project is expected to enhance soybean yield and profitability across the U.S. Mid-South by delivering high-performing, regionally adapted varieties. These improvements could translate into substantial economic gains and increased acreage efficiency. The development of stress-resilient varieties will strengthen the region's competitiveness in national and global markets. In the long term, the project will support more sustainable production systems and improve resilience to environmental stress.
Progress Made:	In the 1st year, >100 breeding lines were teste across 3 locations in SE-Missouri, with PS-data collected at early and late reproductive stages. Yield, UAV imaging, and environmental data were also collected and are currently being analyzed. Additionally, 250 diverse genotypes were evaluated across two environments. Article Accepted on PS-traits (rainfed vs irrigated in Frontiers

Signature of Principle Investigator/Authorized Signer:	Date:
C. Megan Faulkner	7-11-2025

This document should remain as a SINGLE PAGE for the BOARD MEMBER'S QUICK REFERENCE. Email form (no pdf) to midsouthsoybean@gmail.com and swsoy@aristotle.net.

2026 Midsouth Soybean Board

PROPOSAL TEMPLATE *(Limit the final document to 8 pages)*

PROPOSAL TITLE: Leveraging Photosynthetic Efficiency traits for improving soybean productivity in the Mid-South

INVESTIGATORS:

- ***Dr Feng Lin (Lead PI),*** *Assistant Professor, University of Missouri Portageville Fisher Delta Research, Education, Extension, and Center, flbn7@missouri.edu, 573-379-5431 ext 229*
- ***Dr Francia Ravelombola (Co-PI),*** *Research Scientist, University of Missouri, Portageville, srnmv@missouri.edu, 479-316-1060*
- ***Harmeet Singh (Co-PI),*** *PhD Student, University of Missouri, Portageville, hsmyz@missouri.edu, 573-639-7456*

PROGRAM AREA (check all that apply):

___ New Uses of Soybean
___ Soybean Oil or Soybean Meal Uses
___ Food Grade Soybean
___ Soybean Fuel
_✓_Soybean Breeding and Genetics
___ Weed Management
_✓_Irrigation/Water Management
___ Seed Quality
___ Disease Management and Control
___ Fertility Management
___ Insect Management/Control
___ Harvest aids
___ Nematode Management/Control
___ Rotations using soybeans
_✓_Research Validation or Demonstration
_✓_Producer Communications
___ Variety Trials
___ Economics
___ Other (*Identify*)_____

PROJECT STATUS:

New ____ *(Indicate planned length of project–1 of 2, 1 of 3, etc. Note that projects are only approved on a yearly basis.)* Expected research length (yr)_____

Renewal _X_(Year 2 of 5) Remember if you are presenting a renewal, your writing should speak mostly about what you are doing in the following year. You should not be re-requesting money for year one goals. Make sure it is clearly demonstrating progress; have a clear intention of your expected outcomes in the current year, not just over the program life.

Stand alone ___ or cross-commodity ___ (*additional funding from other sources? Name all other sources and amounts co-funded.* _____
_____

_____

2026 TOTAL FUNDING REQUEST $ _30,000_____

2026 MSSB RESEARCH PROJECT PROPOSED BUDGET			
CATEGORY *(see below for guidelines)*		**ORIGINAL**	
A.	**Personnel** (No Permanent Salaries)		
	1. Salaries (See Addendum B)	$14,500	
	2. Wages (hourly workers)		
	3. GRA (include tuition)	$7,291	
B.	**Fringe Benefits** (Flat Fee for GRA Medical Insurance)	$2,605	
C.	**Travel**	$4,000	
D.	**Contractual Services**		
E.	**Subcontracts**		
F.	**Commodities**		
G.	**Publication Costs**		
H.	Other Costs *Materials and Supplies* *Plot Fees*	 $604 $1,000	
TOTAL COST		$30,000	
(MSSB does not allow indirect costs/overhead charges)			

Personnel*: Show number of hours x hourly rate for each category. GRA cost to include tuition and books. MSSB does not pay salaries of principal investigators or cooperating scientists (USB Compliance Manual, Sect. 17, Part 2-D).*
Fringe Benefits: *Amount and rate for indicated salaries, wages, and GRAs must be shown.*
Travel*: Out-of-pocket and per diem expenses (hotel and meals) for site visits, travel to and from meetings (e.g. airfare, vehicle mileage not to exceed the IRS rate), etc.*
Contractual Services*: External lab fees, consultants, etc.*
Commodities*: Expenses related to the conduct of the project (e.g., seed, fertilizers, pesticides, lab supplies).*
Additional Details*: Provide for each budget category in addendum if necessary.*
Reminder*: All payments for project activities are on a reimbursable basis based on an itemized invoice submitted to MSSB each quarter along with a progress report.*
Budget Transfers*: The MSSB follows USB guidelines, which state "The PI may transfer funds amongst budget categories only with MSSB's prior written consent if (i) the amount transferred exceeds 10% of any one general budget category (per annual period) or (ii) the funds transferred are travel related. PI shall request permission from MSSB for all budget reallocations and account for them in his/her financial report."*
Additional Instructions: *See Addendum B.*

TECHNICAL SUMMARY

Soybean [*Glycine max* (L.) Merr] is a major U.S. crop, contributing substantially to the global supply of vegetable oil and protein. As global demand continue to rise, increasing seed yield remains a top priority for improving U.S. farmers' profitability and ensuring food security. While photosynthesis is a core process driving biomass accumulation and seed production, its potential as a direct selection target in soybean breeding has not been fully realized. Based on recent research of De Souza et al., 2022; Montes et al., 2022 and Hu et al., 2024, there is a strong association between photosynthetic traits and seed yield. This project aims to explore natural variation in photosynthetic efficiency across diverse soybean germplasm and elite breeding material under field conditions. Through multi-environment trials, physiological phenotyping and genome wide association studies (GWAS), we aim to identify key traits and candidate genes associated with superior photosynthetic performance and higher yield. Ultimately, this research will support the development of a trait-informed predictive breeding pipeline using advanced research tools that will accelerate the release of high-yielding and resilient soybean varieties for the U.S Mid-South and similar environments.

OUTLINE OF RESEARCH

RATIONALE/JUSTIFICATION FOR RESEARCH:

Soybean is a major U.S. crop, accounting for over 60% of global vegetable oil and protein consumption. Enhancing soybean yield is crucial to meeting growing global demand and boosting long term profitability of U.S. farmers. Photosynthesis, the process by which plants convert sunlight into biomass, plays a central role in soybean growth and productivity. Recent Studies have shown that improving photosynthetic performance can significantly increase yield potential in major crops, including soybean (De Souza et al. 2022). However, photosynthetic efficiency currently remains underutilized trait in soybean breeding programs. This project aims to fill that gap by investigating the genetic and environmental factors influencing photosynthetic traits and their impact on yield in the real-world field conditions. We will evaluate diverse soybean genotypes and advance breeding germplasm across

different environments, identify trait-yield relationships, and conduct genome-wide association studies (GWAS) to pinpoint key genes linked to higher photosynthetic efficiency. The research outcome will directly inform the integration of trait-based selection into soybean breeding pipeline, facilitating the development of high-yield and resilient soybean varieties tailored for U.S. soybean farmers.

OBJECTIVE(S):

1. Identify the photosynthesis related traits strongly correlated with higher seed yield in soybean
2. Identify candidate genes for photosynthetic efficiency traits correlated with high seed yield in soybean
3. Develop a predictive breeding pipeline in soybean using photosynthetic efficiency towards the release of soybean varieties with high yield potential

APPROACH AND EXPERIMENT CONDUCT:

Objective 1: During the first year, we evaluated over 100 breeding lines across 3 locations in Southeast Missouri (Portageville and Fisk), collecting photosynthetic traits data (using MultispeQ device) at both early (R2-R3) and late (R4-R5) reproductive stages. Alongside, we also collected yield traits and UAV imaging, allowing us to integrate canopy level traits with photosynthetic measurements. Additionally, we screened another set of breeding lines under both irrigated and rainfed conditions in Portageville to identify early stage photosynthetic and morpho-physiological markers associated with yield stability (publication accepted), highlighting field-based trait markers valuable for drought resilience breeding. We also screened approximately 80 elite lines at those 3 locations, collecting comprehensive dataset (photosynthetic, UAV imaging and yield traits). Building on these findings, 2nd year focus will expand photosynthetic dataset by incorporating more environments at Fisk (MO) and Ridgway (IL) to strengthen G x E analysis. We will evaluate multiple photosynthetic traits across locations and correlate them with seed yield to determine which traits most consistently predict genotypic performance across environments. These correlations will help identify reliable phenotypic selection criteria to enhance breeding efficiency. Together this multi-environment and multiplatform (field, UAV, MultispeQ)

evaluations will allow us to quantify the genetic variability, assess trait stability and identify critical physiological indicators linked to higher seed yield in elite soybean breeding lines.

Objective 2: Enhancing photosynthetic efficiency using genetic tools is a promising strategy to increase soybean productivity. In the first year, we evaluated 250 diverse soybean genotypes across two distinct environments in Missouri (Portageville and Clarkton), measuring photosynthetic performance under field conditions. We are repeating these evaluations in this second year to strengthen the dataset and enable more robust genome-wide association studies (GWAS). We will be integrating 2-year multi-environment phenotypic data with genotypic matrix to perform GWAS for key photosynthetic traits. Our goal is to identify significant genetic markers trait associations and pinpoint candidate genes linked to high photosynthetic performance and yield potential. These results will provide insights into genetic architecture underlying photosynthetic efficiency in soybean.

Objective 3: In the first year of project, we successfully collected UAV imaging data (RGB and multispectral) across multiple locations and growth stages over 100 breeding lines. These datasets were combined with on-ground MultispeQ-based photosynthetic measurements, seed yield and other agronomic traits. After completing data cleaning and pre-processing, we are currently analyzing and integrating UAV dataset with other physiological-agronomic traits to explore preliminary trends, identify predictive imaging features and evaluate model performance. During the upcoming year, we will advance the predictive modeling to estimate seed yield from photosynthetic, imaging and environmental traits, based on objective-1 results (identifying the useful photosynthetic traits/growth stage). We will explore regression and machine learning approaches to build yield prediction models, followed by validating model performance across environments to identify the most stable and informative traits. Based on our findings from the first year evaluation, we have selected a few elite breeding lines demonstrating high photosynthetic performance and seed yield. Considering these results, we have initiated 3 targeted crosses in 2025 season to combine favorable physiological and agronomic traits. These crosses represent a direct application of our predictive framework, aimed at developing next

generation soybean varieties with improved yield potential. This integrative approach will enable development of predictive breeding pipeline that combines high throughput phenotyping with physiological insights to enhance selection accuracy and decision-making in the MU-FDREEC soybean breeding program. Ultimately, this pipeline will support the accelerated development of high-yielding, stress resilient soybean varieties for Mid-South farmers of the U.S.

PROJECTED IMPACT OF RESULTS ON MID-SOUTH SOYBEAN PRODUCTION

Upon successful completion, this project is expected to significantly improve soybean seed yield and productivity across the U.S. Mid-South region, potentially leading to increased soybean acreage and farm profitability. This improvement could result in significant economic benefits, potentially boosting agricultural productivity by several million dollars annually. Beyond direct economic benefits, the development of high-yielding soybean varieties adapted to the regional environments will enhance the competitiveness of Mid-South soybean farmers in both national and global markets. This will ensure a stable supply of high-quality soybean products for consumers and industries. Indirectly, this project will promote sustainable production systems, reducing vulnerability to environmental stress and strengthen long-term resilience in this region's soybean sector. Overall, this research will deliver lasting agronomic, economic and environmental benefits to the broader agricultural community.

EXPECTED END PRODUCT(S)

- Identification of elite soybean germplasm and releasing varieties with higher photosynthetic efficiency, higher yield performance and improved on farm productivity across Mid-South environments
- Development and validation of predictive models for soybean yield estimation using modern data integration pipelines, supporting precision breeding strategies.
- Discovery of trait-linked molecular markers associated with photosynthetic efficiency and yield, enabling higher selection accuracy in breeding program.
- A PhD dissertation based on this research will be produced and made electronically accessible,

for broader dissemination

- Scientific dissemination through poster and oral presentations across national and international conferences.
- Peer-Reviewed publications for each objective/phase of the study. One manuscript based on early findings related to photosynthesis and yield stability has already been accepted in a peer-reviewed journal, led by the MU-FDREEC team (Harmeet Singh-Bakala, Francia Ravelombola, Cheryl Adeva, Maiara Oliveira, Ru Zhang, Jessica Argenta, Grover Shannon and Feng Lin (2025) Harnessing Photosynthetic and Morpho-Physiological Traits for Drought-Resilient Soybean: Integrating Field Phenotyping and Predictive Approaches . *Frontiers In Press)*

APPENDIX A

BUDGET JUSTFICATION

Graduate Student Assistantship ($24,396)

Funds are requested for a PhD Student to conduct proposed research activities at the University of Missouri – Fisher Delta Research Center in Portageville under the supervision of Dr Feng Lin. A total of $14,500 (6 months) salary is requested for the PhD Student. Medical insurance of $2,605 and a tuition fee of $7,291 (6 months) are requested.

Domestic Travel ($4,000)

Funds in the amount of $4,000 are requested for travel for conference to present research

Other Direct Costs ($1,604)

Funds in the amount of $604 and $1,000 are requested for materials & supplies and plot fees, respectively.

MID SOUTH SOYBEAN BOARD
18 - RA-03

Project Title	Enhanced Synthetic Microbiome Communities to Managed Sudden Death Syndrome		
PI's Name	Asela J. Wijeratne, Ph.D.	E-mail	awijeratne@astate.edu
PI's Title	Associate Professor of Bioinformatics	Institution:	Arkansas State University
Mailing Address	P.O. Box 2760		
City/State/Zip	State University, AR 72467-2760		
Phone number	870-972-3311		
Additional PIs For this project	Scott A. Mangan, PhD, Associate Professor, Arkansas State University Phone: 870-972-3783; Email: smangan@astate.edu		
Research locations (states involved)	Arkansas		

Timeline: **Current Year - FY26**		**Multi-Year Project Information** (if applicable)		
		Year 1	Year 2	Year 3
Start Date	04/01/2025	04/01/2025	04/01/2026	-
End Date	03/31/2027	03/31/2026	03/31/2027	-
Funds Requested	$43,218	$18,109	$25,109	$0

Program Area:	
Other related funding:	None
Objectives:	**1).** Isolate and identify beneficial bacteria and fungi from the soybean rhizosphere that can enhance plant health and disease resistance. **2).** Evaluate these bacteria and fungi for their ability to inhibit *F. virguliforme*, *in vitro*. **3).** Assemble selected beneficial bacteria into Synthetic Microbial Communities (SynComs) and test them in the greenhouse to assess their effectiveness in suppressing Sudden Death Syndrome.
Justification:	SDS in soybeans, caused by *Fusarium virguliforme*, leads to yield losses in the Mid-South. Traditional control methods are inconsistent. This research explores using beneficial microbes in SynComs to improve soybean resistance.
Exp Setup:	Identifying and assembling a microbial community that work against *Fusarium virguliforme.*
Summary:	SDS in soybeans causes significant yield losses in the Mid-South, with traditional controls often ineffective. This study investigates using SynComs to enhance soybean resistance to SDS. In Year 1, beneficial microbes will be isolated and tested. In Year 2, SynComs will be evaluated in greenhouse conditions.
Benefit to midsouth farmers:	SDS can lead to up to 40% yield loss in soybeans, costing around $350 per acre. Effective SynComs could mitigate these losses by delaying SDS symptoms, potentially saving about 3.5 bushels per acre. SynComs also promote better growth, nutrient uptake, and stress resilience in soybeans, reducing reliance on synthetic fertilizers and pesticides. This results in improved yields, cost savings, and environmental benefits.
Progress Made:	Over 400 beneficial bacteria have been isolated from soybean roots, with several showing strong potential to fight *Fusarium virguliforme*, the SDS-causing pathogen. Notably, *Bacillus velezensis* demonstrated strong antifungal activity and is the leading candidate for development into a microbial treatment.
Signature of Principle Investigator	Date: 07/25/25

This document should remain as a SINGLE PAGE for the BOARD MEMBER'S QUICK REFERENCE. Email form to midsouthsoybean@gmail.com and swsoy@aristotle.net.

2026 Midsouth Soybean Board

PROPOSAL TEMPLATE *(Limit the final document to 8 pages)*

PROPOSAL TITLE:____ Enhanced Synthetic Microbiome Communities to Manage Sudden Death_____

INVESTIGATORS: **INVESTIGATORS**:

PI: Asela J. Wijeratne, Ph.D.
Associate Professor of Bioinformatics
Department of Biological Sciences
Arkansas State University
Phone: 870-972-3082
Email: awijeratne@astate.edu

CoPI: Scott A. Mangan, PhD
Associate Professor
Dept. of Biological Sciences
Arkansas State University
Phone: 870-972-3783
Email: smangan@astate.edu

PROGRAM AREA (check all that apply):

___ New Uses of Soybean
___ Soybean Oil or Soybean Meal Uses
___ Food Grade Soybean
___ Soybean Fuel
___ Soybean Breeding and Genetics
___ Weed Management
___ Irrigation/Water Management
___ Seed Quality
__ X _ Disease Management and Control
___ Fertility Management
___ Insect Management/Control
___ Harvest aids
___ Nematode Management/Control
___ Rotations using soybeans
___ Research Validation or Demonstration
___ Producer Communications
___ Variety Trials
___ Economics
___ Other (*Identify*)_____

PROJECT STATUS:

New ____ *(Indicate planned length of project–1 of 2, 1 of 3, etc. Note that projects are only approved on a yearly basis.)* Expected research length (yr)_____

Renewal ___2_ (Year ___2_ of __2__) Remember if you are presenting a renewal, your writing should speak mostly about what you are doing in the following year. You should not be re-requesting money for year one goals. Make sure it is clearly demonstrating progress; have a clear intention of your expected outcomes in the current year, not just over the program life.

Stand alone _X__ or cross-commodity ___ (*additional funding from other sources? Name all other sources and amounts co-funded.* _____

2026 TOTAL FUNDING REQUEST
$ 25,109

2026 MSSB RESEARCH PROJECT PROPOSED BUDGET			
CATEGORY *(see below for guidelines)*		**ORIGINAL**	
A.	**Personnel** (No Permanent Salaries)	2026	
	1. Salaries (See Addendum B)		
	2. Wages (hourly workers)	2,880	
	3. GRA (include tuition)		
B.	**Fringe Benefits** (% *used to calculate*)	229	
C.	**Travel**	1,000	
D.	**Contractual Services**		
E.	**Subcontracts**		
F.	**Commodities**	15,000	
G.	**Publication Costs**	2,000	
H.	Other Costs *(Define)*	4,000	
TOTAL COST		25,109	
(MSSB does not allow indirect costs/overhead charges)			

TECHNICAL SUMMARY

Background: Sudden Death Syndrome (SDS), caused by *Fusarium virguliforme*, continues to threaten soybean yields across the Mid-South. Existing control measures, such as fungicide application and the use of resistant cultivars, remain inconsistent due to environmental variability and limited genetic resistance.

Research Justification and Rationale: Building on emerging research in plant-microbe interactions, this project investigates the potential of beneficial rhizosphere microbes to suppress SDS through natural antagonism and enhanced plant defense. The long-term goal is to develop Synthetic Microbial Communities (SynComs) that can be introduced into the soybean rhizosphere as a sustainable and biologically driven alternative to chemical controls.

Objectives and Approach: In Year 1, we focused on isolating and identifying rhizosphere-associated microbes from soybean cultivars grown in contrasting soil types. Over 400 bacterial isolates were cultured, with 195 undergoing DNA extraction and 65 sequenced using Oxford Nanopore technology for species-level identification. Community-level analysis using 16S rRNA amplicon sequencing was completed to assess the broader microbial landscape and identify taxa associated with disease suppression. Standardized protocols for microbial isolation, storage, and *in vitro* antagonism screening were established to ensure reproducibility and consistency. Results from Year 1 provide a robust foundation for constructing SynComs composed of naturally occurring microbes with demonstrated antagonistic activity against *F. virguliforme*.

In Year 2, selected strains will undergo functional validation and be assembled into SynComs for greenhouse and field testing. These microbial consortia are expected to deliver more consistent SDS control, improve soybean productivity in the Mid-South, and reduce reliance on chemical inputs, supporting more sustainable and resilient agricultural systems.

OUTLINE OF RESEARCH

RATIONALE/JUSTIFICATION FOR RESEARCH:

Sudden Death Syndrome (SDS), caused by the soilborne fungal pathogen *Fusarium virguliforme*, is a

significant threat to soybean productivity in the United States, particularly in the Mid-South region. This pathogen colonizes soybean roots and produces phytotoxins that trigger foliar symptoms and premature senescence, resulting in significant yield losses. Despite the use of fungicides and SDS-tolerant cultivars, disease control remains inconsistent due to environmental variability, limited durability of host resistance, and pathogen adaptation[1]. These challenges underscore the pressing need for sustainable, biologically informed management strategies to enhance crop resilience and minimize chemical inputs[1]. Recent advances in plant-microbe interactions suggest that beneficial rhizosphere microorganisms can enhance plant defense mechanisms and suppress soilborne pathogens. Specifically, certain bacteria and fungi in the soybean rhizosphere exhibit potential to antagonize *F. virguliforme* via mechanisms such as competitive exclusion, antibiosis, and the induction of systemic resistance[2, 3]. Building on these insights, this project aims to develop **Synthetic Microbial Communities (SynComs)** composed of naturally occurring beneficial microbes [4, 5, 6]. These SynComs are intended as a novel biological tool for SDS management and will be developed through isolation, functional characterization, and eventual field validation.

OBJECTIVE(S): We hypothesize that these SynComs, when combined in a specific ratio, will manage SDS more effectively and provide better protection than individual strains. By leveraging SynComs derived from beneficial microbes, the study aims to reduce reliance on chemical treatments and improve soybean yield and health. **Year 1: 1)** Isolate and identify beneficial bacteria and fungi from the soybean rhizosphere that can enhance plant health and disease resistance. **2)** Evaluate these bacteria and fungi for their ability to inhibit *F. virguliforme*, *in vitro*. **Year 2: 3)** Assemble selected beneficial bacteria into SymComs and test them in the greenhouse to assess their effectiveness in suppressing SDS.

APPROACH AND EXPERIMENT CONDUCT:

Objectives and Methodological Approach (Year 1): The goal for Year 1 was to isolate and characterize rhizosphere-associated microbes with the potential to suppress *Fusarium virguliforme*, the

pathogen responsible for soybean Sudden Death Syndrome (SDS). The work was organized into three components:

a) Rhizosphere Sampling and Microbial Isolation: Soybean cultivars with contrasting SDS responses were grown in two soil types (Grundy/Haig, IA and Collins silt loam, AR) under controlled conditions. Plants were harvested at 30 and 60 days, and rhizosphere samples were collected for microbial culturing and DNA extraction. Microbes were isolated using serial dilutions on LB, R2A, and PDA media[7], while additional soil-root samples were processed for metagenomic analysis.

b) Microbial Identification and Cataloging: We have used Oxford Nanopore Technology to identify isolated bacterial species[8]. Functional potential, including plant growth promotion and biocontrol activity, was inferred using literature mining and antiSMASH analysis of biosynthetic gene clusters.

c) Community Analysis of Rhizosphere Microbiota: High-throughput 16S rRNA sequencing of rhizosphere DNA was completed. Ongoing analysis aims to characterize microbial community structure and diversity across soil and cultivar treatments, supporting the identification of beneficial taxa for integration into future SynCom formulations.

d) Progress Summary: To date, over 400 bacterial isolates have been successfully cultured from soybean root zone (rhizosphere) samples across two cultivars and soil types. DNA extraction and 16S rRNA PCR were completed for 195 isolates, and 65 were sequenced.

We are currently identifying the most promising ones. One standout species, *Bacillus velezensis*, demonstrated a strong ability to inhibit the SDS-causing fungus (*Fusarium virguliforme*) in laboratory tests. This is the first time this has been reported. Along with *B. pseudomycoides*, this bacterium also has natural abilities to help plants take up nutrients and fight off disease.

Other bacteria we found, like *Pseudomonas* and *Priestia* species, also show characters that may help soybeans grow better by producing natural plant hormones and improving nutrient availability. These results help us select the best combinations of bacteria for **SynComs**, which we will testnext in the

greenhouse to manage SDS more effectively and sustainably.

Next Steps: Complete 16S sequencing and functional annotation, expand antagonism assays against *F. virguliforme*, analyze metagenomic data for community insights, and begin designing SynCom prototypes for greenhouse testing.

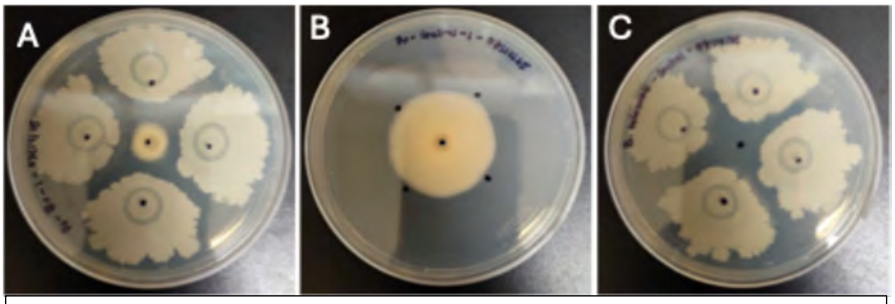


Figure 2. In vitro antagonism assay showing the interaction between *Fusarium virguliforme* and *Bacillus velezensis*. (A) *F. virguliforme* co-cultured with *B. velezensis*, showing inhibition of fungal growth; (2) *F. virguliforme* alone (negative control); and (3) *B. velezensis* alone (bacterial control). The zone of inhibition around *B. velezensis* indicates strong antifungal activity against the SDS pathogen.

Year 2: SynCom Design and Evaluation (Fig. 02): We will construct four SynComs using isolates that demonstrated antagonism against *F. virguliforme* and were identified as co-occurring taxa based on our community analysis (Year 1). Two additional control SynComs will be created: one from randomly selected isolates, and another combining all taxa used in the four experimental SynComs. All six SynComs will first be screened ***in vitro*** for their ability to inhibit *F. virguliforme*, following the protocols established in Objective 2 (Year 1).

The two most effective SynComs, along with the two controls, will then be evaluated **in greenhouse trials** for their ability to suppress SDS. Soybean cultivars, XO 3752 (tolerant) and XO 4132 (susceptible, from BASF), will be used. Seeds will be coated with the SynComs or media (control) before planting in sterilized soil, with five replicates per treatment and randomized pot placement to minimize environmental bias. Seven days post-planting, seedlings will be inoculated with *F. virguliforme* zoospores or media control. To assess microbial dynamics, rhizosphere soil will be sampled at 3- and 8-week post-inoculation for 16S and 18S rRNA sequencing using Oxford Nanopore Technology.

Surface-sterilized roots will also be analyzed for pathogen load via DNA quantification. Disease symptoms will be scored weekly, and plant performance will be monitored by measuring height, leaf number, and biomass. Final yield metrics will include pod and seed number, as well as total aboveground biomass.

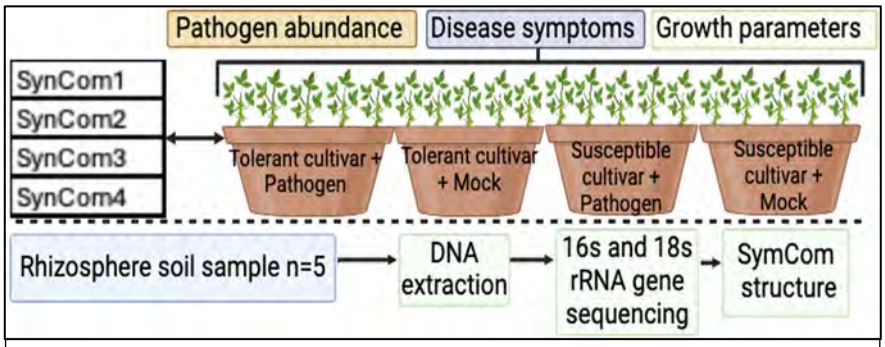


Figure 02. Steps of the proposed Obj 3 project.

PROJECTED IMPACT OF RESULTS ON MID-SOUTH SOYBEAN PRODUCTION

SDS can cause up to 40% yield loss, costing about $350 per acre. Effective SynComs could significantly reduce this loss. Delaying SDS symptoms by one week can save about 3.5 bushels per acre. SynComs could extend this delay by suppressing pathogen activity and increasing savings. SynComs can enhance soybean growth, nutrient uptake, and stress resilience, reducing the need for synthetic fertilizers and pesticides. This leads to improved yields, cost savings, and environmental benefits.

EXPECTED END PRODUCT(S)

The project will produce a comprehensive catalog and database of beneficial bacteria and fungi isolated from the soybean rhizosphere. *In vitro* testing reports will document the antagonistic effects of these bacteria and fungi against *F. virguliforme*. Greenhouse reports will provide detailed findings on the effectiveness of selected bacteria and fungi in suppressing SDS. A shortlist of effective biocontrol candidates will highlight bacterial and fungal strains with proven inhibitory effects, offering a foundation for future biocontrol solutions and potential intellectual property opportunities. We expect to produce presentations and posters for regional scientific society. Additionally, we aim to publish our research in peer-reviewed journals. The protocols, data analytical pipelines, and bacterial and fungal isolates will be available for other researchers to use as valuable tools.

APPENDICES

Wages: Ms. Ashley Flory works as a part-time lab assistant in the Wijeratne lab, manages finances, and oversees orders. Therefore, wages of $20/hr, 3 hrs/week for 48 weeks are requested for $2,880 per year ($2880 total for Year 2). **Fringe Benefits** are requested for Ashley Flory at the part-time non-student rate of 7.94% for $229 per year. **Travel:** $1,000 is requested for PIs and a student to attend conferences. **Commodities:** The request Year 2: 15,000 to cover the purchase of the following: chemicals (e.g., buffers and organic solvents, etc.), bioreagents (e.g., kit for sample preparation for high-throughput sequencing, PCR, primers, etc.), and consumables (e.g., centrifuge tubes, filter pipette tips, and gloves, culture media etc.). **Other Costs (ABI Facility User Fee):** $4,000 for Year 2 is requested to access instruments in the genomic core, high-speed centrifuges, clean bench hood, greenhouse growth chamber, etc. **(Total:** $25,109)

Reference:

1. Rodriguez, M. C., Sautua, F., Scandiani, M., Carmona, M. & Asurmendi, S. Current recommendations and novel strategies for sustainable management of soybean sudden death syndrome. *Pest Manag. Sci.* **77**, 4238–4248 (2021).
2. Xing, L. & Westphal, A. Inhibition of *Fusarium virguliforme* by prokaryotes in vitro. *Subtrop. Plant Sci.* **59**, 24–29 (2007).
3. Ayaz, M. *et al.* Bacterial and Fungal Biocontrol Agents for Plant Disease Protection: Journey from Lab to Field, Current Status, Challenges, and Global Perspectives. *Molecules* **28**, 6735 (2023).
4. Zhou, X. *et al.* Cross-kingdom synthetic microbiota supports tomato suppression of Fusarium wilt disease. *Nat. Commun.* **13**, 7890 (2022).
5. Synthetic microbial consortia derived from rhizosphere soil protect wheat against a soilborne fungal pathogen - PubMed. https://pubmed.ncbi.nlm.nih.gov/36118206/.
6. Prigigallo, M. I., Gómez-Lama Cabanás, C., Mercado-Blanco, J. & Bubici, G. Designing a synthetic microbial community devoted to biological control: The case study of Fusarium wilt of banana. *Front. Microbiol.* **13**, (2022)..
7. Chaudhary, D. K., Khulan, A. & Kim, J. Development of a novel cultivation technique for uncultured soil bacteria. *Sci. Rep.* **9**, 6666 (2019).
8. Hale, B., Watts, C., Conatser, M., Brown, E. & Wijeratne, A. J. Fine-scale characterization of the soybean rhizosphere microbiome via synthetic long reads and avidity sequencing. *Environ. Microbiome* **19**, (2024).

2026 MID SOUTH SOYBEAN BOARD
18 - RA-04

Project Title	Breeding Maturity Group 4 Soybean with Enhanced Resistance to Southern Root-knot Nematode by Reducing Galling and Nematode Reproduction		
PI's Name	Caio Canella Vieira	E-mail	caioc@uark.edu
PI's Title	Assistant Professor	Institution:	University of Arkansas
Mailing Address	495 N Campus Walk, Office 105		
City/State/Zip	Fayetteville, Arkansas, 72701		
Phone number	573-825-1795		
Additional PIs For this project	Travis Faske, University of Arkansas, tfaske@uark.edu. Henry Nguyen, Mizzou, nguyenhenry@missouri.edu. Feng Lin, Mizzou, flbn7@missouri.edu.		
Research locations (states involved)	Arkansas and Missouri. Additional testing sites in LA, MS, TN.		

Timeline: Current Year - FY26		**Multi-Year Project Information** (if applicable)		
		Year 1	Year 2	Year 3
Start Date	4/1/2026			
End Date	3/31/2027			
Funds Requested	$80,000	$	$	$

Program Area: Plant Breeding and Pathology	
Other related funding:	USDA-NIFA, United Soybean Board, Arkansas Soybean Promotion Board. Overlapping exists primarily with breeding activities to support extensive costs and personnel.
Objectives:	i) Characterize the response of lines carrying different combinations of the resistance regions on chromosomes 10 and 13 as well as genetically diverse accessions for nematode reproduction and root galling, and ii) Develop MG 4 breeding populations and varieties with SRKN resistance suitable for production in the Mid-South.
Justification:	Roughly 17 million acres of soybean are planted in MG 4 varieties in the Southern U.S. and most of the MG 4 varieties are susceptible to the SRKN. To sustain the production and durability of SRKN resistance, identifying and deploying genes for resistance that affect different stages of nematode development is critical.
Exp Setup:	The project is divided into nematology and breeding components. The first includes a series of greenhouse and field screening experiments, while the latter involves a complete breeding pipeline to develop SRKN-resistant varieties.
Summary:	This project aims to characterize the impact of new resistant genetic sources on nematode reproduction and root galling and develop MG4 conventional and herbicide-resistant soybean varieties with SRKN resistance that are suitable for production in the Mid-South.
Benefit to Midsouth Farmers:	Resistance deployed into earlier MG is critical for the successful management of SRKN, as it has been moving northwards over time. The successful long-term value of SRKN resistance occurs when multiple resistance mechanisms are deployed and/or multiple resistance genes for SRKN are stacked.
Progress Made:	Novel sources of resistance have been identified, screening protocols have been established, and hundreds of breeding populations and many breeding lines have been developed and advanced across our breeding pipelines.

Signature of Principle Investigator: **Caio Canella Vieira**	Date: 7/16/2025

This document should remain as a SINGLE PAGE for the BOARD MEMBER'S QUICK REFERENCE. Email form (no pdf) to midsouthsoybean@gmail.com and swsoy@aristotle.net.

2026 Midsouth Soybean Board
PROPOSAL TEMPLATE

PROPOSAL TITLE: Breeding Maturity Group 4 Soybean with Enhanced Resistance to Southern Root-knot Nematode by Reducing Galling and Nematode Reproduction

INVESTIGATORS:

Caio Canella Vieira (PI), Assistant Professor, University of Arkansas, 573-825-1795, caioc@uark.edu
Travis Faske, Professor, University of Arkansas, 501-676-3124, tfaske@uark.edu
Henry Nguyen, Professor, University of Missouri, 573-882-5494, nguyenhenry@missouri.edu
Feng Lin, Assistant Professor, University of Missouri, 573-379-5431, flbn7@missouri.edu

PROGRAM AREA (check all that apply):

___ New Uses of Soybean
___ Soybean Oil or Soybean Meal Uses
___ Food Grade Soybean
___ Soybean Fuel
_**X**_ **Soybean Breeding and Genetics**
___ Weed Management
___ Irrigation/Water Management
___ Seed Quality
___ Disease Management and Control
___ Fertility Management
___ Insect Management/Control
___ Harvest aids
_**X**_ **Nematode Management/Control**
___ Rotations using soybeans
___ Research Validation or Demonstration
___ Producer Communications
___ Variety Trials
___ Economics
___ Other (*Identify*)_____

PROJECT STATUS:

New ____ *(Indicate planned length of project–1 of 2, 1 of 3, etc. Note that projects are only approved on a yearly basis.)* Expected research length (yr)_____

Renewal **X** (Year **2 of 5**)

Stand alone ___ or cross-commodity **X** (*additional funding from other sources? Name all other sources and amounts co-funded.*

United States Department of Agriculture (USDA-NIFA), United Soybean Board, Arkansas Soybean Promotion Board. Each project funds a different angle of the research work. Overlapping exists primarily with breeding activities to support extensive costs and personnel.

2026 TOTAL FUNDING REQUEST $ 80,000

CATEGORY *(see below for guidelines)*		**UA-Vieira**	**UA-Faske**	**MU-Nguyen**	**MU-Lin**
A.	**Personnel** (No Permanent Salaries)				
	1. Salaries (See Addendum B)	$12,461	$9,000		
	2. Wages (hourly workers)		$5,000	$11,700	$10,500
	3. GRA (include tuition)				
B.	**Fringe Benefits** (% *used to calculate*)	$3,564 (28.6%)	$2,939 (FT 28.6%) (PT 7.3%)	$895 (7.65%)	$803 (7.65%)
C.	**Travel**	$2,000	$1,361	$2,000	$3,500
D.	**Contractual Services**				
E.	**Subcontracts**				
F.	**Commodities**	$1,975	$1,700	$5,405	$5,197
G.	**Publication Costs**				
H.	Other Costs *(Define)*				
TOTAL COST		$20,000	$20,000	$20,000	$20,000

(MSSB does not allow indirect costs/overhead charges)

Personnel*: Show number of hours x hourly rate for each category. GRA cost to include tuition and books. MSSB does not pay salaries of principal investigators or cooperating scientists (USB Compliance Manual, Sect. 17, Part 2-D).*
Fringe Benefits: *Amount and rate for indicated salaries, wages, and GRAs must be shown.*
Travel*: Out-of-pocket and per diem expenses (hotel and meals) for site visits, travel to and from meetings (e.g. airfare, vehicle mileage not to exceed the IRS rate), etc.*
Contractual Services*: External lab fees, consultants, etc.*
Commodities*: Expenses related to the conduct of the project (e.g., seed, fertilizers, pesticides, lab supplies).*
Additional Details*: Provide for each budget category in addendum if necessary.*
Reminder*: All payments for project activities are on a reimbursable basis based on an itemized invoice submitted to MSSB each quarter along with a progress report.*
Budget Transfers*: The MSSB follows USB guidelines, which state "The PI may transfer funds amongst budget categories only with MSSB's prior written consent if (i) the amount transferred exceeds 10% of any one general budget category (per annual period) or (ii) the funds transferred are travel related. PI shall request permission from MSSB for all budget reallocations and account for them in his/her financial report."*
Additional Instructions: *See Addendum B.*

TECHNICAL SUMMARY

Southern root-knot nematode (SRKN, *Meloidogyne incognita*) is the most important, yield-limiting plant-parasitic nematode of soybean in the Southern U.S. Currently, 17 million acres of soybean are planted in maturity group (MG) 4 varieties in the Southern U.S., and most of the MG 4 varieties are susceptible to the SRKN. Those that are resistant either rely on a single gene and/or are of later maturity group (MG5 and later). To sustain the production and durability of SRKN resistance, identifying and deploying genes for resistance that affect different stages of nematode development would be beneficial. Currently, the mechanism of resistance against the SRKN in MG 4 germplasm is poorly understood. Further, there is no clear understanding of resistance as it relates to nematode reproduction and root galling. This project aims to characterize the impact of new resistant genetic sources on nematode reproduction and root galling and develop MG 4 soybean varieties with resistance against the SRKN that are suitable for production in the Mid-South.

OUTLINE OF RESEARCH

RATIONALE/JUSTIFICATION FOR RESEARCH: Nematodes account for an estimated 14% of grain yield losses worldwide, representing over $100 billion. The SRKN is among the most common species of root-knot nematode that causes yield losses in more than 13 states in the Southern and Southeastern U.S. where approximately 20% of soybeans are grown. The northern range of SRKN includes states such as Illinois and Indiana, where it has been reported to impact soybean production. The SRKN has a broad-spectrum host range that includes several row crops: corn, cotton, grain sorghum, and soybean. Yield losses can reach up to 97% in susceptible varieties when SRKN densities are high. With limited chemical and cultural management options, genetic resistance is the most efficient and economical approach to manage SRKN.

The current availability of MG 4 soybean varieties with resistance to the SRKN is limited. The MG 4 soybean represents approximately 20% of the varieties offered in Pioneer and Asgrow soybean seed guides. Assuming a total of 85 million acres of soybeans planted in the U.S., it can then be estimated

that MG 4 soybeans are planted on 17 million acres. With the change in production practices in the Mid-South and Atlantic region, MG 4 varieties are now grown as far south as Louisiana, Georgia, Alabama, and South Carolina. Resistance to SRKN has been described and effectively deployed in late-maturity groups; however, it is limited in MG 4 commercial soybean varieties. Based on a recent search for MG 4 soybean varieties, resistance to the SRKN was found in only 3 out of 25 varieties listed for Pioneer, and 1 out of 31 varieties for Asgrow. This situation emphasizes the need to develop and deploy MG 4 soybean varieties with SRKN resistance.

Resistance to SRKN is usually described as a complex trait, with a major resistance region identified on chromosome 10, and multiple minor regions on chromosomes 6, 7, 8, 13, 17, and 18 detected from different genetic resources. Our group recently identified additional regions on chromosomes 8, 13, and 17. We plan to expand our understanding of both galling and nematode reproduction in lines carrying a combination of chromosomes 10 and 13 resistance regions.

OBJECTIVE(S): The objectives of this proposal are to i) characterize the response of lines carrying different combinations of the resistance regions on chromosomes 10 and 13 as well as genetically diverse accessions for nematode reproduction and root galling, and ii) develop MG 4 breeding populations and varieties with SRKN resistance suitable for production in the Mid-South.

APPROACH AND EXPERIMENT CONDUCT:

Objective 1 - *Characterization of the mechanism of resistance*: Near-isogenic lines (NILs) for the major QTL on chromosome 10 and a set of RILs derived from the mapping population of Magellan and PI 438489B, representing the combination of resistance regions on chromosomes 10 and 13, will be used in this objective. An inoculated greenhouse pot assay will be used to evaluate the susceptibility of soybean entries based on SRKN reproduction and galling. Two seeds will be planted in cone-trainers containing pasteurized sand. Seedlings will be thinned to one seedling per pot 2 days after emergence. Each seedling will be inoculated with 5,000 eggs of *M. incognita* in 2 ml of water. An isolate of *M.*

incognita was collected from soybeans in Arkansas and maintained on tomato at the Lonoke Extension Center. Each root system will be rated for gall formation 60 days after inoculation, and eggs extracted from an 8 g subsample. Eggs will be extracted with 1.0% sodium hypochlorite and enumerated with a stereoscope. Reproduction will be reported as eggs per gram of root and reproduction factor (RF = Pf/Pi; Pf = final egg counts; Pi = initial egg counts). Each entry will be arranged in a randomized complete block design with six to eight replications per entry, and the experiment will be conducted twice. Entries with differing modes of resistance will be rescreened and used to investigate differentiating genetic traits for resistance to SRKN.

To effectively characterize the mechanism underlying resistance to SRKN, it is essential to genotype the major donor lines in addition to detailed phenotypic data. We aim to develop robust and accurate SRKN-resistant markers based on major Chromosome 10 that can distinguish between resistant and susceptible genotypes, as well as the donor source of resistance among breeding lines. Current SRKN markers lack the resolution to differentiate among donor sources, posing significant limitations for marker-assisted selection (MAS) in breeding programs. To address this, we will incorporate a diverse panel of SRKN resistance donor lines, including Forrest, PI 438489B, PI 567516C, PI 567305, and PI 96354, to develop accurate molecular markers for breeding programs. These markers will be instrumental for the introgression of SRKN resistance and enhancing the precision and efficiency of soybean breeding efforts.

Objective 2 – Development of SRKN-resistant breeding populations: Both Arkansas and Missouri soybean breeding programs are actively breeding for MG 4 SRKN-resistant soybean varieties with strong disease packages including SCN, southern stem canker, and chloride tolerance. In summary, between 15 to 20 bi-parental breeding populations will be developed, including a high-yielding elite modern cultivar and resistant genetic resources (Forrest, PI 438489B, PI 567516C, PI 567305, PI 96354, and more, based on the results from Objective 1). An off-season nursery in Ponce, Puerto Rico will be used to conduct off-season hybridization schemes and generation advancement (three growing

seasons in a year). The F_2 to F_4 generation advancement will be performed using the modified single-pod descent method. Between 100 and 150 F_4 single plants per bi-parental population will be selected and threshed separately in Puerto Rico, and $F_{4:5}$ seeds from selected F_4 plants will be grown in non-replicated progeny rows (2.1m long single rows). Progeny rows will be selected based on overall phenotypic appearance, uniformity, and pod load, and will be genotyped with the Soy3KSNP and molecular markers developed by Nguyen's group in Missouri. Selected lines will be moved into yield trials across multiple locations in the Mid-South. It is worth noting that hundreds of breeding populations have been developed over the duration of this project, of which many breeding lines are currently in the pre-commercial/regional testing stages. In addition, both breeding programs have access to the Enlist-E3 and XtendFlex herbicide resistance technologies and are actively introgressing such traits into many high-yielding conventional SRKN-resistant soybeans.

PROJECTED IMPACT OF RESULTS ON MID-SOUTH SOYBEAN PRODUCTION

The technology developed from this project, including nematode screening protocols, resistant soybean germplasm, molecular markers, and molecular breeding strategies, will help the broad research community, private and public breeders, and growers dealing with SRKN. Resistance deployed into earlier MG is critical for the successful management of the disease, as SRKN has been moving northwards over time. In addition, the successful long-term value of SRKN resistance occurs when multiple resistance mechanisms are deployed and/or multiple resistance genes for SRKN are stacked; this project will continue to enable the knowledge and products necessary to protect SRKN resistance durability. In all, the outcomes of this project will help maintain the competitive position of US agriculture in worldwide soybean production.

EXPECTED END PRODUCT(S)

End products expected throughout the project include i) high-yielding conventional and herbicide-resistant SRKN-resistant varieties broadly adapted to the Mid-South, ii) improved resistant germplasm with both low galling and low nematode reproduction, iii) peer-reviewed publications and production

meetings' materials covering the nematology, molecular, and plant breeding components of this work.

ATTACHMENT 5



Who We Are

ASA Mission

To advocate for U.S. soy farmers on policy and trade

ASA Vision

ASA is the leading soy policy advocate and most sought-after partner and advisor advancing the success and prosperity of U.S. soybean farmers.

State Soybean Affiliates Are a Powerful Force for Soybean Farmers



Soy Organizational Structure



Working Together as the Soy Family for Farmers

- Tremendous Assets: Checkoff and the Association
- USB-ASA relationship stronger than ever
- Excellent collaboration via USSEC and WISHH
- ASA–State Affiliate Coordination

Today's Proposals

Continuation of 2026 Funded Projects

- Economic Analysis and Support
- Soybean Leadership Academy
- Innovation to Market(I2M) Work Group
- ASA Awards Celebration
- SoyStats®
- Young Leader Program

Additional 2027 Proposals

- ASA Action Partnership (ASAAP)

Projects New to ASPB

- Biomass Based Diesel Initiative (BBDI)

ASA Action Partnership (ASAAP) $6,000

2 Meetings Each Year:

- One-day meeting in March in Washington, DC
- Late Summer ASAAP Retreat in Rotating Location

- The summer 2026 ASAAP meeting is August 17-20 in Fairport, NY

ASAAP Benefits

- Two participants from Arkansas at ASAAP's annual meetings
- Focus group/farmer advisory council opportunities with members and leaders

ASA Action Partnership (ASAAP)

The Primary Objectives of ASAAP are:

- Identify and address challenges and issues facing the soybean industry
- Develop an actionable strategy to achieve strategic objectives and goals
- Collaborate with industry, states and national soybean organizations

ASA Action Partnership (ASAAP)



2027 ASAAP Membership

2026 Members Include:

Industry: ADM, AGP, BASF, Bayer Crop Science, Corteva Agriscience, FMC, Inari, John Deere, Syngenta and Valent

State Affiliates: Delaware, Indiana, Iowa, Kansas, Kentucky, Maryland, Minnesota, North Carolina, North Dakota, Ohio, South Carolina, South Dakota, Tennessee, Texas and Wisconsin

National Organizations: United Soybean Board, U.S. Soybean Export Council, Clean Fuels Alliance America, National Oilseed Processors Assn. and Sustainable Advanced Biofuel Refiners

Proposed Investment from the Arkansas Soybean Promotion Board for a 2027 State ASAAP Membership is $6,000.

2027 Economic Analysis and Support

ASA's Economics Department serve a critical role in strategic decision-making by providing analysis and insights that help organizations in the soy industry position U.S. soybean farmer interests with influential groups through various tactics including but not limited to:

- Economic analysis
- Engagement with carbon and environmental markets and life-cycle analysis
- Work in renewable fuels, transportation and trade
- Ongoing review and support related to the farm safety net
- Interactions with other economists related to baseline analysis for markets, conservation programs and safety net spending
- Communicate soybean issues and policy impacts to audiences

2027 Economic Analysis and Support

Additional Sponsorship Benefits of the 2026 Economic Analysis and Support Project

- Virtual or in person briefings at Arkansas Soybean Promotion Board meetings and events by the ASA Economics Department as requested (subject to schedule)
- Quarterly threats and opportunities report for the soy industry
- Early copies of economic reports generated by ASA
- Consultations with ASA Economist
  - Discussions of impacts of state or national policy
  - Suggestions for potential researchers to conduct the research/analysis and on project scope and design





Proposed Investment from the Arkansas Soybean Promotion Board for 2027 Economic Analysis and Support is $5,000.

2027 Soybean Leadership Academy

Soybean Leadership Academy provides:

- Targeted training to state and national soybean board leaders and top staff, increasing their effectiveness as leaders and as boards
- Enhanced collaboration between state affiliate and national soybean organizations, strengthening the voice of U.S. agriculture
- Interaction between senior soybean leadership and newer board members creating strong peer and networking opportunities

2027 Soybean Leadership Academy: Jan. 13-15 in either Indianapolis or Nashville

Proposed Investment from the Arkansas Soybean Promotion Board for the 2027 Soybean Leadership Academy is $3,000.

Soybean Leadership Academy

"It was a much-needed academy for me to take that next step to start looking to get on a board and feel confident while serving."



"I learned so many new skills that will make me a better leader"



"It was a great event, with speakers that were engaging, and I learned a lot."

Tell us about your experience at Soybean Leadership Academy.



"I liked that you focused on individual leadership skills that apply to board members and staff alike rather than over-reaching organizational leadership."



Innovation to Market (I2M) Work Group

The Innovation to Market (I2M) Work Group is a forum designed facilitate the domestic and international introduction, commercialization and market acceptance of new innovations.

I2M Aims To:

- Identify and address challenges impeding the development, commercialization and market acceptance of seed and pesticide products.
- Provide a forum to identify strategies for addressing long-term issues that continue to threaten innovation and productivity in the agriculture industry.
- Create consistent standards and regulatory processes throughout all key export countries.

Innovation to Market (I2M) Work Group

2 Meetings Each Year with 2 Arkansas Representatives Each:

- Two-day meeting in January or February in Washington, DC
- Late Summer Meeting in Rotating Location
- The summer 2026 I2M meeting will be the July 28-30 in Raleigh-Durham, NC.
- Exact 2027 I2M Dates are TBD.



Proposed Investment from the Arkansas Soybean Promotion Board for a 2027 State I2M Work Group Membership is $7,500.

2026 ASA Awards Celebration

The ASA Awards Celebration showcases the industry by:

- Recognizing leadership achievement and outstanding service by soybean growers, state volunteers and industry leaders
- Highlighting key soybean industry initiatives including those in conservation, sustainability, and best management practices
- Inspiring innovation which drives future soybean industry growth

2027 ASA Awards Celebration

The ASA Awards Celebration is the premier opportunity to recognize and celebrate the achievements and contributions made by soybean farmers and industry.

The 2027 ASA Awards Celebration will be held in conjunction with Commodity Classic in New Orleans.

Proposed Investment from the Arkansas Soybean Promotion Board for the 2026 ASA Awards Celebration is $6,000.*
****possible half table for $3,000***



2027 SoyStats®, A Reference Guide to Important Soybean Facts and Figures



Objectives:

- Collect and analyze annual soybean production and utilization data
- Distribute accurate soybean-specific statistics and information
- Online guide with up-to-date information at www.SoyStats.com, printed copies available to funding states upon request



Proposed Investment from the Arkansas Soybean Promotion Board for a Bronze Sponsorship of SoyStats® is $750.

2027 Young Leader Program

The Young Leader program has identified and trained leaders for the soybean industry for more than 40 years. This progressive program encourages diversity by training both partners in the operation.

- Phase I: Early December 2026 in Johnston, Iowa
- Phase II: Late February 2027 in New Orleans during Commodity Classic

Proposed Investment from the Arkansas Soybean Promotion Board for the 2026-2027 Young Leaders Program is $9,200 per couple.



2027 Young Leader Program



"I am already a better farmer and person because of this program."



"My wife and I enjoyed the program. I would 100% do it again."



"Very Well Set Up and Organized. We learned a lot in a short amount of time."



How would you describe your time in the Young Leaders Program?

"I loved all the interaction that was encouraged. It was a great experience."

Biomass-Based Diesel Initiative – Prioritizing U.S. Soy

- Lead and coordinate industry-wide efforts to support soy biomass-based diesel (BBD).
- Protect the interests of soybean farmers related to soy BBD.
- Ensure a robust crush industry.
- Close gaps in addressing BBD issues where CFAA and soy have different objectives.
- Effectively coordinate lowering CI scores for soy BBD.
- Increase ASA's resources to address rapidly growing soy BBD issues.

Proposed Investment* from the Arkansas Soybean Promotion Board for BBDI in FY27 is $5,000**

*Funds invested into BBDI will not be applied towards the Arkansas Soybean Association's representatives on the ASA Board of Directors.
** Unrestricted Funds

2026 Proposal and Funding Review

Continuation of Recent Projects	Projects New to You	Projects New for the Industry
• Economic Analysis and Support • Soybean Leadership Academy • Innovation to Market(I2M) Work Group • ASA Awards Celebration • SoyStats® • Young Leader Program	• ASA Action Partnership (ASAAPP)	• Farmers Fueling the Future
$31,300	$0	$0

Today's Proposals

Continuation of 2026 Funded Projects	Additional 2027 Proposals	Projects New to VSB
• Economic Analysis and Support • Soybean Leadership Academy • Innovation to Market(I2M) Work Group • ASA Awards Celebration • SoyStats® • Young Leader Program	• ASA Action Partnership(ASAAP)	• Biomass Based Diesel Initiative (BBDI)
$31, 450	$6,000	$5,000

Thank you for your continued partnership with the American Soybean Association.

Questions?

Contact Kate Maher
ASA Director, State & Industry Relations
kmaher@soy.org

ATTACHMENT 6

Arkansas Soybean Promotion Board

State of the Industry

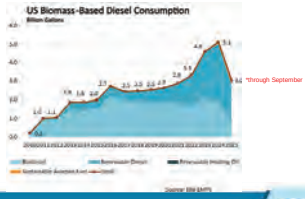
March 12th, 2026

Brad Shimmens

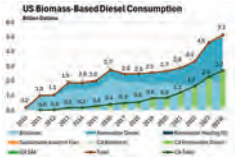
Clean Fuels' Vision

Biodiesel, renewable diesel, and sustainable aviation fuel **will be recognized as mainstream low-carbon fuel options with superior performance and emission characteristics. In on-road, off-road, air transportation, electricity generation, and home heating applications, use *will exceed six billion gallons by 2030,* eliminating over 50 million metric tons of CO2 equivalent greenhouse gas emissions annually. With advancements in feedstock, use will reach 15 billion gallons by 2050.**

BMBD Demand

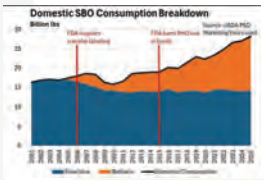


BMBD Consumption on the Rise



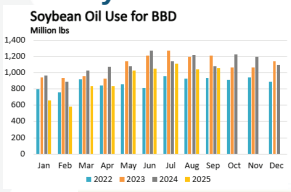
- California plays a key role in BMBD demand
- About half of the domestic BMBD demand since 2021 is in California
- 4 billion gallons in 2025

Soy Demand in BMBD



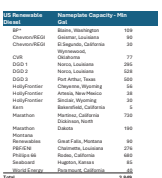
- BMBD growth has been extremely important to soybean demand
- Food demand has been flat since about 2009
- Soybean oil demand in BMBD has grown by over 500% since 2009

Soy Demand in BMBD



- Soybean oil demand now exceeds 1B pounds per month
- 2026 domestic crush estimated at 31B pounds
- Food demand pegged at 14B pounds

Soy Demand in BMBD



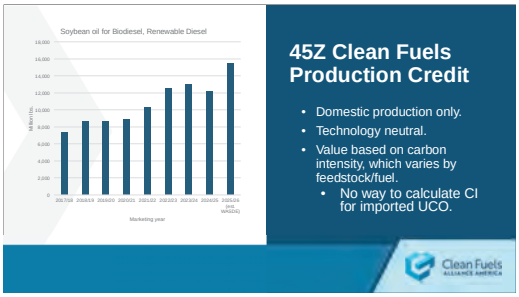
US Renewable Diesel	Nameplate Capacity - Mm Gal	
BP*	Blaine, Washington	109
Chevron/REGI	Geismar, Louisiana	90
Chevron/REGI	El Segundo, California	39
CVR	Wynnewood, Oklahoma	77
DGD 1	Norco, Louisiana	280
DGD 2	Norco, Louisiana	328
DGD 3	Port Arthur, Texas	500
HollyFrontier	Cheyenne, Wyoming	94
HollyFrontier	Artesia, New Mexico	38
HollyFrontier	Sinclair, Wyoming	39
Kern	Bakersfield, California	5
Marathon	Martinez, California	730
Marathon	Dickinson, North Dakota	190
Montana Renewables	Great Falls, Montana	90
PBF/Chalmette	Chalmette, Louisiana	276
Phillips 66	Rodeo, California	680
Seaboard	Hugoton, Kansas	85
World Energy	Paramount, California	48
Total		3,449



BMBD Drivers

- Federal Policy
  - Agriculture Support
  - Environmental Benefits
- State Policy
  - Low Carbon Fuel Standards
  - Production/Use Incentives
  - Mandates
    - On-Road, Heating Oil
- Corporate Policy
  - Carbon Reduction

Federal Policy Drivers



45Z Clean Fuels Production Credit

- Domestic production only.
- Technology neutral.
- Value based on carbon intensity, which varies by feedstock/fuel.
  - No way to calculate CI for imported UCO.

Big Beautiful Bill Wins on 45Z

- ✓ Eliminated ILUC from CI calculation.
- ✓ 45Z extended through 2029 with transferability.
- ✓ Small Agri-Biodiesel Production Credit revived through 2026 ($0.20/gal).
  - ✓ Added transferability.

CI Ranges (kgCO2e/ MMBTU)	Soy	Canola	Tallow	DCO	UCO
Biodiesel	17.8	34.1	13.2	8.0	12.8
	20.7	37.0	19.9	10.9	19.5
Renewable Diesel	24.4	39.6	17.3	11.8	16.9
	25.2	39.8	20.9	15.6	20.6
Sustainable Aviation Fuel	24.5	40.0	17.3	11.7	16.9
	26.5	42.0	19.3	13.7	18.9

EPA Set 2 RVO Proposal

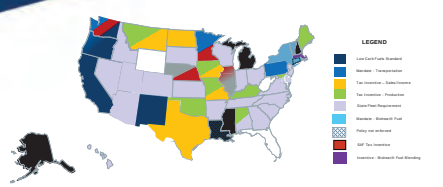
- Proposed robust BBD volumes – for the first time in program history
- Recognized domestic feedstock availability
- Acknowledged industry growth and investments
- Proposed import RIN reduction for imported fuels and feedstocks
- Reduced RD equivalence value based on science

(billion RINs)	2026	2027
BBD	7.12	7.50
BBD Gallons (billion)	5.61*	5.86*
Advanced	9.02	9.46

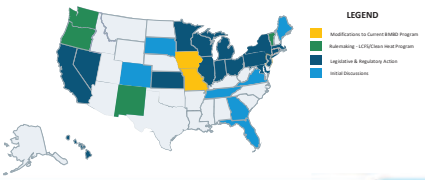
*EPA estimate

State Policy Drivers

STATES WITH NOTABLE BIODIESEL POLICIES



2026 STATE POLICY OUTLOOK



Corporate Policy Drivers

BMBD Corporate Adoption

- Half of Fortune 500 companies have net zero goals
  - up from 8% in 2020

Reduce Scope 1 & Scope 2 by 30% by 2030
Carbon neutral by 2040
Zero emissions by 2040
Zero emissions by 2050
Net Zero by 2050
30% reduction by 2030
Carbon negative by 2030
Zero emissions by 2040
100% carbon neutral by 2030
Net Zero by 2040
30% reduction by 2030
Net Zero by 2040
Reduce Scope 1 & Scope 2 by 40% by 2030

BMBD Markets

- On-Road = ~40B
  - CA LCFS = ~4B
- Off-Road = ~2B
- Bioheat = ~ 4B
- Rail = ~3.8 B
  - Class I – 3.6B
  - Class II, III & Shortlines = ~200M
- Marine = ~85B
  - U.S. = ~3.5B
    - Brown Water = ~.6B
    - Blue Water = ~2.9B
- Air = ~25B

BMBD Acceptance

- Growing Acceptance of Higher Volumes of Biodiesel
  - John Deere – B30 / B100
  - Caterpillar – B20 / B100
  - Wabtec – B20
  - Progress Rail – B20
  - Carlin Combustion / Energy Kinetics / RW Beckett / Webster Combustion Heating Oil Burners – B100
- Find more OEM levels of approval at:
  - https://cleanfuels.org/wp-content/uploads/OEM-Support-Summary_Sept-2025.pdf

BMBD Outlook

- Growing demand as corporate carbon reduction strategy
- State clean fuels policies increase demand
- Market adoption increasing (rail, marine, heating oil)
- SIGNIFICANT Growth in RFS Proposed
  - ~5.6B gallons in 2026

Farm Security

Clean Fuels Empower Our Farmers

- Biodiesel and renewable diesel production supports 10% more of the value of every bushel of U.S. grown soybeans.
- Clean fuels expand market opportunities for feedstock suppliers.
- Increased demand drives research to develop better seed genetics and on-farm practices, resulting in improved crop yields.



Economic Impact

Biodiesel and Renewable Diesel Production Drives Our Economy

U.S. Economic Impact (2024)

5 Billion	$42.4 Billion	107,400	$6 Billion
Gallons	*Economic Impact*	*Jobs*	*Wages*

Source: Economic Impact of Biodiesel on the US Economy 2024

Existing, New & Planned Capacity



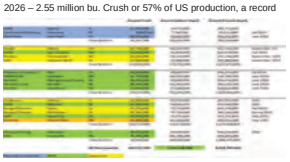
2025 Capacity – 6,700,000,000 gals.

- Biodiesel – 2 billion gals.
- Renewable diesel – 4.5 billion gals. Up 400,000,000 gals.
- SAF – 330,000,000 gals.

New Soybean Crush

500,000,000 bu of crush by 2026 = 5.5 billion lbs. SBO or 743 million gals. BD/RD

2026 – 2.55 million bu. Crush or 57% of US production, a record

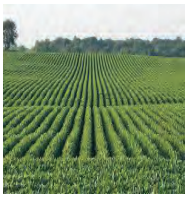




Impact on U.S. Crop Value

Today – Adds 10% to the value of soybeans.

Consolidated Grain and Barge, Sherrill, AR 3/3/26 - $11.45



USDA Forecast 2/19/2026

The USDA's forecast for soybean oil used in biofuel considers the EPA's proposed Renewable Fuel Standard RVOs for 2026 and 2027, which were announced in June 2025. A significant shift in these proposed RVOs from previous RFS regulations is the stipulation that biofuels either imported or produced domestically using foreign feedstocks will receive only half the Renewable Identification Number (RIN) credits compared to biofuels produced within the United States using U.S.-based feedstocks. Given this assumption, the use of soybean oil for biofuel in 2026/27 is expected to rise to 17.3 billion pounds, up 2.5 billion from the prior marketing year. The soybean oil price is forecast to rise to 58 cents per pound. It is important to note that if the final RVOs diverge from the June 2025 proposal, the forecast will be evaluated accordingly in future monthly *WASDE* reports.

Projected volumes

Assuming a positive RVO numbers*

Projected Volumes	2026	2028	2030
Biodiesel	2.1 billion gals.	2.6 billion gals.	2.7 billion gals.
Renewable Diesel	2.9 billion gals.	3.8 billion gals.	4. 7 billion gals
SAF	.50 billion gals.	.710 billion gals.	.740 billion gals
Total	5.5 billion gals.	7.1 billion gals.	8.2 billion gals.
SBO Used	14.8 billion lbs.	22 billion lbs.	27.8 billion lbs.

Market Expansion Drive



$20,000 ($1,959,040)



- **Elevate Visibility:** Position biodiesel, renewable diesel and sustainable aviation fuel as trusted, competitive solutions.
- **Drive Market Growth:** Expand adoption in rail, marine, home heating, aviation and power generation.
- **Engage & Educate:** Use targeted advertising, media outreach and stakeholder engagement to build awareness and confidence.
- **Unify Industry Voice:** Coordinate efforts to maximize visibility and impact.

Clean Fuels ALLIANCE AMERICA

State Market and Environmental Support



Fueling Understanding, Advancing Agriculture

$20,000 ($523,000)

Education & Stakeholder Support

Expand Biodiesel Markets

- **Analytical/Technical Support:** Assist domestic clean energy initiatives: NGO's EJ groups, fleets, consumers, agriculture, rail, marine, aviation
- **Navigate Complex Rulemaking:** Assist stakeholders in rulemaking and legal landscapes
- **Promote Health Benefits:** Trinity Study: Quantify health benefits of biodiesel for use in urban areas, promote reduction in PM emissions
- **Deliver Added Economic Value:** Create stability for soybean farmers amid ongoing market volatility

Clean Fuels ALLIANCE AMERICA

Clean Fuels appreciates the support of our farmers and their checkoffs

Clean Fuels ALLIANCE AMERICA



Brad Shimmens
bshimmens@cleanfuels.org
573-291-7606
cleanfuels.org

Clean Fuels ALLIANCE AMERICA

ATTACHMENT 7



U.S. Soybean farmers WANT NEW MARKETS.

WISHH works to MAKE them HAPPEN.



WISHH connects trade and development across global market systems, improving food security

Developing → Emerging → Expansion → Mature





Trends driving WISHH programming

- **Developing Economies Are Growing Economies**
  - Africa dominates the list of the world's 20 fastest-growing economies
- **Growing Populations Drive Demand for Protein**
  - According to FAO, demand for animal protein is expected to double by 2050
- **Next Generation Entrepreneurs are Key Partners**
  - Between 2017 and 2050, the populations of 26 African countries are projected to expand to at least double their current size
- **Aquaculture is on the Rise**
  - Aquaculture is the world's fastest expanding food production system.
- **Availability of Commercial Feed Pellets is a Bottleneck**
  - Feed accounts for 60-70% of production cost
- **Building Stability Leads to Better Markets, which Leads to Better Trade**
  - FAO's State of Food Security and Nutrition 2024 finds global hunger still affects 9.1 percent of the world's population.



BEFORE they will BUY, they need to be CONFIDENT that …

- Soy WORKS in their operations
- Their customers WANT it
- Their businesses can PROFIT from it



Opportunities in WISHH Markets- Ghana

- **Priority Countries:** Senegal, Ivory Coast, Ghana, Nigeria, Kenya, Uganda, Tanzania
- **Growing demand for protein-** eggs, chicken and fish
- **Major port expansion** and U.S. companies are expanding their investments
- Investment in **aquaculture value chain**
- **Launched aquaculture programs** in East Africa

What's next?

- Addressing high-volume issues- trade routes/times, infrastructure, port operations
- Exporter education



Opportunities in WISHH Markets- Cambodia

- **$19.1m investment** from USDA for aquaculture value chain development (CAST)
- Facilitation of **41,800 MT of U.S. SBM** into Cambodia
- Creation of the **Cambodia Aquaculturist Association**
- **Increased supply and adoption** of high-quality, soy-based feeds
- **Leveraged checkoff funding** for technology transfer for in-pond raceway systems and private extension



What's next?

- CAST activities close this year
- Continue to build the value chain through USDA market development funds and checkoff
- Capitalize on regional wins such as Vietnam

Cambodia Livestock and Aquaculture Feed Opportunities

- Largest dairy in Cambodia uses **50-70 tons of soybean meal** per month
- **Feed mill focused programming** but expanding to working with dairy, poultry and swine producers for resiliency and **increased consumption of soy-based feeds**
- **Increased number of fish hatcheries** since CAST signaling growing demand and increased production knowledge
- **Capitalize on U.S. soy wins in Vietnam**



Opportunities in WISHH Markets- Central Asia

- FY22 **market assessments** in Kazakhstan and Uzbekistan showed opportunity for poultry and aquaculture
- **U.S. investments in the region** by companies like Tyson
- Aligns with the **State Department's C5+1 strategy**
- WISHH has on-the-ground representation and technical assistance
- Implementation of the **Transcaspian Strategic Plan**
- WISHH Signed MOU with the **Uzbek Ministry of Investments, Industry and Trade** to coordinate technical assistance in poultry, aquaculture and dairy and support trade relationships



Tyson

Donnie King, CEO

"It's estimated that approximately 90% of global protein consumption growth will occur outside the United States, with 60% of the volume growth coming from Asia over the next 5 years."*

*(*Southeast, Central and South Asia)*

Source: Talk Business & Politics, "Tyson Foods continues investments in international markets," 8/10/2023



What's in it for Arkansas Farmers?

Market Diversification

$10M+ Leveraged Funding

Experienced Partner

Farmer Meetups & Opportunities to see what it takes

FY27 WISHH Investment Ask

$50,000 General Funding

- Support of WISHH's market development work across regions
- A leader in frontier markets
- Leverage USDA funds at a 6:1 rate

Our sincere thanks for your previous partnership and for your consideration moving forward!



ATTACHMENT 8

U.S. Meat Export Federation

A special presentation for:

Arkansas Soybean Promotion Board

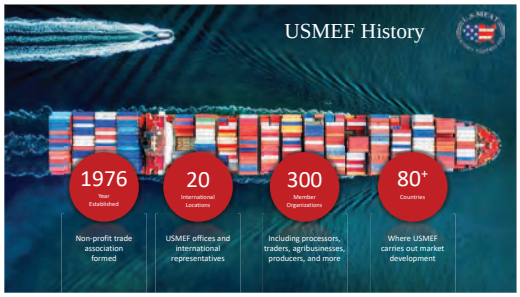
John Hinners, Senior VP, Industry Relations
March 12, 2026

Mission

Increase the **value** and **profit** opportunities for the **U.S. beef, pork, and lamb** industries by enhancing demand in **export markets** through a coordinated and collaborative partnership of all stakeholders.



USMEF History



Established in 1976

- Strong Relationship with the U.S. Department of Agriculture
- Diverse Agriculture Industry Members
- 300+ Active Members

2026 USMEF Officers
Jay Theiler, Chair (Agri Beef Co.)
Dave Bruntz, Chair-Elect (Nebraska Corn Board)
Darin Parker, Vice Chair (PMI Foods)
Ross Havens, Secretary/Treasurer (Cattlemen's Beef Board)



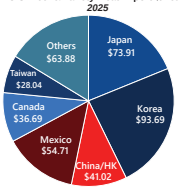

2026 Officers



Beef Export Value per Head by Market

U.S. Beef & Variety Meat Export $/Head
2025

2025 value per head of fed cattle slaughtered = $391.94, -6%

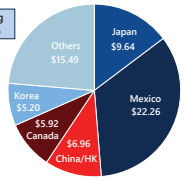


Source: USDA/FAS, USDA/NASS fed slaughter, USMEF

Pork Export Value Per Head by Market

U.S. Pork & Variety meat Export $/head
2025

2025 value per market hog slaughtered = $65.47, -2%



Source: USDA/FAS, USDA/NASS Commercial Hog Slaughter, USMEF

Exporting U.S. Soybeans through U.S. Pork in 2025



Pork exports accounted for
98.8 million bushels
of soybean usage in 2025
for a total market value of
$1.004 Billion

In 2025, pork exports contributed an estimated total economic impact of
10.3% of $10.17 bushel value = $1.05 per bushel

Source: USMEF 2025 study, *Exporting U.S. Soybeans through U.S. Pork*

Upcoming USMEF Meetings

- USMEF Spring Conference in Oklahoma City, OK
  May 20-22, 2026
- USMEF Strategic Planning Conference in Palm Springs, CA
  November 11-13, 2026

John Hinners
jhinners@usmef.org

Thank you! Questions?

ATTACHMENT 9

2026 Grow for Green Soybean Yield Challenge

1

Contest began in 2010 as the Race for 100 with first three 100-bushel winners in 2013. To date we have 46 members of the 100 Bushel Club.

It has transitioned to the Grow for the Green Soybean Yield Challenge with new 100-bushel winners still being recognized.

2

Program began to recognize and award Arkansas producers who have developed management programs that result in very high grain yields by region.

Another goal is to see what works best in Arkansas for the different regions and share the information publicly with the farmers that would benefit from the knowledge.

3

Format:
7 regional divisions
1 statewide convention division
1 Champion division (all 100-bushel winners)

Prizes:
3 prizes per division ($7500, $5000, $2500)
1 prize for Champion ($5000)
New 100-Bushel winners split $5000 and are eligible for a trip to Commodity Classic.

4

Since 2013 a summary of results has been posted on the websites of the ASPB and the AR Soybean Association and published in booklet form. Results are disseminated to all producers with the assistance of the Communications Group.

Results are announced at the annual meeting of the Arkansas Soybean Association in January. Plaques and checks are presented at that time.

5

For 2026 we are asking for $206,900 for the program.

$130,000 is for prizes to winners.

Remainder covers Commodity Classic Expenses, 100-Bushel Club dinner, sponsorship of ARSA annual meeting, lunch at annual meeting, advertising, administrative expenses.

6







Thanks to the Arkansas Soybean Promotion Board for funding the program for the past 15 years.

Thanks to the University of Arkansas System Division of Agriculture, we could not do the program with the assistance of our county agents.

7

ATTACHMENT 10



1

Purpose

Increase public awareness of the importance of soybeans in Arkansas agriculture
- Provide hands-on learning experiences about soil health, food systems, and sustainability
- Engage K–12 students, ASUN students, and community members
- Promote agriculture career pathways and workforce opportunities

Target Audience
- 200+ participants
  - Local K–12 students
  - ASUN students
  - Community members and educators

2

Event Activities & Engagement

Participants will explore soybeans through interactive learning stations:

Soy Planting Station
Take-home planting kits and seed education

Soil Health & Composting Station
Hands-on demonstrations connecting soybeans to regenerative agriculture

Cooking with Soy Demonstration
Taste-testing and voting on soy-based snacks

Educational Booths
Learning about biodiesel, food products, and soy innovations

Children's Activities
Family-friendly agricultural learning experiences

3

Impact on Arkansas Agriculture

Supporting the Arkansas Soybean Industry
- Expands public awareness of soybeans beyond farming communities
  - Highlights soy's role in nutrition, sustainability, and renewable energy
  - Promotes soil restoration and conservation practices

Workforce Development
- Introduces students to careers in:
  - Row-crop agriculture
  - Seed and chemical sales
  - Transportation and logistics
  - Environmental sustainability

ASUN Agriculture Technology Program
Preparing students for high-demand agricultural careers through cross-program collaboration. (CDT, Culinary, and Diesel Technology,

4

Project Investment & Accountability

Total Project Budget: $11,000

Funds support:
- Educational materials and signage
  - Outdoor event infrastructure
  - Guest educators and demonstrations
  - Soy-based educational giveaways
  - Student worker support
  - Community promotion and outreach

Accountability
- All funds managed through **ASU–Newport Business Office**
  - Post-event reporting will include:
- Expenditure report
- Attendance and impact summary
- Photos and media documentation
- Evaluation surveys

Outcome:
Strengthening agricultural awareness, workforce pathways, and community engagement in Arkansas agriculture.

5

ATTACHMENT 11

Promotion Projects

Poinsett County Ag Day 2026

- **Investigators:** Christie Wagley, CEA FCS/4-H
- **Status:** Recompete – Current Proposal requesting a new funding cycle
- **Budget Request:** $8,070.00
- **Objectives:**
  - Nestled in the heart of the Delta, rural Poinsett County is one of the top soybean producing counties in Arkansas. Ag Day provides the children of Northeast Arkansas the chance to participate in an informal, hands-on experience. This allows us to educate our youth about the products our agricultural commodities provide and the role that the agricultural industry plays in our local economy (including soybeans).
  - Promote the Arkansas soybean industry and its positive impact on the region, state and nation.



- Each Ag Day participant will receive a screen-printed t-shirt to wear at Ag Day (with soybean and 4-H promotional messaging). T-shirts will be delivered prior to the event so that participants will have shirts to wear for Ag Day and afterwards.
- This year, we are adding hydration stations to the exhibit rotations, allowing for a quick rest & hydration period in between exhibits. Ice chests would be used to store small, cold, water bottles at hydration stations.
- Promotional items would advertise both the Arkansas Soybean Promotion Board & the soybean industry.

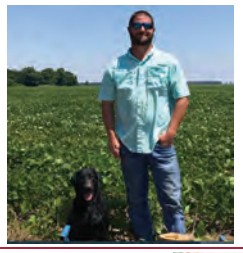
2026 Irrigation Contest (Promotion)

- **CG Henry**
- **Status: Year 9**
- **Budget Request: $10,000**
- **Objectives:**
  - Funds prizes for winners
  - $6,000 for first place
  - $3,000 for second place
  - $1,000 for third place

John Allen McGraw
1st place Soybeans
74.99 BPA
3.57 Bushels Per Inch WUE

Star City, Lincoln County, Arkansas

Used Pipe Planner, Soil Moisture Sensors, Arkansas Watermark App to schedule Irrigation





Zack Brown
2nd place Soybeans
101.2 BPA
3.19 Bushels Per Inch WUE
Success, Arkansas (Clay County)
Moisture Sensors, UA Arkansas Watermark App



Ty Graham
3rd place Soybeans
86.65 BPA
3.08 Bushels Per Inch WUE
Tuckerman, Arkansas (Jackson County)

Soybean Science Challenge

- **Investigators: Julie Robinson and Jeremy Ross**
- **Status: Year 1 of 3**
- **Budget Request: $87,018**
- **Objectives:**
  - **Develop and deliver original educational resources/curriculum to Arkansas junior high and high school students.**
  - **Increase awareness and knowledge of the value of soybeans to the Arkansas economy and potential careers supporting Agricultural sustainability.**
  - **Increase knowledge of the diversity of soy products and uses.**
  - **Increase participation in applied research by Arkansas junior high and high-school students supporting soybean production.**
  - **Development of state-wide educational partnerships to leverage ASPB resources.**
  - **Actively engage students in the "co-creation" of knowledge and reward outstanding student researchers through the Soybean Science Challenge research awards.**
  - **Reach out to science teachers to consider using Soybean Science Challenge online education resources and curriculum in their classroom.**
  - **Encourage teachers, schools, and districts to develop/expand school and community-based gardens where students learn about agricultural crops and practices, nutrition, environmental stewardship, and sustainability.**
  - **Working with regional and national education and teacher organizations to bring Arkansas soybean research and education into classrooms across the USA.**



Arkansas Future Ag Leaders Tour

- **Investigators: Julie Robinson and Jeremy Ross**
- **Status: Recompete**
- **Budget Request: $5,000**
- **Objectives:**
  - **Increase participant's employability in agricultural careers.**
  - **Acquaint participants with the vast resources, market segments, and services available through Arkansas' number one industry.**
  - **Provide participants with a "bird's eye view" of current employment opportunities in the Arkansas agriculture industry.**
  - **Increase student's options and opportunities by networking with future employers.**

Significant Findings for Previous Year for Current Studies or Value to Soybean Industry:

1. The Arkansas Future Ag Leaders Tour helps create a more prepared and informed workforce that better understands the needs and dynamics of the farmers and producers that they will serve in their agricultural related careers across the state.
2. Addresses some job readiness skills that have been identified as deficient by employers.
3. Touring across the state makes students aware of what jobs are available in the state and in local communities all across Arkansas.

Quotes:

- "I learned that there are way more ag jobs in AR than I thought."
- "I will use this experience to lead others and grow or carry this knowledge to others."
- "I will use the knowledge I have received from the many speakers on the job."
- "I learned that Ag careers are about passion for agriculture and helping people."



ARKANSAS SOYBEAN PROMOTION BOARD 2026 PARTNERSHIP PROPOSAL





1

Arkansas FFA

- Premier youth agricultural education and leadership organization
- In over **80%** of school districts
- **18,228** Arkansas FFA members
- **26,500** agricultural education students
- **338** agricultural education teachers
- **217** chapters



2

$100,000 INVESTMENT









PROMOTION + HIGH VISIBILITY + NEXT GENERATION:

AGRICULTURAL EDUCATION ($29,500)
CAREER DEVELOPMENT AND SUCCESS ($25,500)
LEADERSHIP DEVELOPMENT ($45,000)

3

Agricultural Education

- Agriscience Fair
- Student and Teacher Training @ Agricultural Mechanics Lab
- Arkansas Youth Institute and World Food Prize

Career Development and Success

- Career Pathway and Career Development Event Support
- Scholarships

Leadership Development

- Arkansas Leadership Conference
- Marion D. Fletcher Leadership Center Classroom

4

Recognition

- State FFA Convention & Expo (3,900 attendees)
- Greeting to FFA members and guests
- Logo placement on convention t-shirt
- Promotional video played during four pre-sessions
- Premium booth space at expo
- Signage throughout convention and expo with logo
- Annual report, website, and mobile app recognition







5

$100,000 INVESTMENT









PROMOTION + HIGH VISIBILITY + NEXT GENERATION:

ARKANSAS SOYBEAN PROMOTION BOARD

ARKANSAS FFA FOUNDATION

6

ATTACHMENT 13

All Things Soybean

Three County Fair
President Cathy Helton

1

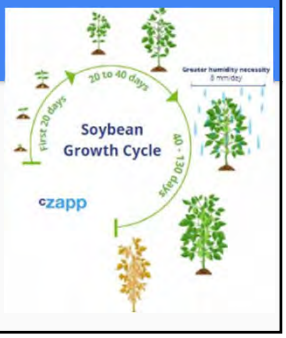
Purpose

- Educate on uses of soybeans
- Interaction with soybean plants and products
- Provide knowledge on what equipment is used to harvest and plant soybeans
- This would help educate over 500 students and faculty across all 3 counties all about soybeans and why they are so important to our community and globally.

2

Education Days at the Fair

- Provide interaction stations
- Invite local seed representor
- Invite local farmers
- Invite equipment dealers
- Have pictures of the process start to finish
- Have soybean related products present



3

Projected Outcomes

- Greater knowledge regarding importance of soybeans
- Create possible career related opportunities
- Soybeans are used in various products including livestock feed





4

Education Stations in the Past





5

Education Stations in the Past





6

Examples We Want to Implement





7

Take Home



8

Thank you for your time!

9

ATTACHMENT 14



Cross County Youth Ag Day
Arkansas Soybean Promotion Board Proposal
Presented by Stacy Witcher
Cross County Farm Bureau Women's Leadership Committee

1

Elementary Ag Education

- Over the last four years, Cross County Farm Bureau Women's Leadership Committee has made yearly visits to our county elementary schools.
- Children who travel past various farm commodities growing in fields between their school and grocery store are not aware of the crops grown in their backyards.
- Yearly visits to individual classrooms are limited by WLC numbers and school time constraints.
- We need a way to reach more children with more agriculture topics.



2



Cross County Youth Ag Day

We want to reach more than 1400 students through a series of Youth Ag Education Days.

3

Stations

- Soybeans
- Rice Research Center
- Corn
- Sweet Potato Demonstration
- Farm Bureau Milk Cow
- Cotton
- Greenway Equipment Tractor
- 4-H Petting Zoo
- Arkansas Cattlewomen's Association
- University of Arkansas County Extension Demonstration

4

Students Learn from Farmers and Ranchers

If we don't tell our stories, someone else will.

The sooner students understand the Agriculture Industry, myths can be debunked before they become imbedded.



5

Budget

T-shirts provided for each student, teacher and volunteer - $12,000

Tents, tables, chair rental for two locations - $7,000

Signage - $2,000

Drinks/snacks for volunteers running stations - $500

Ag Readers for children - $4,000

Portable Toilets for volunteers - $350

Generator Rental - $600

Miscellaneous supplies (paper, name tags, bags, rubber bands, etc) $500

Total expected expenditures $26,950

6


County Wide Engagement
Reaching every elementary child, will reach the majority of homes in our county. Handouts will be shared with family members and we will have the opportunity to educate the entire county.

7


Thank You

8

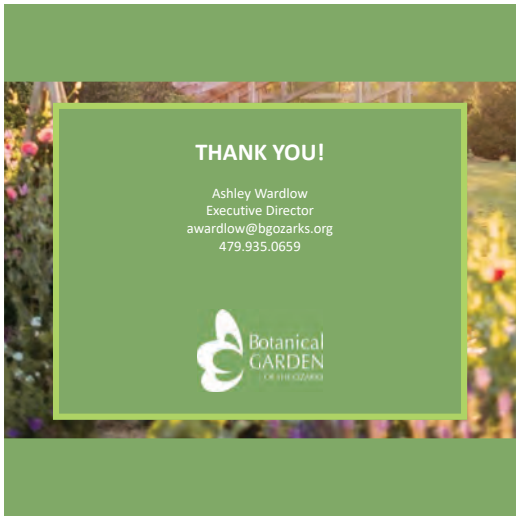
ATTACHMENT 15











ATTACHMENT 16

















ATTACHMENT 17

Soy in Aquaculture
Research to Results

RFP Request | Arkansas Soybean Promotion Board
March 12, 2026

SOY AQUACULTURE ALLIANCE

1

INTRODUCTION

- Family farm in Western Iowa
- 10 years in logistics & commodity trading
- 8 years in advocacy & lobbying



Katie Hall
Executive Director
Soy Aquaculture Alliance

SOY AQUACULTURE ALLIANCE | US SOY

2

MISSION

Soy Aquaculture Alliance (SAA) promotes U.S. aquaculture production and creates aquafeed solutions with U.S. soy.

SOY AQUACULTURE ALLIANCE | US SOY

3

ALLIANCE MODEL



FOCUS

- Maximize soy in aquafeed for key species
- Reduce anti-nutritional factors
- Increase awareness of soy solutions for aquaculture
- Market development in U.S. aquaculture production

SOY AQUACULTURE ALLIANCE | US SOY

4

PROGRAM AREAS

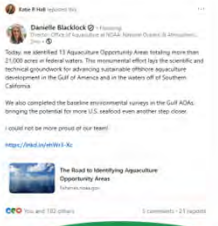


- Research
- Aquaculture Industry Relations
- Market Development (US)
- Soybean Industry Relations
- Policy

SOY AQUACULTURE ALLIANCE | US SOY

5

THE FUTURE OF U.S. AQUACULTURE



FRANKFORT, Ky. (LEX 18): October 28 **"Aquaculture is the fastest growing form of agriculture in the world," said Dr. Andrew Ray, chair of the School of Aquaculture and Aquatic Science. "But one of the big problems is that we import almost 80% of our seafood in the United States, so that growth, fastest in the world, is happening in other countries and we're importing their products, most of which are farm-raised."**



SOY AQUACULTURE ALLIANCE | US SOY

6

PROGRESS: COMMERCIAL-SCALE INLAND RAS



7

RFP PRIORITIES

- Practical on-farm projects
- Commercial-scale and proof-of-value studies
- Mitigating off flavors
- Market analysis and technology advancement
- Innovative ideas moving industry forward



8

PRIORITY SPECIES & SOY PRODUCTS

SPECIES	SOY PRODUCT
• Shrimp	• Soybean Meal (SBM)
• Salmon	• Soy Protein Concentrate (SPC)
• Trout	• Soy Lecithin
• Hybrid Striped Bass	• Fermented Soy++
• Largemouth Bass	
• Catfish	• Holistic value of soy in the diet: nutritional, sustainability, and economical

9

PROGRESS: AQUACULTURE RESEARCH DIRECTOR

Dr. Amrit Bart, University of Georgia

- **"Analysis of soy product value in aquaculture"**
  - Literature review of all previous checkoff research
  - Public data review
- **Outcomes:**
  - Detailed roadmap for future research
  - Gaps in knowledge and soy value
  - Pulling together aqua soy feed research: usable and searchable

10

CLASS A SOYBEAN PARTNERSHIP — FY2026

$25,000 Membership
~~$75,000 Program Support~~

$25,000 Total Support

SOY AQUACULTURE ALLIANCE

11

Thank You

Katie Hall, Executive Director

SOY AQUACULTURE ALLIANCE

12

WEBINARS: Marketing



13

CLASS B SOYBEAN PARTNERSHIP — FY2026

$10,000 Membership
$15,000 Program Support

$25,000 Total Support

SOY AQUACULTURE ALLIANCE

14

FY2026 Renewals	Amount Proposed	Amount Approved
1 Illinois	$ 100,000	$ 75,000.00
2 Iowa	$ 100,000	$ 100,000.00
3 Kansas	$ 100,000	$ 25,000.00
4 Kentucky	$ 100,000	$ 100,000.00
5 Michigan	$ 100,000	$ 25,000.00
6 Missouri	$ 100,000	$ 25,000.00
7 Nebraska	$ 100,000	$ 100,000.00
8 Ohio	$ 100,000	$ 150,000.00
9 South Dakota	$ 100,000	$ 75,000.00
10 Tennessee	$ 25,000	$ 25,000.00
11 Virginia	$ 25,000	$ 25,000.00
12 Minnesota	$ 100,000	$ 25,000.00
	$ 950,000	$ 750,000.00

15

Project	Shorthand	Entity	PI	Start Date	End Date	Current Status
44221	Methionine absorption and ANFs in Salmonids (2024)	University of Idaho	Small	5/1/24	~~4/30/26~~ 12/31/26	Delayed
44223	Machine Learning to Improve ANF Characterization (2024)	University of Idaho	Bledsoe	5/1/24	4/15/26	On Track
44224	Soybean Wax Mitigating Off Flavor (2025)	University of Maryland Baltimore County	Zohar	6/1/25	5/31/27	On Track
44225	Hydrogenated soy oil in trout feed (2025)	Riverence	Trushenski	10/1/25	9/30/27	On Track
44226	Optimizing soy in LMB on-farm (2025)	Lincoln University of Missouri	Matuha	7/1/25	6/30/27	On Track
44227	Production diets for LMB (2025)	Auburn University	Davis	4/1/25	6/30/26	On Track
44229	SBM and SPC in Marine (2025)	Ocean Era	Lowell Hawkins	6/1/25	5/31/26	Delayed

16

PROGRESS: OPEN-OCEAN AQUACULTURE



- Advancing Social License of off-shore/open-ocean aquaculture
- Creating the model for future commercial operations
- Supporting Stronger America Through Seafood (SATS)
- MARA Act Efforts

17

ATTACHMENT 18

FARMERS Fueling the Future

Farmers Fueling the Future



1

Farmers Fueling the Future

- Big-tent, agriculture-focused feedstock coalition
  - Soy focused, but also will work with canola, corn, cotton, sorghum, etc. where there is alignment
  - Centered on the needs of the farmer, delivering value to the farmer
- Focus on research and analysis of biofuel issues that directly impact farm-gate
- Combines checkoff funded research with ASA's policy expertise to rapidly analyze and engage on crop-based biofuel issues
  - Organized by several state checkoff organizations, USB, and ASA

2

2027 Workstreams

Indirect Land Use Change

- Improve the accuracy of global ILUC models so they reflect modern U.S. soybean production systems and crop rotations.
- This work will develop rotation-capable updates to leading models such as GTAP, GCAM, and GLOBIOM to reduce structural bias against soy.

Life Cycle Methodologies

- Evaluate alternative life cycle assessment methods, including protein meal displacement approaches, to ensure oilseeds-based fuels are evaluated consistently with real-world feed markets

International Biofuel Markets

- Engage technical bodies in priority markets including the EU, Canada, and UN-linked aviation and maritime sectors to ensure U.S. soy is accurately represented in fuel policy and modeling frameworks.

Biofuel Market Access

- Develop and pilot a U.S.-centric sustainability and traceability certification framework for soybeans used in biofuel markets.
- Build on the existing Soybean Sustainability Assurance Protocol and enabling credible third-party certification if acceptable

3

Fueling Demand for Arkansas Soy

Arkansas Soybean Promotion Board Request: $15,000

- Arkansas investment helps support:
  - Technical work improving ILUC modeling for soybeans and other biofuel crops in rotation
  - Improving the value of climate smart ag by aligning oilseeds with cereal crops in GREET
  - Development of a row-crop certification to **maintain** biofuel market access
  - Support technical engagement with international biofuel market processes

Arkansas funding is leveraged alongside national checkoff and multi-state investments to deliver research, certification tools, and market engagement that protect long-term demand for soybean oil in biofuel markets.

4

Questions?

FARMERS Fueling the Future

Matt Herman
Iowa Soybean Association &
Farmers Fueling the Future
mherman@iasoybeans.com

Omid Karami
American Soybean Association &
Farmers Fueling the Future
Okarami@soy.org

5

ATTACHMENT 19

Collaborative AgMet Graphics for Within-Season Crop Condition & Progress Tracking

NASA Acres Research Proposal to the 2026 Arkansas Soybean Promotion Board

Alyssa K. Whitcraft
Executive Director |NASA Acres
Director@NASAAcres.org

12 March 2026

Acres est. 2023

Our Mission:
Bridge the gap from space-to-farm and education-to-impact together with U.S. farmers, ranchers, and other agrifood system decision makers.

Our Impact:

- Richer Knowledge about US Ag
- More & Better Tools for Farmers & Ranchers
- Stronger, More Competitive Workforce

We are NASA's consortium focused on U.S. agriculture.

Led by the University of Maryland in partnership with NASA, farmers, researchers, and over 70 partners nationwide.





Proposal Team

Engagement & Outreach



PI: Alyssa Whitcraft
Executive Director, NASA Acres
University of Maryland



Ignacio Ciampitti
Chief Agronomist, NASA Acres
Purdue University



Allison Bredder
Strategic Engagement Officer, NASA Acres
University of Maryland

App Development



Mike Humber
Deputy Director, NASA Acres
University of Maryland



Jacob Orser
Technical Support, NASA Acres
University of Maryland

AgMet Graphics



Ritvik Sahajpal
Crop Condition & Yield Lead, NASA Acres
University of Maryland



Guanyuan Shuai
Postdoctoral Researcher
University of Maryland



Anna Wood
Project Administration
University of Maryland

Coordination

Proposal Summary

Activity 1
Adapt the robust and validated **AgMet Graphics to county-level twice-monthly** to create impact now.

Activity 2
Pilot field-level adaptations of the AgMet Graphics with interested farmers

Activity 3
Interactive, mobile-ready condition monitoring tool that will place information in the pockets of producers.

Path Ahead
Pave the way for new innovations that are fit-for-purpose across the Arkansas soybean landscape.

Working Philosophy:
NASA is your space agency & we are here to bring its value down-to-Earth for your benefit.

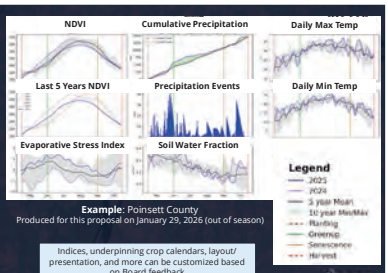
Highest Quality | Co-Creation | Iterative Improvement | Farmer Data Sovereignty & Privacy

---

Activity 1

Adapt the robust and validated **AgMet Graphics to county-level twice-monthly** to create impact now.

- AgMet Graphics are satellite-based indicators that provide **insights on crop condition – which influence yield** – for all soybean-growing counties in Arkansas.
- Ready with ~7 day delay
  - Can be faster, but more $



Example: Poinsett County
Produced for this proposal on January 29, 2026 (out of season)

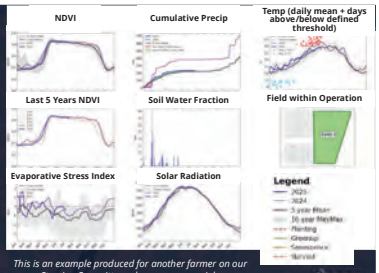
Indices, underpinning crop calendars, layout/ presentation, and more can be customized based on Board feedback

---

Activity 2

Pilot field-level adaptations of the AgMet Graphics with interested farmers

- 2-3 interested farmers
- Farmers provide:
  - Field boundaries
  - Crop rotation
  - Planting / harvest dates
- Each farmer can only see their own operation's data.



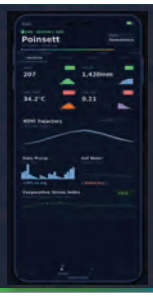
This is an example produced for another farmer on our Steering Committee, who grows perennials

---

Activity 3

Interactive, mobile-ready condition monitoring tool that will place information in the pockets of producers.

- Our vision is to make this field-level for any producer, but piloted and iterated with the interested farmers and through consultation with the AR Soybean Promotion Board
- More complexity can come later



This is a mockup quickly produced by a generative AI tool (Claude) for imagination purposes only!!!

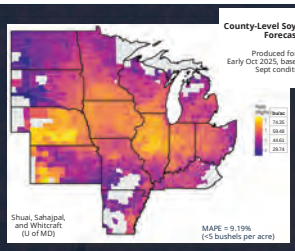
Path Ahead

Pave the way for new innovations that are fit-for-purpose across the Arkansas soybean landscape.

Bring U. of Arkansas Extension on board for future innovations

Example future innovations:

- Yield Forecasts, county-level
- Precision irrigation management
- Yield Forecasts, field-level
- Monitoring of other things...

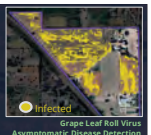


Other Possible Satellite-Based Information

- Cropland & Crop Type Mapping
- Field Boundaries & Sizes
- Evapotranspiration & Water Use
- Crop Calendars
- Within-Season Yield Forecast
- Historical Yield Estimation
- Rangeland Productivity & Utilization
- Soil Moisture
- Soil Health & Soil Organic Carbon
- Crop Area Estimation
- Pest & Disease Mapping
- Cover Crop Utilization & Performance
- Crop Residue & Tillage Mapping
- Canopy Nitrogen Content

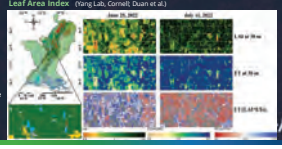
Field Boundaries and Sizes (Yan & Roy; Mich State)





Grape Leaf Roll Virus Asymptomatic Disease Detection (Gold Lab, Cornell; Liu et al.)

Field-to-Regional Evapotranspiration and Leaf Area Index (Yang Lab, Cornell; Duan et al.)



Working Philosophy: Build a Trust Infrastructure

- Boots on the Ground
- **Data Governance**
- Secure Computational Systems
- Being accountable, reliable, and "there" long term.

In 2024, we launched our "Core Principles for Agriculture Data Use" to meet farmers where they are.

"The Ag Data Transparent board of directors*... applauds NASA Acres for... developing these principles to assist researchers and users of satellite imagery with proper data governance."



*ADT Board of Directors:
American Farm Bureau Federation, Nat'l Farmers Union, American Soybean Association, Nat'l Potato Council, Nat'l Sorghum Producers, Nat'l Assoc of Wheat Growers, Nat'l Corn Growers Assoc, John Deere, Hydrgn.Ag, Corteva...

Acres

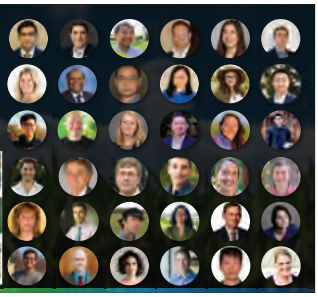
Thank you



Contact:
Alyssa Whitcraft, PhD
director@nasaacres.org
www.nasaacres.org

Farmer Steering Committee





Acres

Backup Materials

NASA Acres

Acres

How We Partner

- **People/orgs fund us (Sustaining & Supporting)**
- **We fund people/orgs (Research, Development, & Extension)**
- **We exchange in kind:** data / effort / expertise, etc. **(Collaborating)**
- **We go for new funding together! (become RD&E)**

Sustaining

Supporting

Research, Development, & Extension

Collaborating

NASA Acres Farm Innovation Ambassador Team (FIAT)

est. 2025

FIAT unites early-adopter farmers with researchers in the development and use of decision-relevant satellite data, tools, & information.





FIAT Formation Committee Members from AL, AR, CA, IA, IL, LA, MA, MD, NM, OK, and TX co-designed the inaugural FIAT Program Charter.

Inaugural NASA Acres FIAT Meeting (March 2025)

Acres

FIAT Steering Committee



Brad Doyle (AR) | Dwane Roth (KS) | Jocelyn Anderson (CA)
John Reifstack (IL) | Kent Martin (OK) | Lacy Cotter Vardaman (TX)
Lance Lillibridge (IA) | Mark Isbell (AR) | Ray Flickner (KS)

FIAT Leadership



Ignacio Ciampitti
NASA Acres Chief Agronomist
Purdue University



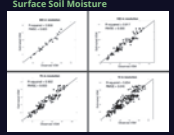
Alyssa Whitcraft
NASA Acres Executive Director
University of Maryland

Acres

What can satellites *(help)* tell us about agriculture?

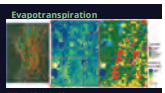
- **What nature is doing** *(what, when, where)*
  - Temperature, precipitation, **soil** moisture, evapotranspiration, flooding, wind speed, extreme weather, drought, water availability...
  - Topography, some soil info...
  - **Disease early detection**

Surface Soil Moisture



Hosseini, UMD (brand new, uses NISAR and S1)

Evapotranspiration



Y. Yang, Mississippi State

Grape Leaf Roll Virus Asymptomatic Disease Detection

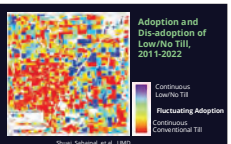


Gold Lab, Cornell; Liu et al.

What can satellites *(help)* tell us about agriculture?

- **What humans are doing** *(what, when, where)*
  - Crop & field management; e.g. **field boundaries,** emergence & harvest dates, irrigation, **cover crop, tillage**
  - Cropland and crop type mapping; area estimation
  - Rotational grazing

Adoption and Dis-adoption of Low/No Till, 2011-2022



Shuai, Sahajpal et al., UMD

Fractional Green Cover >> Cover Crop Maps



Thieme, Hively, Mirsky et al. UMD, USGS, USDA ARS

Field Boundaries and Sizes

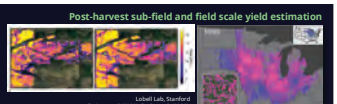


Yan & Roy, Mich State

What can satellites *(help)* tell us about agriculture?

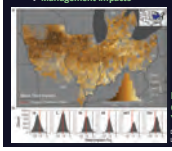
- **What resulted** (and why)
  - Canopy nitrogen content
  - **Yield**
  - GHG emissions and soil C sequestration
  - Water use efficiency
  - **Management impacts**

Post-harvest sub-field and field scale yield estimation



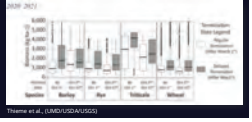
Lobell Lab, Stanford
Deines et al (2020), Dado et al. (2020), Jin et al. (2015)

Impact of Cover Crop on Maize Yield



Deines et al., (2023)
Lobell Lab, Stanford

Impact of planting/terminating cover crops on biomass – by species

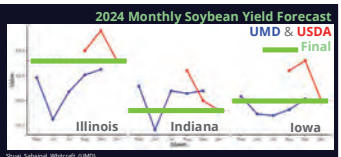


Thieme et al., (UMD/USDA/USGS)

What can satellites *(help)* tell us about agriculture?

- **What we can expect in the future**
  - Pest & disease risk
  - **Within-season yield forecast**
  - Long-term responses to climate change
- **What to do about it**
  - **Manage nutrients** and other inputs
  - Prioritize management activities based on analyses of largest controls on yield

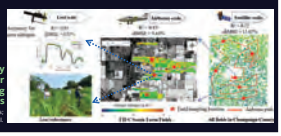
2024 Monthly Soybean Yield Forecast



Shuai, Sahajpal, Whitcraft (UMD)

Cross-Scale Canopy N Detection for Side-Dressing Recommendations

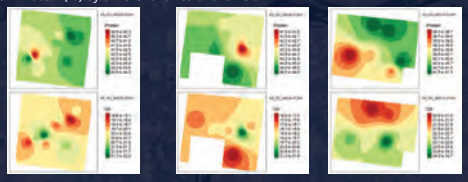
Guan Lab, University of Illinois; S. Wang, K. Guan et al.



Development of a multi-state database on Soybean Protein Quality

Ciampitti et al., Purdue University

Oil-Protein (%) by different zones of the field



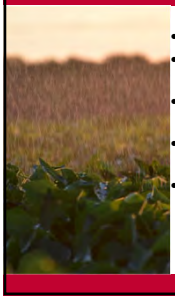
Protein levels can broadly range in different areas of the field (from 38 to 46%) with similar changes for oil concentration (16 to 25%) – with large spatial variations within a field!

ATTACHMENT 20



1

Overview of Proposed Projects



- Chicot Insights' research and Extension experience
- Applying big-data analytics to solve on-farm fertility problems
- Developing overhead irrigation recommendations that optimize yield and net returns
- The counterintuitive relationship among well density, agroeconomic vitality, and aquifer stability
- Addressing labor and water management problems with automation technologies

2

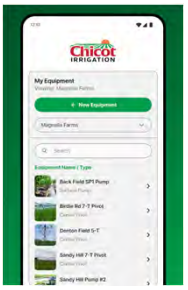
Zach Reynolds' Experience

- Variety screening, Pioneer Seed, AR/MO
- Agronomist/Precision Ag Specialist, Sanders, MS/AL
- R&D/Precision Ag Specialist, Southern Ag Consulting, MS/LA/AR
- Research Project Manager, MSU
  - PI or Co-PI on dozens of state/federal projects; >$7 million
- Research, technical service, consulting

3

Applying big-data analytics to solve on-farm fertility problems

- John Deere Operations Center
- FieldAlytics
- AgSense
- Chicot App
- National Weather Service
- Web Soil Survey
- USGS MRVAA
- PCT
- Comet Model



4

Capturing, Wrangling, Curating and Analyzing Critical Agronomic Data

Genetics	Soils	Agronomic	Climatic
Armor 45-F865	Series (WSS)	Planting date (JDOC)	Temperature (AgSense/NWS)
Armor 47-F665	Texture (WSS/FieldAlytics)	Row spacing (JDOC)	Rainfall (AgSense/NWS)
Asgrow AG44XF4	pH (FieldAlytics)	Plant population (JDOC)	Humidity (AgSense/NWS)
Asgrow AG49XF5	N (JDOC)	Growth stage (University)	DD50 (University)
Innvictis A4924XF	P (FieldAlytics/JDOC)	Yield (JDOC)	
Integra XF49145	K (FieldAlytics/JDOC)	Harvest moisture (JDOC)	
Revere 44-F44	S (FieldAlytics/JDOC)		
USG 7476XF	Mg (FieldAlytics/JDOC)		
Asgrow AG50XF5	Mo (FieldAlytics/JDOC)		
AG54XF5	Zn (FieldAlytics/JDOC)		
NK 52-M2XF5	Salinity (FieldAlytics)		
Progeny 5056XFS	Moisture (AgSense)		

5

Applying big-data analytics to solve on-farm fertility problems



- Fertilizer top line item
- Yield goal, yield history, crop removal, traditional recs?
- Hard to quantify responses
  - Fertility levels don't always have positive correlation with yield
  - 1 + 1 ≠ 2

6

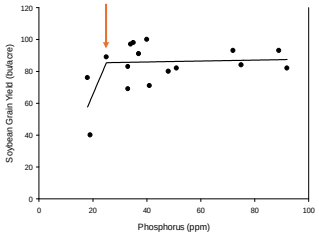
Fertilizer Recommendations

Phosphorus (P) Recs						
		Application_P2O5 lbs/ac				
Index	Soil Test Level (lbs P/ac)	Corn	Soybean	Cotton	Milo	Wheat
Very Low	0-30	120	110	110	110	110
Low	31-50	90	80	80	80	80
Medium	51-70	60	40	40	40	40
High	71-100	30	20	20	20	20
Very High	>100	0	0	0	0	0

- Only accounts for level of nutrient in question.
- Any plateaus? Shortages?
  - What reasons

7

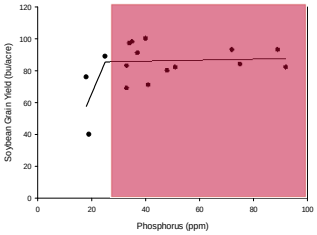
Example: Soybean Grain Yield for Optimum Planting Window as a Function of Soil Test P on Hayti Fine Sandy Loam with pHs ranging from 6.5 ± 0.5



- 25 ± 8 is 95% confidence interval for maximum yield potential

8

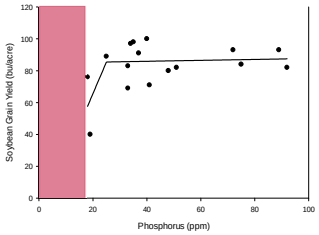
Example: Soybean Grain Yield for Optimum Planting Window as a Function of Soil Test P on Hayti Fine Sandy Loam with pHs ranging from 6.5 ± 0.5



- 25 ± 8 is 95% confidence interval for maximum yield potential
- Probability of positive response when P is ≥ 33 is < 5%

9

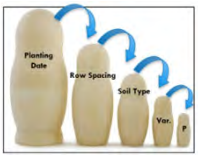
Example: Soybean Grain Yield for Optimum Planting Window as a Function of Soil Test P on Hayti Fine Sandy Loam with pHs ranging from 6.5 ± 0.5



- 25 ± 8 is 95% confidence interval for maximum yield potential
- Probability of positive response when P is ≥ 33 is < 5%
- Probability of positive response when P is < 17 is ≥ 95%

10

In Summary



- Quantify fertility applications
  - Under or over applying
- If response plateaus occur, identify influential factors
  - Soil type, variety, planting date, etc.
- If fertility level is positively correlated with yield, make extra applications to reach plateau

11



12

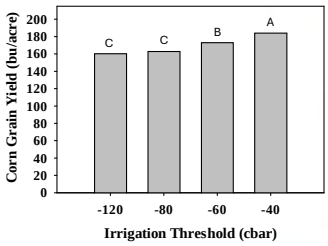
Jason Krutz's Experience

- Soil Scientists, USDA-ARS, Stoneville, MS
- Extension Irrigation Specialist, MSU
- Director, Mississippi Water Resources Research Institute, MSU
- Procured >$30 million in funding from Federal, state, and private sector
- 150 peer reviewed publications
- International and national consulting

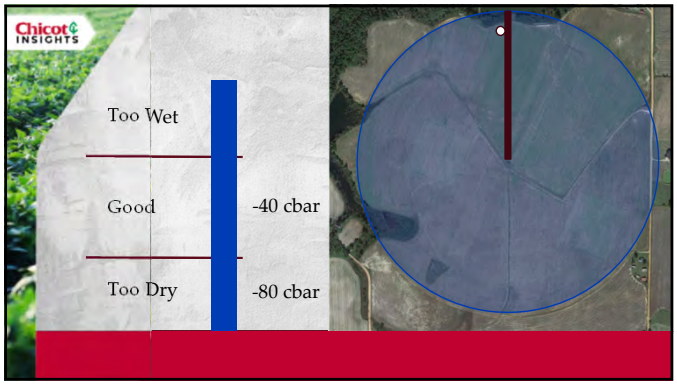
13

Developing Overhead Irrigation Recommendations for Soybean Producers

- Yield lag between overhead and furrow
- Erroneous Irrigation timing and amount
- Limited use of sensor-based irrigation scheduling tools



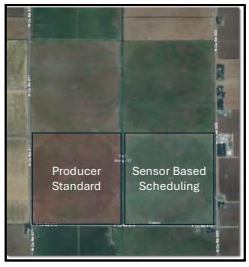
14



15

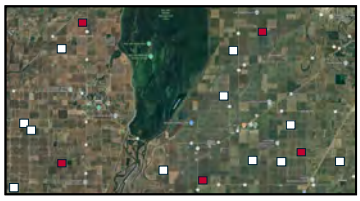
Developing Overhead Irrigation Recommendations: Paired Fields

- Five paired fields per year
  - Producer standard
  - Sensor based scheduling
- Same PD and Variety
- Similar soils
- Insights data capture platform



16

Developing Overhead Irrigation Recommendations: Completely Randomized Design



- 10 locations per/yr
- Soil moisture monitoring
- Range of soil textures
- Representative sample of pivot capacity (gpm/acre)
- Insights data capture

17

Developing Overhead Irrigation Recommendations: Expected Products

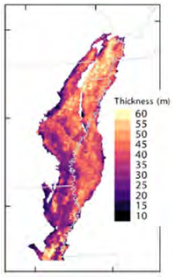
- Elucidate the effects of soil texture, gpm/acre, soil moisture deficit and their interactions on crop productivity and net returns above irrigation costs
- Recommendations for irrigation thresholds or gpm/acre required to achieve optimum crop productivity and profitability over a range of soil textures

18



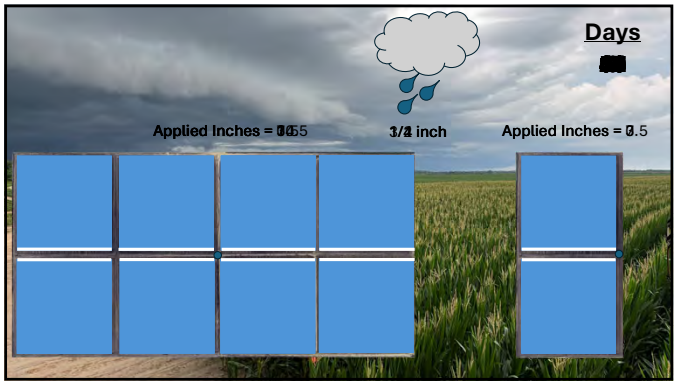
19

Structural Irrigation Strategies that Improve Soybean Productivity, Profitability, and Aquifer Stability



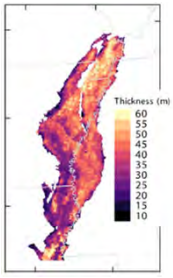
- Aquifer decline reduces aquifer thickness
- Well productivity and aquifer thickness are corelated
- Flow rate decrease as aquifer level declines
- Additionally, more underground line than a well "should" support
- More wells are required on the landscape to maintain or improve crop productivity, profitability, and aquifer sustainability

20



21

Potential Agroeconomic and Environmental Benefits of Well Density Research



- Improve productivity 3 to 7 bu/acre
- Decrease fuel costs, $10 to $20/acre
- Increase profitability $25 to $90/acre
- Reduce water use up to 50%
- Enhance aquifer stability
- Advocate that USDA-NRCS cost share on well instillation

22

Structural Irrigation Strategies that Improve Soybean Productivity, Profitability, and Aquifer Stability



△ Research locations

- Well monitoring at 20, 40, and 60 locations per year from 2026-2027
- Broad range of gpm/acre
- Arry of soil textures
- Differing lengths of run
- Varying longitudinal field slopes
- Insights data capture

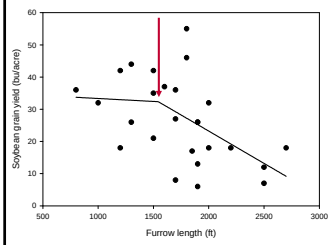
23

Structural Irrigation Strategies that Improve Soybean Productivity, Profitability, and Aquifer Stability

- Determine the effects of gpm/acre, longitudinal slope, length of run, soil texture and their interactions on crop productivity and aquifer withdrawal
- Provide recommendations on gpm/acre that optimize crop productivity and aquifer sustainability over a range of furrow irrigated environments

24

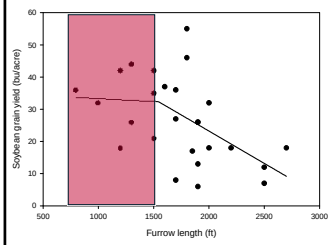
Example: Optimum Furrow Length for Sharkey Clay with Well Capacity at 2600 + 300 gpm



- Fitted hinge point = 1550 ft

25

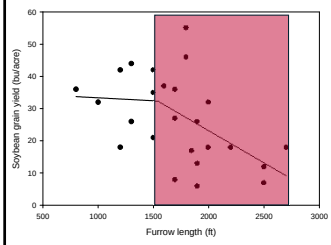
Example: Optimum Furrow Length for Sharkey Clay with Well Capacity at 2600 + 300 gpm



- Fitted hinge point = 1550 ft
- Length of run NS first 1500 ft indicating no correlation with soybean yield

26

Example: Optimum Furrow Length for Sharkey Clay with Well Capacity at 2600 + 300 gpm



- Fitted hinge point = 1550 ft
- Length of run NS first 1500 ft indicating no correlation with soybean yield
- Losing 1.8 bu/acre every 100 ft past 1550 furrow run

27



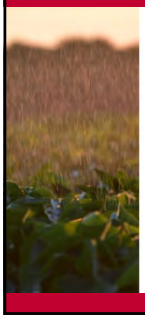
28

Automated Irrigation Technologies that Improve Soybean Productivity, Profitability, and Aquifer Stability

- Persistent labor challenges
- Tremendous frustration with coordinating labor and water management
- Automating optimized furrow irrigation systems may alleviate both problems

29

Soybean Agroeconomics



	Yield	Water Use	WUE	Net Returns
	---Bu/acre---	---Acre-in---	--Bu/acre-in--	-----$-----
Standard	69	12	7	663
IWM	69	9	10	663
P-value	NS	0.0198	0.0194	NS

30

Automated Irrigation Technologies that Improve Soybean Productivity, Profitability, and Aquifer Stability



- Four paired locations per year
  - Producer standard
  - Automated, IWM, < 2 d spin
- Same variety and planting date
- Similar soil textures
- Insights data capture
- Pool well density data if both funded

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Expected Outcomes of Automated Furrow Irrigation Research Proposal



- Integration of IWM technologies improves productivity 5-8 bu/acre while reducing labor and energy costs up to 50%
- Automation is economically viable due to improved productivity coupled with reduced labor and fuel costs
- Automation + IWM reduces water use up to 50%

32

Questions: Automated Irrigation Technologies that Improve Soybean Productivity, Profitability, and Aquifer Stability



33

ATTACHMENT 21



1

MIDSOUTH SOYBEAN BOARD

MID-SOUTH Soybean Board

- ✓ ARKANSAS
- ✓ MISSOURI
- ✓ MISSISSIPPI
- ✓ LOUISIANA
- ✓ TEXAS
- ✓ OKLAHOMA

2

2026 Research Funding Approval

MSSB Member State	Approved
Texas*	✓
Louisiana*	✓
Mississippi*	✓
Oklahoma*	✓
Missouri*	✓
Arkansas	

*Approximately 50 QSSB members from 5 States have already approved these projects.

3

ARKANSAS SOYBEAN PROMOTION BOARD

*** Of 34 projects/16 were approved in August by the 6-state farmer board.*

Arkansas Funding Request	MSSB Budget 2026 - $620,014.00
Renewals	$59,900.25
New	$96,016.50
Total Ask for Arkansas	**$155,916.75**

**AR researchers are lead PIs on just over 50% of the requested funds - $78,651.25; representing 7/16 projects.

4

Title of NEW Projects for 2026	PI	LOC.	MSSB Total	Arkansas Total
Survey of Phy. Root & Stem Rot strains in the Mid-South	Bish	MO	$15,000.00	$3,750.00
Novel Genetic Resources to Improve Soybean Seed Quality	Bluhm	AR	$33,816.00	$8,454.00
Evaluating early soybean for productivity and herbicide efficacy	Lofton	OK	$15,077.00	$3,015.50
Spray application of double stranded RNA for simultaneous management of multiple soybean fungal and insect disease	Chen	LA	$47,824.00	$11,956.00
Screening elite soybean lines for drought tolerance and developing high-throughput drought screening methodologies for the Mid-South	Lin	MO,LA,AR,TX	$65,000.00	$16,250.00
Initiative of a soybean mutation breeding pipeline: Creation of superior traits towards quick releasing improved soybean varieties	Lin	MO	$15,000.00	$3,750.00
Unlocking novel genetic pathways involved in syncytia development for durable soybean cyst nematode resistance	Patil	TX, AR	$54,176.00	$13,544.00
Foliar boron application to minimize flower abortion and improve yield in soybean under drought/rainfed conditions	Shakoofa	TN	$30,000.00	$7,500.00
Porous soybean proteins for the delivery of vitamins	Ali Ubey.	AR	$22,000.00	$5,500.00
Genetic approaches for enhancing salt tolerance in soybean	Vieira	AR	$40,000.00	$10,000.00
Characterizing soybean genotypes for phosphorus efficiency	Vieira	AR	$ 57,012.00	$14,253.00
			$ 394,905.00	$96,016.50

5

Title of Second Year Projects for 2026	PI	LOC.	MSSB Total	Arkansas Req
Modernizing Phosphorus and Potassium recommendations and improving return on investment for climate-smart corn-cover crop-soybean cropping system	Md Rasel Parvej	MO, AR	$60,000.00	$10,000.00
Enhanced Synthetic Microbiome Communities to Manage Sudden Death	Asela Wijeratne	AR	$25109.00	$6277.25
Leveraging Photosynthetic efficiency traits for improving soybean productivity in the Mid-South	Feng Lin	MO	$30,000.00	$7,500.00
			$115,109.00	$23,777.25

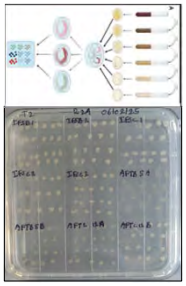
6

Title of Third Year Projects for 2026	PI	LOC.	MSSB Total	Arkansas Req
Breeding maturity group 4 soybean with enhanced resistance to southern root-knot nematode by reducing galling and nematode reproduction	Caio Canella Vieira	AR,MO, LA, MS, TN	$80,000.00	$26,667.00
Expanding Potential Market Demand for and Access to Whole Soy Foods through Nutrition Education	Leigh Ann Bullington	AR, MO	$30,000.00	$7,500.00
			$110,000.00	34167.00
Total budget for Midsouth Soybean Research 2026	$620,014.00	Arkansas		155,916.75

7

Budget By State	Budget Requested/ Approved for 2026	Approvals for 2026 season	Soybean acres By state
ARKANSAS	$155,916.75		3,000,000
MISSISSIPPI	$170,916.75	√	2,000,000
LOUISIANA	$59,900.25	√	1,050,000
MISSOURI	$113,007.00	√	2,500,000* 2 multi-regionals
OKLAHOMA	$10,000.00	√	400,675
TEXAS	$10,000.00	√	100,000
TOTAL	$519,740.75	Need $620,014.00	Shortfall of $100,273.25 – use cash in bank.

8



Enhanced Synthetic Microbiome Communities to Manage SDS

RENEWAL

PI: Wijeratne - Arkansas

Cost: $25109.00 Total; AR - $6277.25

Benefit:

Method for dealing with SDS by isolating and identifying beneficial rhizosphere-associated microbes—both bacterial and fungal—that exhibit antagonistic activity against *F. virguliforme*.

9



Breeding maturity group 4 soybean with enhanced resistance to southern root-knot nematode by reducing galling and nematode reproduction

RENEWAL

PI: Caio - Arkansas

Cost: $80,000 Total; AR - $26,667.00

Benefit:

Resistance deployed into earlier MG is critical for the successful management of SRKN as it has been moving northwards over time. The successful long-term value of SRKN resistance occurs when multiple resistance mechanisms are deployed and/or multiple resistance genes for SRKN are stacked.

10



Leveraging Photosynthetic Efficiency Traits for improving soybean productivity in Midsouth

RENEWAL

PI: LIN - Missouri

Cost: $30,000.00 Total; AR - $7500.00

Benefit:

Quantifying photosynthetic traits like chlorophyll content and photosystem efficiency in diverse soybean germplasm. Find traits strongly correlated with higher seed yield. Using MultispeQ and drones, collect high-throughput photosynthetic data across multiple environments. A genome-wide association study (GWAS) id's markers.

11



Expanding Potential Market Demand and access to whole soy foods through Nutr. Ed.

RENEWAL

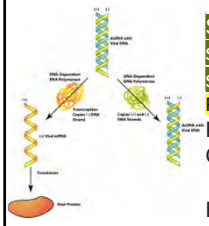
PI: Bullington - Arkansas

Cost: $30,000.00 Total; AR - $7500.00

Benefit:

Cooperative Extension will reach out to schools and nutrition educators to train on the benefits of whole soyfoods in the diet. Goal is to increase the market demand for soybean within food systems (school lunch program) and to add income opportunities for food-grade soybean farmers.

12



Spray application of double stranded RNA for simultaneous management of multiple soybean fungal and insect disease

RENEWAL

PI: Chen - Louisiana

Cost: $47,824.00 Total; AR - $11,956.00

Benefit:

Reduced soybean losses due to fungal pathogens/pests, reduced dependence on fungicides/pesticides, reduced operation cost, reduced environmental pollution, and enhanced sustainability. Creation of new fungicide specifically built for the midsouth.

13



Evaluating early soybean for productivity and herbicide efficacy.

New

PI: Loftin - Oklahoma

Cost: $15,077.00 Total; AR - $3015.50

Benefit:

Yield potential is influenced by planting dates. To mitigate summer stress, earlier planting works best with shorter maturity groups. However, most early cultivars aren't ideal for the region. Environmental stress affects the performance and safety of pre-emergence herbicides. Evaluate planting date, MG, and herbicide treatment across 3 seeding rates and 4 herbicide strategies; delayed residual approach. Data-stand counts, phytotoxicity, weed control, species identification, & final yield.

14



Unlocking novel Genetic Pathways involved in synctia development for durable SCN resistance

New

PI: Patil - Texas

Cost: $54,176.00 Total; AR - $13,544.00

Benefit:

SCN is the leading cause of yield loss in soybeans, and current resistance genes are losing effectiveness. Using single-cell RNA sequencing, we identified new candidate genes, particularly the endoreduplication regulators RBRa and RBRc, that may help restrict nematode feeding site formation in roots. This project will validate these genes' roles in syncytia development and SCN resistance, laying the groundwork for more durable and diverse resistance Researchers gain new insights into plant-nematode interactions and improved yields.

15



Porous soybean proteins for the delivery of vitamins

New

PI: Ubeyitogullari- Arkansas

Cost: $22,000 Total; AR - $5500

Benefit:

Upcycle soy proteins to develop a novel, sustainable approach based on nanoscale science and engineering and supercritical carbon dioxide (SC-CO2) technology to encapsulate vitamins to enhance their stability and bioavailability. Project generates novel nanoporous structures from soy proteins and increases the stability and bioaccessibility of vitamins. Adds value to soybeans, creates new avenues for soy proteins in the food & pharma industries leading to higher prices, and profitability of soybean growers in the mid-southern states.

16

Modernizing P and K recommendations & improving ROI for climate smart corn-cover crop-soybean cropping system

NEW

PI: Parvej- Missouri

Cost: $60,000 Total; AR - $10,000



Benefit:

Assess how cover crop presence and fertilizer timing affect soil P and K availability, nutrient cycling, and yield in corn–soybean systems. Compares fall vs. spring application of five fertilizer rates with and without cover crops. Region-specific updates to P & K management recommendations. Could boost yields by 4–10%, translating to 2.1–5.2 million additional bushels on just 10% of Missouri's soybean acres. Combined with potential fertilizer savings of $5–13 million, economic benefit could exceed $70 million for Missouri producers and more across the Mid-South.

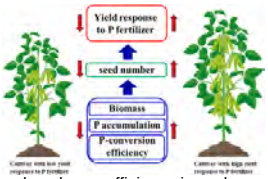
17

Characterizing soybean genotypes for phosphorus efficiency.

NEW

PI: Caio- Arkansas

Cost: $57,012 Total; AR - $14253.00



Benefit:

This proposal aims to identify genetic variation for phosphorus efficiency in soybean. Genomic regions associated with phosphorus efficiency will be characterized to support breeding efforts, addressing the low phosphorus availability in U.S. mid-South soils.Benefit toMidsouthFarmers:The Midsouth farmers will be able to maintain soybean yield while reducing the input costs for phosphorus fertilizer. It will also promote agricultural and environmental sustainability.

18

Novel Genetic Resources to improve soybean seed quality

NEW

PI: Bluhm- Arkansas

Cost: $57,012.00 Total; AR - $14,253.00



Benefit:

The early soybean production system has many benefits for soybean producers in the Mid-South. However, adverse weather (heat, excessive rain) during seed set and harvest often leads to reduced seed quality, primarily due to fungal pathogens.Control options are currently limited. This project will build on years of previous work to create novel transgenic control of soybean seed pathogens. Transgenic control is the quickest, most effective option to address seed quality. All information, transgenes, and transgenic soybean lines from this project will be publicly available.

19

Screening elite soybean lines for drought tolerance and developing high throughput drought screening methodologies for the midsouth.

NEW

PI: Lin- Missouri

Cost: $65,000.00 Total;

AR - $16,250.00



Benefit:

Identify soybean lines that hold up better under drought and create tools that breeders can use to identify drought tolerant lines. This project will lead to drought-tolerant lines that perform well under water-limited environments. It will also provide low-cost, fast ways to check for drought stress in the field. The results can help farmers grow a more reliable crop, reduce water use, and improve profit during dry years.

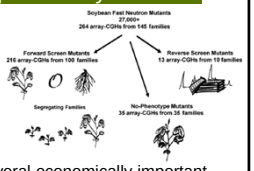
20

Initiative of a soybean mutation breeding pipeline. Creation of superior traits towards quick releasing improved soy varieties.

NEW

PI: Lin- Missouri

Cost: $15,000.00 Total; AR - $3,750.00



Benefit:

The success of this project is anticipated to provide several economically important traits, such as high protein, high oil, and high yield. Plan is to quickly release superior soybean lines compared to conventional breeding pipelines. The improved novel soybean varieties can significantly increase farmers' premium income. **Progress Made:** Selection of two elite soybean varieties were exposed to fast neutron mutagenesis and the M0 seeds are currently planted and grown at the Lee Farm, Portageville for field evaluation and selection.

21

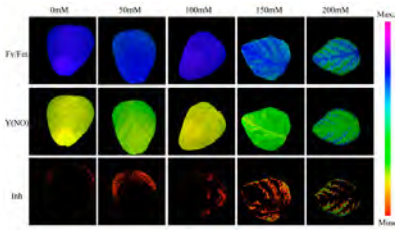
Genetic approaches for enhancing salt tolerance in soybean.

NEW

PI: Caio-Arkansas

Cost: $40,000.00 Total;

AR - $10,000.00



Benefit:

This project will develop chloride-excluding soybean cultivars to enhance productivity on salt-affected soils in the U.S. Mid-South, providing tools, data, and germplasm that improve sustainability and profitability.

22

Survey of Phytophthora Root and Stem Rot Strains in the Midsouth.

NEW

PI: Bish-Missouri

Cost: $15,000.00 Total;

AR - $3,750.00



Benefit:

This project will address gaps in our understanding of how Phytopthora field isolates are adapting to mid-South soybean production practices and provide opportunity to identify new genetic sources of resistance. **Benefit to MidsouthFarmers**:Preserve yield potential in Phytopthora-disease prone areas; develop a stronger breeding pipeline for the Mid-South region. **ProgressMade:** We have used isolates from the North Central U.S. to develop the work flow and methods for Phytophthora isolation, confirmation, characterization, and screening of resistance.

23

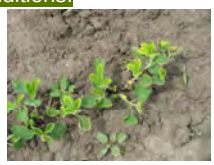
Foliar Boron application to minimize flower abortion and improve yield in soybean under drought/rainfed conditions.

NEW

PI: Shakoofa-Tennessee

Cost: $30,000.00 Total;

AR - $7,500.00



Benefit:

This project addresses yield loss due to flower abortion in drought-prone environments. The project supports cost-effective fertility management recs for Mid-South soybean growers. The project will deliver practical guidance on when and how much boron to apply to help with reproductive stress periods. Farmers will benefit from reduced flower abortion, improved pod set, better drought resilience, more stable yields, and return on investment. Preliminary screening under drought has shown significant variation in flower abortion between soybean genotypes.

24


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MISSOURI SOYBEANS
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MSPB
MISSISSIPPI SOYBEAN PROMOTION BOARD
TEXAS SOYBEAN BOARD
Louisiana Soybean and Grains Research and Promotion Board
Oklahoma Soybean Board

25

ATTACHMENT 22

ARKANSAS SOYBEAN PROMOTION BOARD

FISCAL YEAR 2027
(JULY 2026 – JUNE 2027)

UADA 'ACTIVE' PROPOSALS

COMPILED BY:

ARKANSAS DEPARTMENT OF AGRICULTURE

LIST OF ACTIVE UADA PROJECTS

					PREV ASK	CURRENT ASK		
RA-05	UADA	Evaluating Planting Date Decisions in the Soybean/Rice Rotation	Research	Justin Chlapecka	$30,127.00	$26,956.00	CONTINUOUS; YEAR 2 OF 3	AGRONOMY / ECONOMICS
RA-06	UADA	Investigating the effect of growth regulators on soybean plant architecture and yield	Research	Justin Chlapecka	$31,306.00	$31,674.00	CONTINUOUS; YEAR 2 OF 3	AGRONOMY
RA-07	UADA	Screening Arkansas Soybean Cultivars for Protein Quality as a Novel Food Preservative	Research	Mahfuzur Rahman	$53,235.00	$55,677.00	CONTINUOUS; YEAR 3 OF 3	POST-HARVEST / BREEDING
RA-08	UADA	Development, Evaluation and Production of Agricultural Biologicals for Arkansas Crop Production	Research	Burt Bluhm	$23,857.00	$24,020.00	CONTINUOUS; YEAR 2 OF 3	PHYSIOLOGY / ENVIRONMENT / PATHOLOGY
RA-09	UADA	Utilization of Winter Nursery for Soybean Line Development through Backcrossing	Research	Caio Vieira	$51,000.00	$51,000.00	CONTINUOUS; YEAR 2 OF 3	BREEDING
RA-10	UADA	Overcoming Soybean Yield Plateau by Leveraging Physiology-Efficient and Yield-Formation Traits	Research	Caio Vieira	$83,679.00	$83,790.00	CONTINUOUS; YEAR 3 OF 3	BREEDING / PHYSIOLOGY
RA-11	UADA	Fast-tracking MG4 cultivars with southern root-knot nematode resistance	Research	Caio Vieira	$50,364.00	$50,504.00	CONTINUOUS; YEAR 3 OF 3	BREEDING / PLANT PATHOLOGY
RA-12	UADA	The Arkansas Discovery Farm	Research	Mike Daniels	$28,220.00	$28,561.00	CONTINUOUS; YEAR 2 OF 3	MISC PROJECT
RA-13	UADA	Economics of Automatic Applications in Arkansas Soybean	Research	Ben Thrash	$43,254.00	$43,610.00	CONTINUOUS; YEAR 2 OF 3	ENTOMOLOGY
RA-14	UADA	Educating Growers and Consultants on Insect Monitoring and Control	Research	Ben Thrash	$3,000.00	$3,000.00	CONTINUOUS; YEAR 2 OF 3	ENTOMOLOGY
RA-15	UADA	Refining insect thresholds in Arkansas soybeans	Research	Ben Thrash	$67,904.00	$67,456.00	CONTINUOUS; YEAR 2 OF 3	ENTOMOLOGY
RA-16	UADA	Determining factors associated with poor grain quality in soybean and management options	Research	Terry Spurlock	$52,000.00	$55,000.00	CONTINUOUS; YEAR 2 OF 3	ENTOMOLOGY / PLANT PATHOLOGY / IPM
RA-17	UADA	Development of data-driven recommendations for variable soybean seeding rate in Arkansas	Research	Jeremy Ross	$82,886.00	$47,051.00	CONTINUOUS; YEAR 3 OF 3	AGRONOMY
RA-18	UADA	Screening for soybean tolerance to metribuzin	Research	Jason Norsworthy	$16,232.00	$16,212.00	CONTINUOUS; YEAR 2 OF 3	WEED SCIENCE
RA-19	UADA	Phenotypic Selection Assisted by Seed-Level Near-Infrared Information	Research	Samuel Fernandes	$52,081.00	$52,670.00	CONTINUOUS; YEAR 3 OF 3	BREEDING
RA-20	UADA	Development of a turn-row soybean vegetative health analysis software tool using UAS imagery for production decision support	Research	Jason Davis	$19,682.00	$19,605.00	CONTINUOUS; YEAR 3 OF 3	AGRONOMY / ALTERNATIVE
RA-21	UADA	Comprehensive disease screening soybean varieties in Arkansas	Research	Travis Faske	$133,242.00	$132,094.00	CONTINUOUS; YEAR 3 OF 3	PLANT PATHOLOGY
RA-22	UADA	Monitor and management of fungicide-resistant soybean disease in Arkansas	Research	Travis Faske	$59,728.00	$59,338.00	CONTINUOUS; YEAR 2 OF 3	PLANT PATHOLOGY
					$881,797.00	$848,218.00		

RA-05

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Evaluating Planting Date Decisions in the Soybean/Rice Rotation

Project Type:
Research

Name of Project Manager:
Justin Chlapecka

Name of Project Team Member 1:
Kenton Watkins

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
The goal of this research is to evaluate the optimal timing for soybean and rice planting in Arkansas.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Soybean will be planted at five to six planting dates at the Northeast Rice Research and Extension Center (NERREC) between mid-March and mid-June. 2. Three different maturity groups will be utilized: a late-MG III, mid-MG IV, and early-MG V. Yield and production data will be utilized to examine the economic cost/benefit within each time frame of planting either hybrid or varietal rice versus planting soybean.

BUDGET

Amount of Funding Needed for Project:
$26,956.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Evaluating Planting Date Decisions in the Soybean/Rice Rotation

Lead Investigators: Justin Chlapecka

Co-Investigators: Jeremy Ross, Jarrod Hardke, Brad Watkins

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): Year 2 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Agronomy & Economics

Stated Goal: The goal of this research is to evaluate the optimal timing for soybean and rice planting in Arkansas.

Specific Objectives:

1. To evaluate the agronomic effect of planting date on different soybean maturity groups in Arkansas, including plant height and yield.
2. To determine the total return of planting soybean at different planting dates.
3. To examine the economic cost/benefit of planting decisions in the soybean/rice rotation system when utilizing hybrid rice and inbred varieties.

Methods:

1. Soybean will be planted at five to six planting dates at the Northeast Rice Research and Extension Center (NERREC) between mid-March and mid-June. Planting dates will correspond to Dr. Jarrod Hardke's rice planting date study that is also conducted at the NERREC. Soybean will be planted following University of Arkansas System Division of Agriculture's recommendations for optimum soybean production, other than planting date.
2. Three different maturity groups will be utilized: a late-MG III, mid-MG IV, and early-MG V. The plots will be planted as strip plots with four replications of each planting date by maturity group combination.
3. The agronomic measures that will be taken include stand counts following emergence, plant height at maturity, and seed size (weight).
4. Soybean will be harvested with a small plot combine, as strip plots. Yield and production data will be utilized to examine the economic cost/benefit within each time frame of planting either hybrid or varietal rice versus planting soybean.

Planned Milestones:

1. In 2026 we will establish the trial at the NERREC and will continue the location for a minimum of three years.
2. We will continue to analyze data and evaluate the potential for any changes in the trial protocol to increase efficiency and effectiveness of the study.
3. The project is planned to continue through at least 2027 if funding is provided for subsequent years of study. Multiple years of data will increase the power of the dataset and allow for soybean/rice producers to make a more informed decision on when to plant soybean and rice.

Value to Soybean Industry: Numerous studies have been conducted in both soybean and rice suggesting that earlier planting dates can lead to increase yield potential and thus increased returns. While these

studies are extremely important and have given us a lot of information about when to plant, we are not aware of a study that compares planting soybean and rice on the same dates at the same location. The soybean/rice planting date study aims to answer the question that is commonly posed: “It’s April 15 [or insert your particular date here] and I have a two-day planting window prior to the next rain, what should I be planting?” Having both planting date studies in sync with each other will allow for the direct comparison across crops and allow for an economic analysis of the cost/benefit of planting either crop within each planting window. This study will give rice and soybean producers a point of reference when making planting decisions.

Budget Justifications/Explanation of Travel and Direct Costs:

Personnel funding will include 20% of the cost of a Program Associate. Supplies purchased with funding will include crop inputs, stakes, flags, and other necessary items to conduct the trials. In-state travel will be that required to visit the trial site and to present research at local meetings. The out-of-state travel component will cover a portion of attendance to regional and national meetings such as the Agronomy Society of America’s national meeting and Cotton & Rice Conference.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Chlapecka, Justin *Evaluating planting date decisions in the soybean/rice rotation*

Year	2026/2027	**Project Year**	Year 2 of 3
Lead Investigator	Chlapecka, Justin	**Co-PI #1**	Ross, Jeremy
Co-PI #2	Hardke, Jarrod	**Co-PI #3**	Watkins, Kenton
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Evaluating planting date decisions in the soybean/rice rotation		

Version: 8.0 (09/22/2025)

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Chlapecka, Justin	Ross, Jeremy	Hardke, Jarrod	Watkins, Kenton	Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	AES	CES	CES	AES			

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
Program Associate	Jimmy DuVall	20%	$9,691				$9,691	$9,691	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$9,691	$0	$0	$0	$9,691	$9,691	$0

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
Tuition Calculator Information						$0	$0	$0
Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel					$0	$0	$0
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$2,675	$0	$0	$0	$2,675	$2,675	$0
Graduate Students	$0	$0	$0	$0	$0	$0	$0
Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$2,675	$0	$0	$0	$2,675	$2,675	$0
Personnel Total	$12,366	$0	$0	$0	$12,366	$12,366	$0

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State	$2,000			$1,500	$3,500	$3,500	$0
Out-of-State	$2,000			$0	$2,000	$2,000	$0
Travel Total	$4,000	$0	$0	$1,500	$5,500	$5,500	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Chlapecka, Justin *Evaluating planting date decisions in the soybean/rice rotation*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$3,000				$3,000	$3,000	$0
	Fertilizer/Chemicals	$1,500				$1,500	$1,500	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$4,590	$0	$0	$0	$4,590	$4,590	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$9,090	$0	$0	$0	$9,090	$9,090	$0
	Total for Proposal	$25,456	$0	$0	$1,500	$26,956	$26,956	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

RA-06

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Investigating the effect of growth regulators on soybean plant architecture and yield

Project Type:
Research

Name of Project Manager:
Justin Chlapecka

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
The goal of this research is to determine if any of a select set of growth regulators has utility in Arkansas soybean production, particularly in the early soybean production system (ESPS). There are several studies from Asian and South American countries showing benefits from applying growth regulators at different growth stages and in different growing situations.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Trials will be initiated for a second year at the Northeast Rice Research and Extension Center (NERREC) and the Jackson County Extension Center (Newport) to evaluate the effectiveness of six growth regulators on increasing yield, decreasing plant height, and other desirable outcomes. The growth regulators will be applied foliarly at two different timings, vegetative and early reproductive (R3).

BUDGET

Amount of Funding Needed for Project:
$31,674.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Investigating the Effect of Growth Regulators on Soybean Plant Architecture and Yield

Lead Investigators: Justin Chlapecka

Co-Investigators: Jeremy Ross

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): Year 2 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Agronomy

Stated Goal: The goal of this research is to determine if any of a select set of growth regulators has utility in Arkansas soybean production, particularly in the early soybean production system (ESPS). There are several studies from Asian and South American countries showing benefits from applying growth regulators at different growth stages and in different growing situations.

Specific Objectives:

1. To evaluate the effect of foliar application of different growth regulators on the yield of MG IV soybean.
2. To examine the utility of foliar application of different growth regulators in decreasing plant height of soybean while maintaining yield potential.
3. To determine the effect of foliar application of different growth regulators on the plant architecture of soybean.
4. To evaluate the optimum timing of growth regulator foliar spray to maximize the intended effect of each compound.
5. To identify if a particular growth regulator deserves additional attention and research on its utility in optimizing soybean production in Arkansas.

Methods:

1. Objective 1-2: Trials will be initiated for a second year at the Northeast Rice Research and Extension Center (NERREC) and the Jackson County Extension Center (Newport) to evaluate the effectiveness of six growth regulators on increasing yield, decreasing plant height, and other desirable outcomes. The growth regulators that are planned to be utilized include methyl jasmonate, salicylic acid, tri-iodo benzoic acid (TIBA), kinetin, gibberrelic acid (GA), and trinexapac-ethyl. The center two rows of each plot will be sprayed foliarly and will be harvested with a small plot combine at maturity.
2. Objective 3: The aforementioned trials at the NERREC and Newport will be sampled at physiological maturity to determine plant height, number of branches per plant, fruiting nodes per plant, total pods per plant, seeds per pod, and seed weight.
3. Objective 4: The growth regulators will be applied foliarly at two different timings, vegetative and early reproductive (R3). The growth regulators are expected to have different outcomes when applied during vegetative and reproductive growth.
4. Objective 5: Once data is collected, analyses will reveal if any growth regulator had positive effect on the soybean yield or growth characteristics. Future studies will then be designed to look further into the application of that particular growth regulator in soybean production, including optimal timing and rate.

Planned Milestones:

1. In 2026 we will establish a second year of the trial at two locations, the NERREC and Newport. The second year will help to determine what, if any, growth regulator x timing combination produces a positive outcome for the soybean crop.
2. If any of the treatments appear to have a positive outcome on the soybean crop, future testing will be more in-depth with that product to look at different rates and timings for application.

Value to Soybean Industry: Arkansas producers are faced with narrowing margins in all crops, including soybean. Certain growth regulators have shown the potential in other countries to increase grain yield and to positively affect other attributes such as plant height. When conducting Grow for the Green yield contest verifications as a county extension agent, it seemed that every field would leave yield on the table due to lodging. Decreasing plant height while not changing stalk strength in soybean could lead to an indirect yield increase through reduced lodging incidence, which would have a great impact on Arkansas soybean producers.

Budget Justifications/Explanation of Travel and Direct Costs:

Personnel funding will include $13,000 for hourly personnel to process plant samples at the end of the season. Supplies purchased with funding will include the growth regulators, small plot spray supplies, stakes, flags, and other necessary items to conduct the trials. In-state travel will be that required to visit the trial sites and to present research at local meetings. The out-of-state travel component will cover a portion of attendance to regional and national meetings such as the Agronomy Society of America's national meeting and Cotton & Rice Conference.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Chlapecka, Justin *Investigating the Effect of Growth Regulators on Soybean Plant Architecture and Yield*

Year	2026/2027	**Project Year**	Year 2 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Chlapecka, Justin	**Co-PI #1**	Ross, Jeremy	
Co-PI #2		**Co-PI #3**		
Department	CSES Crop, Soil, Environmental Science			
Commodity Board	Soybean Promotion Board			
Project Title	Investigating the Effect of Growth Regulators on Soybean Plant Architecture and Yield			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Chlapecka, Justin	Ross, Jeremy			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	AES	CES	CES	AES			

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$0	$0	$0	$0	$0	$0	$0

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
Tuition Calculator Information						$0	$0	$0
Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel	$13,000				$13,000	$13,000	$0
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$13,000	$0	$0	$0	$13,000	$13,000	$0

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$0	$0	$0	$0	$0	$0	$0
Graduate Students	$0	$0	$0	$0	$0	$0	$0
Hourly Personnel	$884	$0	$0	$0	$884	$884	$0
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$884	$0	$0	$0	$884	$884	$0
Personnel Total	$13,884	$0	$0	$0	$13,884	$13,884	$0

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State	$4,000				$4,000	$4,000	$0
Out-of-State	$3,000				$3,000	$3,000	$0
Travel Total	$7,000	$0	$0	$0	$7,000	$7,000	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Chlapecka, Justin *Investigating the Effect of Growth Regulators on Soybean Plant Architecture and Yield*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$6,000				$6,000	$6,000	$0
	Fertilizer/Chemicals	$2,500				$2,500	$2,500	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$1,530	$0	$0	$0	$1,530	$1,530	$0
	Jackson County Ext. Center	$760	$0	$0	$0	$760	$760	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$10,790	$0	$0	$0	$10,790	$10,790	$0
	Total for Proposal	$31,674	$0	$0	$0	$31,674	$31,674	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

RA-07

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Screening Arkansas Soybean Cultivars for Protein Quality as a Novel Food Preservative

Project Type:
Research

Name of Project Manager:
Mahfuzur Rahman

Name of Project Team Member 1:
Caio Vieira

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Protein-derived peptides are a growing market, projected to $4.2 million by 2033, with current sources largely limited to animal proteins and microorganisms. This project investigates soy protein-derived peptides as natural alternatives to synthetic food preservatives. These peptides offer proven health benefits and functional activity. Producing preservative peptides from Arkansas-grown soybeans creates new value-added markets.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
1. Conduct a comprehensive screening of soybean varieties to fractionate protein-derived bioactive peptides suitable for application as food preservatives.
2. Utilize fractionated peptides to enhance the shelf life of processed food by preventing lipid oxidation and inhibiting microbial growth.
3. Develop breeding materials with improved seed composition to be used as food preservatives.

BUDGET

Amount of Funding Needed for Project:
$55,677.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Screening Arkansas Soybean Cultivars for Protein Quality as a Novel Food Preservative

Lead Investigators: Mahfuzur Rahman

Co-Investigators: Caio Canella Vieira

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): Year 3 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): **Post-Harvest, Breeding**

Stated Goal:

Synthetic food preservatives are used in food processing to prevent food spoilage and extend shelf life. However, the rising concerns regarding potential health risks associated with these synthetic preservatives have led consumers to exhibit hesitancy in their use. A promising solution involves utilizing natural bioactive peptides as preservatives by preventing lipid oxidation, inhibiting the growth of pathogenic microorganisms, and increasing the shelf life of processed foods. Genetically modified microorganisms (GMOs) have been utilized to produce microbial peptides that function as effective food preservatives.

Soy protein-derived peptides have demonstrated numerous health benefits, including anti-hypertensive, anti-cancer, immunomodulatory, anti-inflammatory, cholesterol-lowering, and gut-protective effects. The utilization of these health-promoting soy protein-derived peptides to replace synthetic preservatives would be of great interest to the food processing industries. The production of these peptides from soybeans developed in Arkansas provides potential financial benefits to growers and the Arkansas soybean industry by introducing a new market for soybean-derived products. Therefore, the goal of this project is to investigate the potential of utilizing the seed protein of Arkansas soybeans as a food preservative.

Specific Objectives:

1. Conduct a comprehensive screening of soybean varieties to fractionate protein-derived bioactive peptides suitable for application as food preservatives.
2. Utilize fractionated peptides to enhance the shelf life of processed food by preventing lipid oxidation and inhibiting microbial growth.
3. Develop breeding materials with improved seed composition to be used as food preservatives.

Methods:

In the first year, eight cultivars (R05-1772, R09-3789 (UA5814HP), R11-7999, R18-10491, R18-14147, R21C-02235, R21C-02304, R98-1821 (Osage)) selected for the study. Hydrolysis was conducted with various endo- and exo-proteases, including Alcalase from *Bacillus licheniformis* and Protease from *Aspergillus oryzae*, to obtain peptide hydrolysates. Functional properties, ferrous ion chelation ability, and lipid oxidation inhibition were evaluated to identify cultivars with novel preservative peptides within each cultivar. The soybean breeding lines demonstrating the best antioxidant and antimicrobial properties will be selected for comparison against synthetic preservatives such as sodium benzoate and EDTA, and natural preservatives in the second year.

In the second year, we will compare the potential of soy bioactive peptides with natural preservatives in various food products. The extracted peptides will be integrated into a liquid food (fruit juice), a viscous food (mayonnaise), and a solid food (cookies), and these formulations will be compared with synthetic preservatives (such as sodium benzoate and EDTA). Quality assessments, short-term storage studies, and accelerated shelf-life studies will be conducted to evaluate the effectiveness of peptides in comparison to

chemical preservatives. We will correlate this data with breeding to develop soybean lines with optimal preservative performance.
Seed composition, including seed protein, oil, and amino acids, will be used as proxies to identify genetic resources with potential optimal preservative performance. Lines with superior preservative performance will be used as parental stocks to develop new breeding populations. Within developed populations, progenies will be screened for seed composition, and lines with desirable seed components will undergo preservative performance tests as described in Objectives 1 and 2.

Planned Milestones:

2024: Conduct experiments to isolate protein from 8 high-protein Arkansas soybean breeding lines. Fractionate bioactive peptides and analyze their quality, assessing their ability to prevent lipid oxidation and inhibit microbial growth. The R98-1821 cultivar exhibited the highest lipid peroxidation inhibition across all treatments compared to other samples, indicating it will provide good storage stability for lipid-rich products over extended periods. The highest ferrous ion chelation activity was 84.78% for the soy cultivar R18-1049 at a protein concentration of only 0.2 mg/mL.

2025: Conducted comprehensive multivariate and correlation analyses of soy protein isolates from all soybean varieties to elucidate relationships among protein structure, functional properties, and nutritional quality. These analyses enabled systematic identification of superior varieties based on nutritional quality (R21C-02235), functional performance (R05-1772 and R11-7999), and structural attributes. Following an isolated evaluation, all varieties were subjected to enzymatic hydrolysis using Alcalase enzyme. The hydrolysates were evaluated using multiple antioxidant assays, including DPPH, ABTS, iron chelation, and copper chelation. Machine-learning models, such as AnOxPePred, were further applied to validate the antioxidant and metal-chelation potential

2026: Hydrolysates exhibiting superior antioxidant and metal-chelation activities, particularly those enriched with high-scoring chelating and antioxidant peptides, will be selected for lipid oxidation inhibition validation in emulsion systems. Lipid oxidation inhibition will be assessed using TBARS and peroxide value assays, and compared directly with the synthetic preservative, EDTA. Emulsion-based food models, including mayonnaise and salad dressing, will be formulated using the best-performing hydrolysates derived from the optimal soybean variety and treatment. Product stability, oxidative stability, and shelf life will be systematically evaluated to confirm the efficacy of targeted peptide-rich hydrolysates as natural preservative alternatives in model food systems.

Value to Soybean Industry:
While soy protein is being used in food products, utilizing the same protein-derived peptides as preservatives would greatly interest the food processing industry. Protein-derived peptides are currently available in the market and are expected to experience significant growth, rising from $2.5 million in 2023 to $4.2 million by 2033. Animal-derived proteins and microorganisms serve as the primary sources for these peptides. Identifying a new application for soy protein-derived peptides, particularly in replacing synthetic preservatives with a plant-derived source, could significantly bolster the soy protein market.

Budget Justifications/Explanation of Travel and Direct Costs ($53,235):
A total of $38,735 is requested to support two students, one graduate and one undergraduate, in extracting and analyzing peptides in PI Rahman's lab. We allocated $6,500 for purchasing chemicals and supplies, and $2,000 is allocated to travel to a scientific meeting to present the data. Furthermore, a total of $8,942 is requested to support a technician in Co-PI Vieira's lab for seed composition analysis and planting and harvesting supplies.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Rahman, Mahfuzur — *Screening Arkansas Soybean Cultivars for Protein Quality as a Novel Food Preservative*

Year	2026/2027	**Project Year**	
Lead Investigator	Rahman, Mahfuzur	**Co-PI #1**	Vieira, Caio
Co-PI #2		**Co-PI #3**	
Department	FDSC Food Science		
Commodity Board	Soybean Promotion Board		
Project Title	Screening Arkansas Soybean Cultivars for Protein Quality as a Novel Food Preservative		

Version: 8.0 (09/22/2025)

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Rahman, Mahfuzur	Vieira, Caio			Total Board Funding Requested	AES Portion	CES Portion
	Select "AES" or "CES" for each PI	AES	AES	CES	CES			
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$0	$0	$0	$0	$0	$0	$0
	Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
	Sukanya Poddar	50%	$25,000				$25,000	$25,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information		$6,795				$6,795	$6,795	$0
	Subtotal: Graduate Student		$31,795	$0	$0	$0	$31,795	$31,795	$0
	Hourly								
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel		$5,000	$6,500			$11,500	$11,500	$0
	Hourly-Students						$0	$0	$0
	Subtotal: Hourly		$5,000	$6,500	$0	$0	$11,500	$11,500	$0
	Fringe Benefits								
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$0	$0	$0	$0	$0	$0	$0
	Graduate Students		$1,600	$0	$0	$0	$1,600	$1,600	$0
	Hourly Personnel		$340	$442	$0	$0	$782	$782	$0
	Hourly-Students		$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits		$1,940	$442	$0	$0	$2,382	$2,382	$0
	Personnel Total		$38,735	$6,942	$0	$0	$45,677	$45,677	$0
	Travel								
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State			$1,000			$1,000	$1,000	$0
	Out-of-State		$2,000				$2,000	$2,000	$0
	Travel Total		$2,000	$1,000	$0	$0	$3,000	$3,000	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Rahman, Mahfuzur *Screening Arkansas Soybean Cultivars for Protein Quality as a Novel Food Preservative*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$6,000	$1,000			$7,000	$7,000	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$6,000	$1,000	$0	$0	$7,000	$7,000	$0
	Total for Proposal	$46,735	$8,942	$0	$0	$55,677	$55,677	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

RA-08

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Development, Evaluation and Production of Agricultural Biologicals for Arkansas Crop Production

Project Type:
Research

Name of Project Manager:
Burt Bluhm

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
This project is focused on discovery, evaluation and production of agricultural microbials (i.e., microbial biofertilizers, rhizobia, microbial pesticides, microbial protectants and related) specific to Arkansas crops and production environments. The goal is to create commercially viable microbials and the necessary production facilities within UADA to enable commercial production of these microbials tailored to benefit Arkansas farmers.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Specific Objectives: 1. Evaluate the efficacy of commercial microbials in major Arkansas crops, including soybean. 2. Isolate and develop novel, Arkansas based agricultural microbials customized for our major crops, including soybean. 3. Obtain and evaluate pilot-scale equipment (biofermenters, bioreactors) to launch and Arkansas-based faculty to serve as a scale up testing faculty for new microbial technologies.

BUDGET

Amount of Funding Needed for Project:
$24,020.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Development, Evaluation and Production of Agricultural Biologicals for Arkansas Crop Production

Lead Investigator: Dr. Burt Bluhm

Collaborator: Dr. Kelly Cartwright

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): Year 2 of 3

Research Areas: Physiology; Environment; Pathology

Stated Goal: This project is focused on discovery, evaluation and production of agricultural microbials (i.e., microbial biofertilizers, rhizobia, microbial pesticides, microbial protectants and related) specific to Arkansas crops and production environments. The goal is to create commercially viable microbials and the necessary production facilities within UADA to enable commercial production of these microbials tailored to benefit our Arkansas farmers. In this way, we could provide sound, novel technologies from within the state to increase yields and profitability for Arkansas agriculture. We propose a project that would be jointly, evenly funded by the Arkansas Soybean Promotion Board, the Arkansas Corn and Grain Sorghum Promotion Board, and the Arkansas Rice Promotion Board to launch this initiative.

Specific Objectives:

1. Evaluate the efficacy of commercial microbials in major Arkansas crops, including soybean.
2. Isolate and develop novel, Arkansas-based agricultural microbials customized for our major crops, including soybean.
3. Obtain and evaluate pilot-scale equipment (biofermenters, bioreactors) to launch an Arkansas-based facility to serve as a scale up testing facility for microbial technologies and as a pilot level production center for commercial-scale, Arkansas-based production of agricultural microbials.

Background: A*gricultural microbials* (sometimes referred to as 'microbials' or 'biologicals') constitute a wide range of commercial products used to improve crop production. These include soil or root-dwelling microbes that act as plant biostimulants, biofertilizers, nodulators, biocontrol agents of various pests, and serve many other functions that promote crop plant health and increase/protect yield. Microbials have an excellent return on value for farmers. They are relatively inexpensive and have proven benefits including more efficient nutrient uptake, nitrogen assimilation, stress alleviation related to water, salt, heat and drought, and control of weeds, diseases and insects. Additionally, microbials are environmentally friendly due to their biological basis. Because of low cost, high returns, and overall safety, the agricultural microbials market is growing rapidly and is forecast to exceed $32 billion worldwide in 10 years, from roughly $7 billion today.

Ultimately, the vision here is to create the necessary program and infrastructure to discover, evaluate and finally produce commercially viable and scaled microbial products that are customized specifically for Arkansas crops and production environments. To our knowledge, there are currently no microbial scale up facilities in Arkansas today. Thus, any scale up work for microbials must be contracted out to facilities in other states even for early product evaluation. As a major land-grant university attached to one of the most productive crop production areas in the U.S., we have an opportunity to function as a microbial hub to service research efforts as well as our farming communities. Beyond the types of microbials described, a program and parallel facility as outlined can also be highly *valuable* to address specific challenges for Arkansas farmers, such as abiotic stress associated with mycotoxin contamination of grain, particularly aflatoxin; mitigating other biotic and abiotic stresses such as unfavorable temperatures and flooding; maximizing efficient uptake of irrigation and nutrients; and other issues of high priority to our growers. Finally, once established, we aim to partner with the UADA

and other crop breeding programs to develop variety 'packages' entailing plant genetics partnered with customized microbials to maximize and protect yield and profitability in Arkansas production conditions.

A key requirement for this project is biofermentation, the capacity for scale-up production of rhizobacteria or other beneficial organisms. This project will require at least one benchtop biofermenter (~5 L) for pilot-scale protocol development, and a larger (~50 L) fermenter to translate pilot-scale production into sufficient biological inoculum for field testing. Subsequent commercial-scale production for Arkansas growers will require additional equipment, industry partnership, or outside investment -- a situation to be addressed as this three-year project advances beyond initial stages. To our best knowledge, there is no public or commercial agricultural fermentation facility in the state of Arkansas that can support this endeavor, and thus we seek to address this critical infrastructure gap for the benefit of multiple cropping systems in the state. It should be emphasized that, as a major research land grant University, we have developed many microbial-based technologies over the years. However, pilot or scale up production has often been a stumbling block to further develop these technologies. This project will help fill that gap.

Methods: For Objective 1, we will focus on establishing a research base by evaluating the benefit of existing, commercially available agricultural microbials on the major crops in Arkansas, including soybean. These will initially focus on yield promotion and improved agronomics. Field testing will be performed at the Fayetteville research station. As the project progresses and new biologicals continually become available, we will annually select products for field testing. For Objective 2, we will collect and isolate novel potential microbials from Arkansas soils and plants, specifically from crop plants or others that appear to thrive despite obvious stressful conditions. We envision focusing primarily on beneficial rhizobacteria but will pursue other categories of microorganisms as supported by experimental data. These novel plant-associating strains will be tested in greenhouse and outdoor plots for efficacy before scaling up production for larger, field-scale evaluations. For Objective 3, we purchased a reconditioned bench-top fermenter in Year 1, so initial optimization experiments for strains obtained in Objective 2 can begin as Year 1 concludes. In Year 2, we anticipate purchasing a reconditioned, larger fermenter/bioreactor capable of producing sufficient inoculum for experiments in greenhouses and outdoor plots. Together, these two fermenters will provide sufficient capacity to take newly discovered biologicals from initial research & development stages to proof of concept and will provide the footprint for commercial production and market viability.

Planned Milestones: In Years 2 and 3, we will evaluate commercial microbials for efficacy on soybean and other major field crops in the state and report results to growers through presentations at meetings and other extension activities. In Year 1, we began to isolate novel, Arkansas-sourced microbials and acquired/set up the bench top fermenter so that active testing of novel microbials can commence in Years 2 and 3. In support of this process, we will acquire/set up the larger fermenter in Year 2 to enable greenhouse and outdoor testing of novel microbials on a larger scale. By Year 3, we anticipate having a fully functional R&D fermentation facility for scale-up production of microbials.

Statement of Projected Value: Agricultural microbials specifically formulated for Arkansas production conditions have the potential to save input costs and thus substantially increase grower profitability. This is particularly important in the face of lower than desired commodity prices coupled with higher input prices -- a situation expected to continue for the foreseeable future.

Budget Justifications: Funds are requested to purchase components for a scale-up fermenter in Year 2, required for project success. Funds are requested for a graduate student to perform project related activities, as well as funds for lab, field, and greenhouse work. Funds are requested for travel to field sites in Arkansas and to present results at a national scientific meeting. Funds are also requested for Dr. Cartwright's participation in the project as a collaborator and consultant.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Bluhm, Burt — *Development, Evaluation and Production of Agricultural Biologicals for Arkansas Crop Production*

Year	2026/2027	**Project Year**	Year 2 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Bluhm, Burt	**Co-PI #1**		
Co-PI #2		**Co-PI #3**		
Department	ENPL Entomology and Plant Pathology			
Commodity Board	Soybean Promotion Board			
Project Title	Development, Evaluation and Production of Agricultural Biologicals for Arkansas Crop Production			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Bluhm, Burt						
Select "AES" or "CES" for each PI	AES	AES	CES	CES	**Total Board Funding Requested**	**AES Portion**	**CES Portion**

Fulltime Personnel

Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$0	$0	$0	$0	$0	$0	$0

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
		33%	$7,000				$7,000	$7,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information		$2,300				$2,300	$2,300	$0
	Subtotal: Graduate Student		$9,300	$0	$0	$0	$9,300	$9,300	$0

Hourly

	Wages				**Total**	**AES Portion**	**CES Portion**
Hourly-Personnel	$4,000				$4,000	$4,000	$0
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$4,000	$0	$0	$0	$4,000	$4,000	$0

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.	**Benefits**				**Total**	**AES Portion**	**CES Portion**
Fulltime Personnel	$0	$0	$0	$0	$0	$0	$0
Graduate Students	$448	$0	$0	$0	$448	$448	$0
Hourly Personnel	$272	$0	$0	$0	$272	$272	$0
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$720	$0	$0	$0	$720	$720	$0
Personnel Total	$14,020	$0	$0	$0	$14,020	$14,020	$0

Travel

Justify out-of-state travel in proposal.	**Travel**				**Total**	**AES Portion**	**CES Portion**
In-State	$500				$500	$500	$0
Out-of-State	$1,500				$1,500	$1,500	$0
Travel Total	$2,000	$0	$0	$0	$2,000	$2,000	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Bluhm, Burt — *Development, Evaluation and Production of Agricultural Biologicals for Arkansas Crop Production*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$8,000				$8,000	$8,000	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$8,000	$0	$0	$0	$8,000	$8,000	$0
	Total for Proposal	$24,020	$0	$0	$0	$24,020	$24,020	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

RA-09

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Utilization of Winter Nursery for Soybean Line Development through Backcrossing

Project Type:
Research

Name of Project Manager:
Caio Vieira

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
This project supports the development of herbicide-resistant soybean cultivars adapted to Arkansas by converting elite conventional breeding lines into Enlist-E3 and XtendFlex. Use of an off-season nursery accelerates generation advancement while maintaining the performance of Arkansas genetics. Continued support ensures growers have access to locally developed soybean varieties with herbicide resistance options suited to production needs.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Elite conventional soybean breeding lines will be converted to Enlist E3 and XtendFlex backgrounds using a structured backcrossing program in an off-season nursery. Multiple generations will be completed each year, followed by seed increase and return of converted lines to Arkansas for yield testing. This cycle will be repeated annually to maintain a continuous pipeline of herbicide-resistant varieties.

BUDGET

Amount of Funding Needed for Project:
$51,000.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Utilization of Winter Nursery for Soybean Line Development through Backcrossing

Lead Investigators: Caio Canella Vieira

Co-Investigators:

Status and Duration of Funding: Year 2 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Breeding

Stated Goal: Most of our soybean cultivar development efforts have been primarily focused on conventional non-GMO cultivar development. In 2020, a backcrossing program to convert elite conventional breeding lines into Enlist-E3® products initiated the efforts to develop herbicide-resistant cultivars. Recently, we acquired a license to develop XtendFlex® materials. This conversion process occurs exclusively in an off-season nursery in Puerto Rico, intending to turn seven generations in three calendar years. The first Arkansas Enlist-E3® breeding lines were yield tested in 2023, and superior lines were entered into 2024 regional trials (USDA Uniform Trials and Arkansas Variety Testing). In 2025, several Enlist-E3® breeding lines were tested in regional trials for another year and are planned to be proposed for commercial release. A sustainable backcross program for herbicide-resistant product development requires significant investments in multiple years of operations in off-season nurseries, therefore, we are seeking further assistance to supplement the development of Enlist-E3® and XtendFlex® backcrossing in off-season nurseries.

Specific Objectives: Leverage off-season nursery to convert conventional breeding lines into Enlist-E3® and XtendFlex® to support a steady pipeline of herbicide-resistant varieties readily available to Arkansas growers.

Methods: A modified backcrossing program has been established in 2023 to support a steady and effective delivery of herbicide-resistant cultivars. As demonstrated in Figure 1, our breeding pipeline consists exclusively of conventional, non-GMO breeding lines. Materials selected to enter regional trials (USDA Uniform Trials and Arkansas Variety Testing) will undergo conversion to both Enlist-E3® and XtendFlex® in an off-season nursery. In 2026, we initiated the conversion of an additional 10 high-yielding elite breeding lines to both Enlist-E3® and XtendFlex® backgrounds.

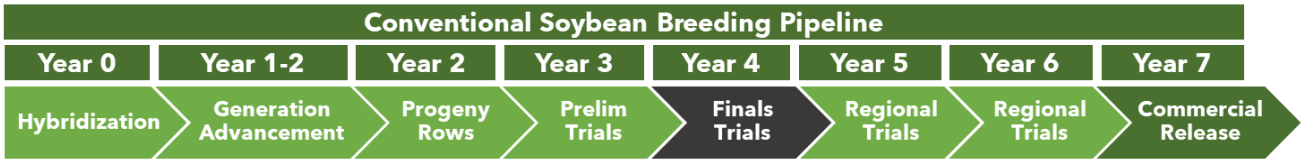


Figure 1. Scheme of the conventional (non-GMO) soybean breeding cultivar development pipeline. Advanced materials selected to enter regional trials (USDA Uniform Trials and Arkansas Variety Testing) will undergo herbicide resistance trait introgression.

The rationale behind maintaining the pipeline exclusively conventional is improved flexibility and operations efficiency. Suppose a conventional breeding line was found to be highly competitive in the Finals Trials (Year 4). With the proposed system, this breeding line can remain conventional (niche market) or be converted into either Enlist-E3® and XtendFlex®. If the breeding line was developed based on a specific herbicide-resistant trait, it would not be possible to convert it to anything else but that herbicide-

resistant trait. It also improves our effectiveness in maintaining seed purity as this minimizes cross-contamination.

Materials selected for regional trials (December of each year, for this example we will use the 2024 season) will undergo three rounds of backcrossing (January 2025 to December 2025) followed by three rounds of generation advancement (January 2026 to December 2026) (Figure 2). In each round, plants will be sprayed with either Enlist Duo (Enlist-E3®) or dicamba (XtendFlex®). Once reaching the BC_2F_3 stage, approximately 50 converted single plants per recurrent parent will undergo seed increase (January 2027 to April 2027). Lines will return to Arkansas and be tested for yield in multiple environments in Summer 2027. Superior lines will be moved into regional trials and pre-foundation seeds in 2028 and may be proposed for commercial release in Spring 2029. Simultaneously, a new cycle of conversion to Enlist-E3® and XtendFlex® will start each year.

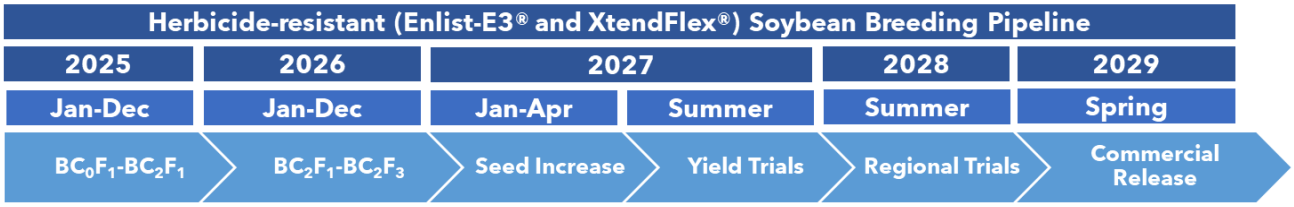


Figure 2. Scheme of herbicide resistance trait introgression. Conventional advanced materials selected to enter regional trials (USDA Uniform Trials and Arkansas Variety Testing) will undergo herbicide resistance trait introgression for two years, followed by two years of yield trials prior to commercial release.

Planned Milestones:

Proposed Activities	Year 1				Year 2				Year 3			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Obj. 1. Introgress Enlist-E3® and XtendFlex® traits into conventional (non-GMO) soybean cultivars												
Backcross BC_0F_1	*X*	*X*										
Backcross BC_1F_1		*X*	*X*									
Backcross BC_2F_1			*X*	*X*								
Backcross BC_2F_1-F_3				*X*	*X*	*X*	*X*	*X*				
Seed Increase								*X*	*X*	*X*		
Yield Trials										*X*	*X*	

Value to Soybean Industry: The University of Arkansas Soybean Breeding Program has been providing high-yielding conventional MG4 and MG5 cultivars at low costs to growers, but it needs to rapidly expand its footprint in herbicide-resistant cultivars. A sustainable and effective backcross program for herbicide-resistant (Enlist-E3® and XtendFlex®) cultivars will improve the accessibility of Arkansas genetics to local growers, allowing them to pick their cultivar of choice with their herbicide resistance package of choice.

Budget Justifications/Explanation of Travel and Direct Costs ($51,000): A total of $3,000 is requested for two visits to the off-season nursery in Puerto Rico to inspect generation advancement and overall project progress. $48,000 is requested to cover the costs of backcross BC_0F_1 to BC_2F_1, as well as one generation of advancement (BC_2F_1-BC_2F_2). This includes the conversion of selected entries from 2025 to both Enlist-E3® and XtendFlex® herbicide resistance traits.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Vieira, Caio — *Utilization of Winter Nursery for Soybean Line Development through Backcrossing*

Year	2026/2027	**Project Year**	Year 2 of 3
Lead Investigator	Vieira, Caio	**Co-PI #1**	
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Utilization of Winter Nursery for Soybean Line Development through Backcrossing		

Version: 8.0 (09/22/2025)

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Vieira, Caio				Total Board Funding Requested	AES Portion	CES Portion
	Select "AES" or "CES" for each PI	AES	AES	CES	CES			
Fulltime Personnel								
Position Title	**Name** *(if position is filled)* / **% Time**	**Salaries**				**Total**	**AES**	**CES**
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
	Subtotal: Salaries	$0	$0	$0	$0	$0	$0	$0
	Graduate Student							
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)* / **% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
	Tuition Calculator Information					$0	$0	$0
	Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0
	Hourly							
		Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel					$0	$0	$0
	Hourly-Students					$0	$0	$0
	Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0
	Fringe Benefits							
Fringe benefits are calculated when salary and wage amounts are entered above.		**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel	$0	$0	$0	$0	$0	$0	$0
	Graduate Students	$0	$0	$0	$0	$0	$0	$0
	Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
	Hourly-Students	$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits	$0	$0	$0	$0	$0	$0	$0
	Personnel Total	$0	$0	$0	$0	$0	$0	$0
	Travel							
Justify out-of-state travel in proposal.		**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State					$0	$0	$0
	Out-of-State	$3,000				$3,000	$3,000	$0
	Travel Total	$3,000	$0	$0	$0	$3,000	$3,000	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Vieira, Caio *Utilization of Winter Nursery for Soybean Line Development through Backcrossing*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies					$0	$0	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Nursery fees, seed shipment	$48,000				$48,000	$48,000	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$48,000	$0	$0	$0	$48,000	$48,000	$0
	Total for Proposal	$51,000	$0	$0	$0	$51,000	$51,000	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

RA-10

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Overcoming Soybean Yield Plateau by Leveraging Physiology-Efficient and Yield-Formation Traits

Project Type:
Research

Name of Project Manager:
Caio Vieira

Name of Project Team Member 1:
Elvis Elli

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Soybean yield gains have slowed due to limited improvement in yield formation traits. This project supports the identification of physiological traits and genetic variation that contribute to improved yield potential. By evaluating diverse germplasm and elite cultivars, this work aims to generate knowledge and breeding materials that support long term and sustainable increases in soybean productivity relevant to Arkansas production environments.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Genetically diverse soybean accessions and elite cultivars will be evaluated for yield formation traits using field trials and UAV-based phenotyping. Genomic analyses will identify genetic regions associated with key physiological traits. Breeding populations will be developed by crossing elite cultivars with diverse accessions showing favorable traits, followed by rapid generation advancement to support future cultivar development.

BUDGET

Amount of Funding Needed for Project:
$83,790.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Overcoming Soybean Yield Plateau by Leveraging Physiology-Efficient and Yield-Formation Traits

Lead Investigators: Caio Canella Vieira

Co-Investigators: Elvis Elli

Status and Duration of Funding: Year 3 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Breeding, Physiology

Stated Goal: Soybean breeding programs have achieved significant success in developing cultivars with improved yield and superior resilience to biotic and abiotic stressors. Despite remarkable advancements, current soybean yield potential is reaching a plateau resulting from limited genetic diversity and reduced possibility of breakthrough allelic combinations. This concern is particularly relevant in modern breeding programs that heavily rely on recycling elite materials through elite-by-elite hybridization schemes. Yield can be expressed as a result of three main physiological processes including cumulative solar radiation interception by the canopy (Ei), radiation use efficiency (RUE), and harvest index (HI, ratio of seed yield to total above-ground biomass). Reports of Ei in soybeans range from 40 to 70%, suggesting that a significant portion of available solar radiation is not efficiently captured by the canopy (Edwards et al., 2005; Lopez et al., 2022). Hence, improving Ei efficiency by modifying canopy architecture could substantially contribute to higher soybean yields. RUE has been reported within the range of 2.3 to 4.3% (Lee et al., 1986; Long et al., 2006; Lopez et al., 2022), which is substantially lower than the theoretical maximum RUE of 9.4% (Sinclair and Muchow, 1999). Maximizing RUE through enhancements in leaf angle (upright leaves) and reduction of antenna size (preventing the trapping of excess energy) can directly contribute to higher soybean yields. HI has been estimated within the ranges of 0.40 to 0.50 (Edwards et al., 2005; de Bruin and Pedersen, 2009; Lopez et al., 2022), leaving as much as 50% opportunity for improvement given the theoretical maximum HI of 0.60 (Austin et al., 1980). Therefore, this research proposal aims to increase soybean yield potential by identifying and incorporating physiology-efficient and yield-formation traits in a population consisting of genetically diverse soybean accessions.

Specific Objectives: The proposal is structured around three specific objectives: **i)** characterization of genetically diverse soybean accessions and modern cultivars based on yield-formation and physiology-efficient traits; **ii)** characterization of the genetic architecture of yield-formation and physiology-efficient traits; **iii)** development of breeding populations derived from high-yielding elite modern cultivars and diverse accessions.

Methods:

Objective 1: Around 250 genetically diverse soybean accessions (PI) will be phenotyped for yield-formation and physiology-efficient traits including Ei, RUE, and HI using a UAV-based image platform. These comprise a subset of the USDA Soybean Germplasm Collection. Cumulative solar radiation interception by the canopy (Ei) will be measured as the size of the canopy throughout the season as this has been reported to have a 1:1 relationship with Ei (Purcell, 2000; Kawasaki et al., 2016; Lopez et al., 2022). The time-series observation of canopy growth will be multiplied by the daily photosynthetic active radiation (PAR) available which is estimated at 48.7% of total solar radiation (Zhu et al., 2008). Solar radiation use efficiency (RUE) will be determined by assessing the ratio between dry biomass at both late vegetative and late reproductive stages and the cumulative PAR intercepted leading up to each biomass collection. Harvest

index (HI) will be calculated as the ratio between dry seed weight (adjusted to zero moisture) and dry biomass collected at R8 (full maturity) from a single 2.1 m row.

Objective 2: The genetic architecture of each trait (Ei, RUE, and HI) will be characterized based on genome-wide association studies (GWAS). Two models will be implemented to detect significant marker-trait associations including BLINK (Huang et al., 2019) and a model that allows the inclusion of population structure in interaction with the environment (G×E) to account for variable patterns of genotype responses in different environments (Canella Vieira et al, 2022).

Objective 3: Bi-parental breeding populations including a high-yielding elite modern cultivar and a diverse accession showing superior physiology-efficient and yield-formation traits will be developed. An off-season nursery will be used to conduct hybridization schemes as well as generation advancement (three growing seasons in a year). Breeding lines with yield potential superior to the elite and PI parents will represent the first generation of physiology-efficient, high-yielding materials. These will be available for further recombination with elite materials through hybridization schemes.

Planned Milestones:

Proposed Activities	Year 1				Year 2				Year 3			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Obj. 1. Characterize soybean genotypes based on yield-formation and physiology-efficient traits												
Select Plant Materials	*X*	*X*										
Conduct Field Trials		*X*	*X*	*X*		*X*	*X*	*X*		*X*	*X*	*X*
Estimate Ei, RUE, and HI		*X*	*X*	*X*		*X*	*X*	*X*		*X*	*X*	*X*
Obj. 2. Characterize the genetic architecture of yield-formation and physiology-efficient traits												
GWAS for Ei, RUE, and HI							*X*	*X*	*X*	*X*	*X*	*X*
Obj. 3. Develop breeding populations derived from high-yielding elite cultivars and diverse accessions												
Develop bi-parental populations						*X*	*X*			*X*	*X*	
Generation advancement (F_1-F_4)								*X*	*X*	*X*	*X*	*X*

Value to Soybean Industry: The historical selection of superior soybean genotypes has been largely based on highly dynamic environmental conditions of target environments. This raises the hypothesis of whether intrinsic improvements in yield-formation traits have been accomplished or breeding programs have sustained high-yielding varieties by mainly targeting stress resilience traits and genetically engineered herbicide tolerance. The main goal of this proposal is to identify genetic variation in diverse accessions associated with physiology-efficiency and yield-formation traits using genomic, phenomics, and advanced statistical analytics for a sustainable and long-term increase in soybean yield and production in Arkansas and the United States.

Budget Justifications/Explanation of Travel and Direct Costs ($83,790): For Vieira, $44,660 is requested for a post-doctoral fellow ($35,000 base plus fringe) who will mainly coordinate UAV flights and data processing. $6,000 is requested for in-state field travel to collect physiological data throughout the season, and $2,000 to present results at a scientific conference. $3,180 is requested for land fees, $3,000 for a variety of supplies, and $2,000 for publication fees. For Elli, $15,950 is requested to partially support a Research Associate ($12,500 plus fringe), $2,500 for in-state travel to assist collecting physiological data throughout the season, and $4,500 for a variety of planting and harvesting supplies.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Vieira, Caio — *Overcoming Soybean Yield Plateau by Leveraging Physiology-Efficient and Yield-Formation Traits*

Year	2026/2027	**Project Year**	Year 3 of 3
Lead Investigator	Vieira, Caio	**Co-PI #1**	Elli, Elvis
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Overcoming Soybean Yield Plateau by Leveraging Physiology-Efficient and Yield-Formation Traits		

Version: 8.0 (09/22/2025)

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Vieira, Caio	Elli, Elvis			Total Board Funding Requested	AES Portion	CES Portion
	Select "AES" or "CES" for each PI	AES	AES	CES	CES			
Fulltime Personnel								
Position Title	**Name** *(if position is filled)* / **% Time** / **Salaries**					**Total**	**AES**	**CES**
Research Associate			$12,500			$12,500	$12,500	$0
Post-doc Fellow		$35,000				$35,000	$35,000	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
	Subtotal: Salaries	$35,000	$12,500	$0	$0	$47,500	$47,500	$0
Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)* / **% Time** / **Wages**					**Total**	**AES Portion**	**CES Portion**
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
	Tuition Calculator Information					$0	$0	$0
	Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0
Hourly								
	Wages					**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel					$0	$0	$0
	Hourly-Students					$0	$0	$0
	Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0
Fringe Benefits								
Fringe benefits are calculated when salary and wage amounts are entered above.	**Benefits**					**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel	$9,660	$3,450	$0	$0	$13,110	$13,110	$0
	Graduate Students	$0	$0	$0	$0	$0	$0	$0
	Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
	Hourly-Students	$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits	$9,660	$3,450	$0	$0	$13,110	$13,110	$0
	Personnel Total	$44,660	$15,950	$0	$0	$60,610	$60,610	$0
Travel								
Justify out-of-state travel in proposal.	**Travel**					**Total**	**AES Portion**	**CES Portion**
	In-State	$6,000	$2,500			$8,500	$8,500	$0
	Out-of-State	$2,000				$2,000	$2,000	$0
	Travel Total	$8,000	$2,500	$0	$0	$10,500	$10,500	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Vieira, Caio *Overcoming Soybean Yield Plateau by Leveraging Physiology-Efficient and Yield-Formation Traits*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$3,000	$4,500			$7,500	$7,500	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication	$2,000				$2,000	$2,000	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$1,590	$0	$0	$0	$1,590	$1,590	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$1,590	$0	$0	$0	$1,590	$1,590	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$8,180	$4,500	$0	$0	$12,680	$12,680	$0
	Total for Proposal	$60,840	$22,950	$0	$0	$83,790	$83,790	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

RA-11

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Fast-tracking MG4 cultivars with southern root-knot nematode resistance

Project Type:
Research

Name of Project Manager:
Caio Vieira

Name of Project Team Member 1:
Travis Faske

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Southern root knot nematode is a major yield-limiting factor for soybean production in Arkansas, yet resistance is rare in MG4 cultivars. This project supports the development of MG4 soybean lines with SRKN resistance adapted to Arkansas by combining molecular markers and field screening. Continued support strengthens the availability of locally adapted soybean varieties capable of maintaining yield under nematode pressure.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Arkansas soybean breeding lines will be screened for SRKN resistance using molecular markers, greenhouse assays, and field evaluations in infested environments. Resistant lines will be used as parents to develop new breeding populations, which will be advanced through off-season nurseries and re-screened to confirm resistance. These activities support steady progress toward SRKN-resistant MG4 soybean cultivars.

BUDGET

Amount of Funding Needed for Project:
$50,504.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Fast-tracking MG4 cultivars with southern root-knot nematode resistance

Lead Investigators: Caio Canella Vieira

Co-Investigators: Travis Faske

Status and Duration of Funding: Year 3 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Breeding and Plant Pathology

Stated Goal: The southern root-knot nematode (SRKN) (*Meloidogyne incognita*, Kofoid & White, 1919) is the most important plant-pathogenic nematode of soybean in Arkansas. It has been detected in 32 out of 35 counties sampled from 2014 and 2018 (Ye et al., 2019) and is estimated to cause an average annual yield loss of 8.6 million bushels. Currently, resistance to SRKN is very limited in MG4 commercial soybean cultivars. Based on a recent search for MG4.0 to 5.3 soybean varieties for Arkansas, resistance to SRKN was found in only 4 out of 30 cultivars listed for Pioneer, and 1 out of 34 cultivars for Asgrow. Thus, the development and deployment of MG4 soybean cultivars with SRKN resistance adapted to Arkansas and the mid-South are essential to sustain yield under SRKN pressure. Marker assisted selection is a good initial step to quickly select germplasm and breeding lines with the resistance traits; however, it is important to evaluate these selections in the field. Many companies do not have a good field screen, but one has been developed by the co-investigator and is used to evaluate commercial varieties marketed for resistance against SRKN. Furthermore, there is some evidence that nematode reproduction may be uncoupled from galling thus some partially resistant lines may not reduce nematode densities for the subsequent cropping season. Therefore, this proposal aims to utilize marker assisted selection and field screening to fast-track the development of soybean cultivars with resistance to SRKN in maturity groups 4.

Specific Objectives: The proposal is structured around two specific objectives: i) Characterize the response to SRKN of breeding lines in the Arkansas Soybean Breeding Program using molecular markers, greenhouse pot assays, and field screenings; ii) Develop breeding populations derived from SRKN-resistant parental lines.

Methods:

Objective 1: The 2026 preliminary breeding lines (~2,000) will be screened utilizing molecular markers linked to a well-known genomic region associated with SRKN resistance (Pham et al., 2013). In 2023, a total of 1,300 genotypes were screened with molecular markers and only 48 Arkansas lines showed resistance to SRKN. In 2024, 1,350 genotypes were screened and 94 showed resistance to SRKN. **In 2025, roughly 2,000 genotypes were selected from progeny rows and are currently undergoing marker-assisted selection. It is worth noting that 2025 represents the first year of progeny rows derived from this project (2023 crosses), so it is expected that we are finally turning the direction of SRKN resistance in Arkansas.** Furthermore, selected entries will be screened in a SRKN-infested field near Lonoke, AR. Plots will consist of 11' single row plots with four replications per entry.

Objective 2: Between 50 to 70 new breeding populations will be developed of which at least one parent is SRKN-resistant. **As mentioned in Objective 1, Arkansas germplasm lacks SRKN resistance, and substantial efforts are needed to reverse this condition**. In 2023, a total of 74 populations derived from at least one SRKN-resistant parent were developed. In 2024, 87 new populations were developed. In 2025, another 84 populations were developed including SRKN-resistant parental lines. In 2026, hybridizations

will be conducted in Fayetteville during the summer, and populations will be advanced to reach homozygosity in an off-season nursery in Puerto Rico. $F_{4:5}$ progeny rows will return in the Summer of 2028, and selected rows will undergo molecular marker screening to confirm SRKN resistance.

Planned Milestones:

Proposed Activities	Year 1				Year 2				Year 3			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Obj. 1. Characterize SRKN response using molecular markers and greenhouse and field screenings												
Select Plant Materials	*X*			*X*	*X*			*X*	*X*			*X*
Greenhouse Screening	*X*	*X*	*X*		*X*	*X*	*X*		*X*	*X*	*X*	
Field Screening		*X*	*X*			*X*	*X*			*X*	*X*	
Marker-assisted Selection	*X*	*X*			*X*	*X*			*X*	*X*		
Obj. 2. Develop breeding populations derived from SRKN-resistant parental lines												
Field Hybridization		*X*				*X*				*X*		
Generation advancement	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*
Grow progeny rows		*X*	*X*	*X*		*X*	*X*	*X*		*X*	*X*	*X*

Value to Soybean Industry: Developing soybean cultivars resistant to SRKN is critical for soybean production in Arkansas. Although this proposal does not cover the complete breeding cycle, typically spanning nearly a decade from crossing to product deployment, it provides a series of necessary goals to begin selecting early-maturity soybean lines with resistance to the SRKN. Such lines will be critical for improved performance and enhanced profit margins in areas where SRKN is a limiting factor for soybean production.

Budget Justifications/Explanation of Travel and Direct Costs ($50,504): From breeding, $19,140 ($15,000 plus fringe) is requested to support 0.25 of a Research Associate conducting field and greenhouse activities. $1,250 is requested for field visits to install plots, maintain, and harvest. A total of $5,000 is requested for marker-assisted selection and nursery fees. From pathology, $17,864 is requested to partially support a field technician ($14,000 base plus fringe). $3,000 is requested for in-state field travel, and $4,250 for a variety of supplies for nematode screening in the field and greenhouse.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Vieira, Caio — *Fast-tracking MG4 cultivars with southern root-knot nematode resistance*

Year	2026/2027	**Project Year**	Year 3 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Vieira, Caio	**Co-PI #1**	Faske, Travis	
Co-PI #2		**Co-PI #3**		
Department	CSES Crop, Soil, Environmental Science			
Commodity Board	Soybean Promotion Board			
Project Title	Fast-tracking MG4 cultivars with southern root-knot nematode resistance			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Vieira, Caio	Faske, Travis			Total Board Funding Requested	AES Portion	CES Portion
	Select "AES" or "CES" for each PI	AES	CES	CES	CES			
Fulltime Personnel								
Position Title	**Name** *(if position is filled)* / **% Time**	**Salaries**				**Total**	**AES**	**CES**
Program Technician		$15,000	$14,000			$29,000	$15,000	$14,000
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
Subtotal: Salaries		$15,000	$14,000	$0	$0	$29,000	$15,000	$14,000
Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)* / **% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
	Tuition Calculator Information					$0	$0	$0
Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0
Hourly								
		Wages				**Total**	**AES Portion**	**CES Portion**
Hourly-Personnel						$0	$0	$0
Hourly-Students						$0	$0	$0
Subtotal: Hourly		$0	$0	$0	$0	$0	$0	$0
Fringe Benefits								
Fringe benefits are calculated when salary and wage amounts are entered above.		**Benefits**				**Total**	**AES Portion**	**CES Portion**
Fulltime Personnel		$4,140	$3,864	$0	$0	$8,004	$4,140	$3,864
Graduate Students		$0	$0	$0	$0	$0	$0	$0
Hourly Personnel		$0	$0	$0	$0	$0	$0	$0
Hourly-Students		$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits		$4,140	$3,864	$0	$0	$8,004	$4,140	$3,864
Personnel Total		$19,140	$17,864	$0	$0	$37,004	$19,140	$17,864
Travel								
Justify out-of-state travel in proposal.		**Travel**				**Total**	**AES Portion**	**CES Portion**
In-State		$1,250	$3,000			$4,250	$1,250	$3,000
Out-of-State						$0	$0	$0
Travel Total		$1,250	$3,000	$0	$0	$4,250	$1,250	$3,000

University of Arkansas System Division of Agriculture

Promotion Board Budget

Vieira, Caio *Fast-tracking MG4 cultivars with southern root-knot nematode resistance*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies		$4,250			$4,250	$0	$4,250
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Marker selection, nursery	$5,000				$5,000	$5,000	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$5,000	$4,250	$0	$0	$9,250	$5,000	$4,250
	Total for Proposal	$25,390	$25,114	$0	$0	$50,504	$25,390	$25,114

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

RA-12

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
The Arkansas Discovery Farm

Project Type:
Research

Name of Project Manager:
Mike Daniels

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Continue to build edge-of-field runoff water quality database for major Arkansas agricultural systems to document various agricultural practices on water quality and build scientific foundation for the sustainable use of natural resources.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Data collection on water quality, water use, soil health and gaseous nutrient losses. Education products on improving nutrient use efficiency, water use efficiency, improvement of soil health, and reduction of gaseous losses of nitrogen and carbon from soils to improve sustainability and profitability.

BUDGET

Amount of Funding Needed for Project:
$28,561.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: The Arkansas Discovery Farm Program

Lead Investigators: Mike Daniels

Co-Investigators:

Status and Duration of Funding: Year 2 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Miscellaneous Project to: 1) monitor runoff water quality, water use, soil health and climate change resiliency on private farms to determine nutrient, sediment losses, carbon sequestration, and greenhouse gas emissions on selected farms; 2) evaluate conservation practices and 3) verify sustainability of current production practices

Stated Goal: The overall goal of the program is to document sustainable and viable farming systems that remain cost-effective in an environmentally sound manner.

Specific Objectives:

1. Provide on-farm verification and documentation of nutrient and sediment loss reductions and water conservation in support of nutrient management planning and sound environmental farm stewardship.
2. Develop and deliver educational programs from on-farm data that will assist producers in achieving both production and environmental goals in support of sustainable farming.
3. Developing a long-term edge-of-field database on the relationship between agriculture and natural resources to provide the scientific foundation for future market-based incentives for ecosystem services provided by agriculture such as carbon sequestration, wildlife habitat, etc.

More specifically, it provides a mechanism to:

- collect on-farm baseline data of the impact of agriculture on natural resources,
- document the performance of conservation practices,
- provide real world, on-farm examples founded on data,
- make the producer a part of the solution process,
- facilitate a multi-agency team to assist farmers,
- provide excellent tour sites for field days which promotes important discussion,
- facilitate farmer to farmer education, and focus attention on conservation, especially with non-agricultural audiences

Methods: The ARDF program, which presently consists of a network of 17 farms throughout Arkansas, is an effective stakeholder-driven conservation demonstration program, where extensive, state-of-the-art water quality monitoring systems are installed on private, working farms including both livestock and row-crop systems to document environmental impact and to demonstrate the potential of NRCS-approved conservation practices' on- and off-farm impacts with respect to documented water quality (Daniels et al., 2018; Daniels et al., 2019), water-use efficiency, soil health and climate change under different production systems.

Planned Milestones:

- Continue to develop one of the nation's largest database on the relationship of agriculture and natural resources with respect to nutrient loss. Data indicates that nutrient losses are relatively small compared to nutrient inputs.
- Summarize trends in the agricultural and water quality nexus using the above-mentioned database of over 3000 samples and 20,000+ individual datapoints for water quality parameters
- Continue to develop educational products such as fact sheets, virtual field trips and field days

Statement of Projected Value:

The Discovery Farm Program (ARDF; Sharpley et al., 2015) has emerged as an important educational platform that has been successful in addressing water quality, water use efficiency, and improving soil health. The value of the program is providing unbiased, research-based information that demonstrates that Arkansas farmers are proactively addressing natural resource concerns brought forward by other sectors of society including environmental groups, decision-makers, regulators, etc. The database that has been developed provides some of the most comprehensive information on the loss of nutrients from agricultural systems. Data have indicated that while nutrients are lost in runoff, the losses are relatively small compared to application amounts, which is a testament to how well farmers are managing fertilizers. This on-farm monitoring program also provides focus to future research. For example, monitoring revealed that potassium, not a water quality concern, is being lost at significant economic value to the farmer. Research is being conducted to find ways to reduce potassium losses and reduce potassium fertilizer needs.

Budget Justifications/Explanation of Travel and Direct Costs:

Salary and Wages: Requested for 0.5 FTE of Discovery Farm Technician, or $22,383 + fringes @27.6% = $6,178

$28,561 total for salary and wages.

Technician is responsible for daily sample collection, equipment maintenance, and other data collection as well as assist with development of educational products.

References

Daniels, M.B., Andrew Sharpley, Bill Robertson, Edward Gbur, Lee Riley, Pearl Webb, Brittany L. Singleton, Amanda Free, Lawrence Berry, Cory Hallmark, and Teresa Nehls 2019. Nutrients in Runoff from Cotton Production in the Lower Mississippi River Basin: An On-Farm Study. Agrosyst. Geosci. Environ. 2:190033 (2019) doi:10.2134/age2019.05.0033

Daniels, M.B., Andrew Sharpley, Darren Harmel and Karma Anderson. 2018. The Utilization of Edge-of-Field Monitoring of Agricultural Runoff in Addressing Nonpoint Source Pollution. Journal of Soil and Water Conservation Society. Volume 73(1): pp 89-96.

Sharpley, A., **M.B. Daniels**, L. Berry, C. Hallmark and J. Hesselbein. 2015. Arkansas Discovery Farms: documenting water quality benefits of on-farm conservation management and empowering farmers. Acta Agriculturae Scandinavica, Section B. Soil and Plant Science. Vol. 65, No. Supplement 2, 186-198. http://dx.doi.org/10.1080/09064710.2014.960444.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Mike Daniels *Arkansas Discovery Farms*

Year	2026/2027	**Project Year**	
Lead Investigator	Mike Daniels	**Co-PI #1**	
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Arkansas Discovery Farms		

Version: 8.0 (09/22/2025)

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Mike Daniels						
	Select "AES" or "CES" for each PI	CES	AES	CES	CES	**Total Board Funding Requested**	**AES Portion**	**CES Portion**
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Technician	Breet Cooper	50%	$22,383				$22,383	$0	$22,383
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$22,383	$0	$0	$0	$22,383	$0	$22,383
	Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information						$0	$0	$0
	Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0
	Hourly								
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel						$0	$0	$0
	Hourly-Students						$0	$0	$0
	Subtotal: Hourly		$0	$0	$0	$0	$0	$0	$0
	Fringe Benefits								
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$6,178	$0	$0	$0	$6,178	$0	$6,178
	Graduate Students		$0	$0	$0	$0	$0	$0	$0
	Hourly Personnel		$0	$0	$0	$0	$0	$0	$0
	Hourly-Students		$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits		$6,178	$0	$0	$0	$6,178	$0	$6,178
	Personnel Total		$28,561	$0	$0	$0	$28,561	$0	$28,561
	Travel								
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State						$0	$0	$0
	Out-of-State						$0	$0	$0
	Travel Total		$0	$0	$0	$0	$0	$0	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Mike Daniels *Arkansas Discovery Farms*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies					$0	$0	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$0	$0	$0	$0	$0	$0	$0
	Total for Proposal	$28,561	$0	$0	$0	$28,561	$0	$28,561

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

RA-13

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Economics of Automatic Applications in Arkansas Soybean

Project Type:
Research

Name of Project Manager:
Ben Thrash

Name of Project Team Member 1:
Nick Bateman

Name of Project Team Member 2:
Glenn Studebaker

Statement of Justification or Purpose of the Project (75 word maximum):
This project aims to evaluate the profitability of automatic insecticide applications at the R3 growth stage in Arkansas soybeans.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
1. Apply insecticides at the R3 growth stage on soybeans planted at various times and various locations across the state and monitor for insect populations. Compare automatic application profit to the profitability of an IPM approach of only spraying when thresholds are reached. 2. Record yields and determine the profitability of automatic insecticide applications.

BUDGET

Amount of Funding Needed for Project:
$43,610.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Economics of Automatic Applications in Arkansas Soybean

Lead Investigators: Ben Thrash

Co-Investigators: Nick Bateman, Glenn Studebaker

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): Year 2 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Entomology

Stated Goal: This project aims to evaluate the profitability of automatic insecticide applications at the R3 growth stage in Arkansas Soybean. A large portion of growers in Arkansas make automatic fungicide applications on soybean near the R3 growth stage. It has become increasingly common for an insecticide to be mixed in with this application for "insurance" purposes. Pyrethroids (lambda-cyhalothrin, bifenthrin) are commonly used in this practice because of their relatively low cost and broad-spectrum against many pests, however their use can inadvertently flare other pests due to them killing beneficial insects. Diamides (Besiege, Vantacor) are also commonly used because of their long residual control against caterpillar pests. However, diamides are relatively expensive, and the likelihood of a caterpillar pest infesting those fields is low much of the time, depending on location and planting date. Occasionally corn earworm still infest soybean after a diamide application leading to further control costs. Nucleopolyhedrovirus (NPV) (Heligen, Hearken) is another insecticide that is commonly used. These products are relatively inexpensive but only work on corn earworm. If earworm is not present at the time of application, the residual control provided can be extremely short depending on environmental conditions. However, NPV does not disrupt beneficial insect populations like some other insecticides such as the pyrethroids.

Specific Objectives:

1. Apply insecticides at R3 growth stage on soybean planted at various times and various locations across the state and monitor for insect populations. Compare automatic application profits to the profitability of an IPM approach of only spraying when thresholds are reached.
2. Record yields and determine the profitability of automatic insecticide applications.
3. Determine if there are specific circumstances when and where an automatic insecticide application may be warranted.

Methods: Insecticides will be applied at the R3 growth stage in large replicated strips in grower fields as well as experiment stations. Insecticides will include lambda-cyhalothrin (Warrior II), chlorantraniliprole (Vantacor), and nucleopolyhedrovirus (Heligen) and will be compared to a treat only as needed plot. On the day of application and each week thereafter plots will be scouted for insect pests and treated as necessary. Yields will be recorded at each location and will be analyzed for profitability.

Planned Milestones:

2025: Initiate trials on multiple grower fields across and research stations across the state

2026: Continue research by conducting trials across the state.

2027: Continue research, analyze data, publish findings.

Value to Soybean Industry: With currently high production costs and relatively low commodity prices, growers are trying to find ways to increase yields and reduce inputs. Automatic insecticide applications are one area where growers may be able to increase profitability by either changing the insecticide they are using or eliminating them all together. This project will help to

Budget Justifications/Explanation of Travel and Direct Costs: Funding will cover the costs of a graduate student. Travel costs will cover graduate student travelling to a couple of conferences to present their research.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Thrash, Ben *Economics of Automatic Insecticide Applications*

Year	2026/2027	**Project Year**	Year 2 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Thrash, Ben	**Co-PI #1**	Bateman, Nick	
Co-PI #2	Studebaker, Glenn	**Co-PI #3**		
Department	ENPL Entomology and Plant Pathology			
Commodity Board	Soybean Promotion Board			
Project Title	Economics of Automatic Insecticide Applications			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Thrash, Ben	Bateman, Nick	Studebaker, Glenn		Total Board Funding Requested	AES Portion	CES Portion
	Select "AES" or "CES" for each PI	CES	CES	CES	CES			
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$0	$0	$0	$0	$0	$0	$0
	Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
	Claire Graves	100%	$23,600				$23,600	$0	$23,600
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information		$10,200				$10,200	$0	$10,200
	Subtotal: Graduate Student		$33,800	$0	$0	$0	$33,800	$0	$33,800
	Hourly								
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel						$0	$0	$0
	Hourly-Students						$0	$0	$0
	Subtotal: Hourly		$0	$0	$0	$0	$0	$0	$0
	Fringe Benefits								
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$0	$0	$0	$0	$0	$0	$0
	Graduate Students		$1,510	$0	$0	$0	$1,510	$0	$1,510
	Hourly Personnel		$0	$0	$0	$0	$0	$0	$0
	Hourly-Students		$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits		$1,510	$0	$0	$0	$1,510	$0	$1,510
	Personnel Total		$35,310	$0	$0	$0	$35,310	$0	$35,310
	Travel								
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State		$5,000	$2,000	$1,000		$8,000	$0	$8,000
	Out-of-State						$0	$0	$0
	Travel Total		$5,000	$2,000	$1,000	$0	$8,000	$0	$8,000

University of Arkansas System Division of Agriculture

Promotion Board Budget

Thrash, Ben *Economics of Automatic Insecticide Applications*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies					$0	$0	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$150	$0	$0	$0	$150	$0	$150
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$150	$0	$150	$0	$150
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$150	$0	$150	$0	$300	$0	$300
	Total for Proposal	$40,460	$2,000	$1,150	$0	$43,610	$0	$43,610

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

RA-14

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Educating Growers and Consultants on Insect Monitoring and Control

Project Type:
Research

Name of Project Manager:
Ben Thrash

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
To educate growers, consultants, and other ag industry on the proper techniques for monitoring and management of soybean insect pest populations and to help provide them with the tools they need to make effective and economical decisions.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
"1. Put the sampling tools needed in the hands of our growers and other decision-makers to promote effective and economical control of insects.
2. Conduct scouting schools as needed and requested by clientele (5-10/ year). "

BUDGET

Amount of Funding Needed for Project:
$3,000.00

Contribution Amount (from organization or sponsor):
$0.00

ARKANSAS SOYBEAN PROMOTION BOARD
2026-2027 PROPOSAL

Title: Educating Growers and Consultants on Insect Monitoring and Control

Lead Investigators: Ben Thrash
Co-Investigators:, Nick Bateman, Glenn Studebaker
Status: Year 2 of 3
Research Area: Entomology

Stated Goal: To educate growers, consultants, and other ag industry on the proper techniques for monitoring and management of soybean insect pest populations and to help provide them with the tools they need to make effective and economical decisions.

Specific Objectives:

1. Increase awareness of the impact soybean insects can have on production
2. Provide growers and other decision-makers with the proper tools to make decisions on insect pest populations in their fields
3. Overall improvement of soybean insect pest management in Arkansas and increased adoption of IPM in soybean production.

Methods:

1. Each year we provide information at turn-row meetings, field days, and seed/ ag distributor field days on proper sampling and management considerations and demonstrate scouting procedures for effective sampling methods.
2. In previous years we were able to have sweep nets donated from chemical companies such as Bayer and Syngenta, however, the last two years we have covered the costs of the sweep nets through our own funds. We have provided over 200 sweep nets to growers, consultants and other decision-makers each year, to promote proper insect management in soybeans for the last 4-5 years. This may sound like enough are already out there, but sweep nets don't last long. Some people can go through several sweep nets in a year. I'm continually amazed at meetings how many people request a sweep net.

Planned Milestones:

1. Put the sampling tools needed in the hands of our growers and other decision-makers to promote effective and economical control of insects.
2. Educate our clientele on the proper management techniques for insect control and increase awareness of Integrated Pest Management (IPM). This should promote the use of thresholds, proper insecticide choices, and conservation of beneficial insects that are so important in the soybean ecosystem. Conduct scouting schools as needed and requested by clientele (5-10/ year).
3. To document these milestones we would like to conduct a survey of growers to monitor, increased awareness of soybean insect management, what growers are spending on insect control, how decisions to control insects are made and increased adoption of IPM in soybean production in Arkansas. This data is used each year to

represent Arkansas in the Soybean Insect Losses for the Midsouth, which is published in the Midsouth Entomologist Journal.

Value to the Soybean Industry: Margins are becoming increasingly tight and spending money controlling insect pests only when necessary is a way to increase profits for growers. Few would argue that soybean insect management has become even more important in recent years and the changes in production have resulted in a need for increased awareness of soybean insect pests. These changes in production have created a need to educate growers and other decision-makers on the proper methods for monitoring insects and increase the awareness of the proper management techniques for effective and economical insect control. We want to make sure Arkansas soybean producers money is wisely spent for insect management.

Budget Justification: All money will be used to buy sweepnets to give to stakeholders.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Thrash, Ben *Educating Growers and Consultants on Insect Monitoring and Control*

Year	2026/2027	**Project Year**	Year 2 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Thrash, Ben	**Co-PI #1**	Bateman, Nick	
Co-PI #2	Studebaker, Glenn	**Co-PI #3**		
Department	ENPL Entomology and Plant Pathology			
Commodity Board	Soybean Promotion Board			
Project Title	Educating Growers and Consultants on Insect Monitoring and Control			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Thrash, Ben	**Bateman, Nick**	**Studebaker, Glenn**		**Total Board Funding Requested**	**AES Portion**	**CES Portion**
Select "AES" or "CES" for each PI	CES	CES	CES	CES			

Fulltime Personnel

Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$0	$0	$0	$0	$0	$0	$0

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information						$0	$0	$0
	Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0

Hourly

	Wages				**Total**	**AES Portion**	**CES Portion**
Hourly-Personnel					$0	$0	$0
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.	**Benefits**				**Total**	**AES Portion**	**CES Portion**
Fulltime Personnel	$0	$0	$0	$0	$0	$0	$0
Graduate Students	$0	$0	$0	$0	$0	$0	$0
Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$0	$0	$0	$0	$0	$0	$0
Personnel Total	$0	$0	$0	$0	$0	$0	$0

Travel

Justify out-of-state travel in proposal.	**Travel**				**Total**	**AES Portion**	**CES Portion**
In-State					$0	$0	$0
Out-of-State					$0	$0	$0
Travel Total	$0	$0	$0	$0	$0	$0	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Thrash, Ben *Educating Growers and Consultants on Insect Monitoring and Control*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$3,000				$3,000	$0	$3,000
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$3,000	$0	$0	$0	$3,000	$0	$3,000
	Total for Proposal	$3,000	$0	$0	$0	$3,000	$0	$3,000

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

RA-15

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Refining insect thresholds in Arkansas soybeans

Project Type:
Research

Name of Project Manager:
Ben Thrash

Name of Project Team Member 1:
Nick Bateman

Name of Project Team Member 2:
Glenn Studebaker

Statement of Justification or Purpose of the Project (75 word maximum):
This project aims to develop cost-effective and sustainable recommendations for the management of the major insect problems in soybean in all regions of Arkansas. Insect management continues to be a major focal point for growers and consultants in Arkansas soybean and developing sound recommendations for the most effective and economical control of insects is key to helping soybean producers maintain profitability.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Large and small block replicated trials will be sprayed on research stations and cooperating grower fields. Insecticide application timings will be staggered to achieve various levels of injury across plots. Damaged pod counts, defoliation, and damaged seed will be recorded for corn earworm, soybean looper, and stink bugs, respectively. Yields will be recorded in all plots.

BUDGET

Amount of Funding Needed for Project:
$67,456.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Refining insect thresholds in Arkansas soybean
Lead Investigators: Ben Thrash
Co-Investigators: Glenn Studebaker, Nick Bateman
Status: Year 2 of 3
Research Area: Entomology

Stated Goal: This project aims to develop cost-effective and sustainable recommendations for the management of the major insect problems in soybean in all regions of Arkansas. Insect management continues to be a major focal point for growers and consultants in Arkansas soybean and developing sound recommendations for the most effective and economical control of insects is key to helping soybean producers maintain profitability. This project addresses various aspects of integrated management of problematic pests associated with soybean production.

Objectives:
Objective 1: Verify/refine thresholds for corn earworm, soybean looper, and the stink bug complex in Arkansas soybean.

Objective 2: Evaluate slug control methods for efficacy and cost effectiveness in Arkansas soybean.

Objective 3: Determine the more efficient sampling methods for wide row, narrow row, and drilled soybean for multiple pests.

Justification: Corn earworm, soybean looper, and the stink bug complex, are the most damaging insect pests of soybean in Arkansas. We have thresholds established for these pests; however, it is good practice to reevaluate these thresholds periodically due to changes in cultivars and management practices across the state. There may also be room for improvement in our current thresholds by adjusting them for soybean growth stage. For example, we know that soybean can compensate from corn earworm injury that occurs during R2 much better than injury occurring at R4, so the threshold could potentially be relaxed during the R2 growth stage. Additionally, the widespread use of the corn earworm virus (Heligen) seems to have brought pod injury to the attention of many growers and consultants because of how closely these fields are being inspected behind a virus application. Many growers and consultants have very low tolerance for pod injury within a soybean field even though soybean can compensate for a relatively large amount of injury from each of these pests. Preliminary research conducted by our colleagues at MS State has shown no yield losses from up to 10% pod damage from corn earworm in plots. This project aims to further improve our thresholds and understand how much pod injury and defoliation can occur before yield loss is realized.

The acreage of seedling soybean damaged by slugs over the past several years is on the rise with some growers replanting as many as three times due to stand loss from a slug infestation. This increase is due to increasingly wet spring weather coupled with the large amount of minimum till/no-till/cover crop acreage in Arkansas. There are very few effective treatments for slugs and those that are effective are very expensive. Deadline, perhaps the most used molluscicide, costs approximately $30/a at the recommended 10 lb/a broadcast rate. Iron chelate is another effective

control option however it is currently even more expensive than Deadline. The only other currently recommended control method is tillage which is unacceptable to some growers. Another option is waiting until the weather becomes drier later in the growing season which can help to reduce slug populations, but soybean yield potential often suffers from the planting delay, and this is not always logistically possible. We have conducted some preliminary research using banded and reduced rate applications of deadline to try and make applications more affordable. In this preliminary research banded applications and reduced rates show some promise but more studies need to be conducted to evaluate their effectiveness. We also frequently receive questions on the effectiveness of using fertilizer to "salt" the slug infestation. We are fairly certain that these applications are ineffective however, without data we are not 100% sure.

With the large discrepancy in soybean production practices throughout the state, based on crop rotation and equipment availability it is important that we determine the most efficient sampling methods for these situations. We receive multiple calls every year wanting to know how best to sample beans that are lodging or best time of day for sampling different pests. We need to determine the best time of day to sample and the best tools to use for different planting arrangements to keep growers profitable.

Methods:

Objective 1. Large and small block replicated trials will be sprayed on research stations and cooperating grower fields. Insecticide application timings will be staggered to achieve various levels of injury across plots. Damaged pod counts, defoliation, and damaged seed will be recorded for corn earworm, soybean looper, and stink bugs, respectively. Yields will be recorded in all plots.

Objective 2. Large block trials will be conducted on grower fields experiencing slug injury. Banded and reduced rates of deadline will be applied and stand counts, slug injury, and yield will be recorded. With Deadline being a bait, having a 48-to-72-hour rain free period after application is the normal recommendation to achieve an acceptable level of control. We will make applications around these rainfall timings to determine the minimum rain-free period need to achieve control. The effect of tillage on slug populations will also be evaluated.

Objective 3. Sampling will be conducted using a sweepnet, drop cloth, and visual counts early in the morning, midday, and late afternoon in wide row and narrow beans at multiple planting dates. All pests will be record and correlations will be made to time of day and sampling method.

Planned Milestones:

2025: Initiate field trials for all three objectives.
2026: Field trials will be continued for all objectives.
2027: Analyze three years data and summarize findings to develop management recommendations.

Value to Soybean Industry:

With the current cost of production for soybean, it is critical to maintain profitability and ensure that when insecticide applications are made that they are justified and economical. With soybean

ability to compensate for insect damage, it is possible that we are spraying too early in many cases. This project will verify our current thresholds on a large block infield setting that has the potential to reduce many insecticide applications and helping growers maintain maximum profitability.

Budget Justification/Explanation of Travel and Direct Costs: Money budgeted for travel will be used to get two and from research locations. Direct cost will be salaries and supplies to conduct field trials.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Thrash, Ben *Refining Insect Thresholds in Arkansas Soybean*

Year	2026/2027	**Project Year**	Year 2 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Thrash, Ben	**Co-PI #1**	Bateman, Nick	
Co-PI #2	Studebaker, Glenn	**Co-PI #3**		
Department	ENPL Entomology and Plant Pathology			
Commodity Board	Soybean Promotion Board			
Project Title	Refining Insect Thresholds in Arkansas Soybean			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Thrash, Ben	Bateman, Nick	Studebaker, Glenn		Total Board Funding Requested	AES Portion	CES Portion
	Select "AES" or "CES" for each PI	CES	CES	CES	CES			
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Program Associate	Andrew Plummer	40%	$15,000				$15,000	$0	$15,000
Program Associate	Taylor Davis	25%	$12,000				$12,000	$0	$12,000
Program Associate	Garrett Felts	20%		$7,000			$7,000	$0	$7,000
Program Associate	Mathew Mann	20%			$3,500		$3,500	$0	$3,500
							$0	$0	$0
	Subtotal: Salaries		$27,000	$7,000	$3,500	$0	$37,500	$0	$37,500
	Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information						$0	$0	$0
	Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0
	Hourly								
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel		$7,000	$4,500	$3,000		$14,500	$0	$14,500
	Hourly-Students						$0	$0	$0
	Subtotal: Hourly		$7,000	$4,500	$3,000	$0	$14,500	$0	$14,500
	Fringe Benefits								
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$7,452	$1,932	$966	$0	$10,350	$0	$10,350
	Graduate Students		$0	$0	$0	$0	$0	$0	$0
	Hourly Personnel		$476	$306	$204	$0	$986	$0	$986
	Hourly-Students		$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits		$7,928	$2,238	$1,170	$0	$11,336	$0	$11,336
	Personnel Total		$41,928	$13,738	$7,670	$0	$63,336	$0	$63,336
	Travel								
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State		$1,600	$1,520	$1,000		$4,120	$0	$4,120
	Out-of-State						$0	$0	$0
	Travel Total		$1,600	$1,520	$1,000	$0	$4,120	$0	$4,120

University of Arkansas System Division of Agriculture

Promotion Board Budget

Thrash, Ben *Refining Insect Thresholds in Arkansas Soybean*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies					$0	$0	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$0	$0	$0	$0	$0	$0	$0
	Total for Proposal	$43,528	$15,258	$8,670	$0	$67,456	$0	$67,456

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

RA-16

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Determining factors associated with poor grain quality in soybean and management options

Project Type:
Research

Name of Project Manager:
Terry Spurlock

Name of Project Team Member 1:
Nick Bateman

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Best management practices will be determined to avoid soybean quality losses and minimize profit loss. These practices will encompass sound IPM, including variety selection and determination of fungicide/insecticide application timing.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Trials will be planted at Rohwer Station to test how well different fungicides improve soybean grain quality. These trials and others, leveraged from other Soybean Board-funded projects, will be sampled at harvest, and diseases and disorders that reduce grain quality will be quantified by fungicide treatment and variety. Results will be shared in county and regional production meetings and made available in online publications.

BUDGET

Amount of Funding Needed for Project:
$55,000.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Determining factors associated with poor grain quality in soybean and management options

Lead Investigators: Dr. Terry Spurlock and Dr. Nick Bateman, UA Division of Agriculture

Status and Duration of Funding: Year 2 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Entomology, Plant Pathology, IPM

Stated Goal: Determine the diseases and disorders affecting soybean grain quality and develop management strategies for growers to avoid losses from poor quality

Specific Objectives:

1. Determine differences in grain quality caused by fungal diseases and disorders among varieties in the official variety trial at Rohwer Station annually (Spurlock).

2. Establish a MG IV fungicide trial and another MG V fungicide trial at Rohwer Station each year based on data collected from the previous season's official variety trial. Varieties with significantly higher diseases impacting grain quality will be chosen for these trials. The aim will be to determine the impact of various fungicide timings on varieties that have shown susceptibility to diseases and disorders negatively impacting grain quality (Spurlock).

3. Samples will be taken from on-farm fungicide trials (4 – 5 trials annually) at harvest and sent to Riceland Foods in Stuttgart for grading and the Spurlock Lab to determine levels of diseases and disorders that impact grain quality (Spurlock).

4. Grain will be sampled from multiple stink bug trials throughout the state with significantly different levels of stinkbug or other insect feeding and grain quality determined. Additionally, samples will be sent to Fayetteville for fungal pathogen identification that may be related to damage caused by insect feeding (Bateman).

Methods/Approach

Objective 1: The official variety trial is planted at Rohwer Station each year to determine susceptibility of varieties to stem canker and other foliar diseases that may occur. This trial will also be used to determine varietal susceptibility to diseases and disorders that impact grain quality. The trial will be planted very late (in June) to maximize disease pressure and limit the opportunity for herbicide drift. Plots will be planted 2-rows wide on 38-inch rows and 10ft long. Each variety will be replicated three times. Plots will be harvested with a mid-sized combine equipped with a research weigh system. During harvest, approximately 16 oz of grain will be collected from each plot just before it enters the weigh system on the plot combine. Levels of fungal diseases on grain (purple seed stain, Phomopsis seed decay, and others) and other disorders will be determined and analyzed by variety.

Objective 2: Two varieties will be chosen from the previous year's variety trial at Rohwer Station and planted in two separate trials, one with the MG IV variety and another with the MG V variety. The trials will be planted mid-June. Both trials will be planted with plots 6-rows wide on 38-inch rows and 20 ft long. Treatments will be various fungicides applied at R3 with each treatment replicated three times in a

randomized complete block design. Two rows of each plot will be harvested on-time and then two more rows 2-3 weeks later. During harvest, approximately 16 oz of grain will be collected from each plot just before it enters the weigh system on the plot combine. Levels of fungal diseases on grain (purple seed stain, Phomopsis seed decay, and others) and other disorders will be determined by fungicide treatment and harvest timing.

Objective 3: As part of another project, 10-12 large plot on-farm fungicide trials (approximately 30-60 acres) are conducted in counties throughout the state and consist of 3-4 fungicide treatments, with a nontreated control and treatments replicated three times. Foliar disease levels and yields for each treatment are determined and reported back to the cooperating grower. Many of these trials have plot yields determined with a weigh wagon. At harvest, approximately one gallon of grain will be sampled from each plot through the weigh wagon sample collection door. Samples will be sent to Riceland Foods in Stuttgart and graded according to their standards then sent to the Spurlock lab in Monticello where diseases impacting grain quality will be determined. These findings will be reported to each cooperating grower in addition to the foliar disease ratings and yields from each fungicide treatment.

Objective 4: Soybean plots will be established in high and low stink bug areas. Two varieties will be planted in a split-block arrangement, with one side receiving weekly sprays for stink bugs and the other side never receiving stink bug applications. After harvest, grain will be rated for stink bug damage, and samples will also be processed for pathogen presence. These studies will be repeated at an early and late planting date.

Planned Milestones:

- Determine the impact that variety alone will have on grain quality
- Observe factors impacting the most common diseases related to soybean grain quality loss
- Evaluate how stink bugs can compound seed quality issues
- Determine best management practices to protect growers from quality losses and disseminate those results at county and regional meetings
- Publish results annually in the Arkansas Soybean Research Series and at the conclusion of the three-year study, publish cumulative findings in a major scientific journal such as Phytopathology.

Value to Soybean Industry: Best management practices will be determined to avoid soybean quality losses and minimize profit loss. These practices will encompass sound IPM, including variety selection and determination of fungicide/insecticide application timing.

Budget Justifications/Explanation of Travel and Direct Costs: The budget reflects the costs of sampling and processing soybean pod samples from tests scattered around the state. Because the methods call for sampling tests planted for other objectives, the weather may present opportunities at more or fewer trial locations. Reactionary travel and labor are budgeted accordingly. Laboratory processing of samples requires typical cleaning and plating of samples, sorting emerging colonies of microorganisms in Petri dishes, and identification by microscopically observed characteristics and molecular methods. A significant portion of M/O is used for laboratory supplies to accomplish these tasks.

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University of Arkansas System Division of Agriculture

Promotion Board Budget

Spurlock, Terry — *Determining factors associated with poor grain quality in soybean and management options*

Year	2026/2027	**Project Year**	Year 2 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Spurlock, Terry	**Co-PI #1**	Bateman, Nick	
Co-PI #2		**Co-PI #3**		
Department	ENPL Entomology and Plant Pathology			
Commodity Board	Soybean Promotion Board			
Project Title	Determining factors associated with poor grain quality in soybean and management options			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Spurlock, Terry	Bateman, Nick			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	CES	CES	CES	CES			

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
Program Associate	Amanda Tolbert	25%	$15,000				$15,000	$0	$15,000
Program Associate	Garrett Felts	25%		$15,000			$15,000	$0	$15,000
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$15,000	$15,000	$0	$0	$30,000	$0	$30,000

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
Tuition Calculator Information						$0	$0	$0
Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel	$6,000				$6,000	$0	$6,000
Hourly-Students		$3,500			$3,500	$0	$3,500
Subtotal: Hourly	$6,000	$3,500	$0	$0	$9,500	$0	$9,500

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$4,140	$4,140	$0	$0	$8,280	$0	$8,280
Graduate Students	$0	$0	$0	$0	$0	$0	$0
Hourly Personnel	$408	$0	$0	$0	$408	$0	$408
Hourly-Students	$0	$4	$0	$0	$4	$0	$4
Subtotal: Fringe Benefits	$4,548	$4,144	$0	$0	$8,692	$0	$8,692
Personnel Total	$25,548	$22,644	$0	$0	$48,192	$0	$48,192

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State	$2,000	$1,000			$3,000	$0	$3,000
Out-of-State					$0	$0	$0
Travel Total	$2,000	$1,000	$0	$0	$3,000	$0	$3,000

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University of Arkansas System Division of Agriculture

Promotion Board Budget

Spurlock, Terry — *Determining factors associated with poor grain quality in soybean and management options*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$1,158	$1,250			$2,408	$0	$2,408
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$1,400	$0	$0	$0	$1,400	$0	$1,400
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$2,558	$1,250	$0	$0	$3,808	$0	$3,808
	Total for Proposal	$30,106	$24,894	$0	$0	$55,000	$0	$55,000

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

RA-17

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Development of data-driven recommendations for variable soybean seeding rate in Arkansas

Project Type:
Research

Name of Project Manager:
Jeremy Ross

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
In a previously funded project, a method was developed to quantify site-specific soybean yield response to seeding rate, identify the drivers of in-field yield variability, and generate a posteriori prescription maps for variable-rate seeding (VRS). The created maps described in-field changes in the agronomic optimum seeding rate (proven to maximize site-specific soybean yield). The project will continue to generate data to develop a tool.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
This study will be conducted on-farm. The participating producers will use John Deere guidance and yield monitoring systems (preferred), and be competent with yield monitoring, yield mapping, and variable-rate technologies. Five seeding rate treatments of 75, 100, 125, 150, and 175 thousand seeds per acre will be applied in strips to bracket the University Planting Prescription.

BUDGET

Amount of Funding Needed for Project:
$47,051.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Development of data-driven recommendations for variable soybean seeding rate in Arkansas

Lead Investigators: Jeremy Ross

Co-Investigators: Greenway Equipment

Status and Duration of Funding: Year 3 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Agronomy

Stated Goal: In a previously funded project, a method was developed to quantify site-specific soybean yield response to seeding rate, identify the drivers of in-field yield variability, and generate a posteriori prescription maps for variable-rate seeding (VRS). The created maps described in-field changes in the agronomic optimum seeding rate (proven to maximize site-specific soybean yield). Findings showed that:

- Soybean yield response to seeding rate varies within commercial fields.
- Some of that variability could be effectively managed using VRS if adequately implemented.
- Management decisions regarding VRS can be made using data that are already available to Arkansas soybean producers including soil test results and public web-soil survey information.

The project goal is to develop data driven VRS recommendations for Arkansas soybeans. The following next steps are needed to meet the project goal:

A. Comparison of findings across growing seasons, to generate a priori VRS prescriptions that minimize risk from weather variability.
B. Economic analysis, to emphasize profitability rather than yields.
C. Implementation of the proposed methodology in new locations, to increase the dataset size, improve the model's prescriptive capabilities, and develop more reliable recommendations.
D. On-farm validation of the created data driven VRS recommendations.

Decision-support tool (e.g., web tool) development, to make the created VRS recommendations accessible to Arkansas producers, crop consultants, and other agricultural stakeholders.

Specific Objectives: This project addresses steps A to C, and we propose the following specific objectives:

1. To develop an algorithm that computes the economic optimum seeding rate from the predicted site-specific yield response to seeding rate, cost of soybean seeds, and crop prices.
2. To evaluate the temporal stability and variability of a posteriori VRS prescription maps created from data collected in the same commercial fields and a minimum of two growing seasons.
3. To generalize findings across locations selected to bracket the typical range of field conditions found in Arkansas.

Methods: This study will be conducted on-farm. One of the fields previously used for this research, plus one new production fields, will be selected per year. The participating producers will use John Deere guidance and yield monitoring systems (preferred), and be competent with yield monitoring, yield mapping, and variable-rate technologies. They will also have a historical record of crop rotations and planting/soil testing data. Preference will also be given to growers interested in multi-year studies. Preferred field size will be 80+ acres. Five seeding rate treatments of 75, 100, 125, 150, and 175 thousand

seeds per acre will be applied in strips to bracket the University Planting Prescription. Treatments will be replicated 4 to 5 times in a field, and each treatment strip will be created from 1 or 2 consecutive planter passes. The seeding rate treatments will be established by the growers in collaboration with the project PIs. The following data will then be collected by the project PIs: soil samples for routine soil testing and texture analysis, stand counts, and hand samples of plants. Data will be collected at a 1 sample per acre resolution. Soil mapping units will be identified using the USDA-NRCS web soil survey. Sentinel-2 satellite images will be downloaded from public data repositories (spatial resolution: 30 ft. Notes regarding plant stress and pest pressure will be taken as needed. Field elevation will be characterized using the digital elevation model gathered from the USGS public database. Flow accumulation will be computed from the field elevation data to characterize field hydrology. Yield monitor data will be collected at harvest.

Statistical analysis will be conducted:

- To characterize in-field changes in soybean yield response to seeding rate, identify the drivers of site-specific variability, and determine if VRS could be used to manage the observed variability.
- To determine the agronomic and economic optimum site-specific seeding rates and generate a posteriori prescription maps for variable soybean seeding rate.
- To assess the temporal stability and variability of the optimum site-specific soybean seeding rates and generate optimized a priori prescriptions.

Different models and computation methods will be considered. Meta-analysis of results will be computed to generalize findings and optimize model performance and computing times. Results from the meta-analysis will support the development of practical and relevant recommendations for variable soybean seeding rate in Arkansas.

Planned Milestones:

- Identify criteria on which VRS prescriptions may be based.
- Develop an algorithm that uses historical field data to predict whether VRS technology could be beneficial in a field.
- Define the most relevant method to generate prescription maps for variable soybean seeding rate.

Automation of data analysis and processing for future implementation into a web-tool.

Value to Soybean Industry: The development of precision planting and variable-rate technologies provides new opportunities for soybean producers to control and optimize seeding densities. However, few recommendations exist to help guide growers in their variable rate seeding decisions and few studies have been conducted to evaluate which field factors most greatly influence optimum seeding rates.

Budget Justifications/Explanation of Travel and Direct Costs: The $5,000 amount will be used for routine soil testing and soil texture analysis.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Ross, Jeremy — *Development of data-driven recommendations for variable soybean seeding rate in Arkansas*

Year	2026/2027	**Project Year**	Year 3 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Ross, Jeremy	**Co-PI #1**		
Co-PI #2		**Co-PI #3**		
Department	CSES Crop, Soil, Environmental Science			
Commodity Board	Soybean Promotion Board			
Project Title	Development of data-driven recommendations for variable soybean seeding rate in Arkansas			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Ross, Jeremy				**Total Board Funding Requested**	**AES Portion**	**CES Portion**
Select "AES" or "CES" for each PI	CES						
Fulltime Personnel							
Position Title / **Name** *(if position is filled)* / **% Time**	**Salaries**				**Total**	**AES**	**CES**
Program Assoc. — Randy Miller — 20%	$12,000				$12,000	$0	$12,000
Program Tech. — Rollins Elam — 20%	$8,800				$8,800	$0	$8,800
					$0	$0	$0
					$0	$0	$0
					$0	$0	$0
Subtotal: Salaries	$20,800	$0	$0	$0	$20,800	$0	$20,800
Graduate Student							
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.							
Name *(if position is filled)* / **% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
					$0	$0	$0
					$0	$0	$0
					$0	$0	$0
					$0	$0	$0
					$0	$0	$0
Tuition Calculator Information					$0	$0	$0
Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0
Hourly							
	Wages				**Total**	**AES Portion**	**CES Portion**
Hourly-Personnel	$7,500				$7,500	$0	$7,500
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$7,500	$0	$0	$0	$7,500	$0	$7,500
Fringe Benefits							
Fringe benefits are calculated when salary and wage amounts are entered above.							
	Benefits				**Total**	**AES Portion**	**CES Portion**
Fulltime Personnel	$5,741	$0	$0	$0	$5,741	$0	$5,741
Graduate Students	$0	$0	$0	$0	$0	$0	$0
Hourly Personnel	$510	$0	$0	$0	$510	$0	$510
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$6,251	$0	$0	$0	$6,251	$0	$6,251
Personnel Total	$34,551	$0	$0	$0	$34,551	$0	$34,551
Travel							
Justify out-of-state travel in proposal.							
	Travel				**Total**	**AES Portion**	**CES Portion**
In-State	$5,000				$5,000	$0	$5,000
Out-of-State					$0	$0	$0
Travel Total	$5,000	$0	$0	$0	$5,000	$0	$5,000

University of Arkansas System Division of Agriculture

Promotion Board Budget

Ross, Jeremy *Development of data-driven recommendations for variable soybean seeding rate in Arkansas*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$2,500				$2,500	$0	$2,500
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs		$5,000				$5,000	$0	$5,000
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$7,500	$0	$0	$0	$7,500	$0	$7,500
	Total for Proposal	$47,051	$0	$0	$0	$47,051	$0	$47,051

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

RA-18

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Screening for soybean tolerance to metribuzin

Project Type:
Research

Name of Project Manager:
Jason Norsworthy

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Metribuzin in mixture with other herbicides, is the most widely used preemergence option growers use in Arkansas soybean based on a recent survey, partly due to its effectiveness on Palmer amaranth and lack of resistance to the herbicide.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
This project involves a greenhouse screening of all soybean varieties submitted to the Official Variety Testing program in Arkansas.

BUDGET

Amount of Funding Needed for Project:
$16,212.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Screening for Soybean Tolerance to Metribuzin

Lead Investigator: Jason K. Norsworthy

Co-Investigator: Jeremy Ross

Status: 2 of 3

Stated Goal: To evaluate commercial soybean varieties for tolerance to metribuzin and make information readily available to growers.

Specific Objectives:

1) To assess the tolerance to metribuzin of soybean varieties entered in the Arkansas OVT.
2) To provide rapid transfer of information regarding the tolerance level or sensitivity of Arkansas-grown soybean varieties to metribuzin.

Methods: All soybean varieties entered in the Arkansas OVT will be sown in a replicated experiment in the greenhouse and evaluated for tolerance to metribuzin. The experiment will be conducted using a silt loam soil, and metribuzin will be applied preemergence at 0.5 lb ai/A, which is a slightly higher than labeled rate for this soil type. This rate will ensure adequate tolerance of those varieties deemed "tolerant" or to have "slight injury". Injury to soybean will be evaluated at 14 and 21 days after treatment on a 0 to 10 scale, where 0 equals no injury and 10 equal complete soybean death. Each variety will then be placed in one of three categories based on its sensitivity to metribuzin, with these being slight injury, moderate injury, or severe injury.

Planned Milestones: Evaluations of soybean varieties will take place in the greenhouse in the fall of the year. Results from the evaluation will be made available on the Extension website (uaex.edu) prior to the first of the year and shared with growers at county and state-wide production meetings.

Value to Soybean Industry: Metribuzin (Sencor or Lexone) was used by most Arkansas soybean growers prior to adoption of Roundup Ready in the mid- to late 1990's. Metribuzin is a broad-spectrum residual herbicide that provides a high level of control of Palmer amaranth, the most problematic weed of Arkansas soybean today. Soybean varieties differ in tolerance to metribuzin; hence, annual testing of available varieties was routine prior to Roundup Ready soybean to allow growers to best match a variety with their anticipated use of metribuzin. Now that preemergence, residual herbicides are once again a major component of weed management in Arkansas soybean, screening of soybean varieties for tolerance to metribuzin is needed. In addition to metribuzin alone products, such as Metri, Metribuzin, etc., a variety of metribuzin-containing products are being promoted and used by Arkansas soybean growers. Some of these products include Canopy (metribuzin + chlorimuron), Authority MTZ (metribuzin + sulfentrazone), and Boundary (metribuzin + S-metolachlor). The metribuzin rate in these

products is less than that which will provide effective control when metribuzin is used alone. The reason for the lower rates of metribuzin in these products is because the sensitivity of the current soybean varieties to metribuzin is unknown; hence, a low rate is applied to minimize the risk of injury to the most sensitive varieties. Soybean producers in Arkansas would greatly benefit from being able to use a full rate of metribuzin in soybean, especially considering that PPO-resistant Palmer amaranth was documented in 12 counties in Northeast Arkansas. Our field research indicates that metribuzin needs to be a major component of the preemergence weed control program on any acre for which the PPO herbicides failed, especially those north of I40. We currently recommend a full rate of metribuzin plus a chloroacetamide on every PPO-resistant pigweed acre.

Budget Justification: My program associate will be responsible for conducting and evaluating the screening. His time is budgeted at 20% of his annual salary along with fringe benefits. For supplies, which include trays and plot stakes, a total of $900 has been budgeted. The total request is for $16,212.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Norsworthy, Jason *Screening for Soybean Tolerance to Metribuzin*

Year	2026/2027	**Project Year**	Year 2 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Norsworthy, Jason	**Co-PI #1**	Ross, Jeremy	
Co-PI #2		**Co-PI #3**		
Department	CSES Crop, Soil, Environmental Science			
Commodity Board	Soybean Promotion Board			
Project Title	Screening for Soybean Tolerance to Metribuzin			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Norsworthy, Jason	Ross, Jeremy			Total Board Funding Requested	AES Portion	CES Portion
	Select "AES" or "CES" for each PI	AES	AES	CES	CES			
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Program Technician	Noah Chandler	20%	$12,000				$12,000	$12,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$12,000	$0	$0	$0	$12,000	$12,000	$0
	Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information						$0	$0	$0
	Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0
			Hourly						
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel						$0	$0	$0
	Hourly-Students						$0	$0	$0
	Subtotal: Hourly		$0	$0	$0	$0	$0	$0	$0
			Fringe Benefits						
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$3,312	$0	$0	$0	$3,312	$3,312	$0
	Graduate Students		$0	$0	$0	$0	$0	$0	$0
	Hourly Personnel		$0	$0	$0	$0	$0	$0	$0
	Hourly-Students		$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits		$3,312	$0	$0	$0	$3,312	$3,312	$0
	Personnel Total		$15,312	$0	$0	$0	$15,312	$15,312	$0
			Travel						
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State						$0	$0	$0
	Out-of-State						$0	$0	$0
	Travel Total		$0	$0	$0	$0	$0	$0	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Norsworthy, Jason *Screening for Soybean Tolerance to Metribuzin*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$900				$900	$900	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$900	$0	$0	$0	$900	$900	$0
	Total for Proposal	$16,212	$0	$0	$0	$16,212	$16,212	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

RA-19

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Phenotypic Selection Assisted by Seed-Level Near-Infrared Information

Project Type:
Research

Name of Project Manager:
Samuel Fernandes

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Dr. Fernandes, located at the University of Arkansas, conducts research in the field of quantitative genetics and will perform work for this grant during the time period of specified. Specifically, Dr. Fernandes along with his student will implement NIR-based prediction models for the soybean breeding program.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
The development of an NIR-based prediction framework will involve: Collection of NIR, yeild and secondary traits information - Statistical and maching learning modeling with phenotypic data collected - Comparison between prediction and real trait measures - Validation in field experiments - Incorporation of the framework into the breeding program.

BUDGET

Amount of Funding Needed for Project:
$52,670.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Phenotypic Selection Assisted by Seed-Level Near-Infrared Information

Lead Investigators: Samuel B Fernandes

Co-Investigators: Caio Canella Vieira

Status and Duration of Funding: Year 3 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Breeding

Stated Goal: Optimizing the genetic variance, selection accuracy, and intensity, as well as the length of the breeding cycle, is the key to successful breeding programs. Achieving these objectives requires integrating molecular marker information with cost-effective phenotyping strategies that preserve accuracy. We propose developing a near-infrared (NIR)- based prediction approach to streamline the phenotypic evaluation and prediction of breeding line performance. By reducing the dependence on traditional field-based phenotyping, it is possible to decrease breeding cycle duration while simultaneously increasing selection intensity—a particularly valuable advantage where experimental resources are limited. This strategy has proven helpful in some crops, as NIR data can be collected at a reduced cost and serve as a pre-selection filter to identify elite individuals before field evaluation. Thus, more expensive field plots can be used to phenotype the most promising candidates. This approach offers the UARK's Soybean Breeding program a practical pathway to enhance selection intensity and accuracy, especially in the initial phases where trials are unreplicated. Our goal is then to develop and validate an NIR-based prediction framework that can work in conjunction with other approaches, such as genomic prediction, to enhance the efficiency of the soybean selection process and increase the likelihood of releasing a superior cultivar. Practically, NIR measurements will be obtained "at no cost" while the QSorter® instrument counts the seeds for field experiments. This NIR-based prediction framework aims to deliver a robust and objective selection strategy that adapts to the realities of unreplicated or sparsely replicated field data. By aligning affordable NIR measurements with predictive modeling, we aim to establish a pre-screening system that increases the rate of genetic gain per unit time, reduces opportunity costs tied to extensive field testing, and empowers the program to intensify selection without sacrificing accuracy. Ultimately, this goal supports a sustainable, data-driven breeding pipeline that can adapt to new traits as they emerge and to shifting production environments.

Specific Objectives: This proposal has two specific objectives: (1) to develop statistical models capable of using seed-level NIR information to predict soybean performance; and (2) to provide a cost-effective alternative that UARK's Soybean Breeding program can implement to increase selection intensity and accuracy. By achieving these objectives, we anticipate accelerating genetic gain while optimizing resource allocation across successive breeding cycles.

Methods: The third year of this project will leverage phenotypic information from previous and future field experiments conducted at the UARK Soybean Breeding program. The phenotypic data currently include trials from 2024 and 2025 and will also include the data sets from 2026. The available traits include yield, seed composition, and biotic and abiotic tolerance. After experiencing delays in finalizing the purchase and installation of the QSorter® instrument, we were able to collect near-infrared information from 1,000 breeding lines generated in the program at the end of the second year of the project. In 2026, this data will be used to build statistical and machine-learning models that use seed-level NIR data to predict phenotypic performance. The statistical models evaluated will include a linear mixed model with an NIRs-

based relationship matrix. The machine learning models will utilize the LightGBM approach and incorporate the same relationship matrix. All models will be evaluated using cross-validation, i.e., we will compare the phenotypic data already available to phenotypic predictions based on NIR and assess the accuracy of these predictions. All these models will be trained on the phenotypic data mentioned above. The next step after developing prediction models is to run individual seeds through the QSorter® and, based on the NIR reads, obtain a prediction of phenotypic performance for each seed, allowing for the selection of the best-predicted lines. Finally, the prediction obtained will be compared with the actual performance of the selected lines in the field.

Planned Milestones:

Activity Description	2026				2027			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Analyze phenotypic data available at the breeding program	**X**	**X**			**X**	**X**		
Collect near-infrared information from individual seeds		**X**	**X**			**X**	**X**	
Develop near-infrared-based prediction models	**X**			**X**	**X**			
Select the best individuals from F_2 populations based on prediction models		**X**				**X**		
Field evaluations of selected lines			**X**	**X**			**X**	**X**
Publish research results								**X**

Value to Soybean Industry: Two factors determine the efficiency of a breeding program in identifying high-quality and high-performance cultivars: selection intensity and selection accuracy. Increasing the number of lines evaluated and the accuracy with which soybean lines are selected will increase the likelihood of developing a high-performance cultivar and, thus, will increase the probability of soybean growers.

Budget Justifications/Explanation of Travel and Direct Costs ($52,670): The majority of the budget is dedicated to an experienced graduate student ($25,000 base, $7,500 tuition, and $1,600 benefits) who will work on collecting the NIR data and developing statistics and machine-learning models. An additional $9,570 is requested for 15% of an FTE research technician. A total of $3,000 is requested for out-of-state travel to attend and present results at scientific meetings, as well as to participate in short courses relevant to this research, $2,500 for publication fees, and $3,500 for seed sample cost.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Fernandes, Samuel *Phenotypic Selection Assisted by Seed-Level Near-Infrared Information*

Year	2026/2027	**Project Year**	Year 3 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Fernandes, Samuel	**Co-PI #1**	Vieira, Caio	
Co-PI #2		**Co-PI #3**		
Department	CSES Crop, Soil, Environmental Science			
Commodity Board	Soybean Promotion Board			
Project Title	Phenotypic Selection Assisted by Seed-Level Near-Infrared Information			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Fernandes, Samuel	Vieira, Caio			Total Board Funding Requested	AES Portion	CES Portion
	Select "AES" or "CES" for each PI	AES	AES	CES	CES			
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
		15%		$7,500			$7,500	$7,500	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$0	$7,500	$0	$0	$7,500	$7,500	$0
	Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
		100%	$25,000				$25,000	$25,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information		$7,500				$7,500	$7,500	$0
	Subtotal: Graduate Student		$32,500	$0	$0	$0	$32,500	$32,500	$0
	Hourly								
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel						$0	$0	$0
	Hourly-Students						$0	$0	$0
	Subtotal: Hourly		$0	$0	$0	$0	$0	$0	$0
	Fringe Benefits								
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$0	$2,070	$0	$0	$2,070	$2,070	$0
	Graduate Students		$1,600	$0	$0	$0	$1,600	$1,600	$0
	Hourly Personnel		$0	$0	$0	$0	$0	$0	$0
	Hourly-Students		$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits		$1,600	$2,070	$0	$0	$3,670	$3,670	$0
	Personnel Total		$34,100	$9,570	$0	$0	$43,670	$43,670	$0
	Travel								
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State						$0	$0	$0
	Out-of-State		$3,000				$3,000	$3,000	$0
	Travel Total		$3,000	$0	$0	$0	$3,000	$3,000	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Fernandes, Samuel *Phenotypic Selection Assisted by Seed-Level Near-Infrared Information*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies					$0	$0	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication	$2,500				$2,500	$2,500	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Sample cost		$3,500			$3,500	$3,500	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$2,500	$3,500	$0	$0	$6,000	$6,000	$0
	Total for Proposal	$39,600	$13,070	$0	$0	$52,670	$52,670	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

RA-20

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Development of a turn-row soybean vegetative health analysis software tool using UAS imagery for production decision support

Project Type:
Research

Name of Project Manager:
Jason Davis

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
The purpose of this project is to produce and validate a user-friendly remote sensing tool that models field health in near real-time for turnrow analysis of soybean fields using drones.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Drone imagery will be collected on multiple dates in participating verification fields. A user-friendly software package will be developed that produces turn-row field maps and reports for field health as measured by canopy closure and relative vegetative health. These maps aim to proved near-real time whole field information to aid in decision making.

BUDGET

Amount of Funding Needed for Project:
$19,605.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Development of a turn-row soybean vegetative health analysis software tool using UAS imagery for production decision support.

Lead Investigators: Jason Davis, Extension Specialist in Remote Sensing and Pesticide Application

Co-Investigators:

Status and Duration of Funding: Year 3 of 3

Research Areas: Agronomy/Alternative

Stated Goal: Produce and validate a user-friendly remote sensing tool that models field health in near real-time for turnrow analysis of soybean fields using drones.

Specific Objectives:

(1) Collect drone imagery of production fields in parallel with the verification program efforts.

(2) Correlate remotely sensed measurements with ground referenced information already being collected with the verification program.

(3) Develop and release a user-friendly software package that leverages the validated workflow for producers, consultants, and agents to use.

Methods:

1. Drone imagery will be collected on multiple dates in participating verification fields. Established treatments in large plots will be imaged using an automated mission. Imagery will be collected in conjunction with verifications programs scouting events to be used as part of workflow validation.
2. A user-friendly software package (downloadable executable program) or web-tool (hosted on UAEX website) will be developed that uses the validated workflow to produce turn-row field maps and reports for field health as measured by canopy closure and relative vegetative health.
3. Imagery will be processed in both the proposed "turn-row" workflow and in a traditional workflow to compare the accuracies, computing requirements, and time demands of each.
4. Targeted mapping analysis will be relative variations in crop canopy estimates and analysis of variations in vegetative health across fields.

Planned Milestones:

Year 1 (Completed) –Imagery collected and correlated with ground referenced information from verification program. Initial software framework to be established using Year 1 data and results will be presented at crop production meetings, blog postings, and other avenues of information.

Year 2 – (Completed) Additional imagery will be collected and validated, updating workflow calculations as needed to reach desirable accuracy. Special consideration will be given to compatibility with non-covered foreign entity manufactured drones. The updated workflow will be coded in a further developed

software framework. If software tools perform to a desirable level of accuracy, they will be released. If further development is needed.

Year 3 – Workflow and software framework will be finalized. Additional field validations conducted. Additionally, efforts will focus on making the software compatible with additional drone platforms as access is made available. Final efforts will be made to make the tool available for download.

Value to Soybean Industry:

Field variability often influences site-specific yield. Some variability can be minimized when robust and regular scouting routines inform production decisions enabling mitigation of water issues, early weed and disease detections, and nutrient deficiencies. However, intensive scouting of each field is time consuming and cumbersome. Current drone technology can be used to gain a whole field perspective when proper processing is applied to collected data; however, these processes require expertise and time outside of the field to locate areas of interest. A user-friendly and robust field modeling tool that processes in seconds and leverages the automated data collection capabilities of drones could significantly facilitate scouting events. If a whole field can be imaged and processed into actionable data in less than 5 minutes, then subsequent informed strategic scouting could maximize localization and, in some cases, early mitigation of field variability.

Budget Justifications/Explanation of Travel and Direct Costs:

The budget reflects personnel, travel, and miscellaneous supplies for fieldwork and data analysis, storage, and processing. Specifically, partial support for a program technician to assist with field work, data collection and training imagery annotation is requested. Additionally, funding for travel to and from field locations to collect imagery and ground reference data. Miscellaneous supplies related to plot work, drone maintenance, and data storage and analysis.

Docusign Envelope ID: 4EB8EFFE-BE49-49F0-8355-F6078F5778B8

University of Arkansas System Division of Agriculture

Promotion Board Budget

Davis, Jason — *Development of a turn-row soybean vegetative health analysis using UAS imagery for production decision*

Year	2026/2027	**Project Year**	Year 3 of 3
Lead Investigator	Davis, Jason	**Co-PI #1**	
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Development of a turn-row soybean vegetative health analysis using UAS imagery for production decision support.		

Version: 8.0 (09/22/2025)

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Davis, Jason				Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	CES	AES	CES	CES			

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
Program Technician	Fnu Abhishek	25%	$11,250				$11,250	$0	$11,250
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$11,250	$0	$0	$0	$11,250	$0	$11,250

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
Tuition Calculator Information						$0	$0	$0
Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel					$0	$0	$0
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$3,105	$0	$0	$0	$3,105	$0	$3,105
Graduate Students	$0	$0	$0	$0	$0	$0	$0
Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$3,105	$0	$0	$0	$3,105	$0	$3,105
Personnel Total	$14,355	$0	$0	$0	$14,355	$0	$14,355

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State	$2,000				$2,000	$0	$2,000
Out-of-State					$0	$0	$0
Travel Total	$2,000	$0	$0	$0	$2,000	$0	$2,000

Docusign Envelope ID: 4EB8EFFE-BE49-49F0-8355-F6078F5778B8

University of Arkansas System Division of Agriculture

Promotion Board Budget

Davis, Jason *Development of a turn-row soybean vegetative health analysis using UAS imagery for production decision*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$3,250				$3,250	$0	$3,250
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$3,250	$0	$0	$0	$3,250	$0	$3,250
	Total for Proposal	$19,605	$0	$0	$0	$19,605	$0	$19,605

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

RA-21

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Comprehensive disease screening soybean varieties in Arkansas

Project Type:
Research

Name of Project Manager:
Travis Faske

Name of Project Team Member 1:
Terry Spurlock

Name of Project Team Member 2:
Daniel Riveria

Statement of Justification or Purpose of the Project (75 word maximum):
Farmers often select cultivars for yield, but diseases can drastically reduce it. In Arkansas, resistance is as important as yield. With over 100 new cultivars released annually and limited resistance data, choosing the right variety is important. This program offers clear disease resistance information to reduce major losses before widespread adoption.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Annually, three experiments will be conducted to evaluate the susceptibility of all entries in the Arkansas Official Variety Testing program to the southern root-knot nematode, frogeye leaf spot, and southern stem canker. These are the three most common and yield-limiting diseases in the state.

BUDGET

Amount of Funding Needed for Project:
$132,094.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Comprehensive Disease Screening of Soybean Varieties in Arkansas

Lead Investigators: Travis Faske and Terry Spurlock

Co-Investigators: Daniel Rivera

Status and Duration of Funding: Year 3 of 3

Research Areas: Plant Pathology

Stated Goal: To provide an independent evaluation of new soybean cultivars for resistance to major diseases and nematodes and post the information on the Arkansas Variety Testing Website.

Specific Objectives:

1. Screen all entries in the University of Arkansas Official Variety Testing (OVT) program for frogeye leaf spot in field plots at the Jackson County Extension Center or on-farm (Faske).
2. Screen all entries in the UA OVT program for southern stem canker using toothpicks inoculations at the Rohwer Research Station (RRS) (Spurlock).
3. Screen all entries in the UA OVT program for southern root-knot at the SWREC (Rivera) and in the field (Faske).
4. Provide a complete package of screening information to Jeremy Ross and other CES personnel by year-end (All).

Methods:

Cultivars and experimental entries of the Arkansas OVT and advanced Arkansas breeding lines will be evaluated in a replicated design in a field or greenhouse screen.

Frogeye leaf spot: Utilize our field nursery location at the NES, where overhead irrigation and space are available. Inoculum to conduct the screen will be produced using laboratory facilities in the Lonoke Extension Center (LEC).

Southern stem canker: We will hand-inoculate 10-12 individual plants in single-row plots using infested toothpicks. Plots will be maintained to promote disease, and all plants will be rated for stem canker and other foliar diseases. Inoculum to conduct the screen will be produced using laboratory facilities at the SEREC. A growth chamber screen of all varieties will be added in 2025, and the results will be compared to the results from the field trial.

Southern Root-knot Nematode: Varieties will be screened in a greenhouse at SWREC. Inoculum to conduct the screen will be produced on-site. Varieties will also be planted in single-row plots in a field screen near Kerr, AR.

Planned Milestones: All screens will be completed, and results will be summarized, analyzed, and posted on the UAF Variety Testing website (www.aaes.uark.edu/variety-testing) and delivered to the CES soybean specialist for the Soybean Update and SOYVA.

Value to Soybean Industry: Most growers select cultivars based primarily on yield performance. Unfortunately, while yield potential is an important factor in cultivar selection, the yield of a cultivar may be drastically reduced by soybean diseases. In Arkansas, resistance to several common soybean pathogens is as important as yield potential in selecting an appropriate cultivar. Soybeans are grown on

about 3.5 million acres in the state each year, with a value of about $500,000,000 annually. Diseases cost $25,000,000 per year in lost yield and quality statewide, by some estimates. Each year, well over 200 new soybean cultivars become available to Arkansas growers. Many of these cultivars are accompanied by little or no information on their resistance to diseases or nematodes. Since only one variety will be grown in a particular field, choosing the best variety can be a difficult decision. This program provides comprehensive information on the disease package that each new cultivar contains prior to widespread use in the state, lowering the risk of severe disease losses due to incorrect cultivar selection.

Budget Justifications/Explanation of Travel and Direct Costs: Proposed funding would support personnel (full-time and hourly) to conduct disease screens at each of the three locations (LEC, SWREC, and SWREC). Travel is for mileage to pick up supplies and conduct trials in the field. Supplies would include relevant materials such as sand, pots, identification tags in the greenhouse screens, materials to produce inoculum, or fuel or repairs to planters or spray equipment for field trials.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Faske, Travis — *Comprehensive Disease Screening of Soybean Varieties in Arkansas*

Year	2026/2027	**Project Year**	Year 3 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Faske, Travis	**Co-PI #1**	Spurlock, Terry	
Co-PI #2	Riveria, Daniel	**Co-PI #3**		
Department	ENPL Entomology and Plant Pathology			
Commodity Board	Soybean Promotion Board			
Project Title	Comprehensive Disease Screening of Soybean Varieties in Arkansas			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Faske, Travis	Spurlock, Terry	Riveria, Daniel		Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI		CES	CES	AES	CES			
Fulltime Personnel								
Position Title	**Name** *(if position is filled)* / **% Time** / **Salaries**					**Total**	**AES**	**CES**
Program Associate		$40,000				$40,000	$0	$40,000
Program Associate			$28,000			$28,000	$0	$28,000
				$15,000		$15,000	$15,000	$0
						$0	$0	$0
						$0	$0	$0
	Subtotal: Salaries	$40,000	$28,000	$15,000	$0	$83,000	$15,000	$68,000
	Graduate Student							
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)* / **% Time** / **Wages**					**Total**	**AES Portion**	**CES Portion**
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
	Tuition Calculator Information					$0	$0	$0
	Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0
	Hourly							
	Wages					**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel	$8,000	$2,000	$2,000		$12,000	$2,000	$10,000
	Hourly-Students					$0	$0	$0
	Subtotal: Hourly	$8,000	$2,000	$2,000	$0	$12,000	$2,000	$10,000
	Fringe Benefits							
Fringe benefits are calculated when salary and wage amounts are entered above.	**Benefits**					**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel	$11,040	$7,728	$4,140	$0	$22,908	$4,140	$18,768
	Graduate Students	$0	$0	$0	$0	$0	$0	$0
	Hourly Personnel	$544	$136	$136	$0	$816	$136	$680
	Hourly-Students	$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits	$11,584	$7,864	$4,276	$0	$23,724	$4,276	$19,448
	Personnel Total	$59,584	$37,864	$21,276	$0	$118,724	$21,276	$97,448
	Travel							
Justify out-of-state travel in proposal.	**Travel**					**Total**	**AES Portion**	**CES Portion**
	In-State	$3,000	$2,000			$5,000	$0	$5,000
	Out-of-State					$0	$0	$0
	Travel Total	$3,000	$2,000	$0	$0	$5,000	$0	$5,000

University of Arkansas System Division of Agriculture

Promotion Board Budget

Faske, Travis *Comprehensive Disease Screening of Soybean Varieties in Arkansas*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$1,000	$2,000	$2,000		$5,000	$2,000	$3,000
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$2,030	$0	$0	$0	$2,030	$0	$2,030
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$1,340	$0	$0	$1,340	$0	$1,340
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$3,030	$3,340	$2,000	$0	$8,370	$2,000	$6,370
	Total for Proposal	$65,614	$43,204	$23,276	$0	$132,094	$23,276	$108,818

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

RA-22

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Monitor and management of fungicide-resistant soybean disease in Arkansas

Project Type:
Research

Name of Project Manager:
Travis Faske

Name of Project Team Member 1:
Terry Spurlock

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Fungicide resistance among some fungal pathogens in soybean and other row crops is widespread. In the case of QoI fungicides, resistance affects the entire class rather than a single active ingredient. Shifts in pathogen sensitivity are typically detected only through laboratory analysis or after resistance has led to significant population increases, resulting in field-wide control failures and yield losses.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Fungal pathogens will be collected each season and tested in the lab for sensitivity to specific fungicide classes (i.e., QoI, DMI, and SDHI fungicides). Results that prevent field-wide fungicide control failures will be shared with the farming community to guide fungicide selection. Additionally, field trials will evaluate the field efficacy of new premix fungicides containing novel active ingredients for one or more commonly used classes.

BUDGET

Amount of Funding Needed for Project:
$59,338.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Monitor and Management of Fungicide-Resistant Soybean Diseases in Arkansas

Lead Investigators: Travis Faske and Terry Spurlock

Co-Investigators:

Status and Duration of Funding: Year 2 of 3

Research Areas: Plant Pathology

Stated Goal: Develop practical management strategies to manage fungicide-resistant foliar diseases (i.e. QoI-resistant frogeye leaf spot, target spot, Cercospora leaf blight). Determine the potential risk of triazole-resistance and SDHI-resistance in various fungal diseases and develop guidelines to reduce the impact of all fungicide-resistant diseases to maximum profit for the Arkansas soybean producers.

Specific Objectives:

1. Evaluate the efficacy and timing of fungicides, labeled and experimental, to control strobilurin-resistant FLS and other foliar diseases (Faske).

2. Investigate the risk and existence of fungicide-resistance in *Cercospora* fungi and other foliar diseases to DMI and SDHI fungicides (Faske).

3. Determine the state-wide distribution of QoI-resistant *Phomopsis longicolla*, the fungus that causes Phomopsis seed decay, a disease impacting grain quality, and QoI-resistant *Septoria glycines*, the fungus that causes brown spot (Spurlock).

4. Develop fungicide-resistance management strategies to delay or prevent fungicide-resistant diseases (Faske & Spurlock).

Methods:

Objective 1: Strobilurin-resistant frogeye leaf spot (S-R FLS) is widespread across Arkansas and the Mid-South. Numerous premix fungicides have been introduced, but their efficacy varies greatly. For example, Priaxor has proven ineffective against FLS in field trials. Furthermore, each year, new premix fungicides enter the marketplace. Thus, regular evaluation of fungicide performance is essential to avoid ineffective products being used by farmers. We will also compare automatic R3 applications with integrated pest management (IPM) approaches using solo triazoles and premixes across multiple soybean varieties. Trials will continue in a commercial field in Pulaski County at the Jackson County Extension Center under irrigated conditions to ensure disease development and reliable screening.

Objective 2: Triazole (Demethylation Inhibitors; DMI) fungicides are now the main in-season tool to manage S-R FLS, but variable performance suggests emerging resistance. Reports from Louisiana indicate triazole-resistant in Cercospora strains may also occur in Arkansas. Confirmation of triazole-resistance is a multi-year project because this resistance is quantitative rather than qualitative. SDHI fungicides used to manage S-R FLS have shown inconsistent control and have a moderate to high risk of developing resistance. Baseline trials and statewide sampling will monitor shifts toward triazole-resistance and SDHI-resistance in *Cercospora* spp. and other prominent foliar diseases.

Objective 3: Brown spot (BS) is present in most soybean fields in Arkansas. This disease typically occurs in the lower to mid-canopy and is often not yield-limiting. In some cases, evidence from field research trials has indicated BS moving to the upper third of the canopy and causing yield losses. Field calls to producer fields and conversations with crop consultants have sometimes indicated BS was not controlled as expected after fungicide application of pre-mix fungicides containing strobilurin chemistries. Phomopsis seed decay (PSD) occurs sporadically on soybean in Arkansas each year. Severity can be variable depending on variety, but the disease is more severe when heavy or prolonged periods of rainfall correspond to the timing of maturing soybean fields. Some evidence from field trials have indicated that fungicide applications can reduce PSD but certain pre-mixes, such as those containing a strobilurin, may not be as effective. State-wide surveys are needed to determine if and where strobilurin fungicide resistance exists for both diseases. Fungal isolates will be collected from leaf and grain samples from on-farm foliar fungicide trials and producer fields each year and screened to determine if fungicide resistant isolates exist in these pathogen populations.

Objective 4: Applied research is needed to develop practical fungicide resistant management strategies to delay or prevent the increase of such diseases in soybean. This information will be extended to producers in a variety of deliverables, which include management strategy articles posted on the Arkansas Row Crops website, updates to the fungicide efficacy tables in the MP-154 and presentations on fungicide resistance at production meetings and field days. Results from these studies will be published in the soybean research series and used to update a fact sheet on fungicide-resistant management of foliar soybean diseases.

Planned Milestones: Several foliar fungicide trials will be established each year at the NES as outlined in objective one. Fungal isolates will be collected each year and evaluated for resistance to various fungicide chemistries at the Lonoke Extension Center and Spurlock's Lab in Monticello, as outlined in objectives two and three. Finally, data from these studies will be used each year to extend the most current management strategies to the Arkansas producers as outlined in objective four.

Value to Soybean Industry: Our study will benefit farmers in several areas. First, the detection and confirmation of a new fungicide-resistant disease would prevent the unnecessary application of an ineffective fungicide, thus saving money. Further, early detection of the potential pitfalls of new chemistries like SDHI with a similar mode of action to the strobilurins would help to develop baselines for fungicide efficacy, thus loss of efficacy could be confirmed and prevent fungicide failures. Multiple years of data are needed to confirm losses to triazole fungicides, which is among the most common fungicides used in Arkansas in soybean, and if ineffective, would be equally important to farmers. Finally, we aim to use and deploy the information collected from these studies to provide practical solutions for the control of fungicide-resistant soybean diseases in Arkansas.

Budget Justifications/Explanation of Travel and Direct Costs: The proposed budget supports personnel (full-time and hourly/students) to conduct trials/experiments, maintain, and collect data. Travel would be primarily for mileage to pay for use of university vehicle or rental car to travel to and from field locations, an overnight stay maybe necessary depending on field activities (i. e. sampling…). Supplies would include those appropriate for such experiments as described such as but not limited to stakes, tags, supplies for planter or sprayer repair, petri dishes, media, reagents, and general lab supplies.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Faske, Travis — *Monitor and Management of Fungicide-Resistant Soybean Diseases in Arkansas*

Year	2026/2027	**Project Year**	Year 2 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Faske, Travis	**Co-PI #1**	Spurlock, Terry	
Co-PI #2		**Co-PI #3**		
Department	ENPL Entomology and Plant Pathology			
Commodity Board	Soybean Promotion Board			
Project Title	Monitor and Management of Fungicide-Resistant Soybean Diseases in Arkansas			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Faske, Travis	**Spurlock, Terry**			**Total Board Funding Requested**	**AES Portion**	**CES Portion**
Select "AES" or "CES" for each PI		CES	CES	CES	CES			
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Program Technician			$18,000				$18,000	$0	$18,000
Program Associate	Amanda Tolbert	35%		$14,000			$14,000	$0	$14,000
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$18,000	$14,000	$0	$0	$32,000	$0	$32,000
	Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information						$0	$0	$0
	Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0
			Hourly						
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel		$7,000	$0			$7,000	$0	$7,000
	Hourly-Students						$0	$0	$0
	Subtotal: Hourly		$7,000	$0	$0	$0	$7,000	$0	$7,000
			Fringe Benefits						
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$4,968	$3,864	$0	$0	$8,832	$0	$8,832
	Graduate Students		$0	$0	$0	$0	$0	$0	$0
	Hourly Personnel		$476	$0	$0	$0	$476	$0	$476
	Hourly-Students		$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits		$5,444	$3,864	$0	$0	$9,308	$0	$9,308
	Personnel Total		$30,444	$17,864	$0	$0	$48,308	$0	$48,308
			Travel						
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State		$2,000	$2,000			$4,000	$0	$4,000
	Out-of-State						$0	$0	$0
	Travel Total		$2,000	$2,000	$0	$0	$4,000	$0	$4,000

University of Arkansas System Division of Agriculture

Promotion Board Budget

Faske, Travis *Monitor and Management of Fungicide-Resistant Soybean Diseases in Arkansas*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$2,000	$3,000			$5,000	$0	$5,000
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$2,030	$0	$0	$0	$2,030	$0	$2,030
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$4,030	$3,000	$0	$0	$7,030	$0	$7,030
	Total for Proposal	$36,474	$22,864	$0	$0	$59,338	$0	$59,338

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

ATTACHMENT 23

ARKANSAS SOYBEAN PROMOTION BOARD

FISCAL YEAR 2027
(JULY 2026 – JUNE 2027)

DAY 2 PROPOSALS

COMPILED BY:

ARKANSAS DEPARTMENT OF AGRICULTURE

Arkansas Soybean Promotion Board

Table of Contents - Member Notes

REF #	ENTITY	PROJECT TITLE & STATUS	REPRESENTATIVE NAME	PREV. FUNDING AMOUNT ($)	REQUESTED AMOUNT ($)	NOTES
USSEC PROMOTION PROPOSALS - DAY 2						
1 - PI-03	U.S. Soybean Export Council	2026 Soy Connext Sponsorship - ***INITIAL; YEAR 1 OF 1***	Lyndsey Erb	$ -	$5,000.00	
1 - PI-04	U.S. Soybean Export Council	Japan Soy Foods Support - ***INITIAL; YEAR 1 OF 1***	Lyndsey Erb	$ -	$15,000.00	
1 - PI-05	U.S. Soybean Export Council	Support of Soy Excellence Centers - ***INITIAL; YEAR 1 OF 1***	Lyndsey Erb	$ -	$15,000.00	
1 - PI-06	U.S. Soybean Export Council	Utilization of U.S. Soy in the Americas - ***INITIAL (LAPSED RETURN); YEAR 1 OF 1***	Lyndsey Erb	$ -	$25,000.00	
1 - PR-07	U.S. Soybean Export Council	2026 USSEC Membership - ***RECOMPETE; YEAR 3 OF 1***	Lyndsey Erb	$ 10,000.00	$10,000.00	
1 - PR-08	U.S. Soybean Export Council	US Soy Promotion in Europe - ***RECOMPETE; YEAR 1 OF 1***	Lyndsey Erb	$ 25,000.00	$25,000.00	
UADA INITIAL RESEARCH PROPOSALS - DAY 2						
2 - RI-20	UADA	Quantifying potential gaseous N losses and soil health implications from non-nodulating soybean - ***INITIAL; YEAR 1 OF 1***	Kris Brye	$ -	$38,240.00	
2 - RI-21	UADA	Temporary flooding effects on soil respiration in tolerant and susceptible soybean varieties in the greenhouse - ***INITIAL; YEAR 1 OF 1***	Kris Brye	$ -	$40,000.00	
3 - RI-22	UADA	Soybean potential yield map and yield gap analysis for Arkansas - ***INITIAL; YEAR 1 OF 3***	Elvis Elli	$ -	$54,255.00	
4 - RI-23	UADA	Insect frass for plant growth promotion and enhanced soybean yields - ***INITIAL; YEAR 1 OF 3***	Gerson Drescher	$ -	$44,829.00	

Arkansas Soybean Promotion Board

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5 - RI-24	UADA	Role of the soil microbiome in conferring flooding tolerance in soybean ***- INITIAL; YEAR 1 OF 2***	Mark McDonald	$ -	$74,712.00	
6 - RI-25	UADA	Establishing a long-term rotational study ***- INITIAL; YEAR 1 OF 3***	Justin Chlapecka	$ -	$18,980.00	
7 - RI-26	UADA	Developing a Screening Pipeline and Candidate Gene Pool for Nematode Resistance in Soybean ***- INITIAL; YEAR 1 OF 3***	Fiona Goggin	$ -	$30,767.00	
8 - RI-27	UADA	Assessment of soybean arthropod community dynamics across Arkansas for IPM ***- INITIAL; YEAR 1 OF 3***	Rupesh Kariyat	$ -	$49,036.00	
9 - RI-28	UADA	Soybean as a conversion crop within integrated crop-livestock systems ***- INITIAL; YEAR 1 OF 3***	Jonathan Kubesch	$ -	$39,339.00	
10 - RI-29	UADA	Valorizing Soy By-products into Mycoprotein via Acid/Alkaline/Enzymatic Treatment and Biomass Fermentation ***- INITIAL; YEAR 1 OF 3***	Sungil Ferreira	$ -	$48,868.00	
11 - RI-30	UADA	Field Variability, Harvest Moisture, and Advanced Storage Monitoring to Improve Arkansas Soybean Quality ***- INITIAL; YEAR 1 OF 3***	Kaushik Luthra	$ -	$64,083.00	
11 - RI-31	UADA	Integrated Strategies for Safe, Efficient, and Profitable Rewetting of Over-Dried Soybeans Using Advanced Bin Aeration Systems ***- INITIAL; YEAR 1 OF 3***	Kaushik Luthra	$ -	$73,796.00	

Arkansas Soybean Promotion Board

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12 - RI-32	UADA	Effects on carcass characteristics, meat quality, and consumer acceptability of inclusion of raw whole soybeans in growing and finishing diets for farm finished beef ***- INITIAL; YEAR 1 OF 2***	Beth Kegley	$ -	$36,250.00	
13 - RI-33	UADA	Transforming Arkansas soybean hulls into high-value probiotic silage: improved digestibility and reduced post-weaning diarrhea in piglets. ***- INITIAL; YEAR 1 OF 1***	Amir Mani	$ -	$30,000.00	
14 - RI-34	UADA	Immunomodulatory effects of isoflavones from soybean meal in broilers challenged with coccidiosis ***- INITIAL; YEAR 1 OF 1***	Shawna Weimer	$ -	$41,788.00	
15 - RI-35	UADA	Development of Highly Digestible Protein Cultivars with Reduced Antinutritional Factors ***- INITIAL; YEAR 1 OF 3***	Mahfuzur Rahman	$ -	$79,880.00	
16 - RI-36	UADA	Increasing Adoption of Elevation Data and Irrigation Scheduling on Furrow-Irrigated Soybeans ***- INITIAL; YEAR 1 OF 3***	Mike Hamilton	$ -	$28,520.00	
17 - RI-37	UADA	Water Management Advancements for Irrigated Soybeans ***- INITIAL; YEAR 1 OF 3***	Chris Henry	$ -	$239,487.00	
18 - RI-38	UADA	Field testing and optimization of biocontrol products targeting Palmer amaranth (pigweed) ***- INITIAL; YEAR 1 OF 3***	Burt Bluhm	$ -	$45,000.00	
19 - RI-39	UADA	Improving Grain Yield Stability in Arkansas Soybean ***- INITIAL; YEAR 1 OF 3***	Caio Vieira	$ -	$50,108.00	

Arkansas Soybean Promotion Board

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19 - RI-40	UADA	Development of High-yielding Soybean Cultivars with Broad Resilience to Stressors ***- INITIAL; YEAR 1 OF 3***	Caio Vieira	$ -	$199,526.00	
19 - RI-41	UADA	Genomic Prediction and Biological Insight to Enhance the Efficiency of Soybean Breeding ***- INITIAL; YEAR 1 OF 3***	Caio Vieira	$ -	$104,180.00	
19 - RI-42	UADA	Soybean Germplasm Enhancement Using Genetic Diversity ***- INITIAL; YEAR 1 OF 3***	Caio Vieira	$ -	$189,826.00	
20 - RI-43	UADA	Evaluating the influence of high-fiber grain coproducts on slowing the growth of gilts during the development period: impacts on iron status, microbiome, and reproductive efficiency ***- INITIAL; YEAR 1 OF 3***	Brittni Littlejohn	$ -	$76,000.00	***$76,000 to be split across promo boards***
UADA RECOMPETING RESEARCH PROPOSALS - DAY 2						
20 - RR-01	UADA	Use of gossypol to inhibit reproduction as a model for feral swine control ***- RECOMPETE; YEAR 1 OF 3***	Brittni Littlejohn	$ 30,000.00	$90,000.00	***$90,000 to be split across promo boards***
21 - RR-02	UADA	Determining the value of fungicide application using on-farm trials ***- RECOMPETE; YEAR 1 OF 3***	Terry Spurlock	$ 52,000.00	$62,000.00	
21 - RR-03	UADA	Understanding Taproot decline, Septoria brown spot, and orange leaf spot; soybean diseases of increasing importance in Arkansas ***- RECOMPETE; YEAR 1 OF 3***	Terry Spurlock	$ 39,075.00	$40,154.00	

Arkansas Soybean Promotion Board

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22 - RR-04	UADA	Investigating Emerging Production Recommendations for Sustainable Soybean Production ***- RECOMPETE; YEAR 1 OF 3***	Jeremy Ross	$ 229,516.00	$232,136.00	
22 - RR-05	UADA	Improving technology transfer in profitable and sustainable soybean ***- RECOMPETE; YEAR 1 OF 3***	Jeremy Ross	$ 77,443.00	$75,527.00	
22 - RR-06	UADA	Science for Success – Arkansas Support for National Soybean Research and Extension Program ***- RECOMPETE; YEAR 1 OF 3***	Jeremy Ross	$ 128,549.00	$137,615.00	
22 - RR-07	UADA	Soybean Research Verification Program - ***RECOMPETE; YEAR 1 OF 3***	Jeremy Ross	$ 200,213.00	$210,672.00	
23 - RR-08	UADA	Integrated management of soybean nematodes in Arkansas ***- RECOMPETE; YEAR 1 OF 3***	Travis Faske	$ 71,459.00	$76,621.00	
24 - RR-09	UADA	Soybean Weed Management: A Team Approach for Improved Control and Profitability ***- RECOMPETE; YEAR 1 OF 3***	Bob Scott	$ 256,835.00	$263,375.00	
25 - RR-10	UADA	Soybean Enterprise Budgets and Production Economic Analysis ***- RECOMPETE; YEAR 1 OF 3***	Breana Watkins	$ 10,000.00	$10,000.00	
26 - RR-11	UADA	Arkansas Soybean Performance Trials - ***RECOMPETE; YEAR 1 OF 1***	John Carlin	$ 40,754.00	$42,491.00	
27 - RR-12	UADA	Fertilization of Soybean ***- RECOMPETE; YEAR 1 OF 3***	Trent Roberts	$ 83,176.00	$85,391.00	
27 - RR-13	UADA	Field-based determination of chloride tolerance in soybean ***- RECOMPETE; YEAR 1 OF 3***	Trent Roberts	$ 51,153.00	$52,179.00	

Arkansas Soybean Promotion Board

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27 - RR-14	UADA	Influence of Cover Crops and Soil Health on Soybean ***- RECOMPETE; YEAR 1 OF 3***	Trent Roberts	$ 63,142.00	$65,325.00	
27 - RR-15	UADA	Monitoring the Extent of Potassium Deficiency and Chloride Toxicity in Arkansas Soybean Fields ***- RECOMPETE; YEAR 1 OF 1***	Trent Roberts	$ 39,574.00	$37,760.00	

DAY 2 TOTAL		
	PREV (FY26)	**CURRENT (FY27)**
PROMOTION:	$ 35,000.00	$95,000.00
RESEARCH:	$ 1,372,889.00	$3,178,716.00

DAY 1 + DAY 2 TOTALS		
	PREV (FY26)	**CURRENT (FY27)**
PROMOTION:	$ 473,540.06	$805,378.00
RESEARCH:	$ 1,408,227.50	$3,732,532.35

ACTIVE UADA PROJECTS (NOT INCLUDED ABOVE)		
	PREV (FY26)	**CURRENT (FY27)**
RESEARCH:	$ 881,797.00	$848,218.00

GRAND TOTALS		
	PREV (FY26)	**CURRENT (FY27)**
PROMOTION:	$ 473,540.06	$805,378.00
RESEARCH:	$ 2,290,024.50	$4,580,750.35

1 - PI-03

Organization/Institution Submitting Proposal:
U.S. Soybean Export Council

Project Title:
2026 Soy Connext Sponsorship

Project Type:
Promotion

Name of Project Manager:
Lyndsey Erb

Name of Project Team Member 1:
Liz Ruskamp

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
See attached proposal

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
See attached proposal (additional budget contribution to be confirmed)

BUDGET

Amount of Funding Needed for Project:
$5,000.00

Contribution Amount (from organization or sponsor):
$0.00

Proposal Title: 2026 Soy Connext Sponsorship

Contact Person: Liz Ruskamp– Industry Affairs Manager, U.S. Soybean Export Council
Eruskamp@ussec.org
16305 Swingley Ridge Road
Suite 200
Chesterfield, MO 60317
314-920-0806

Sponsorship Request: $5,000

Project Description: USSEC is seeking sponsorship for our 2026 annual global conference which will be held in Chicago, August 5 – 7, 2026. This program aims to educate international buyers and U.S. Soy industry stakeholders on innovations that support U.S. Soy's tradition of reliably supplying high quality, sustainable products. The USSEC Soy Connext will connect international buyers and users of soy with suppliers, processors, and allied industry of U.S. soy to promote its intrinsic and extrinsic values.

Background: USSEC's Soy Connext is the premier annual event where buyers and sellers of U.S. soy discover, collaborate and network. Support for USSEC's Soy Connext will allow conference organizers to better articulate the quality advantages of U.S. soy to international buyers and users, which can lead to valuable connections and demand growth. In 2025, Soy Connext attendees learned about some of the key factors affecting global trade including financial dynamics, supply and demand, and supply chains. Attendees also had the option to join breakouts discussing commodity U.S. soy products or specialty products, such as food-grade and IP soybeans. Overall, the event attracted 736 attendees from 59 countries including key decision makers from some of U.S. soy's major export markets.

Proposal Goals and Objectives:

- Host a U.S. soy focused conference attended by international buyers and customers of U.S. soy from USSEC's regions
- Develop an agenda and environment that prioritizes the needs, interests, and expectations of our key accounts

What is the length or time frame of this project?: The time frame for this project is August 5 – 7, 2026

How does this project benefit Arkansas soybean farmers?: USSEC's Soy Connext is the premier annual event where buyers, sellers, and the U.S. value chain discover, collaborate, and network. Support for USSEC's Soy Connext will support better articulation of the quality advantages of U.S. soy which can lead to valuable connections and demand growth. To continue fostering these relationships, USSEC will bring trade teams to the event to continue to promote the value of U.S. soy versus soy from other origins. Ongoing demand growth and the promotion of U.S. soy supports Arkansas farmers' goal of expanding into global markets and positioning U.S. soy as a solution within those markets.

Total Sponsorship Amount: $5,000

- Benefits within the Bronze sponsorship level:
    - One complimentary registration
    - Exposure in conference website and attendee app
    - Dedicated networking space

1 - PI-04

Organization/Institution Submitting Proposal:
U.S. Soybean Export Council

Project Title:
Japan Soy Foods Support

Project Type:
Promotion

Name of Project Manager:
Lyndsey Erb

Name of Project Team Member 1:
Liz Ruskamp

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
See attached proposal

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
See attached proposal (additional budget contribution to be confirmed)

BUDGET

Amount of Funding Needed for Project:
$15,000.00

Contribution Amount (from organization or sponsor):
$0.00

Proposal Title: Japan Soy Foods Support

Contact Person: Liz Ruskamp– Industry Affairs Manager, U.S. Soybean Export Council
Eruskamp@ussec.org
16305 Swingley Ridge Road
Suite 200
Chesterfield, MO 60317
314-920-0806

Funding Request: $15,000

Project Description: This project aims to bolster the Japanese soy food industry by emphasizing the advantages of utilizing U.S. soy for natto production. These efforts will help build growth in the Japanese natto market while highlighting the soy health halo, the inherent sustainability of U.S. soy, and the benefits of sourcing from the U.S.

This project will promote and increase the consumption of U.S. sourced natto, that is exported out of specific areas of the production area, particularly Arkansas. This project targets Japanese natto manufacturers and importer industry segments to increase their awareness of the benefits of U.S. sourced natto.

Background: Thanks in large part to many years of programming supported by QSSBs, the Japanese natto market expanded 60% between 2013-2020 and it is expected to grow further. The objective is to support collaborative promotional efforts made by Federation of Japan 'Natto' Manufacturers Cooperative Society (JNCSF) and USSEC and expand sales of these soybeans from the U.S. With the steady increase of natto soybean acres in Arkansas, this project will aim to use that growth to expand the Japanese natto market further.

List your project objective(s) and goals:

- Create marketing materials that communicate the benefits of U.S. sourced natto
- Provide general support to the Japanese natto industry through events, marketing campaigns, or trade team missions
- Maintain and grow U.S. soy market share in the natto industry
- Continue to build relationships with Japanese manufactures and importers associated with the natto industry. Regional staff will monitor relationships between U.S. and Japanese industry

What is the length or time frame of this project?: The time frame for this project is October 1, 2025 – September 30, 2026

Benefits to Arkansas Soybean farmers: Arkansas Soy, along with key state industry partners, is working to grow the availability of natto and other specialty soy products within the state to grow a value-added

product within that state that can then be exported to key markets. Additionally, Arkansas places high value on the sustainability of soy, which is a key factor when marketing U.S. soy internationally. This is especially important in markets such as Japan where sustainability is a major factor in decision making. Due to Arkansas' growing interest and acres in specialty soy products as well as the focus on sustainability, funding the natto program in Japan brings together the focus that Arkansas Soy farmers have to highlight the benefits and uses of soybeans sourced from the U.S.

Budget:

- **Total Budget: $15,000**
    - The funds may be used for trade team support & travel, project support/ management, trainings, media/advertising/sponsorship, and networking events.

1 - PI-05

Organization/Institution Submitting Proposal:
U.S. Soybean Export Counil

Project Title:
Support of Soy Excellence Centers

Project Type:
Promotion

Name of Project Manager:
Lyndsey Erb

Name of Project Team Member 1:
Liz Ruskamp

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
See attached proposal

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
See attached proposal (additional budget contribution to be confirmed)

BUDGET

Amount of Funding Needed for Project:
$15,000.00

Contribution Amount (from organization or sponsor):
$0.00

Proposal Title: Support of Soy Excellence Centers

Contact Person: Liz Ruskamp– Industry Affairs Manager, U.S. Soybean Export Council
Eruskamp@ussec.org
16305 Swingley Ridge Road
Suite 200
Chesterfield, MO 60317
314-920-0806

Funding Request: $15,000

Project Description: The Soy Excellence Centers (SECs) are a workforce development initiative aimed at helping emerging markets tackle protein challenges and stimulate demand for U.S. soy products. By offering a sustainable and renewable educational model, the SECs promote locally relevant best practices across the soy-related sector. The centers provide foundational and intermediate training in areas such as poultry, aquaculture, feed milling, swine production, crush plant operations, and soy foods. Located throughout the USSEC regions—including MENA, Nigeria (Sub-Saharan Africa), Singapore and Thailand (South/Southeast Asia), India, and Honduras (Americas)—the SECs play a vital role in supporting local industries. This proposal supports continued investment in the Soy Excellence Centers and includes participation on the SEC Global Advisory Panel. The purpose of this panel is to provide strategic oversight and guidance to ensure SEC investments are managed effectively by USSEC. Its goal is to maximize the impact of the centers while delivering a strong return on investment for stakeholders.

Background: Soy demand is projected to exceed 500 million metric tons by 2035, and with a growing global population, major soy-producing countries will need to rise to the challenge. The U.S. is well-positioned to meet this demand, but to maintain U.S. soy as the market leader, ongoing efforts to build demand and cultivate relationships in emerging markets are essential. The Soy Excellence Centers are strategically placed to foster these relationships in key developing regions, offering education and training to those involved in the global soy supply chain. The locations of these centers are aligned with anticipated growth in soy demand, ensuring that U.S. soy remains a top choice in these emerging markets worldwide.

Proposal Goals and Objectives:

- Provide ongoing support for developing new SEC trainings and content
- Maintain and administer the digital platform that houses the SEC Professional Development Community
- Maintain a seat on the SEC Global Advisory Panel to provide ongoing support and guidance for the Soy Excellence Centers

What is the length or time frame of this project?: The time frame for this project is October 1, 2025 – September 30, 2026

How does this project benefit Arkansas soybean farmers?: Arkansas is a supplier of soybeans to many regions, and as populations continue to grow, so will protein demand. Arkansas is positioned to help supply this demand. The regions where the Soy Excellence Centers are located are expected to be some of the largest areas of population growth in the next 10+ years and therefore will have increased protein

demand. This program directly educates individuals on the benefits of U.S. Soy while providing education and training opportunities to communities and organizations. By continuing to support USSEC projects in the emerging markets, Arkansas Soy will help foster relationships with participants and promote the value of the U.S soy advantage

Budget:

- **Total Budget: $15,000**

1 - PI-06

Organization/Institution Submitting Proposal:
U.S. Soybean Export Council

Project Title:
Utilization of U.S. Soy in the Americas

Project Type:
Promotion

Name of Project Manager:
Lyndsey Erb

Name of Project Team Member 1:
Liz Ruskamp

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
See attached proposal

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
See attached proposal (Additional contribution amount to be confirmed)

BUDGET

Amount of Funding Needed for Project:
$25,000.00

Contribution Amount (from organization or sponsor):
$0.00

Proposal Title: Utilization of U.S. Soy in the Americas

Contact Person: Liz Ruskamp– Industry Affairs Manager, U.S. Soybean Export Council
Eruskamp@ussec.org
16305 Swingley Ridge Road
Suite 200
Chesterfield, MO 60317
314-920-0806

Funding Request: $25,000

Project Description: Differentiating U.S. soy from its South American competitors is a key aspect of USSEC programing in the Americas region. This project provides support to the Americas region for the promotion of U.S. soybeans and soybean meal through regional conferences, trade team missions, one-on-one meetings, seminars, and various events. One of the goals of the project is to continue to provide networking and educational opportunities for key industry professionals in the region to learn more about U.S. soy and connect with U.S. suppliers and associated industries. Educating customers of the benefits and availability of U.S. soybeans and soybean meal is important to regional programming efforts that support the America's in the changing dynamics of the global soy market. This is a regional effort targeting producer associations, importers, and poultry, aquaculture, and swine producers.

Background: The Americas region represents four of the top 15 destination markets for U.S. soy. Within most of the markets, the U.S. maintains a large market share. Given this market share, investments made in the Americas region have a direct impact on U.S. soy demand. But with tightened balance sheets and key market changes in all origins, the threat of South American imports will remain high in the years to come. Promoting the U.S. soy advantage in animal and aquaculture utilization is a critical part of our quality differentiation strategy. Swine, poultry, aquaculture, and feed manufacturers have an estimated growth rate between 3 and 5% per year. This project helps to maintain the support needed within the region to promote the advantages and the utilization of U.S. soy to various target audience to continue to build market share and increase exports to the region.

Proposal Goals and Objectives:

- The key goals and objectives of this project are:
    - Host regional workshops, events, and/or trade teams to promote the benefits and utilization of U.S. soy products
    - Promote the benefits of U.S. soy as a feed ingredient within the region
    - Identify market needs and communicate how U.S. soy can provide a product to meet the needs of the market.

What is the length or time frame of this project?: The time frame for this project is October 1, 2025 – September 30, 2026

How does this project benefit Arkansas soybean farmers?: Arkansas directly supplies beans and meal to the U.S. Gulf which serves as a point of origin for the growing demand in Americas. Many of Arkansas' beans are the first to hit the market and subsequently end up in the Americas markets. Support for regional meetings, conferences, and trade teams allows staff to better articulate the quality advantages

of U.S. soy back to key stakeholders. These activities allow the region to highlight messaging that supports the sustainable production practices Arkansas farmers are using to meet the needs of the market. By continuing to support USSEC projects in the emerging and developing markets, Arkansas Soy will help foster relationships with participants and promote the value of the U.S soy advantage.

Budget:

- **Total Budget: $25,000**
    - The funds may be used for trade team support & travel, project support/ management, trainings, and networking events.

1 - PR-07

Organization/Institution Submitting Proposal:
U.S. Soybean Export Council

Project Title:
2026 USSEC Membership

Project Type:
Promotion

Name of Project Manager:
Lyndsey Erb

Name of Project Team Member 1:
Liz Ruskamp

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
See attached proposal

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
See attached proposal

BUDGET

Amount of Funding Needed for Project:
$10,000.00

Contribution Amount (from organization or sponsor):
$0.00

Proposal Title: 2026 USSEC Membership

Contact Person: Liz Ruskamp – Industry Affairs Manager, U.S. Soybean Export Council
Eruskamp@ussec.org
16305 Swingley Ridge Road
Suite 200
Chesterfield, MO 60317
314-920-0806

Funding Request: $10,000

Project Timeline: January 1 – December 30, 2026

Project Overview (Summary): This proposal is to retain membership in the U.S. Soybean Export Council for CY 2026. USSEC works on behalf of our members by helping to build a preference for U.S Soy through various projects, programs, and events. As a member of USSEC, Arkansas Soybean Promotion Board will have access to member only resources including free or discounted registration to regional events, access to subject matter experts and USSEC in-country representatives, as well as access to resources including industry updates, QSSB specific content, and weekly and monthly market insights.

Project Background: USSEC has been a primary contractor supporting U.S. soy international marketing needs for 20 years. The organization employs and partners with some of the world's premier marketing and technical experts serving all areas of soy utilization. Partnering and collaborating with various U.S. soy stakeholders (including USB, ASA, QSSBs, exporters and other industry professionals), USSEC develops strategic goals and plans specific to each international marketing and utilization need. USSEC's networking ranges from domestic and international industry, academia, media, government affairs, logistics, other NGOs supporting U.S. and global agriculture, and most other influences of soy usage and trade.

Benefits to Arkansas Soybean farmers: USSEC works on behalf of our members by helping to build a preference for U.S Soy through various projects, programs, and events. As a member of USSEC, the Arkansas Soybean Promotion Board will have access to member only resources including free or discounted registration to regional events, access to subject matter experts and USSEC in-country representatives, as well as access the resources including industry updates, QSSB specific content, and weekly and monthly market insights.

What is the anticipated economic return to soybean farmers or return on investment from this proposal? USSEC has been working to support U.S. soy in the global marketplace for 20 years. The organization employs and partners with some of the world's premier marketing and technical experts serving all areas of soy utilization. Partnering and collaborating with various U.S. soy stakeholders (including USB, ASA, QSSBs, exporters and other industry professionals), USSEC develops strategic goals and plans specific to each international marketing and utilization need. In the most recent economic analysis completed by the United Soybean Board, for every $1 invested in the soybean checkoff, there is a return on investment of about $12, across all categories of investment by the United Soybean Board.

1 - PR-08

Organization/Institution Submitting Proposal:
U.S. Soybean Export Council

Project Title:
U.S. Soy Promotion in Europe

Project Type:
Promotion

Name of Project Manager:
Lyndsey Erb

Name of Project Team Member 1:
Liz Ruskamp

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
See attached proposal

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
See attached proposal (additional budget contribution to be confirmed)

BUDGET

Amount of Funding Needed for Project:
$25,000.00

Contribution Amount (from organization or sponsor):
$0.00

Proposal Title: U.S. Soy Promotion in Europe

Contact Person: Liz Ruskamp– Industry Affairs Manager, U.S. Soybean Export Council
Eruskamp@ussec.org
16305 Swingley Ridge Road
Suite 200
Chesterfield, MO 60317
314-920-0806

Funding Request: $25,000

Project Description: This project supports regional events and programs focused on the sustainable solution that U.S. soybeans can provide to the European animal production industry. This project will focus on educating customers on the impacts of predicted market changes and dynamics and how to take advantage of using U.S. soy to improve efficiency and sustainability of animal production. Europe has remained one of the top markets for U.S. soybeans and, as European countries continue to push producers to find more sustainable sources, the U.S. is poised to meet this demand. By capitalizing on the sustainable practices that U.S. producers already implement, we can engage with European customers to highlight how U.S. soy can improve animal nutrition while meeting the needs of the market for sustainable solutions.

Background: Sustainability is an important part of U.S. soy advantage and has been an area of interest in Europe for over a decade. USSEC has utilized technical seminars, workshops and one-on-one discussions with key accounts and academia to explain how U.S. soy can be a sustainable, nutritious and economical source of protein. This program focuses on educating customers on how U.S. Soy can help achieve their long-term goals for sustainable and profitable animal production.

List your project objective(s) and goals:

These initiatives will provide the following opportunities:

- Engage buyers/users of soy in opportunities to better understand the U.S. soy advantage.
- Educate buyers/users of soy on soy and feed processing, value-added soy ingredients, and sustainability.
- Leverage relationships with academia, industry professionals, and other "assets" in Europe, or elsewhere (e.g. U.S.), to ensure the appropriate experts and resources are being utilized to achieve goals.

The target audience for this project includes commercial soy and feed related business, animal producers, academia, associations, and opinion leaders within Europe.

What is the length or time frame of this project?: The time frame for this project is October 1, 2025 – September 30, 2026

Benefits to Arkansas Soybean farmers: By supporting animal agriculture training, education, and awareness needs in Europe, this initiative builds upon existing efforts and creates new opportunities for U.S. soy utilization. Through networking, education, and facilitation of various activities, U.S. soy

regularly positions itself as the “product of choice” for many soy users in Europe. Due to Arkansas’ proximity to the river system and the Gulf, many of its whole beans are the first to be marketed and head Gulf to destinations like Europe. 97 percent of Europe’s whole bean imports originate out of the Gulf, meaning that Europe serves as a natural destination for Arkansas soybeans. Promotion of U.S. soy will provide opportunities for soy users to better understand the qualities of U.S. soy and, ultimately, demand more U.S. soy in the region, utilizing positive scientific information supporting the claims of the U.S. soy advantage.

Budget:

- **Total Budget: $25,000**
    - The funds may be used for trade team support & travel, project support/ management, trainings, and networking events.

2 - RI-20

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Quantifying potential gaseous N losses and soil health implications from non-nodulating soybean

Project Type:
Research

Name of Project Manager:
Kris Brye

Name of Project Team Member 1:
Caio Vieira

Name of Project Team Member 2:
Diago Della Lunga

Statement of Justification or Purpose of the Project (75 word maximum):
Non-nodulating, high-yielding soybean varieties have been recently developed in Arkansas. However, non-nodulating soybean varieties potentially require significant fertilizer-nitrogen (N) inputs to offset the N that would otherwise have been biologically fixed from the atmosphere to maintain large yields. Thus, assessing the potential environmental implications of the required fertilizer-N additions is warranted.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
This field study will assess and compare the effects of a non-nodulating soybean variety, relative to a standard nodulating variety, on gaseous-N and -C losses and soil health indicators under different fertilizer-N rates on a silt-loam soil. This proposed study will complement ongoing field research studying the effects of non-nodulating soybean genotypes on protein dynamics and resource allocation.

BUDGET

Amount of Funding Needed for Project:
$38,240.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Quantifying potential gaseous N losses and soil health implications from non-nodulating soybean

Lead Investigators: Dr. Kristofor Brye (CSES)

Co-Investigators: Dr. Caio Vieira (CSES), Dr. Diego Della Lunga (CSES)

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): New (Year 1 of 1)

Research Areas: Agronomy/Alternative and Breeding

Stated Goal: With prior support from the United Soybean Board, non-nodulating, high-yielding soybean varieties have been recently developed in Arkansas to improve the seed-protein concentration, potentially increasing seed-oil level, and enhance soybean marketability. However, non-nodulating soybean varieties potentially require significant fertilizer-nitrogen (N) inputs to offset the N that would otherwise have been biologically fixed from the atmosphere to maintain large yields. Furthermore, if not managed carefully, non-nodulating soybeans could experience substantial gaseous-N and -carbon (C) losses, thus negatively affecting soil health and sustainability. To date, no recommendations have been developed for non-nodulating soybean in terms of fertilizer-N application or soil heath management. Therefore, the goal of this field study is to assess and compare the effects of a non-nodulating soybean variety, relative to a standard nodulating variety, on gaseous-N and -C losses and soil health indicators under different fertilizer-N rates on a silt-loam soil. This proposed study will complement on-going field research studying the effects of non-nodulating soybean genotypes on protein dynamics and resource allocation.

Specific Objectives: The proposed field research project will address the following specific objectives: i) quantify and compare carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O)] loses from an N-fertilized and non-N-fertilized, non-nodulating soybean variety relative to a standard, nodulating soybean variety and bare soil, ii) quantify and compare yield and plant and grain nutrient uptakes among treatments, and iii) quantify and compare soil nutrient changes over time.

Methods: The proposed field study will complement on-going field research trials of co-investigator Vieira at the Rohwer Research Station. Within the up-slope position of a furrow-irrigated field, 16 plots, 20-ft (~ 6 m) long and four rows (i.e., raised beds) wide will be established at the beginning of the 2026 growing season prior planting. Each plot will be assigned one of four treatments that will be replicated four times in a completely randomized design. Treatments will consist of the following: i) a non-nodulating soybean variety with no fertilizer-N addition, ii) the same non-nodulating soybean variety fertilized with a total of ~ 340 kg N ha^{-1}, iii) a standard nodulating soybean variety with no fertilizer-N addition, and iv) bare soil that will have no planted soybeans and will receive no fertilizer-N addition.

The nodulating and non-nodulating soybean variety will be selected from near-isogenic lines currently under development by co-PI Vieira's research team at the University of Arkansas. The fertilizer-N treatment will occur in a split application of 170 kg N ha^{-1}, as urea, at the V6 and R2 stages, for the season total fertilizer-N addition of 340 kg ha^{-1}. All four treatments, including the bare soil, will receive the same amount of fertilizer-phosphorus (P) and potassium (K) additions according to soil-test recommendations. As soon after planting as possible, in the center of each plot, a 20-cm-diameter, PVC base collar will be installed in the top and center of the raised bed, in the planted

soybean row, to facilitate gas measurements. From each of the 16 plots, soil core samples will be collected from the top 4 in (10 cm) at the beginning of the growing season and again at harvest. Soil samples will be oven-dried, weighed, ground, and sieved for soil chemical property analyses. Soil bulk density will be calculated from the dry soil mass and known soil volume. Soil particle-size analyses will be conducted. Soil pH and electrical conductivity, soil organic matter and total C and N concentrations, and Mehlich-3 extractable soil nutrient concentrations (i.e., P, K, Ca, Mg, Na, Fe, S, Mn, Zn, Cu, and B) will be measured.

Aboveground plant samples will be collected at maturity from a 3-ft (1 m) length of row within each of the 12 soybean-containing plots. Plant material will be dried at ~ 55°C for at least 5 days and weighed to determine aboveground dry matter. At harvest, additional plant samples will be collected from each plot and mechanically threshed to separate and collect soybean seeds for yield determination. Sub-samples of dried vegetative plant and seed material will be mechanically ground, sieved through a 1-mm-mesh screen, and analyzed for macro- and micro-nutrient (i.e., P, K, Ca, Mg, Na, Fe, S, Mn, Zn, Cu, and B) and total N and C concentrations. Measured soil and plant elemental concentrations will be converted to soil nutrient contents and plant nutrient uptakes (i.e., kg ha^{-1}).

Carbon dioxide, CH_4, and N_2O will be measured with a field-portable, chamber-based, flow-through gas analyzer system approximately weekly following procedures developed and published by PI-Brye's research team. The whole gas measurement system has been previously obtained as part of a prior grant award from the Arkansas Natural Resources Conservation service at an approximate cost of $110,000, thus representing a substantial commitment of resources to the current proposed project. Season-long gas losses and global warming potential will be calculated from interpolation between consecutive measurement dates.

Soil and plant C and N data, along with the directly measured C and N gas losses, will be used to create estimates of the C and N balance (i.e., major system inputs and outputs) that will be statistically analyzed to assess soil health implications across the treatments. Soil C and N changes over the course of the growing season will be correlated to the plant nutrient uptakes and to the directly measured gas losses under the various treatments.

Planned Milestones: The initial milestone will be the direct quantification of N and C losses from a non-nodulating, furrow-irrigated soybean on a silt-loam soil. A subsequent milestone will be the ability to assess soil health implications of nodulating and non-nodulating soybeans. The ultimate milestone will be to improve the long-term outlook, marketability, and environmental sustainability of Arkansas-grown soybeans with credible, reliable, and replicated field research.

Value to Soybean Industry: Soybean cropping is regarded as one of the most sustainable production systems due to the small-to-zero N inputs required and due to the relatively low gaseous-C and -N losses during the growing season compared to other major commodity crops like rice, corn, and cotton. The introduction of non-nodulating soybean varieties brings the ability to increase seed-protein content and potentially increase seed-oil levels for particular uses, while potentially maintaining large yields and improve soybean marketability for producers. The potential necessity of non-nodulating soybeans to require large fertilizer-N additions could potentially result in greater gaseous-C and particularly -N losses, resulting in a possible decrease in soil health and soil fertility over time. Assessing C and N dynamics through the soil-plant-atmosphere continuum will help evaluate the agronomic and environmental sustainability of non-nodulating soybean genotypes.

Budget Justifications/Explanation of Travel and Direct Costs: Funds will be directed to support ~ 25% time of a post-doctoral associate to conduct the field measurements and soil and plant sampling in the field and for domestic travel to and from the research site, hotel rooms and meals for the research teams when required, and for chemical analyses for soil and plant samples.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Brye, Kristofor — *Quantifying potential gaseous N losses and soil health impliations from non-nodulating soybean*

Year	2026/2027	**Project Year**	New, Year 1 of 1
Lead Investigator	Brye, Kristofor	**Co-PI #1**	Vieira, Caio
Co-PI #2	Della Lunga, Diego	**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Quantifying potential gaseous N losses and soil health impliations from non-nodulating soybean		

Version: 8.0 (09/22/2025)

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Brye, Kristofor	Vieira, Caio	Della Lunga, Diego		Total Board Funding Requested	AES Portion	CES Portion
	Select "AES" or "CES" for each PI	AES	AES	AES	CES			
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
postdoctoral associat	Diego Della Lunga	25%			$15,000		$15,000	$15,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$0	$0	$15,000	$0	$15,000	$15,000	$0
	Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information						$0	$0	$0
	Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0
			Hourly						
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel						$0	$0	$0
	Hourly-Students						$0	$0	$0
	Subtotal: Hourly		$0	$0	$0	$0	$0	$0	$0
			Fringe Benefits						
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$0	$0	$4,140	$0	$4,140	$4,140	$0
	Graduate Students		$0	$0	$0	$0	$0	$0	$0
	Hourly Personnel		$0	$0	$0	$0	$0	$0	$0
	Hourly-Students		$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits		$0	$0	$4,140	$0	$4,140	$4,140	$0
	Personnel Total		$0	$0	$19,140	$0	$19,140	$19,140	$0
			Travel						
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State		$9,600				$9,600	$9,600	$0
	Out-of-State						$0	$0	$0
	Travel Total		$9,600	$0	$0	$0	$9,600	$9,600	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Brye, Kristofor *Quantifying potential gaseous N losses and soil health impliations from non-nodulating soybean*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$2,500	$2,000			$4,500	$4,500	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication	$1,500				$1,500	$1,500	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	soil, plant, seed analyses	$3,500				$3,500	$3,500	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$7,500	$2,000	$0	$0	$9,500	$9,500	$0
	Total for Proposal	$17,100	$2,000	$19,140	$0	$38,240	$38,240	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

2 - RI-21

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Temporary flooding effects on soil respiration in tolerant and susceptible soybean varieties in the greenhouse

Project Type:
Research

Name of Project Manager:
Kris Brye

Name of Project Team Member 1:
Caio Vieira

Name of Project Team Member 2:
Diago Della Lungo

Statement of Justification or Purpose of the Project (75 word maximum):
Biotic and abiotic stresses threaten the multi-billion-dollar US soybean industry, with flooding ranked as the second largest cause of economic loss in agricultural fields. In the Mid-Southern US, flooding risks are greater during the early part of the growing season. The recent development of soybean varieties that are tolerant to flooding at the early vegetative stages can greatly enhance soybean marketability in Arkansas and beyond.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
The proposed greenhouse project will: i) quantify and compare biogeochemical processes during temporary, early season flooding associated with flood-tolerant, flood-sensitive soybean varieties, and bare soil, ii) quantify above- and below-ground plant nutrient uptake, and iii) identify management guidelines to enhance market profitability for temporary, early season flooding
in soybean production systems in the Mid-Southern US.

BUDGET

Amount of Funding Needed for Project:
$40,000.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Temporary flooding effects on soil respiration in tolerant and susceptible soybean varieties in the greenhouse

Lead Investigators: Dr. Kristofor Brye (CSES)

Co-Investigators: Dr. Diego Della Lunga (CSES), Dr. Caio Vieira (CSES)

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): New (Year 1 of 1)

Research Areas: Agronomy/Alternative, Water Management, and Breeding

Stated Goal: United States (US) soybean production accounts for more than 30% of the global soybean production. However, biotic and abiotic stresses threaten the multi-billion US soybean industry, with flooding ranked as the second largest cause of economic loss in agricultural fields. In the Mid-Southern US, flooding risks are greater during the early part of the growing season. In Arkansas, the flood during Spring 2025 alone caused crop-related damages at an estimated cost of $79 million for the agricultural sector. Soybean plants are susceptible to flood-induced damages, specifically at the early vegetative stages, making Arkansas' soybean industry particularly susceptible to flood-related damages. Flood-induced plant damage has been correlated to a reduction in photosynthesis, N fixation, mineral element accumulations, and C assimilation. The recent development of soybean varieties that are tolerant to flooding at the early vegetative stages can greatly enhance soybean marketability in Arkansas and beyond. However, assessments of biogeochemical processes associated with flood-tolerant soybean varieties have not been evaluated yet. Biogeochemical processes are difficult to assess within the soil-plant-atmosphere continuum, but can be studied through the evaluation of soil respiration and nitrification-denitrification processes. Consequently, biogeochemical processes can be quantified measuring carbon dioxide (CO_2) release under aerobic conditions, as plant roots function normally in the presence of adequate oxygen, while methane (CH_4) and nitrous oxide (N_2O) release under anaerobic and predominantly anaerobic condition, respectively, are indicative of stress due to water-logging. Biogeochemical processes partitioned between soil and plant-mediated processes provide accurate assessment of soil and plant response to aerobic and anaerobic conditions. Therefore, the objective of this study is to evaluate the effects of flooding on biogeochemical processes on flood-tolerant and susceptible soybean varieties during early vegetative growth, and bare soil in the greenhouse.

Specific Objectives: The proposed greenhouse project will address the following specific objectives: i) quantify and compare biogeochemical processes during temporary, early season flooding associated with flood-tolerant, flood-sensitive soybean varieties, and bare soil, ii) quantify above- and belowground plant nutrient uptake, and iii) identify management guidelines to enhance market profitability for temporary, early season flooding in soybean production systems in the Mid-Southern US.

Methods: The proposed study will be conducted in rectangular plastic tubs in a greenhouse space in Fayetteville, AR based on procedures used in the past four years to successfully grow rice in a greenhouse setting. Soil will be collected from a field at the Rohwer Research Station within the Mississippi River Valley from a field classified as Herbert silt loam and transported back to Fayetteville for air-drying, sieving, and physical and chemical characterization prior to preparing tubs for the greenhouse experiment. Initial soil samples will be oven-dried, crushed, and sieved and will be analyzed for Mehlich-3 extractable soil nutrients (i.e., P, K, Ca, Mg, Na, S, Fe, Mn, Zn, and Cu), soil pH and electrical conductivity (EC), and soil organic matter and total carbon and N concentrations. Soil physical and chemical properties will be also analyzed at the end of the experiment on a tub-by-tub basis. Twelve tubs will be arranged on the same bench in the greenhouse in a completely randomized design. Treatments will include: i) flood-

tolerant soybean variety R19C-1035 or R21KB-05522, released as a flooding-tolerant, high-yielding soybean germplasm line by the Arkansas Agricultural Experiment Station, ii) flood-sensitive soybean variety S99-2281 or a similar recombinant inbred line (e.g., R23PR-00068E), and iii) bare soil. The three treatments will be replicated three times. Both soybean varieties will be seeded in three tubs each, at the recommended rate for a total of 15 seeds per tub divided into three rows, with five seeds in each row. Across soybean-planted treatments and replications, collars will contain an equal number of plants during the growing season. A flood will be established at the V2 stage, approximately 15-20 days after planting, to a depth of at least 4 in (10 cm) in all 12 tubs. Flood water will be maintained for 7 days to simulate flash floods typically occurring in the Mid-Southern US and to mimic Dr Vieira's field evaluations of flood tolerance. After 7 days, the flood will be removed, and plants will be allowed to recover for an additional 7 days. All the tubs will receive the same amount of fertilizer nutrients (i.e., P, K, and Zn as-needed) during the entire period of study according to soil-test recommendations. Carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) will be measured twice a week from planting until the V2 stage and every other day during the 7 days of flood and during the 7 days following flood release. Gas-sampling base collars, 30 cm in diameter, will be installed right before planting in each tub. Small holes drilled through the bottoms of the base collars will allow free exchange of water between outside and inside of the collars. Gas samples will be collected at 0, 30 and 60 minutes on each sampling date after capping the base collar and will be analyzed by gas chromatography. After the 7-day post-flood-release, recovery period, plant damage will be rated on a tub-by-tub basis using a visual scale 1 to 5, where a score of 1 will represent ≤ 10% of plants exhibiting symptoms of flooding-related damage and a score of 5 will represent > 60% of plants exhibiting symptoms of flooding-related damage. Above- and belowground plant biomass inside the collars will be collected after the 7-day recovery period and after the visual damage ratings, oven-dried at 55°C for at least 5 days, and weighed to determine above- and belowground dry matter. A subsample of aboveground and root vegetative dry matter will be mechanically pulverized, sieved through a 1-mm mesh, and analyzed for total C and N and for total elemental concentrations (i.e., P, K, Ca, Mg, Na, S, Fe, Mn, Zn, and Cu). Soil and above- and belowground plant nutrient uptakes will be determined. The entire experiment will be replicated a second time to confirm results.

Planned Milestones: The initial milestone will be the direct quantification of C and N gas losses from flood-tolerant and flood-sensitive soybeans. A subsequent milestone will be the ability to assess management practices in relation to plant nutrient uptakes and soil respiration processes. The ultimate milestone will be to improve the long-term outlook, marketability, and environmental sustainability of Arkansas-grown soybeans with credible, reliable, and replicated research.

Value to Soybean Industry: The frequency of extreme precipitation in the Mid-Southern US is increasing, posing a large risk to early season soybean growth, especially considering the increasingly adopted early planting schedule designed to avoid prolonged drought periods later in the summer growing season. Furthermore, many producers who rotate soybean with rice rely on zero-grade fields. Thus, flooding is a recurrent stress in Arkansas and more data and knowledge are needed for how to best manage flood stress. The development of flood-tolerant soybean varieties can reduce agronomic losses caused by temporary, early season flooding events, but the ability and rate at which plant can recover after a flood dissipates needs to be evaluated through the plant's ability to recover their metabolic processes. Data analyses will help identify potential mitigation strategies temporary, early season flooding and to reduce the impacts of climate change on soybean production. The approach for this study will provide the agricultural and scientific communities innovative results to align economic, agronomic, and environmental aspects towards more resilient soybean production in Arkansas and beyond.

Budget Justifications/Explanation of Travel and Direct Costs: Funds will be directed to support ~ 20% time for a post-doctoral associate to conduct the greenhouse experiment; supplies to conduct the proposed study; soil, plant, and gas samples; and in-state travel to collect soil to be used in the study tubs.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Brye, Kristofor — *Temporary flooding effects on soil respiration in tolerant and susceptible soybean varieties in the greenhouse*

Year	2026/2027	**Project Year**	New, Year 1 of 1	**Version: 8.0 (09/22/2025)**
Lead Investigator	Brye, Kristofor	**Co-PI #1**	Della Lunga, Diego	
Co-PI #2	Vieira, Caio	**Co-PI #3**		
Department	CSES Crop, Soil, Environmental Science			
Commodity Board	Soybean Promotion Board			
Project Title	Temporary flooding effects on soil respiration in tolerant and susceptible soybean varieties in the greenhouse			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Brye, Kristofor	Della Lunga, Diego	Vieira, Caio		Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI		AES	AES	AES	CES			
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**			**Total**	**AES**	**CES**
postdoctoral associat	Diego Della Lunga	20%		$12,000			$12,000	$12,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$0	$12,000	$0	$0	$12,000	$12,000	$0
Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**			**Total**	**AES Portion**	**CES Portion**
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
	Tuition Calculator Information					$0	$0	$0
	Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0
Hourly								
			Wages			**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel						$0	$0	$0
	Hourly-Students						$0	$0	$0
	Subtotal: Hourly		$0	$0	$0	$0	$0	$0	$0
Fringe Benefits								
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**			**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$0	$3,312	$0	$0	$3,312	$3,312	$0
	Graduate Students		$0	$0	$0	$0	$0	$0	$0
	Hourly Personnel		$0	$0	$0	$0	$0	$0	$0
	Hourly-Students		$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits		$0	$3,312	$0	$0	$3,312	$3,312	$0
	Personnel Total		$0	$15,312	$0	$0	$15,312	$15,312	$0
Travel								
Justify out-of-state travel in proposal.			**Travel**			**Total**	**AES Portion**	**CES Portion**
	In-State		$2,000				$2,000	$2,000	$0
	Out-of-State						$0	$0	$0
	Travel Total		$2,000	$0	$0	$0	$2,000	$2,000	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Brye, Kristofor *Temporary flooding effects on soil respiration in tolerant and susceptible soybean varieties in the greenhouse*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$3,428		$4,000		$7,428	$7,428	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Gas, soil and plant anlysis	$13,820				$13,820	$13,820	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$1,440	$0	$0	$0	$1,440	$1,440	$0
	M & O Total	$18,688	$0	$4,000	$0	$22,688	$22,688	$0
	Total for Proposal	$20,688	$15,312	$4,000	$0	$40,000	$40,000	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

3 - RI-22

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Soybean potential yield map and yield gap analysis for Arkansas

Project Type:
Research

Name of Project Manager:
Elvis Elli

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
While soybean yields in Arkansas have increased over the past few decades, many farmers achieve yields that are well below what is biologically attainable. This project will quantify soybean potential yield across Arkansas and identify the primary causes of yield gaps. This will help farmers understand the attainable yield for their fields, identify the primary drivers of yield loss, and focus investments on the most important factors.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Field trials conducted under near-optimal conditions, combined with literature data, will be used to test a crop growth model that predicts potential yields across Arkansas. Historical yield data from the USDA-NASS, yield contest data, and farm surveys will be used to identify yield gaps and their primary causes across various environments in Arkansas

BUDGET

Amount of Funding Needed for Project:
$54,255.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: ***Soybean potential yield map and yield gap analysis for Arkansas***

Lead Investigators: Elvis Elli

Co-Investigators: Jeremy Ross

Status and Duration of Funding: New, Year 1 of 3

Research Areas: Agronomy

Stated Goal: Soybean yields in Arkansas have increased significantly due to genetic improvements and advances in agronomic management. Yet, realized farm yields generally remain well below what is biologically attainable for a given environment (Grassini et al., 2015). This demonstrates the existence of yield gaps. Identifying where yield is limited and why is key to improving profitability and sustainability in Arkansas soybean production. The essential first step in quantifying yield gaps is to properly estimate potential (maximum) yield across environments. However, this information is currently lacking. The overall goal of this project is to quantify soybean potential yield across Arkansas using field experimentation, farm surveys, and crop modeling, and subsequently identify the primary causes of yield gaps in Arkansas.

Specific Objectives:

1) Create a soybean potential yield map for Arkansas at a fine resolution

2) Quantify the yield gaps and their major causes and identify strategies to close the gaps.

Methods:

Objective 1) Soybean potential yield will be estimated using a crop growth model well calibrated for the region. Model inputs include weather, soil, agronomic management practices, and variety information, while outputs comprise daily crop growth rates and final yields. We will utilize crop growth data from irrigated and rainfed trials conducted over the past two years, new data from experiments under near-optimal conditions, and data from the literature to calibrate the crop growth model to properly estimate potential yields. Weather data will be retrieved from the University of Arkansas System Division of Agriculture (UADA) and NOAA weather stations, while soil profile information will be derived from SSURGO (Soil Survey Staff, 2023). We will estimate potential yields across ~4700 fields in Arkansas. We will use the Cropland Data Layer (CDL) to define the simulation fields and consider only soybean pixels, which will be resampled to a 2.5 km grid (~0.025°) and clipped to the state boundary. PI Elli will lead this objective.

Objective 2) Historical yield data from the U.S. Department of Agriculture – National Agricultural Statistics Service (NASS, 2025), yield contest data, and farm surveys under the guidance of Co-PI Ross will be used to quantify yield gaps, determine their major causes, and identify strategies to close them. The potential yield will be estimated as the yield of a well-adapted variety when grown with non-limited water and nutrients, and in the absence of biotic stresses (Grassini et al., 2015). Yield gaps will be

calculated as the difference between the potential yield obtained from modeling and the actual yield obtained at the farm level. Actual yields will be evaluated in relation to applied inputs and agronomic management information to identify the most likely causes of yield gaps.

Planned Milestones:

Year 1: Field data collection and literature review of potential soybean yields for crop model testing. Weather data will be retrieved and organized for use in modeling from publicly available weather stations across Arkansas. Soil profile information will be retrieved at a 2.5 km grid resolution across the state from SSURGO (Soil Survey Staff, 2023) and organized for model input. A preliminary statewide soybean yield potential map will be created.

Year 2: Refinement of potential yield simulation across Arkansas using the crop growth model. The field experiment for potential yield will be repeated, and new data will be collected and further used for model testing. Compilation of yield contest data, USDA-NASS historical yield data, and yield gap surveys (yield levels, applied inputs, and management factors) across different locations. Preliminary yield gap analysis will be conducted.

Year 3: Final potential yield maps and yield gap analysis completed. Identification of major yield gap causes across various environments and development of strategies to close them. Synthesis of results in educational and extension materials. Results will be presented to stakeholders and prepared for publication in peer-reviewed journals.

Value to the Soybean Industry: As many Arkansas farmers look for ways to reduce input costs in soybean production while maintaining economic returns, identifying the primary drivers of yield loss can help focus investments on the most limiting factors. Arkansas soybean producers face increasing uncertainty from weather variability, rising input costs, and tight profit margins. This project helps producers understand the yield attainable within their specific environments and the reasons yields may fall short under current management practices. This information can be used to prioritize investments in the factors that most strongly limit yield. The yield potential maps and yield gap diagnostics developed through this work will serve as practical extension and educational materials to understand the maximum soybean yield across various environments and identify strategies that support the sustainability and competitiveness of the Arkansas and US soybean value chains.

Budget Justifications/Explanation of Travel and Direct Costs ($54,255):

Funds are requested for 100% support of a PhD student assigned to this project ($30,000 base, $8,000 tuition, $1920 benefits). We request $5,340 for hourly personnel to assist with data collection and compilation ($5,000 base, $340 benefits). In-state travel funds ($3,500) are requested for in-season experimental data collection. Out-of-state travel funds ($2,500) are requested to present research findings at the 2026 Tri-society Agronomy conference. Supply expenses ($2,000) are requested for lab and field supplies (e.g., bags, stakes). A total of $995 is requested for research station maintenance for the experimental site.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Elli, Elvis — *Soybean potential yield map and yield gap analysis for Arkansas*

Year	2026/2027	**Project Year**	
Lead Investigator	Elli, Elvis	**Co-PI #1**	Ross, Jeremy
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Soybean potential yield map and yield gap analysis for Arkansas		

Version: 8.0 (09/22/2025)

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Elli, Elvis	**Ross, Jeremy**				
		Select "AES" or "CES" for each PI	AES	CES	CES	CES	**Total Board Funding Requested**	**AES Portion**	**CES Portion**
		Fulltime Personnel							
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$0	$0	$0	$0	$0	$0	$0
		Graduate Student							
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
		100%	$30,000				$30,000	$30,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information		$8,000				$8,000	$8,000	$0
	Subtotal: Graduate Student		$38,000	$0	$0	$0	$38,000	$38,000	$0
		Hourly							
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel		$5,000				$5,000	$5,000	$0
	Hourly-Students						$0	$0	$0
	Subtotal: Hourly		$5,000	$0	$0	$0	$5,000	$5,000	$0
		Fringe Benefits							
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$0	$0	$0	$0	$0	$0	$0
	Graduate Students		$1,920	$0	$0	$0	$1,920	$1,920	$0
	Hourly Personnel		$340	$0	$0	$0	$340	$340	$0
	Hourly-Students		$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits		$2,260	$0	$0	$0	$2,260	$2,260	$0
	Personnel Total		$45,260	$0	$0	$0	$45,260	$45,260	$0
		Travel							
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State		$3,500				$3,500	$3,500	$0
	Out-of-State		$2,500				$2,500	$2,500	$0
	Travel Total		$6,000	$0	$0	$0	$6,000	$6,000	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Elli, Elvis *Soybean potential yield map and yield gap analysis for Arkansas*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$2,000				$2,000	$2,000	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$995	$0	$0	$0	$995	$995	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$2,995	$0	$0	$0	$2,995	$2,995	$0
	Total for Proposal	$54,255	$0	$0	$0	$54,255	$54,255	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

4 - RI-23

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Insect frass for plant growth promotion and enhanced soybean yields

Project Type:
Research

Name of Project Manager:
Gerson Drescher

Name of Project Team Member 1:
Mark McDonald

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Large amounts of insect manure “frass” are being produced in Tyson’s rearing facilities, but it is currently wasted as its benefits to Arkansas soybean production systems are completely unknown. Research is needed to assess frass impacts on soil health, N fixation, plant nutrition, and crop yields. Data from this project will support the inclusion of frass into current fertilization programs, reducing costs and improving yields for growers.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Field trials at the SAREC (Fayetteville) and PTST (Colt) research stations will test frass impacts in the soil-microbe-plant nexus in soybean production systems. Changes in soil nutrients, microbiome, plant nutrient removal (leaf and grain), leaf damage, and yields will be quantified for 3 years and showcased in field days. Project outcomes include annual reports, 2 peer-reviewed publications, and best frass rates for soybean production systems counting using the ground-based rover for automated plot-level phenotyping.

BUDGET

Amount of Funding Needed for Project:
$44,829.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Insect Frass for Plant Growth Promotion and Enhanced Soybean Yields

Lead Investigators: Dr. Gerson Drescher

Co-Investigators: Helen Amorim, Amanda Ashworth (USDA ARS), Trenton Roberts, Mark McDonald, Prashasti Agarwal

Status and Duration of Funding: New, Year 1 of 3

Research Areas: Agronomy, Alternative, Fertility

Stated Goal: The goal of this project is to evaluate insect frass (a by-product of Tyson Foods' insect rearing facilities) as a soybean fertilizer and plant growth-promoting input, supporting the development of practical recommendations for regionally available manures, enhancing plant protection and crop yields. Frass has an average N-P-K composition of 4-2-2, with no heavy metals and fewer pathogens compared to poultry litter[1,2]. Frass can stimulate plant growth-promoting rhizobacteria (PGPR) activity, enhance biological N fixation, and reduce pest pressure[2] owing to the presence of chitin. In addition, frass has lower moisture content and bulk density, which facilitates transportation and field application for on-farm use in soybean-producing regions. More information: https://www.thefrassinstitute.org/frass-101

[1] Amorim, H.C.S. et al. (2024). Insect frass composition and potential use as an organic fertilizer in circular economies, Journal of Economic Entomology, 117, 1261–1268.

[2] Amorim, H.C.S. et al. (2025). Recycling waste via insect agriculture: Frass impacts on soil and plant health. Journal of Environmental Quality, 54, 1457–1469.

Specific Objectives:

1. Establish field trials to evaluate the impacts of increasing frass rates (0, 2.5, 5, 10, and 25% chitin) as a soybean fertilizer complement to enhance soil health, plant growth, and grain yields.
2. Assess soil nutrients, soil microbiome, plant nutritional status, leaf damage, nutrient use efficiency, and grain yields as affected by frass inclusion in soybean fertilization.
3. Develop recommendations to integrate insect frass into soybean production systems, complementing conventional fertilization and improving long-term soil health and productivity.

Methods:

1. Field experiments will be established at the Milo J. Shult Agricultural Research & Extension Center in Fayetteville and at the Pine Tree Research Station, near Colt, on silt-loam soils with below optimum soil-test P and K. Five treatments will be established in a randomized block design with four replicates, totaling 20 plots. Treatments will be frass application rates to supply 0, 2.5, 5, 10, and 25% chitin. Black soldier fly frass provided by Tyson Foods will be physio-chemically characterized prior to field application. Fertilizer recommendation will be based on soil test values, and P and K supplied via frass will be deducted from corresponding synthetic fertilizer inputs. Plots will be 4 rows wide (30- or 36-in. raised beds) and 30 ft long. Soybean will be planted late April at a seeding rate of 150,000 seeds/ac. Frass will be applied before planting and incorporated into the raised bed. All crop management practices (*e.g.,* weeds, pests, diseases, and irrigation) will follow the UADA recommendations.
2. Preplant and post-harvest soil samples (0-6 in) will be collected from each plot and analyzed for pH, electrical conductivity, soil organic matter, and Mehlich-3 extractable metals at the Marianna

Soil Test Laboratory. Rhizosphere soil and root samples will be collected between R2 and R5 to capture peak nodulation and activity and associated rhizosphere organisms. Samples will be stored at -20-80°C prior to DNA extraction and qPCR analyses in-house. Soil microbiome analyses (DNA sequencing) will be conducted by a commercial lab. Pest damage in soybean leaves will be measured 30, 60, and 90 days after frass application using the LeafByte® app. Leaf samples will be collected at the R2 stage for nutrient (N, P, and K) analysis. At maturity, the two middle rows will be harvested with a small plot combine for yield measurement, and grain moisture content (%) and biomass will be determined in the field. Then, grain subsamples will be collected and taken to the lab, dried, and ground for further nutritional value analyses. Total C, N, P, K, Ca, S, Mg, and micronutrient concentration in soybeans will be quantified. Nutrient-use efficiency will be calculated as yields divided by applied nutrient content.

3. ANOVA followed by mean separation will assess the effects of frass application rates on soil fertility, soil microbiome, leaf damage, grain yield, nutritional value, and nutrient-use efficiency over 3 cropping seasons. Bioinformatic analysis of microbial DNA sequences will be conducted in-house according to established protocols. This project will generate data to support the use of insect frass as a value-added plant growth promoter and waste management solution for Arkansas industries. Research plots will be strategically positioned to provide an opportunity for demonstrations at UADA field days (*e.g.,* Pine Tree Field Day).

Planned Milestones: Progress reports will provide updates on the status of the project. At the end of year 3, data generated will include: frass characterization, soil baseline data and post-harvest soil physicochemical characterization, soil microbiome changes, 30-, 60-, and 90-day leaf damage, biomass and grain yields, and plant nutrient removal. Data from the 3-year research will be analyzed and summarized in the annual publication of the Arkansas Soybean Research Studies and in a peer-reviewed publication. Data from this project will be used to provide practical recommendations for including insect frass as soil improver and plant growth promoter in soybean production systems. Additionally, we will demonstrate the production and environmental benefits of frass for soil health and soybean production during UADA field days and workshops.

Value to Soybean Industry: This project builds on the PI's prior funding from SSARE and collaboration with Tyson Foods, showcasing insect frass as an effective amendment for organic production systems and as a complement to synthetic N-P-K in soybeans and edamame. Preliminary results showed frass (2.4 t ha^{-1}) increased edamame yields by 41-56% relative to NPK at equivalent rates, suggesting frass benefits go beyond nutrient supply. Frass from Tyson's insect rearing operations is currently being wasted or landfilled, and it can serve as a low-cost (or no-cost) plant growth promoter for soybean production in Arkansas. Frass could help reduce costs with fertilizers, improve early-season vigor, nutrient use efficiency, and drought tolerance, lately improving grower's profitability. This work will pave the way for other agronomic and environmental uses of frass, such as the recuperation of soil organic matter in land-leveled fields, degraded soils, marginal lands, and peri-urban areas. Ultimately, this work will strengthen the UADA's leadership in fertilizer innovation and the continued development of sustainable and economically viable solutions for Arkansas soybean producers.

Budget Justifications/Explanation of Travel and Direct Costs: The out-of-state travel budget will support co-PIs participation in the ASA-CSSA-SSSA Annual Meeting in Portland, OR, in November 2026 to present project results and attend additional professional development activities. In-state travel and salary are allocated to support field data collection and data analysis. Supplies and other direct costs are budgeted for soil, plant tissue, and microbiome analyses (~ $70-90/sample). Station maintenance expenses are related to plot fees and crop management for the Fayetteville and Pine Tree trials.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Drescher, Gerson *Insect Frass for Plant Growth Promotion and Enhanced Soybean Yields*

Year	2026/2027	**Project Year**	
Lead Investigator	Drescher, Gerson	**Co-PI #1**	Amorim, Helen
Co-PI #2	McDonald, Mark	**Co-PI #3**	Roberts, Trenton
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Insect Frass for Plant Growth Promotion and Enhanced Soybean Yields		

Version: 8.0 (09/22/2025)

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Drescher, Gerson	Amorim, Helen	McDonald, Mark	Roberts, Trenton	Total Board Funding Requested	AES Portion	CES Portion
	Select "AES" or "CES" for each PI	AES	AES	AES	AES			
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Research Scientist	Helen Amorim	20%	$14,400				$14,400	$14,400	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$14,400	$0	$0	$0	$14,400	$14,400	$0
	Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
	PhD student (Babita)	17%			$5,270		$5,270	$5,270	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information				$1,155		$1,155	$1,155	$0
	Subtotal: Graduate Student		$0	$0	$6,425	$0	$6,425	$6,425	$0
	Hourly								
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel						$0	$0	$0
	Hourly-Students		$2,000				$2,000	$2,000	$0
	Subtotal: Hourly		$2,000	$0	$0	$0	$2,000	$2,000	$0
	Fringe Benefits								
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$3,974	$0	$0	$0	$3,974	$3,974	$0
	Graduate Students		$0	$0	$337	$0	$337	$337	$0
	Hourly Personnel		$0	$0	$0	$0	$0	$0	$0
	Hourly-Students		$2	$0	$0	$0	$2	$2	$0
	Subtotal: Fringe Benefits		$3,976	$0	$337	$0	$4,314	$4,314	$0
	Personnel Total		$20,376	$0	$6,762	$0	$27,139	$27,139	$0
	Travel								
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State		$2,000				$2,000	$2,000	$0
	Out-of-State		$2,500				$2,500	$2,500	$0
	Travel Total		$4,500	$0	$0	$0	$4,500	$4,500	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Drescher, Gerson *Insect Frass for Plant Growth Promotion and Enhanced Soybean Yields*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$3,000		$1,100		$4,100	$4,100	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Soil, Plant, Microbial analysis	$6,000		$1,500		$7,500	$7,500	$0
Station Maintenance	SAREC, Fayetteville	$820	$0	$0	$0	$820	$820	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$770	$0	$0	$0	$770	$770	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$10,590	$0	$2,600	$0	$13,190	$13,190	$0
	Total for Proposal	$35,466	$0	$9,362	$0	$44,829	$44,829	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

5 - RI-24

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Role of the soil microbiome in conferring flooding tolerance in soybean

Project Type:
Research

Name of Project Manager:
Mark McDonald

Name of Project Team Member 1:
Elvis Elli

Name of Project Team Member 2:
Caio Vieira

Statement of Justification or Purpose of the Project (75 word maximum):
The purpose of this work is two-fold: 1) to understand whether the soil microbiome contributes to conferring tolerance to flooding in flood-tolerant varieties developed at the University of Arkansas; 2) to determine how the soil microbiome contributes to flood tolerance.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
This project will take place in active variety testing fields in Stuttgart, AR. Soil samples will be collected pre-flood, twice during flooding (initial plant stress and recovery), and post-flood to evaluate recovery. Soil samples will be used to evaluate changes in the microbiome. Other data will include plant growth and nutrition, and plant health (remote sensing).

BUDGET

Amount of Funding Needed for Project:
$74,712.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Role of the soil microbiome in conferring flooding tolerance in soybean

Lead Investigators: Mark McDonald
Co-Investigators: Elvis Elli, Caio Vieria

Status and Duration of Funding: New, Year 1 of 2

Research Area: Agronomy/Alternative

Stated Goal: The overall goal of this research project is to determine whether flood-tolerant soybean varieties have different soil microbial partners, and whether these partners help confer tolerance and/or improved recovery from flooding compared to non-tolerant varieties. Soil microorganisms have been shown to aid plant stress resilience including against abiotic stressors like flooding. Understanding the relationship between plant genetics and the microbiome will aid improvement of crop genetics and potentially introduce new avenues for management to recover from conditions such as flooding.

Specific Objectives:

1. Investigate the relationship between soil microbial communities and function and crop recovery from flooding stress to determine whether tolerant varieties' recovery is enhanced by specific microbial partners compared to non-tolerant varieties.

Methods:

The proposed work will be conducted within active flooding-tolerance (vegetative stage) variety trials at the Rice Research & Extension Center (RREC) in Stuttgart, AR, under the direction of Dr. Vieira. Two varieties will be assessed in this research, a non-tolerant variety (R23PR-00068) and a flood-tolerant variety (R21KB-05522) developed by Dr. Vieira at the University of Arkansas. The field will be managed under the guidance of Dr. Vieira and Dr. Elli.

Samples will be collected at four time periods surrounding flooding treatments implemented during the vegetative stage and non-flood control treatments: 1) pre-flooding; 2) flooding (2 days); 3) flooding (4-days); 4) post-flood (7-days). These sampling times will allow us to track shifts in the microbial community in relation to known patterns of crop recovery from flooding. Plant samples will be collected at the pre-flood and post-flood timepoints to evaluate changes to plant nutrition. Plant growth data (i.e., photosynthetic activity, NDVI spectra) will be collected at each timepoint to relate plant health to the function of soil microbes. Data will be collected by the graduate student funded by the project and hourly employees under Dr. McDonald, as well as program associates under Drs. Elli and Vieira.

Soil samples will be collected using sterile techniques, stored on ice, and transported to the Arkansas Soil Microbiology Laboratory (ASMBL) directed by Dr. McDonald. Samples will be processed prior to subsampling for downstream biological and soil nutrient analyses. DNA and RNA will be extracted according to ASMBL protocol and sequencing will be conducted at an outside facility to be chosen based on pricing and data quality. DNA sequencing will be conducted at the first and last timepoints to determine shifts in microbial composition following flooding compared to non-flooded soybeans. RNA sequencing will be conducted at each timepoint for the flooded treatment, and the first and last timepoint for the non-flooded, to determine what functions the microbial community has activated in response to flood. Soil data (nutrient analyses, OM, etc.) will be collected at the first and last timepoints to provide important

context to the functions exhibited by the soil microbiome and provide a more complete understanding of the plant-soil-microbe relationship when evaluating the impact of flood.

Planned Milestones:

Study Objectives and Benchmarks	Year 1 (2026)				Year 2 (2027)				Post Project
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	
Graduate Student Hired	X	X							
Objective 1									
Soil Sampling	X	X			X	X			
Plant Sampling	X	X			X	X			
Soil and plant analyses			X	X	X	X	X	X	
Dissemination of results									
Presentation of results			X	X			X	X	X
Publication of work									X

Value to Soybean Industry: As weather events continue to impact Arkansas Soybean Producers, it is important to have as much information as possible to determine how to manage productions systems to be resilient to these abiotic stressors. By understanding the role of the microbiome in conferring recovery to flooding, we can better understand how tolerance can be generated through both plant genetics and soil management. This preliminary study will establish the relationship between crop genetics and the soil microbiome in Arkansas and will enable improved evaluation and development of soybean genetics to take advantage of the plant's "second genome". Further, study results are likely to highlight key microorganisms and/or functions associated with improved recovery from flooding. By determining these key factors, we can develop better management practices that enhance, or introduce, these biological aspects and potentially improve and/or impart tolerance in both tolerant and non-tolerant varieties.

Budget Justifications/Explanation of Travel and Direct Costs: Personnel funding will include 50% of the cost of a master's student salary and tuition under Dr. McDonald, 12% of program associate salary under Dr. Elli to facilitate plant data collection, and 20% of program associate salary under Dr. Vieira to facilitate project implementation and collection of spectral data. The graduate student will be responsible for the collection of soil and plant samples, conducting in-house analyses at the ASMBL, presenting the work at meetings, and writing up the data and interpretation in their thesis and peer-reviewed publication. In-state travel funding is included to cover the cost of visiting the site location at each sampling timepoint and to present the work at local meetings. Out-of-state travel will cover a portion of the graduate student's attendance at the CANVAS (crop, soil, agronomy) meeting in Portland, OR to present their research. Supplies purchased will include the laboratory supplies necessary to complete the DNA and RNA extraction work, enzyme assays, soil preparation, and other materials as necessary to complete the work described above. Other costs include the cost of sequencing analyses based on quotes from sequencing cores and service providers, as well as the cost of soil and plant nutrient analyses based on pricing at the UADA Fayetteville Agriculture Diagnostic Laboratory. The flood-tolerant variety assessment is an active study in Dr. Vieira's research program, and thus, no budget is allocated for field maintenance.

University of Arkansas System Division of Agriculture

Promotion Board Budget

McDonald, Mark *Role of the soil microbiome in conferring flooding tolerance in soybean*

Year	2026/2027	**Project Year**	New, Year 1 of 2	**Version: 8.0 (09/22/2025)**
Lead Investigator	McDonald, Mark	**Co-PI #1**	Elli, Elvis	
Co-PI #2	Vieira, Caio	**Co-PI #3**		
Department	CSES Crop, Soil, Environmental Science			
Commodity Board	Soybean Promotion Board			
Project Title	Role of the soil microbiome in conferring flooding tolerance in soybean			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		McDonald, Mark	Elli, Elvis	Vieira, Caio		Total Board Funding Requested	AES Portion	CES Portion
	Select "AES" or "CES" for each PI	AES	AES	CES	CES			
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Program associate		12%		$7,500			$7,500	$7,500	$0
Program associate		20%			$12,500		$12,500	$0	$12,500
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$0	$7,500	$12,500	$0	$20,000	$7,500	$12,500
	Graduate Student							
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
		50%	$15,500				$15,500	$15,500	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information		$4,250				$4,250	$4,250	$0
	Subtotal: Graduate Student		$19,750	$0	$0	$0	$19,750	$19,750	$0
	Hourly							
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel						$0	$0	$0
	Hourly-Students						$0	$0	$0
	Subtotal: Hourly		$0	$0	$0	$0	$0	$0	$0
	Fringe Benefits							
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$0	$2,070	$3,450	$0	$5,520	$2,070	$3,450
	Graduate Students		$992	$0	$0	$0	$992	$992	$0
	Hourly Personnel		$0	$0	$0	$0	$0	$0	$0
	Hourly-Students		$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits		$992	$2,070	$3,450	$0	$6,512	$3,062	$3,450
	Personnel Total		$20,742	$9,570	$15,950	$0	$46,262	$30,312	$15,950
	Travel							
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State		$1,500	$1,500			$3,000	$3,000	$0
	Out-of-State		$2,000	$2,000			$4,000	$4,000	$0
	Travel Total		$3,500	$3,500	$0	$0	$7,000	$7,000	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

McDonald, Mark *Role of the soil microbiome in conferring flooding tolerance in soybean*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$4,000	$3,000			$7,000	$7,000	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	sequencing, soil, plant analysis	$14,450				$14,450	$14,450	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$18,450	$3,000	$0	$0	$21,450	$21,450	$0
	Total for Proposal	$42,692	$16,070	$15,950	$0	$74,712	$58,762	$15,950

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

6 - RI-25

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Establishing a long-term rotational study

Project Type:
Research

Name of Project Manager:
Justin Chlapecka

Name of Project Team Member 1:
Ana Ona

Name of Project Team Member 2:
Kristina Ala-kokko

Statement of Justification or Purpose of the Project (75 word maximum):
The overarching goal of this study is to establish a long-term rotational study to define the impacts of crop rotation in a soybean, rice, and corn production area. While the short-term effects of crop rotation in soybean, rice, and corn have been studied, it will be beneficial to quantify the long-term effects in a controlled and replicated environment.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Beginning in the 2026 cropping year, plots of soybean, rice, and corn will be initiated at the Northeast Rice Research and Extension Center. The plots will be established in a randomized complete block design (RCBD) and administered as strip trials approximately 200 ft in length and 20 ft in width.

BUDGET

Amount of Funding Needed for Project:
$18,980.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Establishing a long-term rotational study

Lead Investigators: Justin Chlapecka

Co-Investigators: Jeremy Ross, Ana Morales Ona, Kristiina Ala-Kokko, Jason Kelley, and Jarrod Hardke

Status: Year 1 of 3

Stated Goal: The overarching goal of this study is to establish a long-term rotational study to define the impacts of crop rotation in a soybean, rice, and corn production area. The idea for the project comes from the Sanborn Field rotational experiment, which was established in 1888 at the University of Missouri and still continues today. While the short-term effects of crop rotation in soybean, rice, and corn have been studied, it will be beneficial to quantify the long-term effects in a controlled and replicated environment. This study will not only shed light on the short- and long-term effects of crop rotation, but will also serve as a site where sub-projects can be implemented to evaluate the effects of different agronomic treatments across different cropping systems.

Specific Objectives:

1. **Yield performance:** To evaluate the yield performance of soybean, rice, and corn in a continuous monoculture and in various rotational intervals between the three crops.
2. **Soil effects:** To determine the effect of crop rotation on soil properties, including pH, organic matter, nutrient content, and native soil nitrogen availability.
3. **Pest effects:** To determine the pest profile of soybean, rice, and corn under different systems.
4. **Economic analyses:** To examine the economics of each crop rotational system, including profitability and opportunity cost.
5. **Facilitating the future:** To allow for future studies that take into account the cropping system and field history as factors that may influence the effect of other variables.

Methods:

1. **Objectives 1-3:** Beginning in the 2026 cropping year, plots of soybean, rice, and corn will be initiated at the Northeast Rice Research and Extension Center. The plots will be established in a randomized complete block design (RCBD) and administered as strip trials approximately 200 ft in length and 20 ft in width. This method will allow the plots to be independently managed. Once established, the plots will be managed traditionally, according to University of Arkansas System Division of Agriculture recommendations for each crop in the study. The treatment structure will include continuous (year over year) soybean, rice, and corn, and combinations that are common production systems in Arkansas. The total number of rotational systems will be between seven and ten, dependent upon space and reliant upon recommendations from the co-investigators.
2. **Objective 4:** The plots are planned to be oversized, 20 ft x 200-400 ft, to facilitate future expansion in the form of new projects that take advantage of the crop rotation study's footprint. These project ideas will be addressed in the form of new project proposals to the ASPB and to other funding sources, including national-level funding opportunities that can help to stretch our resources farther.
3. **Objective 5:** This rotational framework will also serve as a platform for applied precision nutrient management and sensor-based research. Opportunities include testing nutrient sensing tools across different crops, assessing potential crop residue interference, and identifying optimal

timing for sensor use. Data from this project will help determine how crop residue and timing influence sensor accuracy and provide practical guidelines for crop advisors and growers seeking to make in-season nutrient decisions.

Planned Treatment Structure:

Treatments	2026	2027	2028	2029	2030	2031
Cont. Rice	Rice	Rice	Rice	Rice	Rice	Rice
Cont. Soy	Soybean	Soybean	Soybean	Soybean	Soybean	Soybean
Cont. Corn	Corn	Corn	Corn	Corn	Corn	Corn
1 Rice : 1 Soy	Rice	Soybean	Rice	Soybean	Rice	Soybean
2 Rice :1 Soy	Rice	Rice	Soybean	Rice	Rice	Soybean
2 Soy : 1 Rice	Soybean	Soybean	Rice	Soybean	Soybean	Rice
1 Corn: 1 Soy	Corn	Soybean	Corn	Soybean	Corn	Soybean
1 Soy : 1 Corn : 1 Rice	Soybean	Corn	Rice	Soybean	Corn	Rice
1 Corn: 1 Rice	Corn	Rice	Corn	Rice	Corn	Rice

Planned Milestones: The project is planned to run indefinitely. The first year will involve getting the crop rotation plots established and collecting baseline data, including preliminary assessments for future precision nutrient management research. From that point, each year there will be a continuing set of datapoints that allow us to show trends in yield, soil properties, and pest profiles across time under differing cropping systems. Data at the end of each year, after the third year, can be presented at local, regional, and national meetings, whereas trends in the data should start to appear.

Statement of Projected Value: Crop rotation is valuable, but comparing the value of different rotational systems can give farmers a resource to help determine the expected effects of either integrating other crops or the opposite, continuous rice/soybean/corn production. Oftentimes there is one crop where the price is more advantageous than others, and this study will help define the effect of utilizing different rotational systems.

Budget Justifications/Explanation of Travel and Direct Costs:

Funds are also requested from the Arkansas Rice Research and Promotion Board and the Arkansas Corn and Grain Sorghum Board for the role of rice and corn in the stated project, similar to this proposal. If rice and/or corn funding is not approved, contingency plans include seeking other sources of funding, deletion of treatments, and/or plot size reduction. If the other funding sources are not available to adequately support the project, all funding will be returned to the ASPB.

Expenses for PI include personnel funding of $7,500 for hourly personnel at $15 per hour to help manage the plot area. Supplies purchased with funding will include pesticides, fertilizer, stakes, flags, sample bags, and other necessary items to conduct the trials. Expenses for co-PI Dr. Ana Ona include local travel. Expenses for co-PI Dr. Ala-Kokko will include supplies needed to conduct research and analyses.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Chlapecka, Justin *Establishing a long-term rotational study*

Year	2026/2027	**Project Year**	New, Year 1 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Chlapecka, Justin	**Co-PI #1**	Ross, Jeremy	
Co-PI #2	Ona, Ana	**Co-PI #3**	Ala-Kokko, Kristiina	
Department	CSES Crop, Soil, Environmental Science			
Commodity Board	Rice Research and Promotion Board			
Project Title	Establishing a long-term rotational study			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Chlapecka, Justin	Ross, Jeremy	Ona, Ana	Ala-Kokko, Kristiina	Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	AES	CES	CES	AES			

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$0	$0	$0	$0	$0	$0	$0

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
Tuition Calculator Information						$0	$0	$0
Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel	$7,500				$7,500	$7,500	$0
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$7,500	$0	$0	$0	$7,500	$7,500	$0

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$0	$0	$0	$0	$0	$0	$0
Graduate Students	$0	$0	$0	$0	$0	$0	$0
Hourly Personnel	$510	$0	$0	$0	$510	$510	$0
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$510	$0	$0	$0	$510	$510	$0
Personnel Total	$8,010	$0	$0	$0	$8,010	$8,010	$0

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State			$2,000		$2,000	$0	$2,000
Out-of-State					$0	$0	$0
Travel Total	$0	$0	$2,000	$0	$2,000	$0	$2,000

University of Arkansas System Division of Agriculture

Promotion Board Budget

Chlapecka, Justin *Establishing a long-term rotational study*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$3,000			$1,500	$4,500	$4,500	$0
	Fertilizer/Chemicals	$1,500				$1,500	$1,500	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$2,970	$0	$0	$0	$2,970	$2,970	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$7,470	$0	$0	$1,500	$8,970	$8,970	$0
	Total for Proposal	$15,480	$0	$2,000	$1,500	$18,980	$16,980	$2,000

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

7 - RI-26

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Developing a Screening Pipeline and Candidate Gene Pool for Nematode Resistance in Soybean

Project Type:
Research

Name of Project Manager:
Fiona Goggin

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Soybean cyst nematodes are present in ~70% of Arkansas soybean acreage and frequently co-occur with root knot nematodes. These pathogens can cause yield losses exceeding 50% in heavily-infested fields. Managing them is complex and costly, in part due to limited sources of genetic resistance and emergence of resistance-breaking soybean cyst nematodes. The proposed research will help identify new sources of resistance for these pests.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
We will 1) develop a rapid and effective workflow (i.e. a “pipeline”) for characterizing soybean genes that might potentially contribute to plant defenses against nematodes; and 2) from these so-called “candidate genes,” we will employ our pipeline to zero in on those that are most promising for management of the soybean cyst nematode and potentially also the Southern root knot nematode

BUDGET

Amount of Funding Needed for Project:
$30,767.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Developing a Screening Pipeline and Candidate Gene Pool for Nematode Resistance in Soybean

Lead Investigators: Fiona L. Goggin

Co-Investigators: N/A

Collaborator: Gunvant Patil, Texas Tech University (requires no funding; will provide materials)

Status and Duration of Funding: New, Year 1 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Plant Pathology

Stated Goal: to facilitate the development of soybean germplasm that limits economic losses to soybean cyst, root-knot, and other nematode pests in Arkansas and beyond.

Specific Objectives: We will 1) develop a rapid and effective workflow (i.e. a "pipeline") for characterizing soybean genes that might potentially contribute to plant defenses against nematodes; and 2) from these so-called "candidate genes," we will employ our pipeline to zero in on those that are most promising for management of the soybean cyst nematode (SCN, *Heterodera glycines*) and potentially also the Southern root knot nematode (RKN, *Meloidogyne incognita*) .

We anticipate that the **outputs** of the project would include **a)** useful genes for germplasm improvement; AND **b)** useful methods to continue mining for new sources of nematode resistance, enabling breeders to stay ahead of counter-resistance in the pest.

Methods: The Goggin laboratory will work with a collaborator (Gunvant Patil, Texas Tech University) who has already using single cell RNA sequencing (Figure 1A-C) to identify a starter set of candidate genes that may contribute to SCN resistance in PI437654, a line with the broadest available resistance against diverse SCN races. The Patil lab has also already developed tools to visualize the expression patterns (Figure 1D) and modify the expression levels (Figure 1E) of some of these candidate genes. Using these materials, the Goggin lab will optimize rapid assays with SCN and RKN to test how candidate genes respond to (Figure 1D) and impact nematode infection (Figure 1F-G). Confocal microscopy will be used to visualize how genes respond to nematode attack, and rapid laboratory- and greenhouse bioassays will be used to measure the effects of candidate genes on the nematode infection cycle. Using RKN as well as SCN could potentially help identify broad-acting defenses that impact both species. The methods and data from this project will enable the Goggin and Patil labs to rapidly identify and focus on those candidate genes that have the strongest suppressive effects on nematode infection, that act early in the infection cycle, and that respond to multiple nematode races and possibly even more than one species. This will facilitate the identification of new resistance genes and their subsequent use for germplasm improvement (Figure 1H).

Planned Milestones for Year 1:

PROJECT TIMELINE	Apr-Jul 06				Aug – Nov 06				Dec 06– Mar 07			
Optimize microscopy assay	■	■	■									
Expand current collection of nematode races for diversity panel			■	■	■	■						
Use microscopy assays to describe gene responses to nematodes			■	■	■	■	■	■	■	■	■	■
Optimize rapid lab bioassays to measure SCN & RKN penetration, survival, reproduction, & development	■	■	■	■	■							
Perform bioassays to measure gene effects on nematodes						■	■	■	■	■	■	■

Value to Soybean Industry: Currently, there is a lack of suitable soybean cultivars that carry resistance to both of the most common nematode pests in Arkansas, RKN and SCN. Moreover, for SCN, which are present in ~70% of Arkansas soybean acreage, the sources of resistance that are currently available are limited to specific races, with "resistance-breaking" races being widespread. As a result, nematode management is complex and costly, and yield losses to nematodes can exceed 50% in heavily-infested fields. The proposed research will help identify new sources of genetic resistance that can combat resistance-breaking SCN races, and that may potentially also have value for management of RKN and/or reniform nematodes in Arkansas.

Budget Justifications/Explanation of Travel and Direct Costs: Funds are requested to provide partial support for one research associate (20% time, or $9,020 in salary) and 1 hourly undergraduate research assistant (~10h/week, $6,240 in hourly wages) to conduct the experiments, and to cover station costs associated with greenhouse and growth chamber rental ($5,011). We also request $8,000 in supplies to cover the cost of consumable lab supplies (gloves, pipette tips, petri dishes, bacterial growth media), greenhouse supplies (pots, irrigation tubing, sand), hourly fees for confocal microscope usage, and molecular lab reagents.

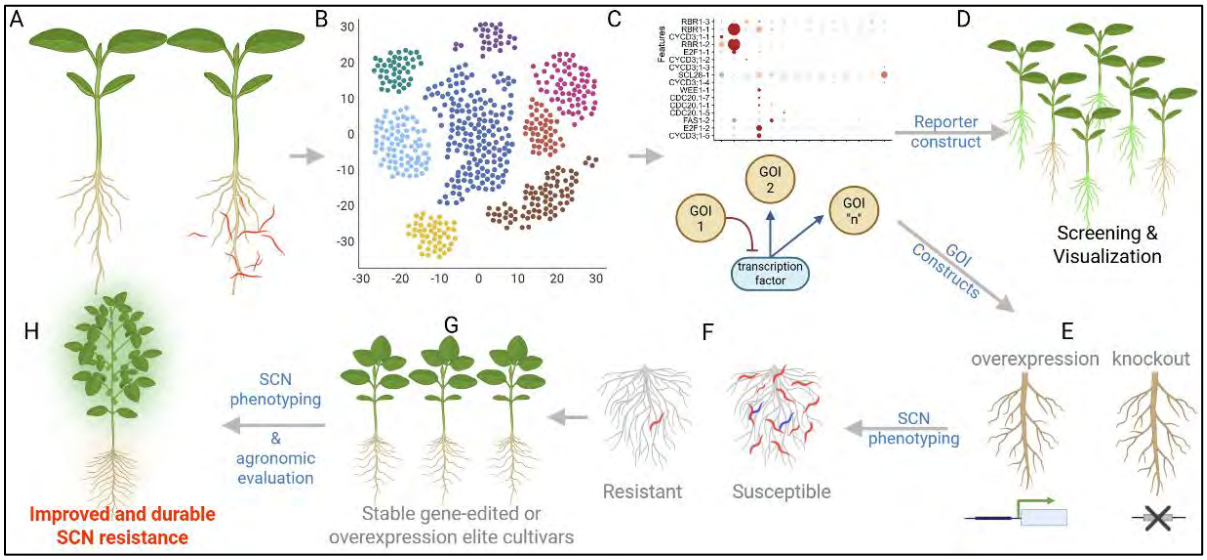


Figure 1: Pipeline for Identifying New Genetic Sources of Nematode Resistance. **(A)** A soybean line (PI 437654) with broad-spectrum SCN resistance and possible resistance to other species was challenged with (right) and without (left) SCN race 3, and **(B)** gene expression analysis **(**single cell RNA-sequencing) was performed to **(C)** identify cell-type-specific genes involved in various processes of SCN resistance. In Year 1 of this project, **(D)** we will use a rapid, high-throughput laboratory assay to validate SCN-responsive expression for selected genes of interest (GOIs) and determine if they also respond to other SCN races or RKN. For the most promising GOIs, **(E)** overexpression and CRISPR-mediated gene-knockout lines will be developed. Beginning at the end of Year 1 and continuing into Year 2, rapid screening bioassays will be performed **(F)** to assess the effects of these lines on the infection cycle of SCN and RKN. **(G)** For the most promising GOIs**,** stable transformants will be generated and assayed in Year 3 against avirulent and virulent SCN races to select for **(H)** broad-spectrum and durable resistance.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Goggin, Fiona — *Developing a Screening Pipeline and Candidate Gene Pool for Nematode Resistance in Soybean*

Year	2026/2027	**Project Year**	New, Year 1 of 1	**Version: 8.0 (09/22/2025)**
Lead Investigator	Goggin, Fiona	**Co-PI #1**		
Co-PI #2		**Co-PI #3**		
Department	ENPL Entomology and Plant Pathology			
Commodity Board	Soybean Promotion Board			
Project Title	Developing a Screening Pipeline and Candidate Gene Pool for Nematode Resistance in Soybean			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Goggin, Fiona				**Total Board Funding Requested**	**AES Portion**	**CES Portion**
Select "AES" or "CES" for each PI	AES	AES	CES	CES			
Fulltime Personnel							
Position Title / **Name** *(if position is filled)* / **% Time** / **Salaries**					**Total**	**AES**	**CES**
Research Associate / Jiamei Li / 20%	$9,020				$9,020	$9,020	$0
					$0	$0	$0
					$0	$0	$0
					$0	$0	$0
					$0	$0	$0
Subtotal: Salaries	$9,020	$0	$0	$0	$9,020	$9,020	$0
Graduate Student							
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition. / **Name** *(if position is filled)* / **% Time** / **Wages**					**Total**	**AES Portion**	**CES Portion**
					$0	$0	$0
					$0	$0	$0
					$0	$0	$0
					$0	$0	$0
					$0	$0	$0
Tuition Calculator Information					$0	$0	$0
Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0
Hourly							
Wages					**Total**	**AES Portion**	**CES Portion**
Hourly-Personnel					$0	$0	$0
Hourly-Students	$6,240				$6,240	$6,240	$0
Subtotal: Hourly	$6,240	$0	$0	$0	$6,240	$6,240	$0
Fringe Benefits							
Fringe benefits are calculated when salary and wage amounts are entered above. / **Benefits**					**Total**	**AES Portion**	**CES Portion**
Fulltime Personnel	$2,490	$0	$0	$0	$2,490	$2,490	$0
Graduate Students	$0	$0	$0	$0	$0	$0	$0
Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
Hourly-Students	$6	$0	$0	$0	$6	$6	$0
Subtotal: Fringe Benefits	$2,496	$0	$0	$0	$2,496	$2,496	$0
Personnel Total	$17,756	$0	$0	$0	$17,756	$17,756	$0
Travel							
Justify out-of-state travel in proposal. / **Travel**					**Total**	**AES Portion**	**CES Portion**
In-State					$0	$0	$0
Out-of-State					$0	$0	$0
Travel Total	$0	$0	$0	$0	$0	$0	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Goggin, Fiona *Developing a Screening Pipeline and Candidate Gene Pool for Nematode Resistance in Soybean*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$8,000				$8,000	$8,000	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$5,011	$0	$0	$0	$5,011	$5,011	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$13,011	$0	$0	$0	$13,011	$13,011	$0
	Total for Proposal	$30,767	$0	$0	$0	$30,767	$30,767	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

8 - RI-27

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Assessment of soybean arthropod community dynamics across Arkansas for IPM

Project Type:
Research

Name of Project Manager:
Rupesh Kariyat

Name of Project Team Member 1:
Ben Thrash

Name of Project Team Member 2:
Glenn Studebaker

Statement of Justification or Purpose of the Project (75 word maximum):
The main goal of this project is to develop an extensive database of insect herbivores, and natural enemies (predators, and parasitoids) prominent in Arkansas soybean fields, and to develop integrated pest management strategies.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
1. Determine seasonal shift in arthropod community composition across soybean growing regions of Arkansas. 2. Evaluate how agronomic proctices influence pest activity in Arkansas soybean fields. 3. Document regions with the economically important pest activities and determine periods when the natural enemies are most active. 4. Use the extensive arthropod community data to develp Arkansas based long term IPM practices.

BUDGET

Amount of Funding Needed for Project:
$49,036.00

Contribution Amount (from organization or sponsor):
$0.00

Soybean Promotion Board - 2026 Proposal

Title: Assessment of soybean arthropod community dynamics across Arkansas for IPM.
Investigators: Dr. Rupesh Kariyat, Ben Thrash, Glen Studebaker, and Nick Bateman
Production System: Soybean
Status: New proposal, Year 1 of 3 (amount: $49,036)
Stated Goal: The main goal of this project is to develop an extensive database to record different herbivore species, and natural enemies (predators, and parasitoids) prominent in Arkansas soybean fields.

Specific objectives:

Objective 1: Determine seasonal shift in arthropod community composition across soybean growing regions of Arkansas
Objective 2: Evaluate how agronomic practices (early and late planting, irrigation, pesticidal spray) influence pest activity and beneficial insects in Arkansas soybean fields.
Objective 3: Document regions with the economically important pest activities and determine periods when the natural enemies are most active in these regions.
Objective 4: Use the extensive arthropod community data to develop Arkansas based long term IPM recommendations supporting informed management decisions for soybean growers in AR.

Methods: Various standard field-based methods will be used to accomplish the aforementioned research objectives. Replicated plot trials will be conducted across soybean research stations in Arkansas. Under the first objective, the trials will be conducted for three years during soybean growing season to determine the seasonal variability in arthropod community dynamics. Under the second objective, small plots will be designated with different agronomic practices with sufficient replications at multiple locations across the research stations with similar traps to monitor how these practices affect pests and their natural enemy's abundance. For objective 3, sampling will be conducted across several regions of the state at different times during the growing season. The collected arthropods will be separated and analyzed based on the regions and timing of their collection which will aid in the determination of 'hotspots' for pest activity as well as beneficials. Finally, these findings will be assimilated and used to develop predictive models to assess the Arkansas soybean arthropod community shift in the future. Most importantly, these data will be utilized to formulate IPM recommendations to support the soybean growers in Arkansas.

Planned Milestones:

2026 (Year 1): Initiate field trials for the first objective, and based on the data obtained in year 1, second objectives will be initiated in the next season (Year 2). For third objective, samples will be collected from multiple locations across the state at different times of the soybean growing season.
2027 (Year 2): The field trails will be continued for objective 1 and 2. In addition, field trials will be initiated for objective 2 as well where soybean will be grown under different agronomic practices in multiple locations. The experiment under objective 2 will continue for the next season (Year 3).
2028 (Year 3). Final year of field trails for all objectives. Analyze soybean arthropod dynamics with 3 years' worth of data to meet objective 1 and 3. For objective 2, data from Year 1 and Year 2 will be used. Finally, these data will be summarized into findings to develop IPM recommendations, and release extension publications and peer reviewer journal articles on soybean arthropod community dynamics across Arkansas.

Statement of Projected: Currently, there is no database on insect pests and natural enemies found in Arkansas soybean fields. An interesting question we must address is when and where do pests attack most and what kind of natural enemies are present in these soybean fields. And how do they vary under different agronomic practices? This project aims to develop an extensive database on arthropod community composition that accounts for seasonal variation in pests and beneficials, effects of agronomic practices on arthropods, and determine the arthropod 'hotspots' across soybean growing regions in Arkansas.

Approach (Procedure to Accomplish Objectives):

Objective 1: Three different soybean growing regions will be chosen across Arkansas where field trials will be conducted for three continuous years. In these fields, each replicated plot will be equipped with different types of traps (sticky traps and vane traps to collect aerial arthropods, and pitfall traps to collect ground dwelling arthropods). The abundance of arthropods will be monitored across three phenological stages of soybean (vegetative-V3/V4 and reproductive-R1/R2, and reproductive- R4/R5) which will provide us with a comprehensive overview of arthropod activity throughout the season. Yield at the harvest will be recorded in these plots to correlate with the abundance of pests and natural enemies in the field.

Objective 2: Based on the arthropod community observed in objective 1, we will split the plots in the same regions into multiple replicated plots and initiate treatments with different agronomic practices. We will have early and late season soybeans within which subplots will consist of irrigated versus non-irrigated regions to determine how timing and irrigation shape the arthropod community dynamics in soybean field. The sampling of arthropods will follow similar protocols like objective 1 with different types of traps. In addition to that, several physiological parameters will be recorded to understand how soybean physiology correlates with the pests and beneficial activity. Finally, yield at the harvest will be observed under all treatments.

Objective 3: Multiple sampling will be conducted in different locations across the UA research facilities and grower cooperator fields in Arkansas during different times of the growing season. The samples will be screened in the laboratory at University of Arkansas, Fayetteville for categorization into their orders, functional groups and families to determine the spatiotemporal variation in arthropod community across soybean growing regions in Arkansas.

Value to the Soybean Industry:

This project is of great importance to the Arkansas soybean industry because it generates the first ever statewide database of insect pests and beneficial arthropods in soybean fields. By understanding when and where economically important pests and beneficials are most abundant across multiple seasons and how they differ by the timing of planting and irrigation practices, we can aid the growers and researchers to develop more efficient scouting methods and optimize the pest management strategies. Identification of "hotspots" across the spatiotemporal scale will allow soybean stakeholders to formulate preventive measures rather than reacting to the pest outbreaks and help in developing region and season specific strategies for pest management. Furthermore, the results from this project will also help in projecting the pest pressure based on the agronomic practices such as late planted soybean might face a different group of defoliators than early planted soybeans and this may change according to the water status of the field as well. Collectively, these findings will aid the Arkansas soybean growers to build effective IPM practices by preventing unnecessary insecticide applications, conservation of beneficials and ensuring sustainable and economic return in the long run.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Dr. Rupesh Kariyat — *Assessment of soybean arthropod community dynamics across Arkansas for IPM.*

Year	2026/2027	**Project Year**	
Lead Investigator	Dr. Rupesh Kariyat	**Co-PI #1**	Thrash, Ben
Co-PI #2	Studebaker, Glenn	**Co-PI #3**	Bateman, Nick
Department	ENPL Entomology and Plant Pathology		
Commodity Board	Soybean Promotion Board		
Project Title	Assessment of soybean arthropod community dynamics across Arkansas for IPM.		

Version: 8.0 (09/22/2025)

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Dr. Rupesh Kariyat	Thrash, Ben	Studebaker, Glenn	Bateman, Nick	Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	AES	AES	CES	CES			

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$0	$0	$0	$0	$0	$0	$0

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
Graduate Student		$8,000				$8,000	$8,000	$0
Graduate Student		$8,000				$8,000	$8,000	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
Tuition Calculator Information		$9,400				$9,400	$9,400	$0
Subtotal: Graduate Student		$25,400	$0	$0	$0	$25,400	$25,400	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel	$3,000	$2,000	$2,000	$2,000	$9,000	$5,000	$4,000
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$3,000	$2,000	$2,000	$2,000	$9,000	$5,000	$4,000

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$0	$0	$0	$0	$0	$0	$0
Graduate Students	$1,024	$0	$0	$0	$1,024	$1,024	$0
Hourly Personnel	$204	$136	$136	$136	$612	$340	$272
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$1,228	$136	$136	$136	$1,636	$1,364	$272
Personnel Total	$29,628	$2,136	$2,136	$2,136	$36,036	$31,764	$4,272

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State	$2,000				$2,000	$2,000	$0
Out-of-State					$0	$0	$0
Travel Total	$2,000	$0	$0	$0	$2,000	$2,000	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Dr. Rupesh Kariyat — *Assessment of soybean arthropod community dynamics across Arkansas for IPM.*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$5,000	$1,000	$1,000	$1,000	$8,000	$6,000	$2,000
	Fertilizer/Chemicals					$0	$0	$0
	Publication	$3,000				$3,000	$3,000	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$8,000	$1,000	$1,000	$1,000	$11,000	$9,000	$2,000
	Total for Proposal	$39,628	$3,136	$3,136	$3,136	$49,036	$42,764	$6,272

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

9 - RI-28

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Soybean as a conversion crop within integrated crop-livestock systems

Project Type:
Research

Name of Project Manager:
Jonathan Kubesch

Name of Project Team Member 1:
Daniel Riveria

Name of Project Team Member 2:
Flint Harrellson

Statement of Justification or Purpose of the Project (75 word maximum):
Stated Goal: Justify soybean as an effective agronomic crop during pasture conversion Specific Objectives: Develop in-state evidence that soybean can be used as a break crop to eliminate unproductive pasture stands.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
This study will be conducted at the LFRS (Batesville) and at the SWREC (Hope) from 2026-2028. At each location the existing pasture stand will be evaluated for botanical composition and then eliminated from assigned treatments. The study will compare agronomic crops before planting a new pasture in the following year.

BUDGET

Amount of Funding Needed for Project:
$39,339.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2025-2026 Proposal

Title: *Soybean as a conversion crop within integrated crop-livestock systems*

Lead Investigators: Drs. Jonathan O.C. Kubesch and Jeremy Ross

Co-Investigators: Harley Warren, Kenny Simon, Drs. Daniel Rivera, Flint Harrelson

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): New

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Alternative

Stated Goal:

Justify soybean as an effective agronomic crop during pasture conversion

Specific Objectives:

Develop in-state evidence that soybean can be used as a break crop to eliminate unproductive pasture stands.

Showcase the production expectations of soybean planted into terminated pasture sods.

Methods:

This study will be conducted at the LFRS (Batesville) and at the SWREC (Hope) from 2026-2028. At each location the existing pasture stand will be evaluated for botanical composition and then eliminated from assigned treatments. The study will compare four treatments:

1. Control: pasture is left as-is and fertilized to the appropriate soil test recommendations
2. Burndown: pasture is eliminated with a 2 qt/acre rate of glyphosate and then planted to the new forage
3. Soybean: pasture is eliminated then planted to soybean
4. Sorghum-sudangrass: pasture is eliminated then planted to sorghum-sudangrass

These plots will be replicated four times at each location for a total of 32 plots. Each year adjacent plot areas will be converted to avoid carryover effects. Plots will be converted as assigned above in the first year, and then planted to bermudagrass or bahiagrass in the second year.

Plots will begin conversion in March/April of each year with pasture stand elimination and then planted in April/May as appropriate for the crop. Stands will be evaluated for the appropriate traditional row-crop and forage metrics (e.g. plant populations and frequency-occupancy grids). Soybean stands will be managed for pest and weed pressure as issues arise.

Control and the sorghum-sudangrass plots will be harvested monthly to assess pasture growth over the calendar year. The burndown plots will be evaluated once the forage species is ready for first harvest (typically August for bahiagrass or bermudagrass). Soybean plots will be harvested for grain yield as well as for forage yield at appropriate time of harvest. Soybean and sorghum-sudangrass plots will be planted to the new forage in the subsequent spring.

The forage plantings made in the soybean and sorghum-sudangrass plots will be assessed alongside the control and burndown in the subsequent season.

Planned Milestones:

Year 1:

2026 sites are planted and converted.

Year 2:

Soybean and sorghum-sudangrass plots are planted to the new forage (either bermudagrass or bahiagrass in the 2026 site. 2027 sites are planted and converted.

Year 3:

Soybean and sorghum-sudangrass plots are planted to the new forage in the 2027 site.

Statement of Projected Value:

This project will identify the opportunity and opportunity cost of using soybean as part of a conversion process.

Budget Justifications/Explanation of Travel and Direct Costs:

The lead investigators will handle project design, implementation, as well as reporting. The co-investigators will maintain the site locations. The program technician, Harley Warren, will collect plot data as well as manage sampling.

Travel will support trips to locations for sampling and measurement, as well as presentations to in-state groups, such as the Arkansas Forage and Grassland Council, as well as the American Forage and Grassland Council.

Supplies and fertilizer/chemicals will support planting, fertilizing, pest control, weed control, and harvesting operations of the plots.

Publication costs will support potential publication as an open-access peer-reviewed article.

Forage testing will support submitting samples to the U of A Shared Nutrition Lab for nutritive value to livestock.

A duplicate proposal has been developed for the corn and grain sorghum promotion board that includes corn instead of soybean and have requested $46,225.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Kubesch, Jonathan *Soybean as a conversion crop within integrated crop-livestock systems*

Year	2026/2027	**Project Year**	New, Year 1 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Kubesch, Jonathan	**Co-PI #1**	Rivera, Daniel	
Co-PI #2	Harrelson, Flint	**Co-PI #3**	Kubesch, Jonathan	
Department	ANSC Animal Sciences			
Commodity Board	Soybean Promotion Board			
Project Title	Soybean as a conversion crop within integrated crop-livestock systems			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Kubesch, Jonathan	Rivera, Daniel	Harrelson, Flint		Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI		CES	AES	CES				
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Program Tech	Harley Warren	10%	$4,388				$4,388	$0	$4,388
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$4,388	$0	$0	$0	$4,388	$0	$4,388
	Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information						$0	$0	$0
	Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0
	Hourly								
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel						$0	$0	$0
	Hourly-Students						$0	$0	$0
	Subtotal: Hourly		$0	$0	$0	$0	$0	$0	$0
	Fringe Benefits								
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$1,211	$0	$0	$0	$1,211	$0	$1,211
	Graduate Students		$0	$0	$0	$0	$0	$0	$0
	Hourly Personnel		$0	$0	$0	$0	$0	$0	$0
	Hourly-Students		$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits		$1,211	$0	$0	$0	$1,211	$0	$1,211
	Personnel Total		$5,599	$0	$0	$0	$5,599	$0	$5,599
	Travel								
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State		$6,000	$3,000	$3,000		$12,000	$3,000	$9,000
	Out-of-State		$3,000	$1,500	$1,500		$6,000	$1,500	$4,500
	Travel Total		$9,000	$4,500	$4,500	$0	$18,000	$4,500	$13,500

University of Arkansas System Division of Agriculture

Promotion Board Budget

Kubesch, Jonathan *Soybean as a conversion crop within integrated crop-livestock systems*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$2,000	$1,000	$1,000		$4,000	$1,000	$3,000
	Fertilizer/Chemicals	$2,000	$1,000	$1,000		$4,000	$1,000	$3,000
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Forage testing	$2,000	$2,000	$2,000		$6,000	$2,000	$4,000
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$870	$0	$0	$0	$870	$0	$870
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$870	$0	$870	$0	$870
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$6,870	$4,000	$4,870	$0	$15,740	$4,000	$11,740
	Total for Proposal	$21,469	$8,500	$9,370	$0	$39,339	$8,500	$30,839

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

10 - RI-29

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Valorizing Soy By-products into Mycoprotein via Acid/Alkaline/Enzymatic Treatment and Biomass Fermentation

Project Type:
Research

Name of Project Manager:
Sungil Ferreira

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Valorize soybean by-products, such as soy molasses and SPC/SPI insoluble fiber, into food-grade mycoprotein (alternative protein). Transform low-value streams into high-value protein ingredients to reduce waste and disposal costs, strengthen in-state processing, and open new markets and revenue for Arkansas soybean growers and processors.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Convert molasses sugars using enzymes (alpha-galactosidase then invertase); pretreat fiber with mild acid/alkali and enzymatically hydrolyze; ferment with Neurospora crassa producing alternative protein from the fungal biomass (like a vertical farm). A rolling techno-economic assessment will guide optimization. Validate at pilot scale and share results via extension and stakeholder outreach.

BUDGET

Amount of Funding Needed for Project:
$48,868.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Valorizing Soy By-products into Mycoprotein via Acid/Alkaline/Enzymatic Treatment and Biomass Fermentation

Lead Investigators: Sungil Ferreira

Co-Investigators: N/A

Status and Duration of Funding: New, Year 1 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Post-Harvest/Application

Stated Goal: Develop a cost-effective, food-grade pathway to produce mycoprotein from two abundant soybean by-products, soy molasses (from aqueous ethanol soy protein concentrate production) and insoluble fiber from soy protein concentrate and isolate manufacturing, by combining targeted enzymatic pretreatment (for oligosaccharide-rich molasses) and mild acid/alkaline + enzymatic saccharification (for fiber), followed by aerobic fermentation with *Neurospora crassa*. This project will reduce waste, open new markets for soy processors and growers, and has the potential to position Arkansas at the forefront of value-added soy innovation.

Specific Objectives: Objective 1 (Years 1–2): Soy Molasses for Mycoprotein Production. Establish a proof-of-concept for using soy molasses from aqueous ethanol soy protein concentrate (SPC) production as the primary carbon source for mycoprotein, and optimize *Neurospora crassa's* fermentation for biomass yield and protein quality. A rolling TEA will quantify costs, conversion efficiency, and utility needs to guide process decisions.

Objective 2 (Years 1–3): Valorizing soy protein concentrate and soy protein isolate (SPI) Insoluble Fiber, which is about 20% of the seed by weight. Develop a practical pathway to convert insoluble fiber from SPC/SPI manufacturing into fermentable sugars via mild pretreatments and enzymatic hydrolysis, while controlling inhibitors. Demonstrate robust fermentation performance on fiber-derived hydrolysates. TEA will be updated continuously to compare routes and identify the most cost-effective option.

A continuous TEA will aggregate real-time data across objectives to deliver a commercialization roadmap for Arkansas soybean by-product valorization.

Methods: Objective 1 (Years 1–2): Soy Molasses for Mycoprotein Production. We will establish proof-of-concept for using soy molasses (from aqueous ethanol SPC production) as the primary carbon source for aerobic fungal fermentation to produce mycoprotein. This includes: (i) testing enzymatic pretreatment, α-galactosidase to hydrolyze raffinose-family oligosaccharides RFOs (stachyose, raffinose), followed by invertase to cleave sucrose into glucose and fructose; (ii) evaluating *Neurospora crassa's* endogenous invertase expression and adding supplemental α-galactosidase as needed based on measured stachyose/raffinose levels; and (iii) optimizing fermentation conditions (pH, temperature, fed-batch sugar strategy) to maximize biomass and protein yield. A rolling Techno-Economic Assessment (TEA) will run in parallel to quantify enzyme costs, conversion efficiencies, and utilities, guiding go/no-go decisions and process refinements throughout Years 1–2.

Objective 2 (Years 1–3): Valorizing SPC/SPI Insoluble Fiber. To advance circular bioeconomy principles, we will convert insoluble fiber from SPC/SPI production into fermentable sugars for mycoprotein fermentation. This objective includes: (i) applying mild alkaline pretreatment (0.5–2% NaOH, 60–100 °C) to enhance delignification and porosity and mild acid pretreatment (0.2–1.0% H_2SO_4, 80–130 °C) to open

hemicellulose; (ii) evaluating enzymatic saccharification with cellulase/β-glucosidase and xylanase; and (iii) monitoring inhibitors (e.g., HMF, furfural) and conditioning hydrolysates as needed prior to fermentation. The resulting sugar streams will be fermented with *N. crassa* to benchmark biomass yield and protein content. TEA will be updated continuously (Years 2–3) to compare pretreatment/saccharification routes, estimate sugar costs per kg, and evaluate the impact of inhibitor control on overall economics.

Planned Milestones: Year 1: We will complete feedstock characterization, then optimize the molasses pathway by validating the α-galactosidase → invertase sequence and confirming *Neurospora crassa* invertase expression; one peer reviewer publication, extension publication and presentation for stakeholders.

Year 2: We will initiate mild alkaline and mild acid pretreatments of SPC/SPI insoluble fiber, and optimize enzymatic hydrolysis (cellulase/β-glucosidase/xylanase); one peer reviewer publication, extension publication and presentation for stakeholders.

Year 3: Validate fermentation on both feedstocks on a larger scale; finalize techno-economic assessment (TEA); disseminate final findings through publications and stakeholder workshops.

Value to Soybean Industry: This project creates new revenue streams to soybean processors by converting soy molasses and SPC/SPI insoluble fiber into food-grade mycoprotein for use in meat blends and alternative protein products. It advances sustainability and circularity by valorizing side streams, reducing waste and disposal costs, and enabling local manufacture of lower-carbon protein ingredients aligned with market demand for sustainable foods. This project will deliver a transformative pathway for Arkansas agriculture by expanding soybean residues into high-value protein ingredients. By creating new markets and reducing waste through, the project supports rural economic development and strengthens domestic resiliency in food and bioproduct supply chains. The outcomes align with USDA priorities for circular bioeconomy and rural prosperity, positioning Arkansas as a leader in sustainable protein innovation.

Budget Justifications/Explanation of Travel and Direct Costs: One PhD graduate student is budgeted for 12 months at $23,000 plus $1,472 in fringe, and $6,795 in tuition (15 credits at $453/credit) to conduct data collection. One hourly Personnel is budgeted for 200 hours at $19.22/h to support lab assays, at $3,840 and $261 in fringe benefits. To attend scientific conferences and visit soybean farms and processors, $4,000 is budgeted. Supplies and Materials for the first year of experiments (including glassware, chemicals, enzymes, etc.) are budgeted at $8,000. Year 1 results will be published as a peer-reviewed manuscript, supported by $1,500 in publication costs. Altogether, the Year-1 request total for the proposal is $48,868.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Ferreira, Sun — *Valorizing Soy By-products into Mycoprotein via Acid/Alkaline/Enzymatic Treatment and Biomass Fermentation*

Year	2026/2027	**Project Year**	New, Year 1 of 3
Lead Investigator	Ferreira, Sun	**Co-PI #1**	
Co-PI #2		**Co-PI #3**	
Department	FDSC Food Science		
Commodity Board	Soybean Promotion Board		
Project Title	Valorizing Soy By-products into Mycoprotein via Acid/Alkaline/Enzymatic Treatment and Biomass Fermentation		

Version: 8.0 (09/22/2025)

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Ferreira, Sun				Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	AES	AES	CES	CES			

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$0	$0	$0	$0	$0	$0	$0

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
TBC	50%	$23,000				$23,000	$23,000	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
Tuition Calculator Information		$6,795				$6,795	$6,795	$0
Subtotal: Graduate Student		$29,795	$0	$0	$0	$29,795	$29,795	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel	$3,840				$3,840	$3,840	$0
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$3,840	$0	$0	$0	$3,840	$3,840	$0

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$0	$0	$0	$0	$0	$0	$0
Graduate Students	$1,472	$0	$0	$0	$1,472	$1,472	$0
Hourly Personnel	$261	$0	$0	$0	$261	$261	$0
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$1,733	$0	$0	$0	$1,733	$1,733	$0
Personnel Total	$35,368	$0	$0	$0	$35,368	$35,368	$0

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State					$0	$0	$0
Out-of-State	$4,000				$4,000	$4,000	$0
Travel Total	$4,000	$0	$0	$0	$4,000	$4,000	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Ferreira, Sun — *Valorizing Soy By-products into Mycoprotein via Acid/Alkaline/Enzymatic Treatment and Biomass Fermentation*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$8,000				$8,000	$8,000	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication	$1,500				$1,500	$1,500	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$9,500	$0	$0	$0	$9,500	$9,500	$0
	Total for Proposal	$48,868	$0	$0	$0	$48,868	$48,868	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

11 - RI-30

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Field Variability, Harvest Moisture, and Advanced Storage Monitoring to Improve Arkansas Soybean Quality

Project Type:
Research

Name of Project Manager:
Kaushik Luthra

Name of Project Team Member 1:
Ana ona

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Soybean grain quality and storability in Arkansas are strongly influenced by field variability, harvest moisture decisions, and storage management. This project will generate Arkansas-specific data linking field conditions and harvest moisture to grain damage, spoilage risk, and insect infestation during storage. By evaluating advanced CO_2 and VOC sensing for early detection of storage problems, the project will support improved decision-making,

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Field studies at the Northeast Rice Research and Extension Center will quantify relationships between soil variability, harvest moisture, and soybean grain quality. Soybeans will be harvested across a range of moisture contents and evaluated for physical damage, quality, and storage performance. Laboratory-scale storage trials will use CO_2 and VOC sensors to monitor spoilage and insect activity. Results will be used to develop practical guidance

BUDGET

Amount of Funding Needed for Project:
$64,083.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Field Variability, Harvest Moisture, and Advanced Storage Monitoring to Improve Arkansas Soybean Quality

Lead Investigators: Kaushik Luthra

Co-Investigators: Ana Morales Ona

Status and Duration of Funding: New, Year 1 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Post-Harvest

Stated Goal: The goal of this project is to improve soybean grain quality, and storability, by linking field-level variability, harvest moisture, and advanced storage monitoring tools for early detection of spoilage and insect infestation under Arkansas climatic conditions.

Specific Objectives:

Year 1: Quantify how soil properties, landscape position, and in-season crop variability influence spatial differences in soybean grain quality when harvested at the recommended 13% moisture content.

Year 2: Determine the role of harvest moisture content on soybean physical damage (cracks, splits, and seed coat integrity), overall grain quality, and susceptibility to spoilage and insect infestation during storage under Arkansas environmental conditions.

Year 3: Evaluate the use of carbon dioxide (CO_2) and volatile organic compound (VOC) sensing as early-warning indicators for spoilage and insect activity in stored soybeans.

Methods: This three-year project will be conducted at the Northeast Rice Research and Extension Center (NERREC) in Harrisburg, Arkansas, in collaboration with Arkansas soybean producers. The research follows a progressive field-to-storage framework that mirrors real-world producer decision-making.

Objective 1: A primary soybean field at NERREC will serve as an intensive study site under uniform management. Soil properties including texture, organic matter, pH, nutrient status, and electrical conductivity will be mapped along with topographic features such as elevation and slope. In-season canopy condition will be assessed using aerial imagery and crop sensing tools. Soybeans will be harvested at the recommended market moisture of approximately 13%. Grain yield and representative samples will be collected from stratified field zones representing high, medium, and low productivity areas. Soybean samples will be evaluated for physical quality indicators including splits, seed coat damage, test weight, and visible defects, as well as protein and oil content.

Objective 2: Year 2 will explicitly evaluate how deviations from recommended harvest moisture affect soybean quality and storage outcomes. Soybeans will be harvested across a moisture gradient representative of Arkansas harvest conditions (approximately 8%–15%). Soybean samples at each harvested moisture will be evaluated for physical quality indicators including splits, seed coat damage, test weight, and visible defects, as well as protein and oil content. Storage trials will assess how low harvest moisture-induced splits, seed coat damage influences spoilage progression and insect susceptibility, during storage.

Objective 3: In Year 3, laboratory-scale storage bin will be instrumented with carbon dioxide (CO_2) and volatile organic compounds (VOC) sensors to detect early biological activity associated with spoilage

organisms and insects. Soybeans will be harvested at 13% moisture and stored at 75°F temperature for a period of up to 3 months. Samples will be tracked for mold growth and insect activity. Continuous CO_2 and VOC monitoring during storage will be used for correlation of sensor signals with observed grain quality deterioration and insect activity. Separate trials where controlled insect and microbial colonies will be introduced to quantify sensor response. The outcome will be actionable sensor thresholds that provide earlier warnings than traditional moisture and temperature monitoring, supporting improved on-farm storage management.

Planned Milestones:

Year 1:

• Establish relationships between field variability and soybean grain quality at 13% harvest moisture.

Year 2:

• Quantify effects of harvest moisture deviations on cracks, splits, and storage risk.

Year 3:

• Validate CO_2 and VOC sensing for early detection of spoilage and insect infestation.

Value to Soybean Industry: Arkansas produces over three million acres of soybeans annually, where both field variability and harvest decisions strongly influence grain quality and storage outcomes. While 13% moisture is the recommended harvest target, deviations are common due to weather and logistics.

This project will:

- Improve understanding of how field variability affects soybean grain quality even at optimal harvest moisture
- Define quality and storage risks associated with harvesting too dry or too wet
- Reduce spoilage and insect losses during storage by enabling early detection of storage problems

Budget Justifications/Explanation of Travel and Direct Costs:

Funds are requested to support program associates and hourly employees for field sampling, harvest operations, and laboratory analyses. Additional costs include field operations at NERREC, laboratory supplies for soybean quality and storage experiments, limited publication costs, and in-state travel for sample transport and producer collaboration. No indirect costs are requested.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Luthra, Kaushik — *Field Variability, Harvest Moisture, and Advanced Storage Monitoring to Improve Arkansas Soybean Quality*

Year	2026/2027	**Project Year**	New, Year 1 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Luthra, Kaushik	**Co-PI #1**	Ana Morales Ona	
Co-PI #2		**Co-PI #3**		
Department	BAEG Biological & Agricultural Engineering			
Commodity Board	Soybean Promotion Board			
Project Title	Field Variability, Harvest Moisture, and Advanced Storage Monitoring to Improve Arkansas Soybean Quality			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Luthra, Kaushik	Ana Morales Ona			Total Board Funding Requested	AES Portion	CES Portion
	Select "AES" or "CES" for each PI	AES	CES	CES	CES			
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Program Associate		25%	$15,000				$15,000	$15,000	$0
Program Associate		25%		$15,000			$15,000	$0	$15,000
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$15,000	$15,000	$0	$0	$30,000	$15,000	$15,000
	Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information						$0	$0	$0
	Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0
			Hourly						
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel		$5,760	$5,760			$11,520	$5,760	$5,760
	Hourly-Students						$0	$0	$0
	Subtotal: Hourly		$5,760	$5,760	$0	$0	$11,520	$5,760	$5,760
			Fringe Benefits						
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$4,140	$4,140	$0	$0	$8,280	$4,140	$4,140
	Graduate Students		$0	$0	$0	$0	$0	$0	$0
	Hourly Personnel		$392	$392	$0	$0	$783	$392	$392
	Hourly-Students		$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits		$4,532	$4,532	$0	$0	$9,063	$4,532	$4,532
	Personnel Total		$25,292	$25,292	$0	$0	$50,583	$25,292	$25,292
			Travel						
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State		$1,000	$1,500			$2,500	$1,000	$1,500
	Out-of-State						$0	$0	$0
	Travel Total		$1,000	$1,500	$0	$0	$2,500	$1,000	$1,500

University of Arkansas System Division of Agriculture

Promotion Board Budget

Luthra, Kaushik — *Field Variability, Harvest Moisture, and Advanced Storage Monitoring to Improve Arkansas Soybean Quality*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$5,000	$3,000			$8,000	$5,000	$3,000
	Fertilizer/Chemicals					$0	$0	$0
	Publication	$2,000				$2,000	$2,000	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$1,000	$0	$0	$1,000	$0	$1,000
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$7,000	$4,000	$0	$0	$11,000	$7,000	$4,000
	Total for Proposal	$33,292	$30,792	$0	$0	$64,083	$33,292	$30,792

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

11 - RI-31

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Integrated Strategies for Safe, Efficient, and Profitable Rewetting of Over-Dried Soybeans Using Advanced Bin Aeration Systems

Project Type:
Research

Name of Project Manager:
Kaushik Luthra

Name of Project Team Member 1:
Chris Henry

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Over-drying of soybeans during harvest and storage results in weight loss, reduced market value, and potential safety risks when rewetting is attempted without guidance. This project will generate Arkansas-specific, science-based recommendations for safely rewetting over-dried soybeans using ambient air aeration. By quantifying structural loads, grain quality impacts, and economic returns, the project will help producers recover lost value.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
The project will document common soybean bin designs and aeration practices in Arkansas through consultations with producers and vendors. A laboratory-scale, instrumented grain bin will be constructed to measure structural loads, airflow, and moisture movement during controlled soybean rewetting. Rewetting scenarios will be tested under Arkansas-relevant conditions, followed by evaluation of quality, storability, energy use, and economics.

BUDGET

Amount of Funding Needed for Project:
$73,796.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Integrated Strategies for Safe, Efficient, and Profitable Rewetting of Over-Dried Soybeans Using Advanced Bin Aeration Systems

Lead Investigators: Kaushik Luthra

Co-Investigators: Christopher G. Henry

Status and Duration of Funding: New, Year 1 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Post-Harvest

Stated Goal: To develop safe, science based, and economically viable strategies for rewetting over dried soybeans in Arkansas using ambient air aeration systems, while minimizing risks to bin structural integrity and soybean quality.

Specific Objectives:

1. Characterize Arkansas soybean storage bin infrastructure and current producer practices related to over-drying, aeration, and moisture management.
2. Experimentally evaluate safe soybean rewetting strategies under Arkansas relevant temperature and humidity conditions using instrumented laboratory scale bin systems.
3. Assess the impacts of controlled rewetting on soybean quality, storability, and economic returns, and develop science-based rewetting guidelines for Arkansas producers.

Methods: There are commercial systems that manage grain moisture and much interest in post-harvest moisture content in grains. However, little is known about the impact to bin structural integrity from the re-hydration of grain that increases the hygroscopic load. When grain is wetted in metal storage bins, it swells and imposes extremely high pressures on bin structures. It is likely that growers are rewetting soybeans using commercially available products that may be reducing the life or could cause catastrophic failure of bins. Little work has been done to develop recommendations or procedures on how to reduce the loads on bins. Vendors that manufacture bins are not the same companies that are providing the grain management systems. This project aims to do fundamental research to develop methods, procedures and recommendations for increasing the grain moisture of soybeans without compromising structural integrity of metal on-farm grain storage bins.

Consultations with vendors will be conducted across Arkansas to document common bin sizes, corrugated wall thicknesses by height, steel yield strength, airflow capacities, fan configurations, and grain handling system types. Vendor input will be used to supplement producer data and characterize typical bin construction materials and structural properties relevant to rewetting. Results will guide experimental design and identify potential safety concerns.

The project will first create a small in-lab model of a grain bin using metal and sheets manufactured by a bin manufacturer to represent commonly sold grain bins in Arkansas. The forces of the grain expansion will be measured using strain gages. Soybeans representative of Arkansas varieties will be dried or collected from harvested fields, to typical over dried moisture levels (approximately 9–11%) and rewetted in controlled increments using ambient air. Instrumentation will measure moisture migration, airflow, and forces acting on bin walls and floors during rehydration. Different airflow rates and configurations will be evaluated to establish safe operating thresholds.

In year one we will focus on developing methodology and in year 2 and 3 we will test varieties of beans, bulk density/test weight differences, bean size to develop a model that can be used for recommendations. In year 2 we will expand our methods based on results from the first year.

During this project we will also collaborate with Dr. Henry's pump control efforts to adapt the hardware and firmware for this project, so that the outcome could be implemented in a simple control system that could be used both for irrigation and bin control. Currently PCB boards already exist in Dr. Henry's projects that can be easily adapted to motor control from irrigation pump motors to fan control in grain bins. This project will attempt to adapt or provide some programming time for firmware development. This hardware will be used as proof of concept once control algorithms have been developed.

This project will follow a laboratory first and engineering driven approach to reduce risk and provide actionable guidance before any field scale recommendations. Following rewetting, soybeans will be evaluated for germination, moisture uniformity, oil and protein content, physical damage, and short-term storability. Energy use and operational costs associated with rewetting will be recorded and compared against recovered grain weight to assess economic feasibility for Arkansas producers.

Planned Milestones:

Year 1: Arkansas bin system vendor consultations, Construction and calibration of laboratory scale bin system, Instrumentation set up, Initial rewetting trials and structural response measurements

Year 2: Expanded rewetting experiments across airflow and moisture scenarios, Soybean quality and storability evaluation

Year 3: Economic analysis of using rewetting guidelines with the proposed control system, Refinement of rewetting guidelines. Development of producer focused tools and Extension materials

Value to Soybean Industry: Arkansas grows over 3 million acres of soybeans annually. Moisture loss from over-drying, driven by harvest delays and uncontrolled aeration, results in 1–3% weight loss per acre, translating to $15–$35 lost revenue per acre. Even partial adoption of safe rewetting (e.g., 10% of acres) could reclaim $5–10 million in annual value.

This project's results will:

- Prevent potential bin failures by providing structural safety thresholds for moisture gain.
- Offer tailored rewetting strategies validated for local climates and soybean types.
- Improve soybean value and reduce shrink losses through safe moisture recovery.
- Provide a framework for future automation (e.g., fan control) and tools for bin control.
- Build producer confidence through lab-scale validation before any field application.

Budget Justifications/Explanation of Travel and Direct Costs: Cost will be used for staff salary and travel. Supplies and direct costs for construction of lab bin, instrumentation, fabrication, cables, controls, and labor or supplies from outside fabrication and contractors as needed.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Luthra, Kaushik — *Integrated Strategies for Safe, Efficient, and Profitable Rewetting of Over-Dried Soybeans Using Advanced Bin*

Year	2026/2027	**Project Year**	New, Year 1 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Luthra, Kaushik	**Co-PI #1**	Henry, Christopher	
Co-PI #2		**Co-PI #3**		
Department	BAEG Biological & Agricultural Engineering			
Commodity Board	Soybean Promotion Board			
Project Title	Integrated Strategies for Safe, Efficient, and Profitable Rewetting of Over-Dried Soybeans Using Advanced Bin Aeration Systems			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Luthra, Kaushik	Henry, Christopher			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI		AES	AES	CES	CES			
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
							$0	$0	$0
Program Associate		25%	$15,000				$15,000	$15,000	$0
Program Specialists		6%		$6,000			$6,000	$6,000	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$15,000	$6,000	$0	$0	$21,000	$21,000	$0
	Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information						$0	$0	$0
	Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0
	Hourly								
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel						$0	$0	$0
	Hourly-Students						$0	$0	$0
	Subtotal: Hourly		$0	$0	$0	$0	$0	$0	$0
	Fringe Benefits								
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$4,140	$1,656	$0	$0	$5,796	$5,796	$0
	Graduate Students		$0	$0	$0	$0	$0	$0	$0
	Hourly Personnel		$0	$0	$0	$0	$0	$0	$0
	Hourly-Students		$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits		$4,140	$1,656	$0	$0	$5,796	$5,796	$0
	Personnel Total		$19,140	$7,656	$0	$0	$26,796	$26,796	$0
	Travel								
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State		$5,000	$1,000			$6,000	$6,000	$0
	Out-of-State						$0	$0	$0
	Travel Total		$5,000	$1,000	$0	$0	$6,000	$6,000	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Luthra, Kaushik *Integrated Strategies for Safe, Efficient, and Profitable Rewetting of Over-Dried Soybeans Using Advanced Bin*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$20,000	$6,000			$26,000	$26,000	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	contractor, fab, controls	$15,000				$15,000	$15,000	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$35,000	$6,000	$0	$0	$41,000	$41,000	$0
	Total for Proposal	$59,140	$14,656	$0	$0	$73,796	$73,796	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

12 - RI-32

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Effects on carcass characteristics, meat quality, and consumer acceptability of inclusion of raw whole soybeans in growing and finishing diets for farm finished beef

Project Type:
Research

Name of Project Manager:
Beth Kegley

Name of Project Team Member 1:
Zena Herrera

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
To investigate the effects of feeding raw whole soybeans to farm finished beef measuring the impact on calf growth, carcass characteristics, meat quality, antioxidant capacity, and consumer acceptability. Offering new markets to soybean producers for raw whole soybeans, including soybeans that cannot be sold for further processing.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Beef steers will be fed, through stocker and/or finishing phases, diets that include raw whole soybeans or diets that have no soy products. Cattle growth performance will be monitored and carcass characteristics will be measured. Input costs and carcass values will be recorded and used for economic analyses. Loins will be collected and used to measure meat quality parameters including fatty acid composition, antioxidant capacity, and tenderness.

BUDGET

Amount of Funding Needed for Project:
$36,250.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Effects on carcass characteristics, meat quality, and consumer acceptability of inclusion of raw whole soybeans in growing and finishing diets for farm finished beef.

Lead Investigators: Beth Kegley and Zena Herrera

Co-Investigators: Jeremy Powell

Status and Duration of Funding: New, Year 1 of 2

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Post-Harvest

Stated Goal: The goal of this proposed research is to assess how feeding diets containing raw whole soybeans to steers in growing and/or finishing phases will impact growth performance, carcass yield and quality, economics, and beef fatty acid composition, antioxidant capacity, tenderness, and consumer acceptability

Specific Objectives: The objectives are to determine: 1) the effect of supplementing raw soybeans to beef stocker cattle during the growing phase; 2) the effect of feeding raw whole soybeans in diets for farm finished beef; and 3) the interaction of these treatments on carcass characteristics and meat quality.

Methods: For this study, 40 Angus crossbred steers will be stratified by sire and body weight then sorted randomly into one of four pastures (n = 10 steers/pasture) and pastures will be assigned randomly to one of two treatment groups (n = 2 pastures/treatment) being 1) control group fed an isonitrogenous supplement with no soy product (GCON); and 2) treated group supplemented with raw whole soybeans at a rate of 0.3% of body weight (GSOY) The amount of supplements offered will be adjusted after body weight is measured every 28 days. Supplements will be offered beginning approximately 60 days after weaning (July 2026, when steers are 9 months old and weigh approximately 600 lb) and will continue through the grazing season (until September 2026). At the conclusion of the grazing phase when steers weigh approximately 800 lb, steers in each pen will be divided and moved to 8 pens where they will be offered a total mixed ration (to target gain of 4 lb/day). Two dietary treatment groups will be 1) control offered a diet containing distillers' grains, cracked corn, balage, and micronutrients (FCON), and 2) treated group supplemented with raw whole soybeans (15%), cracked corn, soybean hulls, balage, and micronutrients (FSOY). Half the steers on each growing phase treatment will be fed each of the finishing diets resulting in 10 steers for each of the four treatment combinations. Finishing treatments will continue until the average weight of the steers is approximately 1,300 lb (February 2027). Steers will be shipped to a commercial abattoir and harvested.

Growth Performance: Steers will be weighed every 28 days and average daily gain calculated. During the finishing phase feed intake will be recorded daily and feed efficiency calculated.

Carcass characteristics: Carcass weights, dressing percentage, yield grade, marbling score, ribeye area, backfat, and percentage of kidney pelvic fat will be recorded at the abattoir.

Economics: All costs for feed, medications, and other inputs will be recorded. Value of carcasses will be obtained and profit/loss calculated.

Meat: At the UADA Red Meat Abattoir each loin will be halved and each half will be designated to be either wet or dry aged for 28 days after carcass fabrication. Loin halves will be assessed for shrink and trim loss after the aging period and then will be cut into 1-inch steaks. Steaks will be assigned and used to assess retail color and oxidation across a 7-day display period, tenderness, fatty acid composition, pH, volatile compound analysis, and sensory attributes.

Planned Milestones: Whole raw soybeans are an acceptable source of protein (40% crude protein) and energy (93% total digestible nutrients, 19.4% fat) in cattle (>300 lb) rations, because rumen microbes detoxify the trypsin inhibitor that limits unheated soybeans use in poultry and swine diets (Lehmkuhler and VanValin, 2021). Due to the oil content, whole soybeans must be limited to 15% of the diet dry matter in total mixed rations or supplemented at <0.3% of body weight to grazing cattle, else the oil interferes with rumen fiber degradation. But this level of feeding would still provide a meaningful and potentially cost-effective protein supplement for cattle (Berger, 2025).

The addition of soybeans to a feedlot diet has been shown to impact carcass characteristics when compared to a control diet (Bausch et al., 2026). Specifically, cattle fed diets containing whole soybeans had greater hot carcass weights and larger *longissimus* muscle area when compared to control (Bausch et al., 2026). However, these studies failed to look at the impact soybeans had on other meat quality parameters, specifically oxidative stability, color, and flavor. Furthermore, soybeans contain isoflavones, which are known antioxidant compounds that could reduce the oxidation of muscle during retail display. Previous work in poultry diets found that soybean inclusion decreased malondialdehyde content in the breast fillets of male broilers (Jiang et al., 2007). While several studies have looked at the impact of soybean addition to monogastric diets, little research has been done in meat quality of ruminants.

Value to Soybean Industry: Soybean products, particularly soybean meal, are a common ingredient in poultry diets, but the beef cattle industry accounted for only 6.8% of soybean meal use in 2019 and 2020 (ASA, 2021). The market for whole soybeans in beef cattle diets is currently small, but is of increased interest (Brown, 2025, Whole, Roasted Soybeans are a Viable Option for Beef Cattle Feed - Research Highlight - Soybean Research & Information Network - SRIN). Raw whole soybeans can be used in ruminant diets and are an excellent source of energy and protein. Research indicates that rumen microbes can detoxify the antinutritional factors that make heating soy products mandatory for use in poultry and swine diets. However, many beef cattle producers are unaware that raw soybeans can be used in this way. Demonstrating the use of raw soybeans would increase soybean producers options for marketing soybeans that are ineligible for further processing. In addition, raw soybeans have valuable nutrients (protein and energy) that are needed in cattle rations. The Covid pandemic increased interest in locally farm-raised beef and in Arkansas this system includes producers feeding diets as proposed in this project. Results could create a greater use of soybean products among cattle producers, where growth performance and meat quality are important to a producer's bottom line.

Budget Justifications/Explanation of Travel and Direct Costs: **$36,250 (Year 1)**
$20,300 (Year 2)

Year 1 - Cattle Management (animal health products, feed, labor; estimating 40 steers × 250 days × $2.30/day)	$23,000
Year 1 - Transporting steers to abattoir	$1,500
Year 1 - Feed analyses	$750
Year 1 – Collection of carcass data (40 × $75)	$3,000
Year 1 – Purchase of loins for laboratory analyses ($200/loin × 40)	$8,000
Year 2 - Laboratory analyses	
Retail Display Color (40 x 2 aging treatments x $10/sample)	$800
Oxidation (40 x 2 aging treatments x $50/sample)	$4000
Fatty acids (40 × 2 aging treatments x $50/sample)	$4000
Volatile Compound Analysis (40 x 2 aging treatments x $75/sample)	$6000
Sensory Testing (40 x 2 aging treatments x $50/sample)	$4000
Year 2 - Travel to Scientific Meeting (out of state)	$1,500

University of Arkansas System Division of Agriculture

Promotion Board Budget

Kegley, Beth *Carcass characteristics, meat quality, and consumer acceptability of inclusion of raw whole soybeans in diets for*

Year	2026/2027	**Project Year**	New, Year 1 of 2
Lead Investigator	Kegley, Beth	**Co-PI #1**	Herrera, Zena
Co-PI #2	Powell, Jeremy	**Co-PI #3**	
Department	ANSC Animal Sciences		
Commodity Board	Soybean Promotion Board		
Project Title	Carcass characteristics, meat quality, and consumer acceptability of inclusion of raw whole soybeans in diets for beef		

Version: 8.0 (09/22/2025)

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Kegley, Beth	Herrera, Zena	Powell, Jeremy		Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	AES	AES	CES	CES			

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$0	$0	$0	$0	$0	$0	$0

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
Tuition Calculator Information						$0	$0	$0
Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel					$0	$0	$0
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$0	$0	$0	$0	$0	$0	$0
Graduate Students	$0	$0	$0	$0	$0	$0	$0
Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$0	$0	$0	$0	$0	$0	$0
Personnel Total	$0	$0	$0	$0	$0	$0	$0

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State					$0	$0	$0
Out-of-State	$1,500				$1,500	$1,500	$0
Travel Total	$1,500	$0	$0	$0	$1,500	$1,500	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Kegley, Beth *Carcass characteristics, meat quality, and consumer acceptability of inclusion of raw whole soybeans in diets for*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$23,000	$8,000			$31,000	$31,000	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Data collection fee, feed analysis	$3,750				$3,750	$3,750	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$26,750	$8,000	$0	$0	$34,750	$34,750	$0
	Total for Proposal	$28,250	$8,000	$0	$0	$36,250	$36,250	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

13 - RI-33

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Transforming Arkansas soybean hulls into high-value probiotic silage: improved digestibility and reduced post-weaning diarrhea in piglets.

Project Type:
Research

Name of Project Manager:
Amir Mani

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
This project addresses a clear post-harvest opportunity for the Arkansas soybean industry by converting soybean hulls, currently a low-value byproduct, into a functional, value-added feed ingredient for the swine sector. Through controlled fermentation by probiotic bacteria, the project aims to enhance digestibility, improve gut health, and reduce post-weaning diarrhea in nursery pigs derived by E.coli infection. The outcomes directly support increased utilization, market diversification, and economic returns for Arkansas soybean producers while aligning with swine industry priorities to reduce antibiotic reliance and improve production efficiency.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Project activities include optimization of probiotic-inoculated soybean hull silage mix using selected lactic acid bacteria, characterization of fermentation dynamics and microbial succession, and evaluation of fiber transformation and nutrient bioavailability. Biological efficacy will be validated through in vitro digestibility assays and an IACUC-approved nursery pig feeding trial assessing growth performance and gut health outcomes. A techno-economic analysis will integrate biological results with cost and market data to define commercial feasibility and return on investment for producers.

BUDGET

Amount of Funding Needed for Project:
$30,000.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Transforming Arkansas soybean hulls into high-value probiotic silage: improved digestibility and reduced post-weaning diarrhea in piglets.

Lead Investigators: Dr. Amir Mani

Co-Investigators: Dr. Tsung-Cheng Tsai

Status and Duration of Funding: New, Year 1 of 1

Research Areas: Post-Harvest, Alternative Uses, Economics.

Stated Goal: The Arkansas agricultural landscape processes over 3 million acres of soybeans annually1. With a 2024 harvest of approximately 166.1 million bushels, the state generates an estimated 250,000 tons of soybean hulls annually, assuming standard crushing yields where hulls constitute 8–10% of seed weight2. Currently, these hulls are marketed as low-value roughage or filler, often trading as low as ~$40/ton3. The goal of this project is to transform these hulls into high-value probiotic-fermented silage that enhances nursery pig nutrition and reduces post-weaning diarrhea (PWD) using specific probiotic bacteria as inoculants.

This project integrates controlled ensiling with Lactiplantibacillus plantarum and Pediococcus pentosaceus. These strains are selected to rapidly acidify the silage matrix, suppressing pathogenic organisms and degrading anti-nutritional factors (ANFs) such as trypsin inhibitors4. By delivering live probiotics and producing organic acids (lactic and acetic acid) that lower gut pH, the silage aids protein digestion and inhibits the proliferation of enterotoxigenic E. coli5. Furthermore, the microbial bioconversion improves fiber fermentability, which targets gut barrier function and immune health via increased production of butyrate in the hindgut6. The ultimate goal is to create a scalable feed ingredient that increases the economic value of soybean hulls, creates new revenue streams for Arkansas producers, and lowers health-related costs in the swine industry.

Specific Objectives:

1. Optimize synergistic probiotic bioconversion: Develop and optimize multi-ingredient soybean hull silage formulations using multi-response desirability function model to refine inclusion rates based on fermentation kinetics, lactic acid concentration, and probiotic viability7.

2. Characterize microbial succession: Quantify temporal shifts in bacterial communities from epiphytic baselines to probiotic consortia using 16S rRNA gene sequencing. Correlate

community shifts with fermentation end-products (lactic, acetic, propionic, butyric acids) to define pathogen suppression mechanisms8.

3. Quantify fiber fraction transformation: Measure the conversion of insoluble fiber (Neutral Detergent Fiber [NDF], Acid Detergent Fiber [ADF]) to soluble dietary fiber (SDF) during ensilation. Evaluate implications for fermentable substrate availability relevant to hindgut short-chain fatty acid (SCFA) production and anti-inflammatory signaling9.

4. Determine nutrient bioavailability: Quantify changes in Standardized Ileal Digestibility (SID) of essential amino acids using in vitro digestion models calibrated for nursery pigs10.

5. Validate health outcomes: Evaluate biological efficacy in nursery pigs by assessing intestinal morphology (villus height, crypt depth), tight junction integrity (Occludin/ZO-1 expression), and clinical PWD incidence 11,12.

6. Assess economic value: Conduct a partial budget and sensitivity analysis. Integrate biological performance data with market analyses to compare current hull market values with projected value-added silage pricing and estimate ROI for Arkansas producers13.

Methods:

1. *Fermentation treatments* **(Completed, Fig. 1A**).

2. *Microbiome characterization* (**Completed, Fig. 1D).**

3. *Chemical and nutritional analyses* (Completed, Fig. 1B, and 1C).

4. In vitro digestibility (Proposed): A two-phase pepsin–pancreatin digestion model simulating the nursery pig GI tract will be used to estimate digestible energy (DE) and SID of essential amino acids10. Changes in anti-nutritional factors (trypsin inhibitors) will be quantified and mechanistically linked to bioavailability.

5. Nursery pig performance (Proposed): An IACUC-approved feeding trial will validate biological efficacy. Weaned piglets (~21 days old) will be assigned to a control diet or a diet with 10% fermented silage (n=48). Metrics include Average Daily Gain (ADG), Feed Conversion Ratio (FCR), and PWD incidence over 6 weeks. Gut tissues will be analyzed for histomorphology and barrier integrity (qPCR of tight-junction proteins)12**.**

6. Techno-economic modeling (Proposed): A partial budget and sensitivity analysis will be developed. The model will calculate production costs (inoculants, labor) vs. benefits (feed efficiency, reduced medication). Results will define commercial viability and breakeven scenarios for industry adoption.

Planned Milestones: Months 1–6 (Phase I): Focus on biological translation and scale-up. Conduct advanced in vitro digestion assays to link microbial fiber depolymerization to amino acid SID. Scale up production from laboratory mini-silos to farm-level storage units. Validate fermentation robustness of farm-produced silage via pH, organic acid profiles, and probiotic density (>1×10^9 CFU/g). **Months 7–12 (Phase II)**: Conduct the in vivo nursery pig feeding trial to validate growth performance and gut health resilience. Analyze physiological data (histomorphology, diarrhea scoring). Complete the economic sensitivity analysis. Deliver technical reports and extension-ready economic tools to the Board.

Value to Soybean Industry: This project directly advances the post-harvest valorization of soybean by-productsthrough: ***1. Revenue Generation:*** Upgrading hulls from low-value roughage (~$40/ton) to a functional feed ingredient (~$100/ton). ***2. Market Diversification:*** Developing a high-value monogastric feed application reduces exposure to volatility in ruminant markets and positions Arkansas as a leader in functional feed innovation. 3. ***Production Efficiency:*** Probiotic silage targets gut health, reducing reliance on antibiotics and zinc. Improved herd health translates to better feed efficiency and throughput, strengthening demand for soy-derived feeds.

Budget Justifications/Explanation of Travel and Direct Costs: Total Request: $30,000 (AES). The budget is structured exclusively around direct project costs including: **Materials and Supplies:** Covers reagents for HPLC (organic acid profiling), DNA extraction/sequencing (microbiome analysis), in vitro digestion assays, and general laboratory consumables. **2. Animal Care:** Costs for purchasing nursery pigs, feed ingredients, and housing for the IACUC-approved efficacy trial. **3. Analysis:** Fees for external nutrient profiling and specialized assays. **4. Travel:** Local travel to the research farm for sample collection and experiment monitoring. No funds are requested for faculty salaries, permanent equipment, or overhead.

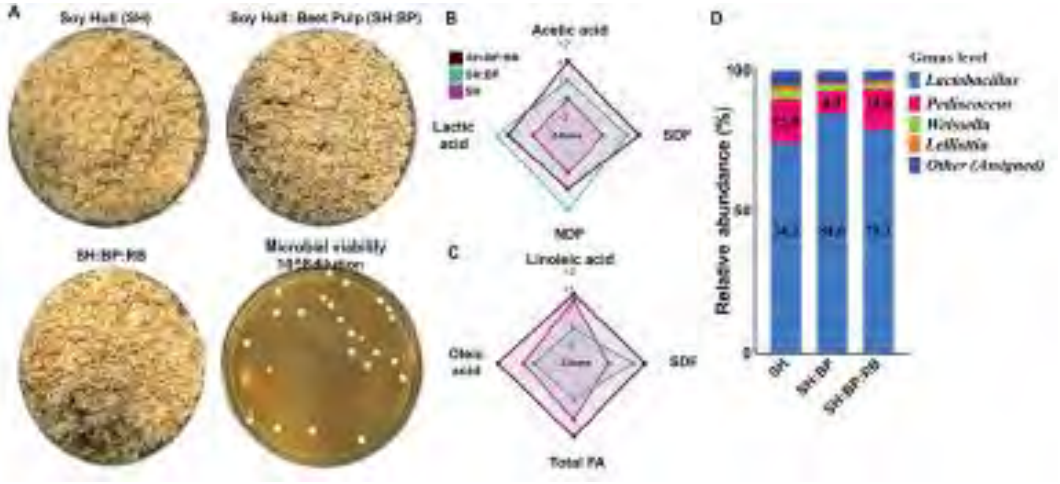


Figure 1. Probiotic-inoculated soybean by-product silages.

(A) Visual appearance of silage mixtures after 20 days of ensilation and inoculant viability (10^{-8} dilution).

(B&C) Fermentation efficiency measures. (D): microbial community composition of ensiled products

References:

1. USDA National Agricultural Statistics Service. (2024). Arkansas State Agriculture Overview.
2. Stein, H. H., et al. (2006). Energy and nutrient digestibility in soybean hulls and other soy products. Journal of Animal Science, 84(11), 2977.
3. Arkansas Department of Agriculture. (2024). Weekly Feedstuffs Market Report.
4. Torres-Pitarch, A., et al. (2018). Fermentation of soybean meal with Lactobacillus species to reduce anti-nutritional factors. Animal Feed Science and Technology, 245, 85-93.
5. Suiryanrayna, M. V., & Ramana, J. V. (2015). A review of the effects of dietary organic acids fed to swine. Journal of Animal Science and Biotechnology, 6, 45.
6. Jha, R., & Berrocoso, J. D. (2015). Dietary fiber utilization and its effects on physiological functions and gut health of swine. Animal, 9(9), 1441-1452.
7. Montgomery, D. C. (2017). Design and Analysis of Experiments. 9th Edition. Wiley.
8. Mani, A., et al. (2024). A brain microbiome in salmonids at homeostasis. Science Advances, 10(1), eadj3648.
9. Bindelle, J., et al. (2008). Voluntary intake, chemical composition, and in vitro digestibility of fresh forages. Animal Feed Science and Technology, 140, 153.
10. Boisen, S., & Fernández, J. A. (1997). Prediction of the total tract digestibility of energy in feedstuffs and pig diets by in vitro analyses. Animal Feed Science and Technology, 68(4), 277-286.
11. Stein, H. H., et al. (2007). Apparent and true ileal digestibility of amino acids in soy products by pigs. Journal of Animal Science, 85, 298.
12. Liao, S. F., & Nyachoti, M. (2017). Using probiotics to improve swine gut health and nutrient utilization. Animal Nutrition, 3(4), 331-343.
13. Kay, R. D., et al. (2012). Farm Management. 7th Edition. McGraw-Hill.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Mani, Amir — *Transforming Arkansas soybean hulls into high-value probiotic silage: reduced post-weaning diarrhea in piglets*

Year	2026/2027	**Project Year**	New, Year 1 of 1	**Version: 8.0 (09/22/2025)**
Lead Investigator	Mani, Amir	**Co-PI #1**	Tsai, Tsung Cheng	
Co-PI #2		**Co-PI #3**		
Department	ANSC Animal Sciences			
Commodity Board	Soybean Promotion Board			
Project Title	Transforming Arkansas soybean hulls into high-value probiotic silage: reduced post-weaning diarrhea in piglets			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Mani, Amir	Tsai, Tsung Cheng			Total Board Funding Requested	AES Portion	CES Portion
	Select "AES" or "CES" for each PI	AES	AES	CES	CES			
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
PI	Mani, Amir	0%	$0				$0	$0	$0
Co-PI #1	Tsai, Tsung Cheng	0%	$0				$0	$0	$0
Research Technician	Das, Aparajita	0%	$0				$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$0	$0	$0	$0	$0	$0	$0
	Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information						$0	$0	$0
	Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0
	Hourly								
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel						$0	$0	$0
	Hourly-Students						$0	$0	$0
	Subtotal: Hourly		$0	$0	$0	$0	$0	$0	$0
	Fringe Benefits								
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$0	$0	$0	$0	$0	$0	$0
	Graduate Students		$0	$0	$0	$0	$0	$0	$0
	Hourly Personnel		$0	$0	$0	$0	$0	$0	$0
	Hourly-Students		$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits		$0	$0	$0	$0	$0	$0	$0
	Personnel Total		$0	$0	$0	$0	$0	$0	$0
	Travel								
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State						$0	$0	$0
	Out-of-State						$0	$0	$0
	Travel Total		$0	$0	$0	$0	$0	$0	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Mani, Amir — *Transforming Arkansas soybean hulls into high-value probiotic silage: reduced post-weaning diarrhea in piglets*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$11,750				$11,750	$11,750	$0
	Fertilizer/Chemicals	$800				$800	$800	$0
	Publication	$3,000				$3,000	$3,000	$0
	Statistical Consulting	$1,500				$1,500	$1,500	$0
Other Direct Costs		$12,950				$12,950	$12,950	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$30,000	$0	$0	$0	$30,000	$30,000	$0
	Total for Proposal	$30,000	$0	$0	$0	$30,000	$30,000	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

14 - RI-34

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Immunomodulatory effects of isoflavones from soybean meal in broilers challenged with coccidiosis

Project Type:
Research

Name of Project Manager:
Shawna Weimer

Name of Project Team Member 1:
Danielle Graham

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
This proposal aims to evaluate the effects of dietary soy-derived isoflavones on the performance and health status of broilers. Additionally, it will assess the interactions between soy isoflavones and coccidia species to determine whether these soy bioactive compounds can improve resistance to coccidiosis in broilers.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Broiler chickens will be fed diets containing varying levels of soybean meal and isoflavones and challenged with coccidiosis or remain unchallenged. Growth performance, immune, and antioxidant responses will be measured. Laboratory analyses will verify diet composition and evaluate bioactive compounds to determine the immunomodulatory effects of soy isoflavones on broiler health.

BUDGET

Amount of Funding Needed for Project:
$41,788.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: ***Immunomodulatory effects of isoflavones from soybean meal in broilers challenged with coccidiosis***

Lead Investigators: Shawna Weimer

Co-Investigators: Danielle Graham

Status and Duration of Funding: New, Year 1 of 1

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Post-Harvest

Stated Goal:

This proposal aims to evaluate the effects of dietary soy-derived isoflavones on the performance and health status of broilers. Additionally, it will assess the interactions between soy isoflavones and coccidia species to determine whether these soy bioactive compounds can improve resistance to coccidiosis in broilers.

Specific Objectives:

1) Evaluate the effect of dietary soy isoflavone supplementation on broiler performance, immune response, and gut health.

2) Determine the impact of dietary soy isoflavone supplementation on broiler response to coccidiosis severity, immunomodulation, and antioxidant status.

Methods:

The study will evaluate the effects of dietary soy isoflavone supplementation on the response to coccidiosis challenge in broiler chickens. Day-of-hatch broiler chicks will be sourced from a commercial hatchery and placed into pens at the University of Arkansas Poultry Research Farm. Birds will be randomly allocated to five dietary treatments, with 8 pens per treatment group (80 total pens):

Treatment	Diet	Coccidiosis challenge	Pens
1	Negative control (no SBM)	Control (no challenge)	8
2	Positive control (high SBM)	Control (no challenge)	8
3	Low SBM	Control (no challenge)	8
4	As 3 + ≈70 ppm soy isoflavones	Control (no challenge)	8
5	As 3 + ≈140 ppm soy isoflavones	Control (no challenge)	8
6	Negative control (no SBM)	Challenge	8
7	Positive control (high SBM)	Challenge	8
8	Low SBM diet	Challenge	8
9	As 3 + ≈70 ppm soy isoflavones	Challenge	8
10	As 3 + ≈140 ppm soy isoflavones	Challenge	8

Isoflavone inclusion in the diet will be verified by laboratory analysis to ensure accurate dosing. All diets will be pelleted and quality-checked for uniformity. Diet 1 will contain very low levels of isoflavones and will serve as a relative control for comparison within the study. Diet 2 will be another internal control diet

with high levels of soybean meal. The SBM level will be similar to an all-vegetable corn-SBM diet, where Lys, Met, and Thr are utilized. Diet 3 will be a low SBM diet with SBM levels similar to those found in commercial diets utilizing co-products such as DDGS and MBM. Diets 4 and 5 will be the same as diet 3, but contain 2 increasing levels of soy isoflavones, with diet 5 providing similar isoflavone levels to diet 2 (high SBM diet).

On day 14, birds in the coccidiosis challenge group will receive a 10x dose of a commercial vaccine (Coccivac-B52) in 1mL of sterile saline containing live *Eimeria acervulina*, *E. maxima*, *E. mivati*, and *E. tenella* oocysts via oral gavage. The control groups will receive an equivalent volume of sterile saline.

Data collection will occur throughout the starter and grower phases to capture performance, immune, and antioxidant responses. Performance metrics (body weight and feed intake) will be recorded weekly from day 0 to day 28. Immune function will be assessed through weekly blood sampling from one sentinel bird per pen, using immunofluorescent staining and flow cytometry to profile leukocyte populations. Additionally, plasma will be isolated from blood samples to assess intestinal integrity biomarkers, and cloacal swabs will be collected weekly to monitor mucosal immunity via secretory IgA concentrations by ELISA. Oocyst shedding will be quantified following the McMaster method on days 14, 21, and 28 (DPI 0, 7, and 14). Intestinal lesion scores will be collected from two birds per pen on day 21. Liver samples collected on day 28 will be analyzed for antioxidant capacity, including malondialdehyde (MDA) and superoxide dismutase (SOD) activity.

Planned Milestones:

Month(s)	Milestone
1-2	Project initiation: finalize protocols, obtain approvals, source chicks and vaccine, prepare diets
3-4	Conduct study: place chicks, begin dietary treatments, administer challenge, collect data
5-9	Complete laboratory analysis: blood/liver assay, analyze data, submit winter report (1/20/2027)
10-12	Prepare and submit manuscript to Poultry Science, submit final report (5/15/2027)

Value to Soybean Industry:

The project aligns with the Arkansas Soybean Board's strategic plan by exploring the value-added benefits of soy components for animal health, which could increase demand for U.S. soybeans and profitability for soybean farmers.

Budget Justifications/Explanation of Travel and Direct Costs: Total = $41,788

Category	Amount	Justification
Graduate Student	$19,260	0.5 FTE MS student to run the project
Fringe	$1,233	6.40%
Tuition	$6,795	$453 x 15 credits
Supplies	$13,000	Animals, feed, assays, and laboratory supplies
Publication	$1,500	1 publication in Poultry Science

Promotion Board Budget

Year	2026/2027	**Project Year**		**Version: 8.0 (09/22/2025)**
Lead Investigator	Weimer, Shawna	**Co-PI #1**	Graham, Danielle	
Co-PI #2		**Co-PI #3**		
Department	POSC Poultry Science			
Commodity Board	Soybean Promotion Board			
Project Title	Immunomodulatory effects of isoflavones from soybean meal in broilers challenged with challenged with coccidiosis			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Weimer, Shawna	Graham, Danielle			Total Board Funding Requested	AES Portion	CES Portion
	Select "AES" or "CES" for each PI	AES	AES	AES	AES			
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$0	$0	$0	$0	$0	$0	$0
	Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
	MS Student	50%	$19,260				$19,260	$19,260	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information		$6,795				$6,795	$6,795	$0
	Subtotal: Graduate Student		$26,055	$0	$0	$0	$26,055	$26,055	$0
	Hourly								
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel						$0	$0	$0
	Hourly-Students						$0	$0	$0
	Subtotal: Hourly		$0	$0	$0	$0	$0	$0	$0
	Fringe Benefits								
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$0	$0	$0	$0	$0	$0	$0
	Graduate Students		$1,233	$0	$0	$0	$1,233	$1,233	$0
	Hourly Personnel		$0	$0	$0	$0	$0	$0	$0
	Hourly-Students		$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits		$1,233	$0	$0	$0	$1,233	$1,233	$0
	Personnel Total		$27,288	$0	$0	$0	$27,288	$27,288	$0
	Travel								
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State						$0	$0	$0
	Out-of-State						$0	$0	$0
	Travel Total		$0	$0	$0	$0	$0	$0	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Weimer, Shawna *Immunomodulatory effects of isoflavones from soybean meal in broilers challenged with challenged with*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$5,000	$8,000			$13,000	$13,000	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication	$1,500				$1,500	$1,500	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$6,500	$8,000	$0		$14,500	$14,500	$0
	Total for Proposal	$33,788	$8,000	$0		$41,788	$41,788	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

15 - RI-35

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Development of Highly Digestible Protein Cultivars with Reduced Antinutritional Factors

Project Type:
Research

Name of Project Manager:
Mahfuzur Rahman

Name of Project Team Member 1:
Caio Vieira

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Arkansas soybean protein currently shows <90% digestibility compared with ~100% for milk and egg, limiting its competitiveness as a high-quality protein source. This project aims to characterize genetic variation in seed protein digestibility with Arkansas soybean germplasm. Genome analyses will identify candidate genes to develop breeding tools that enhance digestibility, ultimately leading to improved Arkansas soybean market.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
This project will follow a multi-year pipeline focused on soybean nutritional quality. The first phase will quantify protein digestibility and antinutritional factors in 200 genetically diverse Arkansas breeding lines, followed by genome-wide association and functional genomics analyses to dissect the genetic architecture underlying these traits and enable marker-assisted improvement of soybean varieties.

BUDGET

Amount of Funding Needed for Project:
$79,880.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: ***Development of Highly Digestible Protein Cultivars with Reduced Antinutritional Factors***

Lead Investigators: Mahfuzur Rahman

Co-Investigators: Caio Canella Vieira

Status and Duration of Funding: New, Year 1 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): **Post-Harvest and Breeding**

Stated Goal:

Soy protein currently dominates the global plant-based protein market owing to its relatively high protein yield, agronomic adaptability, and extensive processing infrastructure. However, despite its economic importance and versatility, the nutritional limitations of soy protein hinder its optimal utilization as a sustainable protein source. These constraints primarily arise from the presence of antinutritional factors, such as phytic acid, trypsin inhibitors, and tannins, which interfere with mineral bioavailability and impair proteolytic enzyme activity. Furthermore, the amino acid profile of soy, characterized by a suboptimal concentration of sulfur-containing amino acids (methionine and cysteine), contributes to lower true ileal digestibility and limits its overall protein quality compared to animal-derived proteins.

In high-protein Arkansas soybean lines from our previous work, in vitro protein digestibility ranged from 81% to 88%, with PDCAAS values of 0.71 to 0.86, indicating genotypic variation. Trypsin inhibitor activity (≈3.3–3.7 TIU/mg) and phytic acid (≈0.52–0.62 g/kg) were observed, suggesting differences in major antinutritional factors. By comparison, egg and milk proteins exhibit very high true digestibility (often ≥98%) and a PDCAAS of 1.0, as they are largely free of potent antinutritional factors and possess excellent profiles of indispensable amino acids. Although soy protein has a favorable amino acid composition, it contains substantial levels of trypsin inhibitors, phytic acid, lectins, and allergenic storage proteins, which reduce protein digestibility and amino acid bioavailability. The objective of this study is to evaluate 200 soybean cultivars to identify genetic factors associated with protein digestibility, PDCAAS, and key antinutritional factors (trypsin inhibitors, phytic acid, and tannins).

Objectives

This project can be structured as a multi-year pipeline:

1. Determine the protein digestibility and antinutritional factors in a subset of 200 soybean breeding lines representing the genetic diversity available in the Arkansas Soybean Breeding program.
2. Characterize the genetic architecture of protein digestibility and antinutritional factors through genome-wide association studies and functional genomics.

Methods:

Objective 1 involves phenotyping 200 Arkansas soybean breeding lines, milling and defatting them into flour, and then analyzing the flour for crude protein and in vitro gastrointestinal digestion. Protein digestibility will be assessed using defatted flour and crude protein determination, followed by in vitro simulated gastrointestinal digestion (pepsin–pancreatin system). Antinutritional factors, including phytic acid, tannins, and trypsin inhibitors that interfere with protein digestion, will be quantified using established colorimetric, HPLC, or spectrophotometric assays. Amino acid composition, with emphasis on sulfur-containing residues and essential amino acids, will be determined using HPLC, UPLC, or targeted metabolomics. Additional protein functional traits, such as solubility, aggregation, and thermal properties, will be measured to help interpret variability in digestibility.

For Objective 2, phenotypic data generated in Objective 1 will be integrated with existing high-density genotypic data for the 200 soybean lines to characterize the genetic architecture underlying protein digestibility, PDCAAS, and antinutritional factors. Genome-wide association analyses will be conducted using mixed linear models that account for population structure and kinship to identify loci significantly associated with digestibility and antinutritional traits. Significant genomic regions will be further explored using candidate gene analysis, functional annotation, and available transcriptomic or gene expression resources to infer biological mechanisms. Allelic effects and trait correlations will be evaluated to assess potential trade-offs with protein concentration and agronomic performance. These will determine the feasibility of selecting for improved protein quality through conventional breeding and marker-assisted or genomic selection approaches.

Planned Milestones:
Year 2026-2028: Quantify digestibility and antinutritional factor content. Two hundred soybean breeding lines will be screened over the period of 2026-2028. Publish the results in the Arkansas Soybean Research Studies & a peer-reviewed journal, and present data at national scientific meetings. In addition, integrate protein digestibility and antinutritional phenotypes with existing multi-environment agronomic data for the 200 lines. Assess genetic correlations between digestibility, protein concentration, yield, and seed composition to identify lines that combine acceptable agronomic performance with improved protein quality.

Year 2028: Besides quantifying digestibility and antinutritional factors, incorporate significant markers and genomic regions into the Arkansas Soybean Breeding Program through marker-assisted screening or genomic prediction models. Identify a subset of elite breeding lines with favorable alleles for protein digestibility and reduced antinutritional factors for advancement and use as parents. Deliver practical selection guidelines (traits, thresholds, and markers) to inform future variety development targeting food- and feed-grade soybeans. Publish the results in the Arkansas Soybean Research Studies & potentially apply for a patent. Further, the data will be used to develop breeding material by Dr. Caio Canella Vieira.

Value to Soybean Industry:
The global soy protein market is currently valued at approximately $ 8–9 billion in 2024, depending on the definition and segment (isolates, concentrates, and ingredients). Several market analyses project that this value will approximately double by around 2032–2034, reaching about 14–15 billion US dollars as demand for plant-based and sustainable proteins continues to rise.
This project, which delivers cultivars with higher protein digestibility and reduced antinutritional factors, directly enhances the value of every Arkansas bushel by improving feed efficiency and nutritional quality for both livestock and human food markets.This will ensure that Arkansas soybeans remain competitive and preferred in the rapidly growing plant-based protein market.

Budget Justifications/Explanation of Travel and Direct Costs:
Considering the number of samples, a dedicated research associate and technician are required. A total of $37,240 is requested to support an associate and an hourly student who will execute the experimental plan. Additionally, $2,000 is requested for travel to a scientific meeting to present data, and $20,000 is allocated for purchasing chemicals and supplies in PI Rahman's lab and the external lab. A total of $19,140 is requested to partially cover the salary of a postdoctoral fellow with a background in bioinformatics and genomic analysis ($15,000 plus fringe benefits), as well as $1,500 for attending a bioinformatics workshop outside the state. It is worth noting that the extensive cost of acquiring genomic data is already being covered by other projects supported by the Arkansas Soybean Promotion Board, hence the smaller budget for Co-PI Vieira.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Rahman, Mahfuzur — *Development of Highly Digestible Protein Cultivars with Reduced Antinutritional Factors*

Year	2026/2027	**Project Year**	
Lead Investigator	Rahman, Mahfuzur	**Co-PI #1**	Vieira, Caio
Co-PI #2		**Co-PI #3**	
Department	FDSC Food Science		
Commodity Board	Soybean Promotion Board		
Project Title	Development of Highly Digestible Protein Cultivars with Reduced Antinutritional Factors		

Version: 8.0 (09/22/2025)

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Rahman, Mahfuzur	Vieira, Caio			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	AES	AES	CES	CES			

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
Associate	Nikitha Modupalli		$25,000	$15,000			$40,000	$40,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$25,000	$15,000	$0	$0	$40,000	$40,000	$0

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information						$0	$0	$0
	Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel	$5,000				$5,000	$5,000	$0
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$5,000	$0	$0	$0	$5,000	$5,000	$0

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$6,900	$4,140	$0	$0	$11,040	$11,040	$0
Graduate Students	$0	$0	$0	$0	$0	$0	$0
Hourly Personnel	$340	$0	$0	$0	$340	$340	$0
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$7,240	$4,140	$0	$0	$11,380	$11,380	$0
Personnel Total	$37,240	$19,140	$0	$0	$56,380	$56,380	$0

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State					$0	$0	$0
Out-of-State	$2,000	$1,500			$3,500	$3,500	$0
Travel Total	$2,000	$1,500	$0	$0	$3,500	$3,500	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Rahman, Mahfuzur *Development of Highly Digestible Protein Cultivars with Reduced Antinutritional Factors*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$20,000				$20,000	$20,000	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$20,000	$0	$0	$0	$20,000	$20,000	$0
	Total for Proposal	$59,240	$20,640	$0	$0	$79,880	$79,880	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

16 - RI-36

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Increasing Adoption of Elevation Data and Irrigation Scheduling on Furrow-Irrigated Soybeans

Project Type:
Research

Name of Project Manager:
Mike Hamilton

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
The goal of this project is to improve irrigation efficiency by using elevation data to increase water distribution uniformity in furrow-irrigated soybeans and improve irrigation scheduling by incorporating sensor-informed decisions to support timely irrigations.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Elevation data will be collected across selected furrow-irrigated soybean fields to generate digital elevation models and field maps suitable for irrigation planning and design to improve water distribution uniformity. Irrigations will be scheduled using soil moisture sensors to determine the plant available soil moisture as well as the rooting depths during the various soybean growth stages.

BUDGET

Amount of Funding Needed for Project:
$28,520.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: *Increasing Adoption of Elevation Data and Irrigation Scheduling on Furrow-Irrigated Soybeans*

Lead Investigators: Mike Hamilton, Irrigation Instructor

Co-Investigators:

Status and Duration of Funding: New, Year 1 of 3

Research Areas Irrigation

Stated Goal: The goal of this project is to improve irrigation efficiency and reduce water, labor, and fuel use in Arkansas furrow-irrigated soybean production through increased adoption of elevation data, sensor-informed irrigation scheduling, and improved poly-tubing irrigation design. By integrating field-specific elevation information with commercially available soil-moisture monitoring technologies, this project seeks to support timely irrigation decisions, improve water distribution uniformity, and increase irrigation efficiency under current producer practices.

Specific Objectives:

Objective 1: Improve irrigation efficiency and reduce water, labor, and fuel use in furrow-irrigated soybean systems by integrating elevation data and sensor-informed irrigation scheduling into current producer practices.

Objective 2: Increase the accuracy and effectiveness of poly-tubing layout and water delivery by generating field-specific elevation data and flow-based irrigation designs tailored to individual soybean fields.

Objective 3: Support education, demonstration, and adoption of improved irrigation practices by assisting producers, consultants, and University of Arkansas Division of Agriculture and NRCS personnel with field-level examples, technical guidance, and data-driven decision tools.

Methods: To accomplish these objectives, the project will focus on field-level data collection, irrigation system design, ongoing evaluation, and technical support throughout the growing season. A minimum of four paired fields will be evaluated, collecting data compared to four conventionally furrow-irrigated soybean fields where elevation data will not be used. Elevation data will be collected across selected furrow soybean fields using aerial mapping technology when field conditions allow to improve irrigation uniformity across the field crown. This data provides centimeter-level resolution and allows identification of subtle field features such as backbones or ridges and low areas that are not visible through traditional surveying methods. In fields where surface conditions limit aerial data collection, NTRIP-enabled Global Navigation Satellite System (GNSS) rover surveys will be conducted along planned poly-tubing runs to capture elevation data needed for poly-tubing designs.

Elevation data will be processed using established geospatial software platforms, including Pix4D Mapper, ArcGIS Pro, and QGIS, to generate digital elevation models and field maps suitable for irrigation planning. These maps will be used to design poly-tubing layouts and inlet configurations using irrigation design software such as Pipe Planner. Designs will account for field slope, length of runs, well capacity, and desired flow rates to improve water distribution uniformity.

Flows will be measured using flow meters to determine pumping capacity in gallons per minute, and PumpTrakr will be installed to monitor water use and hours of operation. These measurements will be

incorporated into irrigation designs to ensure that poly-tubing hole sizes and furrow spacing align with the available water supply. Matching system design to actual well output reduces inefficiencies, shortens irrigation time, minimizes over pumping, and reduces runoff.

Planned Milestones:

Milestone Objective 1: Elevation data and sensor-informed scheduling are applied to complete irrigation designs for participating soybean fields.

Milestone Objective 2: Field-specific elevation maps and flow-based poly-tubing designs are finalized and delivered to producers.

Milestone Objective 3: Field demonstrations and technical assistance activities are conducted with producers, consultants, and agency personnel

Value to Soybean Industry: This project will demonstrate how elevation-informed irrigation design and sensor-informed scheduling can reduce unnecessary irrigation, lower fuel and labor demands, and improve water-use efficiency in furrow-irrigated soybean systems. By comparing improved irrigation practices with current producer methods, the project will generate practical, field-level evidence to support adoption. The projected value includes reduced input costs, improved irrigation performance, and long-term sustainability of water resources for Arkansas soybean producers.

Budget Justifications/Explanation of Travel and Direct Costs: Travel associated with this project is primarily for in-state travel to field sites and on-farm locations. Out-of-state travel is to attend professional meetings to present research findings. Other direct costs associated with this project involve supplies, equipment repair and maintenance directly related to the described research efforts.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Mike Hamilton — *Increasing Adoption of Elevation Data and Irrigation Scheduling on Furrow-Irrigated Soybeans*

Year	2026/2027	**Project Year**	New, Year 1 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Mike Hamilton	**Co-PI #1**		
Co-PI #2		**Co-PI #3**		
Department	CSES Crop, Soil, Environmental Science			
Commodity Board	Soybean Promotion Board			
Project Title	Increasing Adoption of Elevation Data and Irrigation Scheduling on Furrow-Irrigated Soybeans			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Mike Hamilton						
	Select "AES" or "CES" for each PI	CES	AES	CES	CES	**Total Board Funding Requested**	**AES Portion**	**CES Portion**
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$0	$0	$0	$0	$0	$0	$0
Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information						$0	$0	$0
	Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0
Hourly								
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel		$15,000				$15,000	$0	$15,000
	Hourly-Students						$0	$0	$0
	Subtotal: Hourly		$15,000	$0	$0	$0	$15,000	$0	$15,000
Fringe Benefits								
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$0	$0	$0	$0	$0	$0	$0
	Graduate Students		$0	$0	$0	$0	$0	$0	$0
	Hourly Personnel		$1,020	$0	$0	$0	$1,020	$0	$1,020
	Hourly-Students		$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits		$1,020	$0	$0	$0	$1,020	$0	$1,020
	Personnel Total		$16,020	$0	$0	$0	$16,020	$0	$16,020
Travel								
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State		$4,000				$4,000	$0	$4,000
	Out-of-State		$1,500				$1,500	$0	$1,500
	Travel Total		$5,500	$0	$0	$0	$5,500	$0	$5,500

University of Arkansas System Division of Agriculture

Promotion Board Budget

Mike Hamilton *Increasing Adoption of Elevation Data and Irrigation Scheduling on Furrow-Irrigated Soybeans*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$7,000				$7,000	$0	$7,000
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$7,000	$0	$0	$0	$7,000	$0	$7,000
	Total for Proposal	$28,520	$0	$0	$0	$28,520	$0	$28,520

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

17 - RI-37

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Water Management Advancements for Irrigated Soybeans

Project Type:
Research

Name of Project Manager:
Chris Henry

Name of Project Team Member 1:
John Carlin

Name of Project Team Member 2:
Caio Vieira

Statement of Justification or Purpose of the Project (75 word maximum):
This project is an effort to develop and promote the use and application of irrigation water management and improve yield and yield stability for irrigated soybeans in Arkansas. The primary focus is to refine and adapt tools for mid-south soybean production.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Document water savings, yield improvements, profitability improvements using an Irrigation Contest and irrigation schools. Test new ideas on how to improve water retention curve development methods. Specifically develop intake families for Arkansas Irrigated Soils and max irrigation set times by variety. Deliver irrigation info through a novel cloud metering system. Test pit-less tailwater recovery water savings on paired soybean fields.

BUDGET

Amount of Funding Needed for Project:
$239,487.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Water Management Advancements for Irrigated Soybeans

Principle Investigators: C. G. Henry, U of Arkansas, **Collaborators:** T. Burcham, NERREC; N. Newberry, NERREC; John Carlin, Variety Testing; Vieira Caio, Soybean Breeding
Production System: All
Status: Year 1 of 3

Goal: This project is an effort to develop and promote the use and application of irrigation water management and improve yield and yield stability for irrigated soybeans in Arkansas. The primary focus is to refine and adapt tools for mid-south soybean production.

Objectives: The objective of this project is research, document and demonstrate irrigation water management practices on working soybean farms through an Irrigation Yield Contest Demonstration. These practices include the implementation of Computerized Hole Selection, Surge irrigation, soil moisture monitoring, ET based scheduling, irrigation initiation and irrigation termination.

1. Document water savings, yield improvements, profitability improvements using an Irrigation Contest. Compare yield and water use differences to document the efficacy and improved profitability of conservation practices.
2. Deliver irrigation schools in the winter months. (new) migrate, support and collaborate on a Master Irrigator Curriculum and Program.
3. Further develop recommendations for surge irrigation and soil moisture sensors. Improve soil water information about Arkansas and mobile app development for sensors. Test new ideas on how to improve water retention curve development methods. Specifically develop intake families for Arkansas Irrigated Soils and max irrigation set times.
4. Improve ability to measure and document water use through new cloud meter telematics. delivered to the irrigator during the season.
5. Test pit-less tailwater recovery water savings on paired soybean fields at NERREC and automation valves and pump controls for automated management.

Methods:

We propose to continue our work by integrating research results with the on-farm demonstration program through the Arkansas Irrigation Yield Contest. Contestants are increasing the average water use efficiency over time. Considerable effort has been placed on documenting the water use of soybeans using sap flow. The next step is to further develop tools for growers to use this new knowledge.

There are on average 20 contestants annually that participate in the irrigation yield contest. The contest coupled with irrigation schools have resulted in increased awareness and implementation of IWM impacting over 50% of the irrigators in the state. Schools are 6 hours and include meals and this project defers the some of the cost of the supplies. Industry has responded in support of the contest by matching the cash prize donated by the board with in-kind donations making the total prize for the contest over $125,000. We working to evolve the irrigation contest and irrigation schools into a Master Irrigator Program. We are working with NRCS to develop a program that would provide additional EQIP points to irrigators who have completed a Master Irrigator Certification.

Retention curve data has been developed for Arkansas soils, experiments are needed to validate those new curves and there is a need for intake families and for data for maximum irrigation set times. One feature we would like to add to the calculator is intake family and intake rate curves to improve and validate the new retention curves. Currently one challenge with retention curves is that when soils are dry there may

be adequate water available, but the transfer of water through capillarity and adsorption may be limited enough that crops can stress. We plan to do fundamental work to characterize the intake rates, or intake families of our irrigated soils in Arkansas.

The other issue that has never been addressed in irrigation is how long can set times by before causing yield stress. We propose to partner with the breeding and variety testing program to evaluate the new retention curve data, test irrigation set times of 12, 18, 24, 30, 36, 48 and 60 hours across a range of varieties at plots in RREC. This will provide for a data set of variety by set time yield response while also allowing us to validate the new retention curve data and mobile app recommendations.

The program is developing a new and novel flowmeters with telemetry and analytics for irrigators, prototypes will be testing on irrigation contest fields. The meters provide data back to the farmers in real time and with end of the season reports based on the current reports provided in the contest. Work to improve the cloud meter system is ongoing. The meters will be tested on some fields in the irrigation contest in 2026 as an early pilot. Hardware is complete work on a new metering method still requires improvement and engineering time. We are working to develop a credit system where every irrigator that enters the contest can receive a reward based on how well they did in the contest.

Considerable success was achieved with the promise of using the pit-less tailwater system in furrow irrigated soybeans. Used on two 50 acre commercial scale fields in 2026 at the NERREC station, it was used for all irrigation events. While it reduces water use by 4 ac-in/ac there was a significant yield difference, a penalty for the pit-less system, that may be due to leaving water standing too long on the field. We propose to test different varieties under the pit-less system 5-10 varieties within the pit-less system to evaluate if there are varieties that can handle the short-term flooding effect of tailwater recovery without yield penalty. Additionally, we will future the engineering of the system to automate the inlet and outlet into a more commercial-ready valve system.

The summary of the findings will be reviewed and the results will be made available to growers, consultants, and others through the mobile apps we publish, public meetings, extension and research publications, the internet, county extension training, and on-farm visits.

Planned Milestones: April 1, 2026 to March 31, 2029 (three cropping seasons). Currently requesting funding for year 1. In year one we will conduct two plot studies, one on the pitless system, the other on the irrigation duration. Valve electronics are done in year 1 we will finalize the pump control and optimize valve mechanical shortcomings.

Value to the Soybean Industry: Consistently high soybean yields are essential for sustaining profitable soybean production systems in Arkansas. Irrigation tool improvement, adoption and awareness of IWM allows for yield stability for soybean farmers. The cloud meter has the potential to be a real game-changer akin to yield monitors for combines and allows for an extension of the contest to more growers.

Justifications (Budget): The budget includes labor for staff time. Supplies and direct costs to support the IWM contest, meals, plot fees, steel, aluminum, coding, engineering assistance, repair, and fabrication. Some payroll for Carlin and travel for Caio to collaborate in the variety by irrigation treatment study.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Henry, Christopher *Water Management Advancements for Irrigated Soybeans*

Year	2026/2027	**Project Year**	New, Year 1 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Henry, Christopher	**Co-PI #1**	Carlin, John	
Co-PI #2	Vieira, Caio	**Co-PI #3**		
Department	BAEG Biological & Agricultural Engineering			
Commodity Board	Soybean Promotion Board			
Project Title	Water Management Advancements for Irrigated Soybeans			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Henry, Christopher	Carlin, John	Vieira, Caio		Total Board Funding Requested	AES Portion	CES Portion
		Select "AES" or "CES" for each PI	AES	AES	CES	CES			
Fulltime Personnel									
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Program Associate	Russ Parker	40%	$29,148				$29,148	$29,148	$0
Program Specialist	Nathan Blankenship	30%	$27,161				$27,161	$27,161	$0
Program Specialist	Shruti Vaman	40%	$19,353				$19,353	$19,353	$0
Program Associate	Kris Keller	30%	$19,890				$19,890	$19,890	$0
Post Doc	Dorsa Darikendeh	25%	$22,191				$22,191	$22,191	$0
	Subtotal: Salaries		$117,744	$0	$0	$0	$117,744	$117,744	$0
	Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
				$3,000			$3,000	$3,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information						$0	$0	$0
	Subtotal: Graduate Student		$0	$3,000	$0	$0	$3,000	$3,000	$0
	Hourly								
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel		$12,000	$3,500			$15,500	$15,500	$0
	Hourly-Students						$0	$0	$0
	Subtotal: Hourly		$12,000	$3,500	$0	$0	$15,500	$15,500	$0
	Fringe Benefits								
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$32,497	$0	$0	$0	$32,497	$32,497	$0
	Graduate Students		$0	$192	$0	$0	$192	$192	$0
	Hourly Personnel		$816	$238	$0	$0	$1,054	$1,054	$0
	Hourly-Students		$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits		$33,313	$430	$0	$0	$33,743	$33,743	$0
	Personnel Total		$163,057	$6,930	$0	$0	$169,987	$169,987	$0
	Travel								
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State		$6,000		$2,500		$8,500	$6,000	$2,500
	Out-of-State		$4,000				$4,000	$4,000	$0
	Travel Total		$10,000	$0	$2,500	$0	$12,500	$10,000	$2,500

University of Arkansas System Division of Agriculture

Promotion Board Budget

Henry, Christopher *Water Management Advancements for Irrigated Soybeans*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$25,000				$25,000	$25,000	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Meals, contract work	$10,000				$10,000	$10,000	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$20,000	$0	$0	$0	$20,000	$20,000	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$2,000	$0	$0	$0	$2,000	$2,000	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$57,000	$0	$0	$0	$57,000	$57,000	$0
	Total for Proposal	$230,057	$6,930	$2,500	$0	$239,487	$236,987	$2,500

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

18 - RI-38

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Field testing and optimization of biocontrol products targeting Palmer amaranth (pigweed)

Project Type:
Research

Name of Project Manager:
Burt Bluhm

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Palmer amaranth (pigweed) is a pressing pest issue for Arkansas soybean production. In previous work supported by the Arkansas Soybean Promotion Board, fungal pathogens were isolated from pigweed throughout Arkansas to identify viable biological control candidates. The goal of this project is to perform a series of field, greenhouse, and laboratory tests to optimize these organisms as bioherbicides targeting Palmer amaranth.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
The specific objectives of this project are to determine the optimal parameters for maximizing pigweed lethality from bioherbicide applications. Evaluate the stability, persistence, and overwintering of bioherbicides. Access methods to apply phytotoxins produced by biocontrol organisms to chemically control pigweed

BUDGET

Amount of Funding Needed for Project:
$45,000.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Field testing and optimization of biocontrol products targeting Palmer amaranth (pigweed)

Lead Investigator: Dr. Burt Bluhm

Collaborator: Dr. Kelly Cartwright

Status and Duration of Funding: New, Year 1 of 3

Research Areas: Weeds, Economics

Stated Goal: Herbicide-resistant Palmer amaranth (pigweed) is one of the most pressing pest issues for Arkansas soybean production. Biological controls (bioherbicides) based on fungal pathogens have been commercialized for some weed pests, but not pigweed. In previous work supported by the Arkansas Soybean Promotion Board, fungal pathogens were isolated from pigweed throughout Arkansas to identify viable biological control candidates. From this work, we identified several fungal isolates capable of specifically killing Palmer pigweed. *The goal of this project is to perform a series of field, greenhouse, and laboratory tests to optimize these organisms as bioherbicides targeting Palmer amaranth.*

Specific Objectives:

1. Determine the optimal parameters to maximize pigweed lethality from bioherbicide applications
2. Evaluate the stability, persistence, and overwintering of bioherbicides
3. Assess methods to apply phytotoxins produced by biocontrol organisms to chemically control pigweed

Methods:

In prior work, we isolated and evaluated a large number of fungal pathogens of Palmer pigweed. Two groups stood out as viable bioherbicide candidates: *Colletotrichum* spp. and *Diaporthe* spp. Each has distinct characteristics that make them promising bioherbicide candidates. The *Colletotrichum* isolates aggressively attack and kill pigweed seedlings at emergence, reduce pigweed vigor, and dramatically decrease reproductive capacity. In some circumstances, they kill mature pigweed plants, but this is less consistent and needs further optimization. The *Diaporthe* isolates kill juvenile plants and produce a host-selective phytotoxin that specifically and aggressively targets Palmer pigweed plants. We have evaluated numerous parameters for both groups of organisms, including taxonomic identity, host specificity, culturing and storage parameters, and phytotoxin production. We have performed a series of greenhouse experiments to initially explore application parameters and conditions that maximize lethality. We are now at a stage of development where we need more information from field testing, particularly with respect to lethality and interactions of bioherbicide candidates with the environment. We also need more information about how the phytotoxin produced by *Diaporthe* spp. interacts with the Palmer pigweed in field conditions. All of this information will ultimately be required for EPA registration of bioherbicide candidates.

Objective 1. Determine the optimal parameters to maximize pigweed lethality from bioherbicide applications. In a series of greenhouse tests, we evaluated a wide range of application strategies for both groups of bioherbicide candidates. Pre-emergence applications were generally the most lethal, although applications on older plants were effective in ideal environmental conditions. In this objective, we will perform applications in field conditions (microplots and conventional fields) with the goal of optimizing lethality, reducing pigweed seed production, and decreasing vigor of any surviving plants. We will focus on application timing, rates, application methods, and combinatorial formulations. We will focus on

optimizing applications before emergence, on juvenile pigweed plants (less than 4" in height), and on pigweed plants approaching maturity. We will test a range of formulations that vary in inoculum concentration, combinations of candidate strains/species, and 'tank mixes' with herbicides that may not kill Palmer pigweed individually, but may act synergistically with bioherbicides to increase lethality. We will assess individual vs. multiple applications within a season and evaluate efficacy based on the number and timing of applications. Based on the data collected from these activities, we will perform economic analyses to assess the potential impact of bioherbicides on producer profitability.

Objective 2. Evaluate the stability, persistence, and overwintering of bioherbicides. A key question regarding bioherbicides is how they interact with the environment. In particular, it is important to determine how long bioherbicides stay active during the season after an application, how far bioherbicide organisms migrate from application sites, whether or not bioherbicide organisms overwinter and survive in following seasons, whether populations that might overwinter provide meaningful levels of weed control, and whether populations of bioherbicide organisms are genetically stable and/or capable of interacting with other native microbes. We will test these parameters in controlled microplots and field conditions at the UADA research station in Fayetteville. We will perform re-isolations of the bioherbicide candidates from plants and soil throughout the season, and during the following season, after bioherbicide applications. We will quantify bioherbicide pathogen populations and confirm their identity with diagnostic molecular markers. We will assess pigweed populations in the growing season following initial applications to see if any potential bioherbicide carry-over conveys meaningful weed control across growing seasons. For a subset of the re-isolated bioherbicide collections, we will re-sequence their genomes and compare to the original isolates to see if any genetic drift/exchange is occurring. These experiments will provide important information that will be required for EPA registration.

Objective 3. Assess methods to apply phytotoxins produced by biocontrol organisms to chemically control pigweed. The *Diaporthe* isolates in this study produce a host-selective phytotoxin that is specifically active against Palmer pigweed. We will evaluate whether the phytotoxin is effective against Palmer pigweed in field conditions when applied directly as a conventional herbicide. We will explore a range of phytotoxin concentrations as well as the number, rate, and timing of applications. Experiments will be conducted in microplots and fields at the UADA research station in Fayetteville.

Planned Milestones: Objective 1 will be conducted over the three years of the project, as multiple seasons of field data will be required to establish optimal application parameters. Results from each season will be used to refine the experimental design for the following season. Objective 2 will also span all three years of the project, as multiple seasons will be required to assess potential overwintering and environmental interactions. Objective 3 will also require all three years of the project, as environmental variability from year to year is likely to affect the efficacy of phytotoxin applications.

Value to Soybean Industry: Herbicide-resistant weeds are the most problematic and expensive pest management issue in row-crop agriculture. Palmer pigweed is one of the most expensive and challenging pests affecting Arkansas soybean production. Attempts to control 'super' weeds can cost $30-50 per acre, and as much as $150/acre if hand-rouging is required. Herbicide-resistant pigweed has played a large role in forcing producers to consider options such as Xtend soybeans, which potentially limits the diversity of soybean varieties available to producers, and are controversial due to off-target effects of dicamba.

Budget Justifications/Explanation of Travel and Direct Costs: Funds are requested for laboratory experiments pertaining primarily to bioherbicide development and toxin analyses. Funds are requested for the participation of project personnel (a graduate student and a research technician). Funds for in-state travel are requested to attend growers' meetings and to support field research. Funds for out-of-state travel are requested for project participants to present project results at scientific meetings.

University of Arkansas System Division of Agriculture
Promotion Board Budget

Bluhm, Burt — *Field testing and optimization of biocontrol products targeting Palmer amaranth (pigweed)*

Year	2026/2027	**Project Year**	New, Year 1 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Bluhm, Burt	**Co-PI #1**		
Co-PI #2		**Co-PI #3**		
Department	ENPL Entomology and Plant Pathology			
Commodity Board	Soybean Promotion Board			
Project Title	Field testing and optimization of biocontrol products targeting Palmer amaranth (pigweed)			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Bluhm, Burt						
	Select "AES" or "CES" for each PI	AES	AES	CES	CES	**Total Board Funding Requested**	**AES Portion**	**CES Portion**
Fulltime Personnel								
Position Title	**Name** *(if position is filled)* / **% Time**	**Salaries**				**Total**	**AES**	**CES**
Research Technician	25%	$12,000				$12,000	$12,000	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
Subtotal: Salaries		$12,000	$0	$0	$0	$12,000	$12,000	$0
Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)* / **% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
	Tuition Calculator Information					$0	$0	$0
Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0
Hourly								
		Wages				**Total**	**AES Portion**	**CES Portion**
Hourly-Personnel		$6,700				$6,700	$6,700	$0
Hourly-Students						$0	$0	$0
Subtotal: Hourly		$6,700	$0	$0	$0	$6,700	$6,700	$0
Fringe Benefits								
Fringe benefits are calculated when salary and wage amounts are entered above.		**Benefits**				**Total**	**AES Portion**	**CES Portion**
Fulltime Personnel		$3,312	$0	$0	$0	$3,312	$3,312	$0
Graduate Students		$0	$0	$0	$0	$0	$0	$0
Hourly Personnel		$456	$0	$0	$0	$456	$456	$0
Hourly-Students		$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits		$3,768	$0	$0	$0	$3,768	$3,768	$0
Personnel Total		$22,468	$0	$0	$0	$22,468	$22,468	$0
Travel								
Justify out-of-state travel in proposal.		**Travel**				**Total**	**AES Portion**	**CES Portion**
In-State		$500				$500	$500	$0
Out-of-State		$4,000				$4,000	$4,000	$0
Travel Total		$4,500	$0	$0	$0	$4,500	$4,500	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Bluhm, Burt *Field testing and optimization of biocontrol products targeting Palmer amaranth (pigweed)*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$10,032				$10,032	$10,032	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Subcontract for Dr. Kelly Cartwri	$8,000				$8,000	$8,000	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$18,032	$0	$0	$0	$18,032	$18,032	$0
	Total for Proposal	$45,000	$0	$0	$0	$45,000	$45,000	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

19 - RI-39

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Improving Grain Yield Stability in Arkansas Soybean

Project Type:
Research

Name of Project Manager:
Caio Vieira

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Soybean yield in Arkansas varies widely due to diverse soils, cropping systems, and environmental conditions. This project supports the identification of traits and genetic factors associated with grain yield stability across Arkansas production environments. By improving understanding of how stability develops during the growing season, this work supports long-term efforts to raise the baseline level of soybean performance across the state.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Soybean genotypes will be evaluated across multiple Arkansas environments using replicated yield trials and UAV-based phenotyping conducted throughout the growing season. Image-derived traits, agronomic data, and genomic information will be analyzed to identify patterns and genetic regions associated with grain yield stability. These results will be used to support informed selection decisions within the soybean breeding program.

BUDGET

Amount of Funding Needed for Project:
$50,108.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Improving Grain Yield Stability in Arkansas Soybean

Lead Investigators: Caio Canella Vieira

Co-Investigators:

Status and Duration of Funding: New, Year 1 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Breeding

Stated Goal: Soybean production in Arkansas occurs across highly diverse and often stress-prone environments, including variation in soil types ranging from sandy to clay soils, crop rotations such as soybean and rice systems, flood-prone fields, and rainfed production areas. These environmental differences contribute to inconsistent grain yield performance across locations and years. While traditional multi-environmental yield trials effectively identify high-yielding lines, they provide limited insight into when and how yield instability develops during the growing season. As a result, breeding decisions often rely solely on end-of-season yield, missing opportunities to understand crop responses to environmental variation across developmental stages.

The goal of this project is to improve the evaluation and selection of soybean genotypes with stable grain yield performance by integrating multi-environment yield testing with UAV-based phenotyping and genomic analysis. By monitoring crop growth and stress responses throughout the season, this project will characterize phenotypic stability and plasticity over time and link these patterns to grain yield outcomes. In addition, this work will identify key traits and genomic regions that support grain yield stability across Arkansas soybean production environments. This approach supports the development of soybean varieties with improved yield stability across Arkansas production environments and provides insights that may help reduce yield variability across locations and years.

Specific Objectives: The specific objectives of this proposal are to i) evaluate soybean genotypes for grain yield performance and stability across representative Arkansas production environments.; ii) quantify within-season phenotypic stability and plasticity using UAV-based phenotyping across vegetative and reproductive growth stages, and iii) identify traits and genomic regions associated with grain yield stability and develop integrated phenomics- and genomics-based prediction tools to support breeding decisions.

Methods: Roughly 300 soybean genotypes will be evaluated annually across 4 locations representing major Arkansas cropping systems and soil types. Standard replicated yield trials will be conducted at each location, and soil samples will be collected to characterize site-specific properties contributing to genotype × environment interactions. UAV flights will be conducted 4 to 6 times during the growing season to monitor crop development from vegetative through reproductive stages using multispectral sensors. Imagery will be used to quantify canopy growth, uniformity, and stress responses over time.

Grain yield will be measured at maturity using a plot combine, and seed samples will be collected for composition analysis. Image-derived metrics describing temporal stability and phenotypic plasticity will be developed and compared with traditional yield-based stability measures to determine whether yield stability can be detected earlier in the season. All genotypes will be characterized using genome-wide molecular markers available through the Arkansas Soybean Breeding program. This data will be used to identify genomic regions and agronomic traits associated with grain yield stability and to develop integrated

prediction models that combine genomic and UAV-derived information for early identification of stable soybean genotypes.

Planned Milestones: Milestones include the successful evaluation of soybean genotypes for grain yield and yield stability across representative Arkansas production environments. Phenotyping datasets consisting of UAV-derived metrics, agronomic traits, and grain yield will be generated to describe within-season patterns of crop stability and variability. Grain yield stability metrics will be established and compared across environments to identify genotypes with consistent performance. Genomic analyses will result in the identification of traits and genomic regions associated with grain yield stability. Final milestones include the development and application of integrated phenomics- and genomics-based tools to support informed selection of soybean breeding material with improved yield stability.

Value to the Soybean Industry: This project supports Arkansas growers by improving our understanding of the traits and genetic factors that contribute to consistent grain yield performance across diverse production environments. By integrating UAV-based phenotyping and genomic analysis with traditional yield trials, this work enables the identification of traits and genomic regions associated with yield stability throughout the growing season. The outcomes of this project support the development of soybean varieties better suited to sustaining competitive production levels across Arkansas and strengthening the long-term resilience and competitiveness of soybean farming in the state.

Budget Justifications/Explanation of Travel and Direct Costs ($50,108): A total of $39,168 is requested to support a Ph.D. student, including $30,000 in base salary, fringe benefits, and $7,248 in tuition. The student will be responsible for field trial establishment, maintenance, and harvest, as well as data collection and analysis. An additional $5,500 is requested for in-state travel to conduct UAV flights across testing locations throughout the growing season, and $5,440 is requested for land fees across the University of Arkansas research stations network to support field trial implementation.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Vieira, Caio *Improving Grain Yield Stability in Arkansas Soybean*

Year	2026/2027	**Project Year**	New, Year 1 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Vieira, Caio	**Co-PI #1**		
Co-PI #2		**Co-PI #3**		
Department	CSES Crop, Soil, Environmental Science			
Commodity Board	Soybean Promotion Board			
Project Title	Improving Grain Yield Stability in Arkansas Soybean			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Vieira, Caio				Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	AES	AES	CES	CES			
Fulltime Personnel							
Position Title / **Name** *(if position is filled)* / **% Time**	**Salaries**				**Total**	**AES**	**CES**
					$0	$0	$0
					$0	$0	$0
					$0	$0	$0
					$0	$0	$0
					$0	$0	$0
Subtotal: Salaries	$0	$0	$0	$0	$0	$0	$0
Graduate Student							
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.							
Name *(if position is filled)* / **% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
Graduate Student 100%	$30,000				$30,000	$30,000	$0
					$0	$0	$0
					$0	$0	$0
					$0	$0	$0
					$0	$0	$0
Tuition Calculator Information	$7,248				$7,248	$7,248	$0
Subtotal: Graduate Student	$37,248	$0	$0	$0	$37,248	$37,248	$0
Hourly							
	Wages				**Total**	**AES Portion**	**CES Portion**
Hourly-Personnel					$0	$0	$0
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0
Fringe Benefits							
Fringe benefits are calculated when salary and wage amounts are entered above.	**Benefits**				**Total**	**AES Portion**	**CES Portion**
Fulltime Personnel	$0	$0	$0	$0	$0	$0	$0
Graduate Students	$1,920	$0	$0	$0	$1,920	$1,920	$0
Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$1,920	$0	$0	$0	$1,920	$1,920	$0
Personnel Total	$39,168	$0	$0	$0	$39,168	$39,168	$0
Travel							
Justify out-of-state travel in proposal.	**Travel**				**Total**	**AES Portion**	**CES Portion**
In-State	$5,500				$5,500	$5,500	$0
Out-of-State					$0	$0	$0
Travel Total	$5,500	$0	$0	$0	$5,500	$5,500	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Vieira, Caio *Improving Grain Yield Stability in Arkansas Soybean*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies					$0	$0	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$1,560	$0	$0	$0	$1,560	$1,560	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$1,360	$0	$0	$0	$1,360	$1,360	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$1,260	$0	$0	$0	$1,260	$1,260	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$1,260	$0	$0	$0	$1,260	$1,260	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$5,440	$0	$0	$0	$5,440	$5,440	$0
	Total for Proposal	$50,108	$0	$0	$0	$50,108	$50,108	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

19 - RI-40

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Development of High-yielding Soybean Cultivars with Broad Resilience to Stressors

Project Type:
Research

Name of Project Manager:
Caio Vieira

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
This project sustains the Arkansas Soybean Breeding program by supporting the development of high-yielding MG4 indeterminate soybean cultivars adapted to Arkansas production environments. Continued investment ensures delivery of locally developed varieties that combine competitive yield, resilience to stressors, and lower seed costs. The program provides Arkansas farmers with stable access to soybean genetics selected and tested locally.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Breeding populations will be developed using targeted hybridization and advanced through off-season nurseries. Breeding lines will be evaluated using integrated phenotypic and genomic tools and tested extensively across Arkansas environments. Superior lines will be advanced through preliminary, advanced, and regional trials, supporting a continuous pipeline of Arkansas-adapted soybean cultivars.

BUDGET

Amount of Funding Needed for Project:
$199,526.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Development of High-yielding Soybean Cultivars with Broad Resilience to Stressors

Lead Investigators: Caio Canella Vieira

Co-Investigators:

Status and Duration of Funding: New, Year 1 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Breeding

Stated Goal: The Arkansas Soybean Breeding has a long-standing history of developing and releasing high-yielding soybean varieties adapted to Arkansas production systems. In recent years, the program has strategically transitioned toward maturity group (MG) 4 indeterminate soybean varieties to better align with evolving production practices, planting windows, and environmental conditions in Arkansas and the Mid-South. This transition has been validated by the strong performance of recent releases in regional evaluations, including USDA Uniform Trials, where conventional Arkansas lines have matched or outperformed leading commercial checks.

The goal of this project is to sustain and strengthen this long-standing breeding effort by continuing the development of high-performing MG 4 indeterminate soybean varieties in conventional, Enlist-E3®, and XtendFlex® backgrounds. The breeding program integrates genomic-based targeted hybridization, rapid generation advancement through off-season nurseries, genomic-assisted selection, and extensive multi-location testing across the University of Arkansas research station network and collaborators. These allow superior breeding lines to be identified earlier and more reliably, improving selection efficiency while maintaining the rigorous field validation required for successful variety release. Continued support of this program ensures a stable pipeline of competitive, locally adapted soybean varieties that deliver consistent performance and value to Arkansas producers.

Specific Objectives: The specific objectives of this proposal include i) targeted hybridization based on genetic characterization of parental lines to develop high-yielding lines; ii) advance breeding populations efficiently through off-season nursery; iii) characterize breeding lines through integrated phenotypic and genomic evaluation for yield, stress tolerance, and adaptation; and iv) advance elite breeding lines using extensive multi-location testing across Arkansas environments.

Methods: The proposed breeding approach is summarized in figure 1. Overall, the goal is to have breeding lines ready to be tested and characterized in three years, which pending satisfactory yield performance across multiple locations, can be entered into an intensive testing network earlier. In summary, parental lines will be chosen out of USDA Northern and Southern trials from Arkansas and other programs based on yield performance, as well as needs from different projects. All parental lines will be genotyped using a genome-wide marker panel to characterize their response to multiple biotic and abiotic stressors, as well as establish genetic similarities and simulate superior combinations. F_1 seeds will be sent to off-season nurseries in November of each year and quickly advance to the F_4 stage over 18 months. $F_{4:5}$ seeds will return to Arkansas to be tested in progeny rows. In this stage, UAV-based yield estimation will be combined with the breeder's notes to select lines that will compose the preliminary stage. In the preliminary stage, all lines will be genotyped using a genome-wide marker panel to characterize their response to multiple biotic and abiotic stressors and estimate breeding values based on molecular markers. These will be tested for yield across replicated trials within the UARK testing network. Lines with superior yield performance and adaptability, as well as favorable responses to biotic and abiotic stressors, will be moved into the advanced

stage. From there, a smaller pool of genotypes will be intensively tested for yield and adaptation across locations in Arkansas and other mid-south States. Superior lines will then be entered in multiple regional trials, including the Arkansas State Variety Testing and the USDA Uniform Trials. These entries will also undergo conversion to both Enlist-E3® and XtendFlex® in an off-season nursery (details on proposal Utilization of Winter Nursery for Soybean Line Development through Backcrossing).

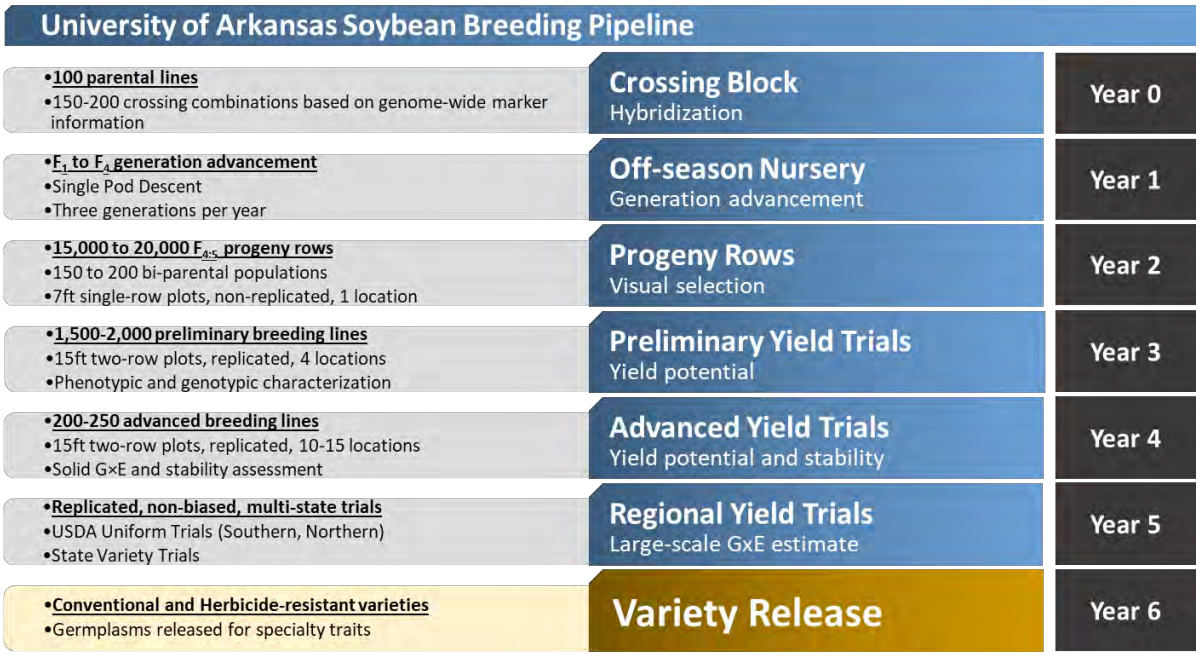


Figure 1. Summarized breeding pipeline for the University of Arkansas Soybean Breeding program.

Planned Milestones: Milestones include successfully completing the planned hybridization schemes (150-200); obtaining pure and homogeneous progeny rows from off-season nursery (15,000-20,000); selecting and conducting preliminary (1,500-2,000) and advanced trials (200-250); characterizing based on molecular markers and phenotypic assays the response to biotic and abiotic stressors as well as yield potential of breeding lines.

Value to Soybean Industry: The Arkansas Soybean Breeding program supplies Arkansas farmers with soybean varieties developed, tested, selected, and commercialized specifically for Arkansas production environments. These varieties deliver competitive yield performance and stability while maintaining lower seed costs than proprietary alternatives. Because all selection and testing occur within the state, released varieties reflect local soils, weather patterns, and management practices. In addition to direct variety releases, Arkansas farmers also benefit indirectly through material transfer agreements with seed companies that rely on Arkansas genetics to deploy products suited for local production systems. Continued support of this program ensures Arkansas growers have access to high-performing, affordable soybean genetics tailored to their production needs.

Budget Justifications/Explanation of Travel and Direct Costs ($199,526): A total of $105,876 is requested to partially a Research Associate ($32,232 plus fringe), Research Technician ($26,718 plus fringe), and a Graduate Student ($22,000, $7,248 tuition, plus fringe). A total of $7,000 for in-state travel to install, maintain, and harvest field experiments, as well as $2,500 for presenting at a scientific conference. A total of $53,000 in supplies is requested, including $12,000 for molecular markers, $32,000 for off-season nursery fees, and $9,000 for a breeding software license. $31,150 is requested for land fees across the UADA research station network.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Vieira, Caio — *Development of High-yielding Soybean Cultivars with Broad Resilience to Stressors*

Year	2026/2027	**Project Year**	New, Year 1 of 3
Lead Investigator	Vieira, Caio	**Co-PI #1**	
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Development of High-yielding Soybean Cultivars with Broad Resilience to Stressors		

Version: 8.0 (09/22/2025)

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Vieira, Caio				Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	AES	AES	CES	CES			

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
Research Associate		50%	$32,232				$32,232	$32,232	$0
Research Technician		50%	$26,718				$26,718	$26,718	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$58,950	$0	$0	$0	$58,950	$58,950	$0

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
	100%	$22,000				$22,000	$22,000	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
Tuition Calculator Information		$7,248				$7,248	$7,248	$0
Subtotal: Graduate Student		$29,248	$0	$0	$0	$29,248	$29,248	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel					$0	$0	$0
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$16,270	$0	$0	$0	$16,270	$16,270	$0
Graduate Students	$1,408	$0	$0	$0	$1,408	$1,408	$0
Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$17,678	$0	$0	$0	$17,678	$17,678	$0
Personnel Total	$105,876	$0	$0	$0	$105,876	$105,876	$0

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State	$7,000				$7,000	$7,000	$0
Out-of-State	$2,500				$2,500	$2,500	$0
Travel Total	$9,500	$0	$0	$0	$9,500	$9,500	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Vieira, Caio *Development of High-yielding Soybean Cultivars with Broad Resilience to Stressors*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$53,000				$53,000	$53,000	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$11,130	$0	$0	$0	$11,130	$11,130	$0
	CTST, Marianna	$0	$3,120	$0	$0	$3,120	$3,120	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$3,400	$0	$0	$3,400	$3,400	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$2,520	$0	$0	$0	$2,520	$2,520	$0
	RIRE, Stuttgart	$6,120	$0	$0	$0	$6,120	$6,120	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$2,520	$0	$0	$0	$2,520	$2,520	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$2,340	$0	$0	$2,340	$2,340	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$75,290	$8,860	$0	$0	$84,150	$84,150	$0
	Total for Proposal	$190,666	$8,860	$0	$0	$199,526	$199,526	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

19 - RI-41

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Genomic Prediction and Biological Insight to Enhance the Efficiency of Soybean Breeding

Project Type:
Research

Name of Project Manager:
Caio Vieira

Name of Project Team Member 1:
Samuel Fernandes

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
This project supports the use of genomic information to improve selection efficiency and increase genetic gain in soybean. By expanding genomic datasets and integrating biological context into prediction models, this work improves how breeding decisions are informed rather than increasing field testing intensity. Continued investment strengthens data-driven selection approaches that support long term improvement of Arkansas soybean genetics.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Genome-wide marker data will be generated for breeding lines entering yield trials, including higher-density variants when appropriate. Genomic prediction models will be refined using phenotypic, environmental, and biological information. Bioinformatics analyses will link important genomic regions to traits, and results will be used to guide selection strategies that improve efficiency and genetic gain within the breeding pipeline.

BUDGET

Amount of Funding Needed for Project:
$104,180.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Genomic Prediction and Biological Insight to Enhance the Efficiency of Soybean Breeding

Lead Investigators: Caio Canella Vieira

Co-Investigators: Samuel Fernandes

Status and Duration of Funding: New, Year 1 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Breeding

Stated Goal: Building on the successful development and validation of genomic prediction models using large-scale multi-environment data under the project 'Genomic Prediction to Enhance the Efficiency of Soybean Breeding', the goal of this next phase is to enhance breeding decision-making and cultivar development by integrating functional genomics and bioinformatics into the predictive breeding pipeline. Specifically, this project aims to move beyond prediction accuracy alone by identifying, prioritizing, and deploying biologically informed genomic regions, candidate genes, and molecular pathways associated with yield, stress resilience, and adaptation in Arkansas-relevant environments. By linking functional genomic insight directly to selection decisions, this phase will improve selection confidence, trait fixation, and the efficiency of developing superior soybean cultivars.

Specific Objectives: This project has three specific objectives, including i) expanding genomic data on breeding lines entering yield trials, ii) refining and validating genomic prediction models for key economically important traits, and iii) integrating bioinformatics and functional genomics to support selection decisions.

Methods:

Objective 1: Each year, all breeding lines advancing from progeny rows into preliminary yield trials (approximately 1,500 lines annually) will be genotyped using the Illumina Soy6KSNP Chip. This genotyping platform provides reliable, cost-effective genome-wide marker coverage to support selection decisions. In addition, we will expand genomic resolution by incorporating higher-density genomic data that captures hundreds of thousands of genetic variants, allowing better representation of the genetic diversity present in Arkansas breeding germplasm. This data will also enable customization of marker sets tailored to traits and genetic backgrounds relevant to Arkansas production environments through strategic partnerships with HudsonAlpha.

Objective 2: Genomic prediction models will be continuously refined using artificial intelligence and machine learning approaches combined with mixed-model frameworks commonly used in plant breeding. These models will integrate genomic, phenomics, and environmental covariates to improve prediction accuracy for yield, stress tolerance, and local adaptation. To ensure robust and reliable predictions, methods will be applied to filter and prioritize informative genetic markers, reducing overfitting and multicollinearity. Training populations will also be optimized by accounting for genetic relatedness and clustering among breeding lines, improving model performance when predicting new material entering the pipeline.

Objective 3: To move beyond marker-based prediction alone, bioinformatics and functional genomics analyses will be used to better understand the biological basis of economically important traits. Genomic regions identified as important by prediction models will be linked to known genes, biological pathways, and publicly available molecular data, including transcriptomic resources when appropriate. This

information will help prioritize and fixate key traits such as yield stability and stress tolerance, increasing confidence that selected lines possess durable, genetically supported advantages. These insights will feed directly back into breeding decisions, improving long-term genetic gain and cultivar performance.

Planned Milestones:

Proposed Activities	Year 1				Year 2				Year 3			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Obj. 1. Generate genomic data on breeding lines entering yield trials												
Genotype breeding lines using the Illumina Soy6K SNP Chip	*X*	*X*			*X*	*X*			*X*	*X*		
Expand datasets using higher-density variants and customized markers		*X*	*X*			*X*	*X*			*X*	*X*	
Obj. 2. Development and refinement of genomic prediction models												
Update and refine genomic prediction models using new genomic and field data	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*
Integrate covariates, machine learning, and optimized training populations	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*
Obj. 3. Bioinformatics and functional genomics to support selection												
Identify genomic regions associated with yield, stress tolerance, and adaptation			*X*	*X*			*X*	*X*			*X*	*X*
Link important genomic regions to genes and biological pathways using bioinformatics tools				*X*				*X*				*X*

Value to Soybean Industry: This project supports delivering better soybean varieties to Arkansas farmers faster and with greater reliability. By improving how breeding lines are selected before expensive field testing, the program reduces risk and focuses resources on lines with the highest potential for yield, stress tolerance, and local adaptation. Integrating genomic prediction with biological insight increases confidence that released varieties will perform consistently across Arkansas environments. The outcome is a more efficient breeding pipeline that strengthens the competitiveness and profitability of Arkansas soybean production.

Budget Justifications/Explanation of Travel and Direct Costs ($104,180): For Vieira, $38,280 is requested to partially support a post-doctoral fellow working on bioinformatics and genomics ($30,000 base plus fringe). A total of $2,500 is requested for out-of-state travel to attend and present at a scientific conference, $25,000 for supplies including molecular markers, and $2,500 for publication fees. For Fernandes, $31,900 is requested to partially support a Research Associate ($25,000 base plus fringe), as well as $4,000 for out-of-state travel to attend and present results at scientific conferences.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Vieira, Caio — *Genomic Prediction and Biological Insight to Enhance the Efficiency of Soybean Breeding*

Year	2026/2027	**Project Year**	New, Year 1 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Vieira, Caio	**Co-PI #1**	Fernandes, Samuel	
Co-PI #2		**Co-PI #3**		
Department	CSES Crop, Soil, Environmental Science			
Commodity Board	Soybean Promotion Board			
Project Title	Genomic Prediction and Biological Insight to Enhance the Efficiency of Soybean Breeding			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Vieira, Caio	Fernandes, Samuel			Total Board Funding Requested	AES Portion	CES Portion
	Select "AES" or "CES" for each PI	AES	AES	CES	CES			
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Post-doc Fellow			$30,000				$30,000	$30,000	$0
Research Associate				$25,000			$25,000	$25,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$30,000	$25,000	$0	$0	$55,000	$55,000	$0
	Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information						$0	$0	$0
	Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0
			Hourly						
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel						$0	$0	$0
	Hourly-Students						$0	$0	$0
	Subtotal: Hourly		$0	$0	$0	$0	$0	$0	$0
			Fringe Benefits						
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$8,280	$6,900	$0	$0	$15,180	$15,180	$0
	Graduate Students		$0	$0	$0	$0	$0	$0	$0
	Hourly Personnel		$0	$0	$0	$0	$0	$0	$0
	Hourly-Students		$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits		$8,280	$6,900	$0	$0	$15,180	$15,180	$0
	Personnel Total		$38,280	$31,900	$0	$0	$70,180	$70,180	$0
			Travel						
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State						$0	$0	$0
	Out-of-State		$2,500	$4,000			$6,500	$6,500	$0
	Travel Total		$2,500	$4,000	$0	$0	$6,500	$6,500	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Vieira, Caio *Genomic Prediction and Biological Insight to Enhance the Efficiency of Soybean Breeding*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$25,000				$25,000	$25,000	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication	$2,500				$2,500	$2,500	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$27,500	$0	$0	$0	$27,500	$27,500	$0
	Total for Proposal	$68,280	$35,900	$0	$0	$104,180	$104,180	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

19 - RI-42

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Soybean Germplasm Enhancement Using Genetic Diversity

Project Type:
Research

Name of Project Manager:
Caio Vieira

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
This project strengthens the long term sustainability of Arkansas soybean production by expanding the genetic diversity available for breeding. By identifying and incorporating diverse germplasm from other regions and the USDA Soybean Germplasm Collection, this work provides new genetic resources needed to support yield stability, grain quality, and stress tolerance in future soybean varieties developed for Arkansas.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Diverse soybean germplasm will be identified using historical performance data, genomic information, and prediction models. Selected materials will be incorporated as parents in breeding populations and advanced through established pipelines. Field evaluations will be conducted to assess performance and trait expression, supporting continuous enrichment of the Arkansas soybean germplasm pool.

BUDGET

Amount of Funding Needed for Project:
$189,826.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Soybean Germplasm Enhancement Using Genetic Diversity

Lead Investigators: Caio Canella Vieira

Co-Investigators:

Status and Duration of Funding: New, Year 1 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Breeding

Stated Goal: Because of domestication and decades of trait-focused breeding, modern soybean varieties have a narrow genetic base. In the United States, more than 85% of the parentage of modern cultivars traces back to a small number of ancestral lines, resulting in limited genetic diversity for key agronomic and stress-related traits. This lack of diversity is particularly challenging for breeding programs targeting yield stability, grain quality, and tolerance to biotic and abiotic stressors under dynamic production conditions.

The Arkansas Soybean Breeding program has historically relied on a limited set of adapted germplasm, and while recent efforts have transitioned the program toward MG4 indeterminate cultivars, additional genetic diversity is needed to sustain long-term progress. The goal of this proposal is to continuously broaden the genetic base of the Arkansas soybean germplasm pool by identifying, introducing, and utilizing diverse germplasm from other regions and from the USDA Soybean Germplasm Collection. This work serves as a foundational, long-standing component of the breeding program, supplying novel genetic variation needed to develop competitive soybean varieties that benefit Arkansas farmers.

Specific Objectives: This proposal is grounded in two specific objectives, including i) introduction of novel genetic backgrounds from plant introductions (PIs) and elite germplasm from other growing regions to strengthen the genetic pool of the Arkansas Soybean Breeding program, and ii) incorporation of unique economically important traits, including grain quality, composition, and tolerance to biotic and abiotic stressors, using targeted breeding and selection schemes.

Methods: Previous years of this research have identified several PIs that have acceptable yield, early maturing, and indeterminacy combined with unique economically important traits under diverse genetic backgrounds. In addition, multiple high-yielding elite breeding lines from various production regions were used in our crossing block in combination with high-yielding Arkansas-adapted elite cultivars. Substantial efforts will continue to identify potential genetic sources with desirable traits to be implemented within the genetic pool of the Arkansas program. Leveraging historical datasets, the USDA Soybean Germplasm Collection, and well-trained prediction models, additional genotypes will be identified and implemented as parental lines in our population development pipeline. Simply put, models will be trained based on previous years of the Arkansas yield trials; the breeding values (for instance, yield) of untested genotypes will be estimated, and superior candidates will be included in our program. This will be the foundation of generating genetic diversity in our program and can be referred to as 'Discovery Breeding'. Strategies for hybridization and population development will follow as described in the proposal 'Development of High-yielding Soybean Cultivars with Broad Resilience to Stressors', focusing on the efficiency and timeframe of the pipeline to maximize genetic gain.

Planned Milestones: A major milestone is the development and validation of prediction models based on historical datasets and genome-wide molecular markers. With this, we can simply plug in molecular marker information of untested genotypes to estimate their breeding values for multiple economically important

traits in target environments. Additional milestones include precisely identifying and incorporating novel genetics into our program; developing breeding populations derived from these novel genetics, as well as conducting field trials to assess their superiority under real-world conditions.

Value to Soybean Industry: This project provides the genetic foundation necessary to sustain long-term soybean improvement in Arkansas. By identifying and incorporating diverse germplasm with unique agronomic and quality traits, this work expands the range of genetic options available to develop high-performing, locally adapted soybean varieties. The resulting genetic diversity directly supports the development of cultivars with improved yield stability, stress tolerance, and trait combinations that are difficult to source from existing commercial germplasm. As a result, Arkansas farmers benefit from a breeding program that is better equipped to respond to emerging challenges and deliver competitive soybean varieties over the long term.

Budget Justifications/Explanation of Travel and Direct Costs ($189,826): A total of $90,986 is requested to partially support a Research Associate ($32,232 plus fringe), a Research Technician ($26,718 plus fringe), and an hourly student ($1,750 monthly stipend, total $15,750). $10,000 is requested for in-state field travel for planting, maintenance, note-taking, and harvesting of plots. $54,000 is requested in direct costs, including $40,000 for off-season nursery fees, $8,000 for external plot fees, and $6,000 for a variety of planting and harvesting supplies, including envelopes, stakes, and bags. A total of $34,840 is requested to support land fees across the University of Arkansas research extension network.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Vieira, Caio — *Soybean Germplasm Enhancement Using Genetic Diversity*

Year	2026/2027	**Project Year**	New, Year 1 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Vieira, Caio	**Co-PI #1**		
Co-PI #2		**Co-PI #3**		
Department	CSES Crop, Soil, Environmental Science			
Commodity Board	Soybean Promotion Board			
Project Title	Soybean Germplasm Enhancement Using Genetic Diversity			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Vieira, Caio						
	Select "AES" or "CES" for each PI	AES	AES	CES	CES	**Total Board Funding Requested**	**AES Portion**	**CES Portion**
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Research Associate		50%	$32,232				$32,232	$32,232	$0
Research Technician		50%	$26,718				$26,718	$26,718	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$58,950	$0	$0	$0	$58,950	$58,950	$0
	Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information						$0	$0	$0
	Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0
	Hourly								
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel						$0	$0	$0
	Hourly-Students		$15,750				$15,750	$15,750	$0
	Subtotal: Hourly		$15,750	$0	$0	$0	$15,750	$15,750	$0
	Fringe Benefits								
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$16,270	$0	$0	$0	$16,270	$16,270	$0
	Graduate Students		$0	$0	$0	$0	$0	$0	$0
	Hourly Personnel		$0	$0	$0	$0	$0	$0	$0
	Hourly-Students		$16	$0	$0	$0	$16	$16	$0
	Subtotal: Fringe Benefits		$16,286	$0	$0	$0	$16,286	$16,286	$0
	Personnel Total		$90,986	$0	$0	$0	$90,986	$90,986	$0
	Travel								
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State		$10,000				$10,000	$10,000	$0
	Out-of-State						$0	$0	$0
	Travel Total		$10,000	$0	$0	$0	$10,000	$10,000	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Vieira, Caio *Soybean Germplasm Enhancement Using Genetic Diversity*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$6,000				$6,000	$6,000	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Nursery, external plots	$48,000				$48,000	$48,000	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$7,560	$0	$0	$0	$7,560	$7,560	$0
	RIRE, Stuttgart	$19,720	$0	$0	$0	$19,720	$19,720	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$7,560	$0	$0	$0	$7,560	$7,560	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$88,840	$0	$0	$0	$88,840	$88,840	$0
	Total for Proposal	$189,826	$0	$0	$0	$189,826	$189,826	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

20 - RI-43

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Evaluating the influence of high-fiber grain coproducts on slowing the growth of gilts during the development period: impacts on iron status, microbiome, and reproductive efficiency

Project Type:
Research

Name of Project Manager:
Brittni Littlejohn

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Productive sow herds are vital to the swine industry, but high cull rates cause economic losses. In 2024, the U.S. swine sector faced a sow cull rate of 40-45%. Incorporating high fiber in diets to slow growth during development can boost reproductive efficiency, as shown in our recent research. The objective is to evaluate how dietary fiber from rice, soybean, and grain coproducts can improve swine welfare and promote sustainable farming.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Experiments with terminal gilts will assess the effects of high-fiber grain coproducts on blood biomarkers, microbiome, and reproductive cycles. Results will inform a breeding herd study, with team members documenting procedures and outcomes for presentations at industry conferences.

BUDGET

Amount of Funding Needed for Project:
$76,000.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Evaluating the influence of high-fiber grain coproducts on slowing the growth of gilts during the development period: impacts on iron status, microbiome, and reproductive efficiency

Co-Investigator(s): Brittni Littlejohn; Tsungcheng Tsai; Samatha Howe

Status and Duration of Funding: New, Year 1 of 3

Stated Goal: The ultimate goal is to identify high-fiber by-product combinations that enhance the iron status of sows and extend their longevity

Research Areas: Economics

Specific Objectives:

Objective 1: Define the effect of combining defatted rice bran, corn germ meal, and soybean hulls on body iron status and blood metabolic parameters in female pigs.

Objective 2: The ideal prototype from objective 1 will be used to assess its impact on female pigs during development and to monitor its effects on metabolic function, iron status, and reproductive performance.

Methods:

Sow longevity refers to the length of time a female pig is kept in the production cycle before being sold. As long as she successfully breeds and produces offspring, a sow will be kept until she reaches the recommended age for culling (removal from the herd). Sows that are healthy and productive each farrowing cycle and stay in the herd longer provide an increased return on investment for swine producers. Maternal nutrition significantly impacts sow and offspring health. Sows that are too fat at breeding often exhibit lameness, lower lactation intake**,** and reproductive issues. Our recent study showed that gilts (immature female pigs) fed low-nutrient, high-fiber diets, particularly emphasizing high-fiber grain co-products like wheat middlings and corn distiller's dried grain with solubles, increased the number of productive sows remaining in the system over four farrowing cycles, suggesting that low-nutrient diets during gilt development enhance body condition recovery, which may extend sow longevity. We hypothesize that such diets program metabolism to improve nutrient utilization, support body restoration, and enhance nursing ability, ultimately increasing longevity. Our pilot study also suggests that manipulating dietary fiber during gilt growth can improve sow lifespan, warranting further evaluation of alternative fiber sources. Additionally, gilts that survive beyond three farrowing cycles exhibit higher hemoglobin and hematocrit, at first breeding, suggesting a better iron status and potentially serving as early markers for longevity. A hemoglobin level of 8 mg/mL is considered safe to prevent anemia in pigs, but optimal levels for reproductive females remain undefined. Dietary fiber, often considered anti-nutritive in young pigs due to immature hindgut microbes, becomes beneficial in adults like sows, where functional microbes ferment complex carbohydrates into SCFAs for nutrient absorption. Fermentable fibers can regulate iron, blood glucose, and improve health by maintaining low luminal pH and enhancing iron absorption. Soybean hulls (~65% NDF) contain fermentable hemicellulose and pectin. Corn germ meal (~9.5% crude fiber, 45% NDF) is mainly hemicellulose. Solubility and digestibility of these fibers vary (30-50%), with soybean hulls having higher soluble fiber compared to defatted rice bran. Growing interest in dietary fibers stems from reduced antibiotic use in livestock. Most research targets crossbred marketing pigs, but pre-breeding gilt studies are limited. We propose a three-year project to evaluate these fibers' effects on metabolic health and reproductive performance.

Years 1 & 2: The fiber content varies among cultivars. To develop an effective prototype fiber product, it is essential to understand the fiber content of ingredients used in animal diets. Results from fiber analysis will inform diet formulation criteria. Crossbred marketing female pigs will be sourced from the

University of Arkansas Animal Science Swine Research Unit at 9 weeks of age. They will be randomly assigned to either a nutrient-adequate or a moderately nutrient-deficient, high-fiber diet. Body weight and intake will be measured biweekly, while blood markers and stool samples will be collected at each phase transition. From weeks 23 to 26, pigs will be monitored daily for signs of estrus during fence-separated exposure to boars. At the end of week 26, pigs will be subjected to a glucose challenge study to determine the interrelationship of dietary fiber content on blood glucose and body iron status.

Year 2 & 3: Results from Years 1 and the first part of Year 2 will guide the design of a breeding herd study in Years 2 and 3. Maternal line females will be assigned to control or prototype fiber diets (based on objective 1) at 9 weeks of age. These gilts will undergo the same experimental setup as in objective 1 and will be followed through four reproductive cycles to assess the impact of dietary fiber on reproductive performance and sow longevity.

Planned Milestones:

The initial phase will involve sourcing grain coproducts and analyzing their fiber content. Following chemical analyses, the focus will shift to acquiring crossbred marketing female pigs to test the effects of supplementing various high-fiber grain coproducts, both individually and combined, on blood biomarkers, microbiome, and estrus cycles. Blood markers such as glucose and iron, along with microbiome profiles from the first year, will inform the development of an optimal coproduct prototype for future studies. Data from Years 1 and 2 will guide a breeding herd study in Years 2 and 3, where females will be assigned to control or prototype fiber diets at 9 weeks old. These gilts will undergo similar procedures and be monitored through four reproductive cycles to evaluate dietary fiber’s impact on reproductive performance and sow longevity. The successful prototype will be presented at national swine conferences.

Value to Soybean Industry:

Reproductive sow herds are a vital commodity in the swine industry. High cull rates cause significant economic losses for producers. Manipulating nutrient levels during development has been shown to improve reproductive efficiency in various species, and our recent study supports this. In 2024, the U.S. swine industry reported a sow cull rate of 40-45%, with a mortality rate of 12.3%. While disease, lameness, and organ prolapse contribute to mortality, some causes remain unknown. Reproductive difficulties also lead to intentional culling, further impacting economic viability. Understanding how dietary fiber from rice, soybean, and grain coproducts benefits sow health can improve welfare and contribute to sustainable agriculture by utilizing these by-products. Successful project results will be shared with swine producers for validation at a commercial scale and offer alternative strategies for production systems. Additionally, we plan to secure external funding and industry support to further explore how dietary fibers influence sow health and address current production challenges.

Budget Justifications/Explanation of Travel and Direct Costs:

The proposed annual budget requests funds to be allocated across potential investing boards, such as the Arkansas Rice Research and Promotion Board, Corn Grain and Sorghum Board, and Soybean Promotion Board. The funds will support a graduate student's stipend and tuition, and hourly student wages. Travel expenses, both domestic and out-of-state, are necessary for maintaining collaboration and attending professional meetings to share research findings. Maintenance and operations costs cover animals, feed, sampling supplies, laboratory materials, and analyses, including feed, blood, and microbiome tests. The first animal study is estimated to cost $250 per animal for 180 animals, while the second trial involves 40 sows, costing about $350 each per cycle, across four cycles. Publication fees are included to publish and share the research results.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Littlejohn, Brittni — *Evaluating the influence of high-fiber grain coproducts on slowing the growth of gilts during the development*

Year	2026/2027	**Project Year**	New, Year 1 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Littlejohn, Brittni	**Co-PI #1**	Tsungcheng Tsai	
Co-PI #2	Samatha Howe	**Co-PI #3**		
Department	ANSC Animal Sciences			
Commodity Board	Soybean Promotion Board			
Project Title	Evaluating the influence of high-fiber grain coproducts on slowing the growth of gilts during the development period…			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Littlejohn, Brittni	Tsungcheng Tsai	Samatha Howe		Total Board Funding Requested	AES Portion	CES Portion
	Select "AES" or "CES" for each PI	AES	AES	AES	CES			
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$0	$0	$0	$0	$0	$0	$0
	Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
	PhD Student	33%	$7,700				$7,700	$7,700	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information		$2,762				$2,762	$2,762	$0
	Subtotal: Graduate Student		$10,462	$0	$0	$0	$10,462	$10,462	$0
	Hourly								
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel		$3,334				$3,334	$3,334	$0
	Hourly-Students						$0	$0	$0
	Subtotal: Hourly		$3,334	$0	$0	$0	$3,334	$3,334	$0
	Fringe Benefits								
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$0	$0	$0	$0	$0	$0	$0
	Graduate Students		$493	$0	$0	$0	$493	$493	$0
	Hourly Personnel		$227	$0	$0	$0	$227	$227	$0
	Hourly-Students		$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits		$720	$0	$0	$0	$720	$720	$0
	Personnel Total		$14,516	$0	$0	$0	$14,516	$14,516	$0
	Travel								
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State		$500				$500	$500	$0
	Out-of-State		$1,000				$1,000	$1,000	$0
	Travel Total		$1,500	$0	$0	$0	$1,500	$1,500	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Littlejohn, Brittni *Evaluating the influence of high-fiber grain coproducts on slowing the growth of gilts during the development*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$6,800				$6,800	$6,800	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication	$1,280				$1,280	$1,280	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs		$51,904				$51,904	$51,904	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$59,984	$0	$0	$0	$59,984	$59,984	$0
	Total for Proposal	$76,000	$0	$0	$0	$76,000	$76,000	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

20 - RR-01

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Use of gossypol to inhibit reproduction as a model for feral swine control

Project Type:
Research

Name of Project Manager:
Brittni Littlejohn

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Feral swine are an invasive species that have been estimated to cause over $1.5 billion/year in damages to crops, habitat, and private property in the U.S. Gossypol is a naturally occurring polyphenolic compound in the cottonseed plant found to inhibit fertility in various species, including humans. Our long-term goal is to assess the potential for gossypol in the form of baiting to reduce feral hog populations in Arkansas.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Our lab group proposes the continuation of a series of trials evaluating the use of gossypol to suppress fertility in swine as a model for feral swine population control. Next steps will focus on 1) product development improvements and ensuring intermittent feeding of domestic boars will translate to a field setting, 2) a pilot study to evaluate impacts of the bait on cyclicity of domestic female swine, and 3) a field study in feral swine.

BUDGET

Amount of Funding Needed for Project:
$90,000.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Use of gossypol to inhibit reproduction as a model for feral swine control

Lead Investigator(s): B. P. Littlejohn

Co-Investigator(s): T. Tsai and D. White, Jr.

Status and Duration of Funding: New, Year 1 of 3

Research Areas: Economics

Stated Goal: To evaluate the use of gossypol to inhibit fertility of swine (for the potential use of gossypol as a bait for feral swine population control)

Specific Objectives: 1. Using domestic and/or feral swine to conduct a series of experiments to evaluate the use of feed containing gossypol to inhibit reproductive function

2. Obtain input from 1) state and federal agencies and 2) collaborators in wildlife biology/population management to prepare for ongoing and future research phases

Methods: *Specific Objective 1.* Gossypol from cottonseed has been found to impede reproductive function in various species, including swine. Gossypol consumption has been associated with decreased sperm production and quality in male swine, suppressed fertility in females, and disruption of pregnancy leading to increased rates of abortion. Our *long-term goal* is to assess the potential for gossypol in the form of baiting to reduce feral hog populations in Arkansas. To accomplish this goal, our lab group proposes the continuation of a series of trials evaluating the use of gossypol to suppress fertility in swine as a model for feral swine population control. Due to the preliminary nature of the proposed research, trials will be sequential and conditional on each previous trial. Projects will be repeated and adjusted as necessary prior to starting subsequent trials to improve the efficiency and effectiveness of methods. Our lab's preliminary research results, supported by the Arkansas Corn and Grain Sorghum Board (CGSB) and the Arkansas Soybean Promotion Board (SPB), evaluated the use of gossypol-containing cottonseed oil added as a top dress to a standard swine diet on semen quality and health of domestic boars. Results showed severely decreased motility of sperm from boars that consumed gossypol-containing cottonseed oil for a 42-day period, with some boars reaching 0% motility. Ongoing phases of our research are focusing on product development improvements for the bait. Pending implementation of necessary improvements identified in ongoing phases, we plan to pursue 3 potential lines of research in the proposed 3-year study:

Experiment 1: Our lab has established the effectiveness of feeding gossypol-containing cottonseed oil to domestic boars daily in a controlled setting as a part of our proof-of-concept research phase. However, intermittent consumption of a bait would be expected in a field setting due to environmental pressures and feeding behavior patterns of feral swine. The primary objectives of Experiment 1 will be to evaluate the effectiveness of 1) improved methods and product development and 2) intermittent feeding over a 42-day period to mimic expected feeding behavior of feral hogs in the field.

Experiment 2: Method and product development improvements to date will be implemented in an initial pilot study in females. The primary objective of Experiment 2 will be to determine if gossypol-containing cottonseed oil fed to cycling females will inhibit cyclicity. Pending outcomes of the primary objective, a secondary objective will evaluate impacts on pregnancy rates.

Experiment 3: Pending the need for study replication and adjustments to Experiments 1 and 2, a field study will be conducted on a population of feral hogs in the state of Arkansas. A multi-site experiment will evaluate whether the developed gossypol-containing bait reduces measures of piglet recruitment.

Specific Objective 2. Historically, the use of toxicants as methods of feral swine control have not been well accepted by the public or regulatory agencies in the state of Arkansas. Preliminary data support the potential for gossypol-containing cottonseed oil utilized in a bait as a viable method to reduce feral swine population growth rates. Therefore, as we proceed with this line of research it is essential to have support from state and federal regulatory agencies for future product approvals. Our lab group has established working relationships with collaborators in wildlife biology/population management and with the Arkansas Feral Hog Eradication Task Force from the early phases of our preliminary research. Early input from collaborators in wildlife biology/population management have increased the potential for our methods to translate to field conditions, and early input from the Arkansas Feral Hog Eradication Task Force have helped ensure a place for such a bait product in the state of Arkansas.

Planned Milestones: Our lab group's initial trials, joint-funded by the Arkansas CGSB and SPB, established a successful line of research supporting the potential use of gossypol-containing cottonseed oil as a contraceptive in boars. It is important to note that preliminary data has already provided adequate evidence to support our *proof-of-concept phase*. However, additional controlled research trials using domestic swine as a model are needed prior to field studies. Next steps will focus on evaluating product development improvements and ensuring intermittent feeding will translate to a field setting. We are also ready to start focusing on impacts of our gossypol-containing oil product not just on the male but also the female. As a next step, our lab group has also invited an experienced wildlife biologist, Don White, Jr., to assist in designing field studies. As stated above, trials will be sequential and conditional on each previous trial. Trials will be repeated and adjusted as necessary prior to starting subsequent trials to improve the effectiveness of methods. Additionally, we will continue to seek input from state and federal agencies as a part of Objective 2. Ongoing results will be reported to the commodity boards supporting the proposed research on a regular basis.

Value to Soybean Industry: Feral swine are an invasive species that have been estimated to cause over $1.5 billion/year in damages to crops, habitat, and private property in the U.S. and over $20 million/per year in Arkansas. Due to their prolific nature, the state would need to eliminate around 60% of the population each year to halt population growth. Hunting, trapping, and shooting are simply not effective enough to control the exponential population growth. It is important to note that currently, Arkansas law only allows poison bait for rodent control. It is also imperative that control measures not cause harm to humans, other wildlife, or scavengers. Gossypol is a naturally occurring polyphenolic compound in the cottonseed plant found to inhibit fertility in various species, including humans.

Budget Justifications/Explanation of Travel and Direct Costs: The proposed annual budget is a total request to be split across investing boards (potential investing boards to include: the Arkansas Rice Research and Promotion Board, CGSB, and SPB). Funds are requested to support the stipend and tuition for a graduate student, partial support of a research technician, partial support of a postdoctoral associate, and hourly student support. In-state and out-of-state travel will be necessary for Objective 2 to maintain communication with state and federal agencies and collaborators in wildlife biology and population management. Out-of-state travel (domestic and/or international) will include travel to professional meetings to pursue research collaboration opportunities and disseminate research results. Maintenance and operations costs will include the cost of animals, feed, sampling supplies, laboratory supplies, feed analyses, semen analyses, laboratory analyses, etc. Pending the need for study replication, each project is estimated to require up to 50 hogs at an estimated cost of $300 per animal in feed and maintenance costs. Publication fees are included to disseminate research results.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Brittni Littlejohn *Use of gossypol to inhibit reproduction as a model for feral swine control*

Year	2026/2027	**Project Year**	New, Year 1 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Brittni Littlejohn	**Co-PI #1**	Tsungcheng Tsai	
Co-PI #2	Don White, Jr.	**Co-PI #3**		
Department	ANSC Animal Sciences			
Commodity Board	Soybean Promotion Board			
Project Title	Use of gossypol to inhibit reproduction as a model for feral swine control			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Brittni Littlejohn	**Tsungcheng Tsai**	**Don White, Jr.**		**Total Board Funding Requested**	**AES Portion**	**CES Portion**
	Select "AES" or "CES" for each PI	AES	AES	AES	CES			
	Fulltime Personnel							
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Program Technician	Jordan Crawford	10%	$5,000				$5,000	$5,000	$0
Postdoctoral Associate		20%	$10,000				$10,000	$10,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$15,000	$0	$0	$0	$15,000	$15,000	$0
	Graduate Student							
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
	PhD Student	100%	$23,800				$23,800	$23,800	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information		$8,285				$8,285	$8,285	$0
	Subtotal: Graduate Student		$32,085	$0	$0	$0	$32,085	$32,085	$0
	Hourly							
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel						$0	$0	$0
	Hourly-Students		$2,000				$2,000	$2,000	$0
	Subtotal: Hourly		$2,000	$0	$0	$0	$2,000	$2,000	$0
	Fringe Benefits							
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$4,140	$0	$0	$0	$4,140	$4,140	$0
	Graduate Students		$1,523	$0	$0	$0	$1,523	$1,523	$0
	Hourly Personnel		$0	$0	$0	$0	$0	$0	$0
	Hourly-Students		$2	$0	$0	$0	$2	$2	$0
	Subtotal: Fringe Benefits		$5,665	$0	$0	$0	$5,665	$5,665	$0
	Personnel Total		$54,750	$0	$0	$0	$54,750	$54,750	$0
	Travel							
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State		$1,000				$1,000	$1,000	$0
	Out-of-State		$3,500				$3,500	$3,500	$0
	Travel Total		$4,500	$0	$0	$0	$4,500	$4,500	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Brittni Littlejohn *Use of gossypol to inhibit reproduction as a model for feral swine control*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$12,000				$12,000	$12,000	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication	$3,750				$3,750	$3,750	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs		$15,000				$15,000	$15,000	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$30,750	$0	$0	$0	$30,750	$30,750	$0
	Total for Proposal	$90,000	$0	$0	$0	$90,000	$90,000	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

21 - RR-02

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Determining the value of fungicide application using on-farm trials

Project Type:
Research

Name of Project Manager:
Terry Spurlock

Name of Project Team Member 1:
Jason Davis

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
This research aims to answer difficult questions asked by farmers and consultants as to the value added by foliar applications of fungicides. It also will generate data that should be used to develop disease thresholds for Septoria brown spot and frogeye leaf spot, clarifying when to apply fungicide for these two diseases as well as answer questions regarding the value of fungicide application using American-made drones.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
We will work with farmers, consultants, county agents, and industry to locate 10-12 fields across the production area of AR to place and complete fungicide trials on soybean. Once completed, detailed reports of trial results will be given to all involved and the results shared at state and regional production meetings and published online.

BUDGET

Amount of Funding Needed for Project:
$62,000.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Determining the value of fungicide application using on-farm trials

Lead Investigators: Dr. Terry Spurlock**,** Extension Plant Pathologist**,** Department of Entomology and Plant Pathology, Division of Agriculture

Co-Investigators: Dr. Jason Davis, Application Technology Specialist, Division of Agriculture

Status and Duration of Funding: New, Year 1 of 3

Research Areas: Plant Pathology, IPM, Ag Technology

Stated Goal: To cooperate with farmers, consultants, and county agents to determine when and where a **fungicide application or fungicide + product(s) marketed to improve plant health** protects a soybean crop and adds value to the crop above the input cost.

Specific Objectives:

1. **Work with farmers or consultants on their farms** to determine the value of fungicide applications. This project is targeted at early-career farmers that may struggle with these decisions (Spurlock).

2. **Test products that the farmer and consultants would like to see.** They guide the test. Products will be applied within label specifications and at the common rate most often recommended (Spurlock).

3. **Utilize strip trials combined with spatial analysis to develop disease thresholds.** Specifically, we aim to train a master's student and have the student's project be to establish a spray threshold for Septoria brown spot, a disease that has become much more economically important in the last five years. We would also like to reevaluate the threshold for frogeye leaf spot (MS student & Spurlock).

4. **Utilize American-made drones** to apply products and determine the best application parameters using traditional ground applications as the standard (Davis).

Methods: Strip trials will be established on farms prior to R1. Trial locations will be determined by the farmers, likely based on questions regarding past field performance. Plots will be 40 rows-wide and extend the length of the field. Treatments will consist of at least an untreated control, a fungicide of the farmers' choosing and a comparable standard fungicide, replicated three times in a randomized complete block design. Trials will be approximately 30-40 acres in total size (divided into 9 fungicide plots minimum). Treatments will be applied at R3. To determine disease thresholds, data will be collected at 10 - 20 locations per plot, depending on the length of the plot, using a 0-9 rating scale where a rating of '0' indicates no disease and a rating of '9' indicates the disease was severe. The points where diseases are rated will be marked by sub-inch GPS (RTK) and recorded by location. Yield data will be provided by the farmer using a yield monitor. If yield monitor data is unavailable, yield data will be collected using the farmer's combine and a weigh wagon. Product efficacy against the diseases present and the diseases' impact on soybean yields will be determined. Data will be analyzed after each field season and product efficacy determined. Yield monitor data will be compared spatially to GPS points to establish disease thresholds. At select locations,

additional treatments of the fungicide standard will be applied aerially by drone and compared to the fungicide treatments applied using ground applications and the nontreated control.

Planned Milestones: Each year, a report will be made available to cooperating farmers, consultants, and county agents explaining in detail the findings of the trial at their location. Results will be presented at production meetings in addition to being made available as an annual summary of all trials in the Arkansas Soybean Research Series. Since this version of the project is a continuation of previous work, after three more field seasons we will have accumulated close to 100 trial locations around the state. The entirety of these data will be used to model regional and field-level risks of losses due to foliar diseases. These results will be published in refereed scientific literature.

These results will also be used in a planned precision agriculture training series for crop consultants, farmers, county agents, and aerial applicators through the Cooperative Extension Service to extend best practices (both operational and safety) for aerial applications of fungicides with American-made drone sprayers.

Value to Soybean Industry: This research aims to answer difficult questions asked by farmers and consultants as to the value added by foliar applications of various aggressively marketed products. It also will generate data that should be used to develop disease thresholds for Septoria brown spot and frogeye leaf spot clarifying when to apply fungicide for these two diseases as well as answer questions regarding the value of fungicide application using drones.

Budget Justifications/Explanation of Travel and Direct Costs: The budget reflects personnel, travel, and supply cost to move equipment, mark strips, and apply products in 10 -12 on-farm field trial locations in 10-12 different counties. A graduate student stipend and tuition is included as this student will be using these trials as part of a master's project.

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University of Arkansas System Division of Agriculture

Promotion Board Budget

Spurlock, Terry — *Determining the value of fungicide application using on-farm trials*

Year	2026/2027	**Project Year**	New, Year 1 of 3
Lead Investigator	Spurlock, Terry	**Co-PI #1**	Davis, Jason
Co-PI #2		**Co-PI #3**	
Department	ENPL Entomology and Plant Pathology		
Commodity Board	Soybean Promotion Board		
Project Title	Determining the value of fungicide application using on-farm trials		

Version: 8.0 (09/22/2025)

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Spurlock, Terry	Davis, Jason			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	CES	CES	CES	CES			

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
Technician	Robert Hoyle	25%	$12,000				$12,000	$0	$12,000
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$12,000	$0	$0	$0	$12,000	$0	$12,000

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
MS Student		$13,000				$13,000	$0	$13,000
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
Tuition Calculator Information		$10,000				$10,000	$0	$10,000
Subtotal: Graduate Student		$23,000	$0	$0	$0	$23,000	$0	$23,000

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel		$11,500			$11,500	$0	$11,500
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$0	$11,500	$0	$0	$11,500	$0	$11,500

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$3,312	$0	$0	$0	$3,312	$0	$3,312
Graduate Students	$832	$0	$0	$0	$832	$0	$832
Hourly Personnel	$0	$782	$0	$0	$782	$0	$782
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$4,144	$782	$0	$0	$4,926	$0	$4,926
Personnel Total	$39,144	$12,282	$0	$0	$51,426	$0	$51,426

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State	$3,500	$3,000			$6,500	$0	$6,500
Out-of-State					$0	$0	$0
Travel Total	$3,500	$3,000	$0	$0	$6,500	$0	$6,500

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University of Arkansas System Division of Agriculture

Promotion Board Budget

Spurlock, Terry *Determining the value of fungicide application using on-farm trials*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$2,074	$2,000			$4,074	$0	$4,074
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$2,074	$2,000	$0	$0	$4,074	$0	$4,074
	Total for Proposal	$44,718	$17,282	$0	$0	$62,000	$0	$62,000

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

21 - RR-03

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Understanding Taproot decline, Septoria brown spot, and orange leaf spot; soybean diseases of increasing importance in Arkansas

Project Type:
Research

Name of Project Manager:
Terry Spurlock

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
We aim to continue to refine the management of taproot decline on soybean, a disease that seems to be increasing in its importance in AR. We will also work to determine a fungicide application threshold for Septoria brown spot, a common disease that growers and consultants struggle to manage because it frequently occurs in soybean fields but only recently became recognized as being a disease that causes yield losses.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Trials will be planted at Rohwer Station and Jerome to determine varieties resistant to taproot decline and seed treatment or in-furrow fungicides that may also be effective. Trials will also be planted at Rohwer Station to determine varieties that have resistance to Septoria brown spot and fungicides that are most effective. Most importantly, we will work to develop a threshold to help growers know when a fungicide application should be made.

BUDGET

Amount of Funding Needed for Project:
$40,154.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Understanding Taproot decline, Septoria brown spot, and orange leaf spot; soybean diseases of increasing importance in Arkansas

Lead Investigators: Terry Spurlock, Extension Plant Pathologist, UA Division of Agriculture

Co-Investigators:

Status and Duration of Funding: New, Year 1 of 3

Research Areas: Plant Pathology, IPM

Stated Goal: To determine management strategies for taproot decline and Septoria brown spot and determine the causal agent for orange leaf spot, a disease generating questions by consultants and industry representatives

Specific Objectives:

1. Monitor the regional distribution of taproot decline and determine the disease's impact on yield.
2. Determine management strategies for taproot decline (variety, seed treatment, and in-furrow fungicides).
3. Develop an integrated management plan for Septoria brown spot and report on varietal susceptibility, varietal resistance, and fungicide efficacy. Train a master's student with focus on this objective, applied plant pathology, and pest management.
4. Determine the causal agent of orange leaf spot and its impact on yield.

Methods:

1. **Determine the distribution of taproot decline across the soybean production area in Arkansas.** Images of field symptoms and signs will be made available to county agents, farmers, and consultants via email, text groups, social media, and county meetings. Fields confirmed to have taproot decline will be recorded by GPS location and marked on a larger regional map and that updated map (positive counties) will be made available annually in county and regional meetings and in the Arkansas Soybean Research Series.

2. **a. Determine disease severity on commonly planted varieties.** Field trials will be planted at an on-farm location in Jerome, AR, in a field that has severe taproot decline and southern root-knot nematode. Approximately 20 varieties with some resistance to root-knot will be planted in a randomized complete block and replicated 6 times. Varieties' susceptibility to taproot decline will be determined. Because of the root-knot nematode, variety selection for these on-farm trials are limited to those with resistance. Therefore, an attempt will be made to treat a portion of the field with Telone II, a fumigant nematicide, prior to planting to allow for more varieties (some root-knot susceptible) to be planted. An inoculated variety trial will also be planted at the Rohwer Research Station with varieties that cannot be included in the trials at Jerome. The design of these trials will be similar. Stand counts, vigor, disease symptomology, and yield differences will be determined in all trials.

   b. Determine the efficacy of seed treatment and in-furrow fungicides against the disease. Soybean varieties that are susceptible to taproot decline will be chosen for field trials. Field trials will be replicated treatments of soybean varieties with various seed treatment fungicides, and/or with or without in-furrow fungicides. These trials will be planted at Jerome and Rohwer Research Station, and treatments will be arranged in a randomized complete block design with 6-8 replications. Stand counts, vigor, disease symptomology, and yield differences will be determined

in all trials.

3. **Develop an integrated management plan for Septoria brown spot.** Foliar fungicide trials will be planted at Rohwer Station using two soybean varieties that have shown susceptibility to brown spot. Fungicides representing each commonly used mode of action on soybean will be applied and their efficacy on brown spot and yield protection determined. Trials will be arranged in a randomized complete block design with 6-8 replications. Eleven different fungicides along with a nontreated control will be tested in each trial.

4. **Determine the causal pathogen for orange leaf spot.** Soybean leaf samples have been collected and a fungus isolated with high frequency from orange spot leaf lesions. Inoculations in a growth chamber produced similar symptoms. However, the identity of this fungus is still unknown, and further testing is required to both validate symptoms and confirm its identity.

Planned Milestones: Results will be presented annually at county production meetings, social media, and the Arkansas Soybean Research Series after each field season. After three field seasons, the results will be published in referred scientific literature.

Value to Soybean Industry: Data will continue to be collected on the regional distribution of taproot decline occurrence and yield losses associated with the disease. In previous field observation, when severe, yield losses have been between 10-20 bushels per acre. While we have found products that show some efficacy in laboratory trials and field trials, their value with respect to yield protection vs cost of application is still in question. Varietal recommendations are likely our most effective tool and must be made from field testing of market available varieties each year to provide up to date and relevant information to our growers. In addition, establishing an understanding of the interaction with cultivars and alternative ways that symptoms express themselves on the plant will be critical to continue characterizing the diseases or potential complex interactions. Understanding the regional distribution, commercially available seed treatment's efficacy, and varietal susceptibilities are necessary for successful management of taproot decline in Arkansas.

Septoria brown spot occurs in most fields in Arkansas. However, yield losses in field trials have confirmed the suspicions of many that scout soybean, brown spot can cause yield losses. Because of these two factors, and tight budgets, determining when to apply a fungicide for brown spot is best described as 'tricky'. The results of this work will improve the management of this disease by providing the best products to apply for control and varieties that are more resistant (or susceptible) to the disease.

Additionally, a new disease of soybean, tentatively called orange leaf spot, has generated numerous questions and concerns among consultants and industry representatives. The impact to yield of this disease in unclear, as is the pathogen that causes this disease. However, in some fields it has been observed to be severe. Because of this, our preliminary testing should be to determine the pathogen that causes this disease and then, if successful, determine the varieties that are most susceptible to the disease.

Budget Justifications/Explanation of Travel and Direct Costs: Station plot and maintenance fees cover on-station trials at the Rohwer Research station. The travel and supply line items will allow for reactionary data collection when commercial fields are located with moderate to severe taproot decline. Supply also covers laboratory processing of samples including baiting of taproot decline from soil using toothpicks and Petri dishes for plating of samples on growth media, classification, and selection of emerging fungal colonies in Petri dishes, and identification by molecular methods.

Docusign Envelope ID: 7D8E8B71-19E0-46F0-A30B-C1CDB049A1F5

University of Arkansas System Division of Agriculture

Promotion Board Budget

Spurlock, Terry *Understanding Taproot decline, Septoria brown spot, and orange leaf spot; soybean diseases of increasing*

Year	2026/2027	**Project Year**	New, Year 1 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Spurlock, Terry	**Co-PI #1**		
Co-PI #2		**Co-PI #3**		
Department	ENPL Entomology and Plant Pathology			
Commodity Board	Soybean Promotion Board			
Project Title	Understanding Taproot decline, Septoria brown spot, and orange leaf spot; soybean diseases of increasing importance in Arkansas			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

			Spurlock, Terry					
		Select "AES" or "CES" for each PI	CES	AES	CES	CES	**Total Board Funding Requested**	**AES Portion**	**CES Portion**
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Program Associate	Amanda Tolbert	20%	$12,000				$12,000	$0	$12,000
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$12,000	$0	$0	$0	$12,000	$0	$12,000
	Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
	MS Student	50%	$13,000				$13,000	$0	$13,000
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information		$5,000				$5,000	$0	$5,000
	Subtotal: Graduate Student		$18,000	$0	$0	$0	$18,000	$0	$18,000
	Hourly								
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel						$0	$0	$0
	Hourly-Students						$0	$0	$0
	Subtotal: Hourly		$0	$0	$0	$0	$0	$0	$0
	Fringe Benefits								
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$3,312	$0	$0	$0	$3,312	$0	$3,312
	Graduate Students		$832	$0	$0	$0	$832	$0	$832
	Hourly Personnel		$0	$0	$0	$0	$0	$0	$0
	Hourly-Students		$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits		$4,144	$0	$0	$0	$4,144	$0	$4,144
	Personnel Total		$34,144	$0	$0	$0	$34,144	$0	$34,144
	Travel								
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State		$2,000				$2,000	$0	$2,000
	Out-of-State						$0	$0	$0
	Travel Total		$2,000	$0	$0	$0	$2,000	$0	$2,000

Docusign Envelope ID: 7D8E8B71-19E0-46F0-A30B-C1CDB049A1F5

University of Arkansas System Division of Agriculture

Promotion Board Budget

Spurlock, Terry *Understanding Taproot decline, Septoria brown spot, and orange leaf spot; soybean diseases of increasing*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$2,000				$2,000	$0	$2,000
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$2,010	$0	$0	$0	$2,010	$0	$2,010
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$4,010	$0	$0	$0	$4,010	$0	$4,010
	Total for Proposal	$40,154	$0	$0	$0	$40,154	$0	$40,154

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

22 - RR-04

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Investigating Emerging Production Recommendations for Sustainable Soybean Production

Project Type:
Research

Name of Project Manager:
Jeremy Ross

Name of Project Team Member 1:
Ben Thrash

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
To investigate new and untested management inputs to improve soybean production, maximize grain yield, and maintain seed quality. This project involves researching and developing data to develop recommendations for soybean agronomic production practices and insect control and management practices.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Replicated research trials will be developed and implemented during the course of this project to investigate topics including: insecticide production rate and efficacy on several soybean insect pests; deer deterrent product and timing evaluation; new soybean variety evaluations; foliar product evaluations; etc.

BUDGET

Amount of Funding Needed for Project:
$232,136.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Investigating Emerging Production Recommendations for Sustainable Soybean Production

Lead Investigators: Jeremy Ross

Co-Investigators: Ben Thrash and other selected Extension Soybean Commodity Committee Members

Status and Duration of Funding: New, Year 1 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Agronomy/Entomology

Stated Goal: To investigate new and untested management inputs to improve soybean production, maximize grain yield, and maintain seed quality

Specific Objectives:

1. Continue to initiate test demonstrations for controlling economically damaging insect pests that often impact the Early Soybean Production System. These pest complexes include Dectes Stem Borer, Grape Colaspis, Thirps, Potato Leaf Hopper, Soybean Looper, and Stink Bug.
2. Evaluate performance of soybean varieties of different herbicide technologies including Enlist, and XtendFlex.
3. Investigate deer deterrent options and commercially available products. This will include cooperative protocols with Mississippi State University.
4. Examine the potential of using new and innovative production factors, and how they influence soybean yields and profitability. Detail research is needed to advise producers in the use of plant growth regulators, alterative fertilizer sources and other soybean production inputs currently not being tested in Arkansas for soybean production sustainability.

Methods:

1. Replicated research trials will be established to evaluate the performance of soybean varieties of the different herbicide technologies compared to popular varieties. These tests will consist of MG IV and MG V varieties at two locations. Measurements will include grain yield, lodging, shatter, and canopy structure.
2. Replicated research trials will be established to investigate the profitability of foliar applications of plant growth regulators, fertilizers, and fungicides to determine their impact on soybean yield and plant health. These data will be used in production meetings and production newsletters to either validate or refute the claims made by the manufacturer.
3. Initiate preliminary studies to determine the impact of insect pest in GMO and conventional production systems. Attempts will be made to expedite sweep sampling evaluation of various pest measures for improved pest management strategies. Additional trials evaluating new and existing insecticides and seed treatments will also be initiated. Trials evaluating the possible interaction between insecticides and commonly used herbicides will also be conducted.
4. Establish on-farm and small plot replicated research trials across the state to evaluate commercially available deer deterrents and timings of application. In-field assessments will be conducted to determine efficacy of each product. Standard protocols will be conducted in conjunction with Mississippi State University.

Planned Milestones:

1. Research identifying the most profitable recommendations to be used for all Soybean Production System will be implemented in 2026. These research objectives are to identify the most productive and most profitable planting date, seeding rate, and row spacing for MG IV and MG V production systems.
2. Evaluate pest management strategies to ensure economic thresholds are established for identifiable pests regardless of sampling technique. Conduct numerous on-farm insecticide/seed treatment evaluations to determine appropriate insecticides for Arkansas soybean pests.

Value to Soybean Industry: Each year Arkansas soybean producers are encouraged by industry to implement new and often untested management inputs to improve soybean production. Many of these inputs are termed by the soybean community as "snake oils" while others may be production practices and are rarely tested under controlled non-biased research trials in order to determine their effectiveness. Many reasons exist for not conducting these trials. A major reason is that some industry members do not want to invest in this testing, but rather use these funds in advertising and marketing of their products. The lack of an effective testing program for these materials can lead to continued use of these products often based simply on "word of mouth" or observations by the manufacturer. The use of these products is often encouraged by the apparent low costs. Producers often comment that "…its only $2 an acre…" and can rarely document a yield benefit. This industry has the potential of costing the Arkansas soybean producers million of dollars each year without accurate research trials to support or refute the use of these products or practices.

Budget Justifications/Explanation of Travel and Direct Costs: In-state travel will be used to conduct the research stated above across the state and out-of-state travel will be used to attend, participate and present research data at regional and national meetings such as the ASA Annual Meeting, Tri-State Soybean Forum, and Commodity Classic. Monies in the "Other Direct Costs" budget category will be used to pay in part for the service contracts on research equipment, maintenance and repair cost of research equipment, and GPS subscriptions.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Ross, Jeremy — *Investigating Emerging Production Recommendations for Sustainable Soybean Production*

Year	2026/2027	**Project Year**	New, Year 1 of 3
Lead Investigator	Ross, Jeremy	**Co-PI #1**	Thrash, Ben
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Investigating Emerging Production Recommendations for Sustainable Soybean Production		

Version: 8.0 (09/22/2025)

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Ross, Jeremy	Thrash, Ben			Total Board Funding Requested	AES Portion	CES Portion
	Select "AES" or "CES" for each PI	CES	CES					
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Program Assoc	Randy Miller	40%	$24,000				$24,000	$0	$24,000
Program Tech	Rollins Elam	40%	$17,600				$17,600	$0	$17,600
Program Assoc	Nathan Pearrow	40%	$28,000				$28,000	$0	$28,000
Program Assoc	Andrew Plummer	30%		$17,000			$17,000	$0	$17,000
Program Assoc	Taylor Harris	30%		$17,000			$17,000	$0	$17,000
	Subtotal: Salaries		$69,600	$34,000	$0	$0	$103,600	$0	$103,600
	Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information						$0	$0	$0
	Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0
			Hourly						
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel		$12,000	$3,700			$15,700	$0	$15,700
	Hourly-Students						$0	$0	$0
	Subtotal: Hourly		$12,000	$3,700	$0	$0	$15,700	$0	$15,700
			Fringe Benefits						
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$19,210	$9,384	$0	$0	$28,594	$0	$28,594
	Graduate Students		$0	$0	$0	$0	$0	$0	$0
	Hourly Personnel		$816	$252	$0	$0	$1,068	$0	$1,068
	Hourly-Students		$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits		$20,026	$9,636	$0	$0	$29,661	$0	$29,661
	Personnel Total		$101,626	$47,336	$0	$0	$148,961	$0	$148,961
			Travel						
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State		$10,000				$10,000	$0	$10,000
	Out-of-State		$4,000				$4,000	$0	$4,000
	Travel Total		$14,000	$0	$0	$0	$14,000	$0	$14,000

University of Arkansas System Division of Agriculture

Promotion Board Budget

Ross, Jeremy *Investigating Emerging Production Recommendations for Sustainable Soybean Production*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$7,500				$7,500	$0	$7,500
	Fertilizer/Chemicals	$2,500				$2,500	$0	$2,500
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Service Contract/Equip. Repairs	$30,000				$30,000	$0	$30,000
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$24,800	$0	$0	$0	$24,800	$0	$24,800
	PTST, Colt	$4,375	$0	$0	$0	$4,375	$0	$4,375
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$69,175	$0	$0	$0	$69,175	$0	$69,175
	Total for Proposal	$184,801	$47,336	$0	$0	$232,136	$0	$232,136

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

22 - RR-05

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Improving technology transfer in profitable and sustainable soybean

Project Type:
Research

Name of Project Manager:
Jeremy Ross

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
To ensure that improved production practices for soybean production in Arkansas are distributed in a timely manner via production and distribution of Extension publications, news articles, blog post, and other methods.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Timely publication of the Soybean Update, Arkansas Soybean Research Studies, and other Extension publications. Contribute to county, state and regional meeting including the Tri-State Soybean Forum. Contribute content and information to blog post, webinars, news articles and other venues on current and timely soybean production topics.

BUDGET

Amount of Funding Needed for Project:
$75,527.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Improving Technology Transfer for Profitable and Sustainable Soybean Production

Lead Investigators: Jeremy Ross

Co-Investigators:

Status and Duration of Funding: New, Year 1 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Agronomy

Stated Goal: To ensure that improved production practices for soybean production in Arkansas are distributed in a timely manner

Specific Objectives:

1. To ensure timely development and distribution of the Soybean Update publications as well as update computer assisted variety selection program.
2. To improve the rate of technology transfer and adaption by the implementation of educational programs that impart critical decision-making information at advisory and producer level for improved profitability for sustainable soybean production systems (non-irrigated and irrigated), including the use of weekly electronic soybean reports (e-mail and blog) and timely newsletters such as Arkansas Weekly Soybean Report.
3. Continue to coordinate state and regional meetings to facilitate the latest soybean production updates. These will include the Arkansas Soybean Research Summit, Tri-State Soybean Forum, as well as other events deemed necessary by emerging production problems.
4. To increase the awareness of county extension agents, consultants, agribusiness representatives, concerned producers of the status, direction, and value of current soybean research and Extension efforts.
5. Publication of the Soybean Research Series, which will be an on-line archive of yearly reports of the projects funded by the Arkansas Soybean Promotion Board.

Methods:

1. Procure personnel and equipment to develop and disseminate the *Arkansas Soybean Update* December each year.
2. Assist with development of the *Arkansas Row Crops Blog*, *Arkansas Weekly Soybean Report*, and *Soybean Notes* newsletters, and other educational materials including slide sets, fact sheets, and other related soybean production materials for county Extension agents, consultants and producers.
3. Organize State and/or regional SRVP/Technology Transfer, country tours and production clinics to evaluate Soybean Research Verification Program fields, Extension demonstrations and innovative producer successes.
4. Assist with the organization of in-depth educational meetings such as the Arkansas Soybean/Corn Research Conference, Tri-State Soybean Forum, and short courses, seminars at county, area or statewide meetings.
5. PI's with projects funded by the Arkansas Soybean Promotion Board will submit articles to be reviewed and published in the Soybean Research Series. These articles will serve as yearly reports to the Arkansas Soybean Promotion Board.

Planned Milestones:

1. Development and dissemination of the *Arkansas Soybean Update* by December 2026.
2. Develop and disseminate the Arkansas Weekly Soybean Report, Soybean Notes, and Weekly Blog Post weekly throughout the 2026 production season.
3. Assist with County Extension Agents and Agricultural Experiment Stations to provide soybean production updates, field days, and other methods of information delivery for critical production solutions throughout the 2026 production season.
4. Publish articles in the 2025 Soybean Research Series by November 2026.

Value to Soybean Industry: In 2025, the University of Arkansas, Division of Agriculture tested over 150 different soybean cultivars in the Commercial Cultivar Test. At last count, ten soybean seed companies were either headquartered or had an invested interest in Arkansas. Each of these different companies attempt to gain their market share of the estimated 3 plus million acres each year. Due to the large economic investment and critical nature of soybean variety selection, producers need a method to compare these cultivars in a way to ensure maximum production with little risk to pests such as soybean diseases and nematodes.

The Soybean Update publications, as well as a new variety selection website, are readily accepted as a means to help producers with these decisions. Each of these reports provide a summary of yields, disease ratings, nematode evaluations, and other agronomic information for those varieties tested in Arkansas for at least two years. This is evident in the dissemination each year. Historically, these publications have been distributed to over 9,000 clientele each year through the County Extension offices throughout the State. While the success of each of these is obvious, the timeliness of producing and disseminating these materials needs to be more efficient.

Budget Justifications/Explanation of Travel and Direct Costs: $3,500 for equipment for producing and filming podcast and virtual meetings; $1,000 for software.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Ross, Jeremy — *Improving Technology Transfer for Profitable and Sustainable Soybean Production*

Year	2026/2027	**Project Year**	New, Year 1 of 3
Lead Investigator	Ross, Jeremy	**Co-PI #1**	
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Improving Technology Transfer for Profitable and Sustainable Soybean Production		

Version: 8.0 (09/22/2025)

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Ross, Jeremy				Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	CES						

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
Program Assoc	Randy Miller	10%	$6,100				$6,100	$0	$6,100
Program Tech	Rollins Elam	10%	$4,400				$4,400	$0	$4,400
Program Assoc	Amy Tallent	50%	$33,800				$33,800	$0	$33,800
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$44,300	$0	$0	$0	$44,300	$0	$44,300

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
Tuition Calculator Information						$0	$0	$0
Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel					$0	$0	$0
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$0	$0	$0	$0	$0	$0	$0

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$12,227	$0	$0	$0	$12,227	$0	$12,227
Graduate Students	$0	$0	$0	$0	$0	$0	$0
Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$12,227	$0	$0	$0	$12,227	$0	$12,227
Personnel Total	$56,527	$0	$0	$0	$56,527	$0	$56,527

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State	$1,500				$1,500	$0	$1,500
Out-of-State	$10,000				$10,000	$0	$10,000
Travel Total	$11,500	$0	$0	$0	$11,500	$0	$11,500

University of Arkansas System Division of Agriculture

Promotion Board Budget

Ross, Jeremy *Improving Technology Transfer for Profitable and Sustainable Soybean Production*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$2,000				$2,000	$0	$2,000
	Fertilizer/Chemicals					$0	$0	$0
	Publication	$1,000				$1,000	$0	$1,000
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Podcast Equip/Software	$4,500				$4,500	$0	$4,500
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$7,500	$0	$0	$0	$7,500	$0	$7,500
	Total for Proposal	$75,527	$0	$0	$0	$75,527	$0	$75,527

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

22 - RR-06

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Science for Success – Arkansas Support for National Soybean Research and Extension Program

Project Type:
Research

Name of Project Manager:
Jeremy Ross

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
With this project, we will be able to develop and distribute research-based information to soybean farmers in Arkansas and across the U.S. on emerging best management practices (BMP's). We will contribute to the Science for Success program by expanding previously successful efforts with the continued development of soybean BMP's through both the effective summarization of existing data and the generation of new data driven information.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Conduct in-field soybean research trials to generate data for BMP's (National N Credit Study, Potassium Rate Study; etc.). Participate in monthly Science for Success virtual meetings, attend and participate in three in-person Science for Success meeting during the year, and attend and contribute to one in-person Extension educational materials meeting in August 2026. Contribute to social media outreach.

BUDGET

Amount of Funding Needed for Project:
$137,615.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Science for Success – Arkansas Support for National Soybean Research and Extension Program

Lead Investigators: Jeremy Ross

Co-Investigators:

Status and Duration of Funding: New, Year 1 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Agronomy

Stated Goal: Participate in the Science for Success program by conducting soybean production research and contributing to educational materials that will be distributed at the local, regional, and national level.

Specific Objectives: With this project, we will be able to develop and distribute research-based information to soybean farmers in Arkansas and across the U.S. on emerging best management practices (BMP's). We will contribute to the Science for Success program by expanding previously successful efforts with the continued development of soybean BMP's through both the effective summarization of existing data and the generation of new data driven information that will allow soybean farmers to increase revenue and invest in sustainable on-farm practices.

Methods:

1. Participate in national soybean research protocols to contribute data for BMP's.
2. Contribute data and expertise for Extension publications, social media releases, videos, and webinars to deliver BMP's at the local, regional, and national level.
3. Attend and participate in Science for Success virtual and in-person meetings to develop common-theme localized research efforts, Extension educational materials, and team-building activities.

Planned Milestones:

1. Conduct in-field soybean research trials to generate data for BMP's (National N Credit Study, Potassium Rate Study; etc.)
2. Participate in monthly Science for Success virtual meetings, attend and participate in three in-person Science for Success meeting during the year, and attend and contribute to one in-person Extension educational materials meeting in August 2026.
3. Contribute to social media outreach through posting field observations during the growing season and contributing short videos of Science for Success content.

Value to Soybean Industry: The Science for Success program is a collaborative team of Extension personnel from diverse soybean growing regions across the U.S. Individuals within this group are using grants like this one to leverage funding and support from local QSSB's to conduct the needed research to generate soybean BMP's. Through this group, we can generate research data across diverse environments in a shorter timeframe than would be possible from a single state or regional program. Since the inception of the Science for Success program, this group has generated national data that has contributed to educational materials on foliar nutrient products and additional sulfur fertility of soybean. We have also developed national publication from existing knowledge and data generated from local QSSB funding on management decisions across growth stages, soybean planting dates, soybean seeding rates, and optimal row spacing for soybean production. Research data and Extension publications are available

on multiple platforms including individual state websites, the Soybean Research and Information Network and the Crop Protection Network. Research data and Extension educational materials generated from this project will benefit soybean growers from Arkansas to the national level.

Budget Justifications/Explanation of Travel and Direct Costs: The $10,000 in in-state travel will be used to travel to research locations throughout the growing season to conduct the needed research; the $12,5000 in out-of-state travel will be used to attend meetings where Extension publications will be generated and discussion of research topics, and attend and present research results at the World Soybean Research Conference in Rosario, Argentina from April 5-7, 2027. Monies in the "Other Direct Costs" category include postage for shipping samples, equipment repairs, and other items needed for the research mentioned above.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Ross, Jeremy — *Science for Success - Arkansas Support for National Soybean Research and Extension Program*

Year	2026/2027	**Project Year**	New, Year 1 of 3
Lead Investigator	Ross, Jeremy	**Co-PI #1**	
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Science for Success - Arkansas Support for National Soybean Research and Extension Program		

Version: 8.0 (09/22/2025)

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Ross, Jeremy				**Total Board Funding Requested**	**AES Portion**	**CES Portion**
Select "AES" or "CES" for each PI	CES						
Fulltime Personnel							
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total** / **AES** / **CES**
Program Assoc	Randy Miller	30%	$18,000				$18,000 / $0 / $18,000
Program Tech	Rollins Elam	30%	$13,200				$13,200 / $0 / $13,200
Program Assoc	Amy Tallent	50%	$34,000				$34,000 / $0 / $34,000
							$0 / $0 / $0
							$0 / $0 / $0
	Subtotal: Salaries		$65,200	$0	$0	$0	$65,200 / $0 / $65,200
	Graduate Student						
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total** / **AES Portion** / **CES Portion**
							$0 / $0 / $0
							$0 / $0 / $0
							$0 / $0 / $0
							$0 / $0 / $0
							$0 / $0 / $0
	Tuition Calculator Information						$0 / $0 / $0
	Subtotal: Graduate Student		$0	$0	$0	$0	$0 / $0 / $0
	Hourly						
			Wages				**Total** / **AES Portion** / **CES Portion**
	Hourly-Personnel		$5,000				$5,000 / $0 / $5,000
	Hourly-Students						$0 / $0 / $0
	Subtotal: Hourly		$5,000	$0	$0	$0	$5,000 / $0 / $5,000
	Fringe Benefits						
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total** / **AES Portion** / **CES Portion**
	Fulltime Personnel		$17,995	$0	$0	$0	$17,995 / $0 / $17,995
	Graduate Students		$0	$0	$0	$0	$0 / $0 / $0
	Hourly Personnel		$340	$0	$0	$0	$340 / $0 / $340
	Hourly-Students		$0	$0	$0	$0	$0 / $0 / $0
	Subtotal: Fringe Benefits		$18,335	$0	$0	$0	$18,335 / $0 / $18,335
	Personnel Total		$88,535	$0	$0	$0	$88,535 / $0 / $88,535
	Travel						
Justify out-of-state travel in proposal.			**Travel**				**Total** / **AES Portion** / **CES Portion**
	In-State		$10,000				$10,000 / $0 / $10,000
	Out-of-State		$12,500				$12,500 / $0 / $12,500
	Travel Total		$22,500	$0	$0	$0	$22,500 / $0 / $22,500

University of Arkansas System Division of Agriculture

Promotion Board Budget

Ross, Jeremy *Science for Success - Arkansas Support for National Soybean Research and Extension Program*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$7,000				$7,000	$0	$7,000
	Fertilizer/Chemicals	$2,500				$2,500	$0	$2,500
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Postage/Repairs/Phone Charges	$7,500				$7,500	$0	$7,500
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$6,455	$0	$0	$0	$6,455	$0	$6,455
	PTST, Colt	$3,125	$0	$0	$0	$3,125	$0	$3,125
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$26,580	$0	$0	$0	$26,580	$0	$26,580
	Total for Proposal	$137,615	$0	$0	$0	$137,615	$0	$137,615

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

22 - RR-07

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Soybean Research Verification Program

Project Type:
Research

Name of Project Manager:
Jeremy Ross

Name of Project Team Member 1:
Brian Deaton

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
To verify University of Arkansas, Division of Agriculture recommendation for soybean production, and to maintain an economic data base of production practices on a large-scale field basis.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Farmer-cooperators are selected in soybean-producing counties and the soybean crop grown at the cooperator's expense under the technical direction of the SRVP coordinators. All production practices are based on current Extension Service recommendations. Complete records of field operations are maintained for economic analyses of individual fields.

BUDGET

Amount of Funding Needed for Project:
$210,672.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Soybean Research Verification Program

Lead Investigators: Jeremy Ross

Co-Investigators: Chris Elkins, Brian Deaton and Coordinator to be hired

Status and Duration of Funding: New, Year 1 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Verification

Stated Goal: To verify University of Arkansas, Division of Agriculture recommendation for soybean production, and to maintain an economic data base of production practices on a large-scale field basis.

Specific Objectives:

1. To conduct field trials to verify that high yields can be profitably produced by coordinating the implementation of all research-based recommendations.
2. To aid researchers in identifying areas of soybean production and marketing that need further study.
3. To improve recommendations which contribute to profitable soybean production utilizing both irrigated and non-irrigated production of both early season (indeterminate) and conventional (determinate) varieties into economically sustainable soybean production systems for the Arkansas farmers.
4. To utilize the Soybean Research Verification Program (SRVP) concept to maintain and improve producers, County Extension Agents' and other crop advisors' soybean production and marketing expertise.

Methods: Farmer-cooperators are selected in soybean-producing counties and the soybean crop grown at the cooperator's expense under the technical direction of the SRVP coordinators. Computerized soil test and variety selection programs and jointly developed Research/Extension weed, insect, and disease programs are utilized. All production practices are based on current Extension Service recommendations. Complete records of field operations are maintained for economic analyses of individual fields.

Planned Milestones: The 2026 Arkansas SRVP will consist of approximately 20 fields representing different production systems for the various soybean production regions within the state. Data obtained from these studies will be evaluated against the objectives. SRVP coordinators will meet with farmer-cooperators during the winter to determine variety, pesticide, and other agronomic practices, which will be utilized during the growing season. SRVP coordinators will make weekly visits to each SRVP field during the growing season to monitor and evaluate each field's progress. Economic data collected during the growing season will be calculated and reported in a final yearly report. SRVP data will be presented at County production meetings and other meetings deemed appropriate.

Value to Soybean Industry: Soybean yields in Arkansas continue to increase but yields can increase more if Arkansas soybean farmers adopt and implement new technology. To increase the state's yield average, new technology including "Precision Agriculture" must be quickly transferred from the University researcher to the soybean producer. The SRVP allows soybean producers to observe University of recommended production practices being implemented on typical producer fields across the state. The SRVP provides for faster adoption of new and existing technology for improved soybean production efficiency for both irrigated and non-irrigated production. The SRVP also demonstrates the

profitability of recommended production systems in “real world” high-yield (irrigated environments and also the variable non-irrigated environments and offers an opportunity to enhance cooperating producers’ and county Extension agents’ marketing expertise.

Budget Justifications/Explanation of Travel and Direct Costs: Both SRVP coordinators travel to each field on a weekly basis during the growing season. Before and after the growing season, coordinators are traveling to meet with potential cooperators and County Agents to plan the coming season and participating in State meeting by presenting SRVP data. Cooperating County Agents are provided two one-way trips to visit their SRVP field twice a week. Out-of-state travel is included in the budget to provide both SRVP coordinators the opportunity to participate in national meetings such as the Commodity Classic or ASA meetings. Additional Direct Cost are $2,000 for cell phone/MiFi charges, $5,600 for four additional soil sensor packages (Decision King Lite, 4 Watermark Sensors, and 6-month PK Link subscription), and $3,500 for cell service for soil moisture sensors**.**

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University of Arkansas System Division of Agriculture
Promotion Board Budget

Ross, Jeremy *Soybean Research Verification Program*

Year	2026/2027	**Project Year**	New, Year 1 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Ross, Jeremy	**Co-PI #1**	Deaton, Brian	
Co-PI #2		**Co-PI #3**		
Department	CSES Crop, Soil, Environmental Science			
Commodity Board	Soybean Promotion Board			
Project Title	Soybean Research Verification Program			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Ross, Jeremy	Deaton, Brian			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	CES	AES					

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
Program Assoc	Chris Elkins	95%	$65,000				$65,000	$0	$65,000
Program Assoc	TBD	95%	$57,000				$57,000	$0	$57,000
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
		Subtotal: Salaries	$122,000	$0	$0	$0	$122,000	$0	$122,000

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
Tuition Calculator Information						$0	$0	$0
Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel		$4,500			$4,500	$4,500	$0
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$0	$4,500	$0	$0	$4,500	$4,500	$0

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$33,672	$0	$0	$0	$33,672	$0	$33,672
Graduate Students	$0	$0	$0	$0	$0	$0	$0
Hourly Personnel	$0	$306	$0	$0	$306	$306	$0
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$33,672	$306	$0	$0	$33,978	$306	$33,672
Personnel Total	$155,672	$4,806	$0	$0	$160,478	$4,806	$155,672

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State	$25,000	$800			$25,800	$800	$25,000
Out-of-State	$5,000	$800			$5,800	$800	$5,000
Travel Total	$30,000	$1,600	$0	$0	$31,600	$1,600	$30,000

Maintenance & Operations

	M&O				Total	AES Portion	CES Portion
Supplies	$5,000	$1,094			$6,094	$1,094	$5,000
Fertilizer/Chemicals					$0	$0	$0

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University of Arkansas System Division of Agriculture
Promotion Board Budget

Ross, Jeremy *Soybean Research Verification Program*

	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Cell Service/Soil Moisture Senso	$12,500				$12,500	$0	$12,500
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$17,500	$1,094	$0	$0	$18,594	$1,094	$17,500
	Total for Proposal	$203,172	$7,500	$0	$0	$210,672	$7,500	$203,172

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

23 - RR-08

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Integrated management of soybean nematodes in Arkansas

Project Type:
Research

Name of Project Manager:
Travis Faske

Name of Project Team Member 1:
Joanna Kud

Name of Project Team Member 2:
Daniel Riveria

Statement of Justification or Purpose of the Project (75 word maximum):
The southern root-knot nematode is estimated to be the leading cause of soybean grain loss in Arkansas and consistently ranked among the top three soybean diseases in the Southern United States. Despite the economic impact, research on the field efficacy of nematicides and trueness of varieties marketed as resistant is limited, as only a few nematologists are investigating this pathogen system.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Each year, three to four field experiments are conducted to evaluate the efficacy of new and commercially available nematicides to manage the southern root-knot nematode. Furthermore, four to five field experiments are conducted to evaluate soybean varieties marked as nematode-resistant in a field with a history of severe nematode infestation. Field efficacy and yield data from these experiments were collected and shared through various venues.

BUDGET

Amount of Funding Needed for Project:
$76,621.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Integrated Management of Soybean Nematodes in Arkansas

Lead Investigators: Travis Faske

Co-Investigators: Joanna Kud and Daniel Rivera

Status and Duration of Funding: New, Year 1 of 3

Research Areas: Plant Pathology

Stated Goal: To determine the significance and potential risk of soybean nematodes in Arkansas. To evaluate currently existing methods for controlling nematodes in soybean, and to test newly emerging control technology and resistant varieties. Encourage producers and consultants to sample for soybean nematodes. Finally, develop sustainable, economically feasible nematode management strategies for Arkansas producers.

Specific Objectives:

1. Determine the efficacy and economic practicality of currently labeled nematicides for soybean nematode management through field trials. Evaluate new experimental nematicides in lab and greenhouse nematode response experiments. (Faske)

2. Evaluate the field performance of commercially available and new soybean varieties marketed as resistant to the southern root-knot nematodes. (Faske)

3. Characterize mechanisms and durability of resistance to southern root-knot nematode. (Faske/Kud)

4. Promote sampling soybean fields for nematodes and identify the most important species affecting production by continuing to offer free nematode assays sponsored by the AR SPB. (Faske/Riveria)

5. Investigate how cultural practices impact the survival of southern RKN in the field (Faske/Emerson)

6. Raise awareness of important, yield-limiting soybean nematodes. Develop and deliver practical, sustainable management strategies that integrate resistant varieties, nematicides, and crop rotation to reduce nematode-related economic losses. (Faske)

Methods:

Objective 1. The field efficacy of commercially available and experimental nematicides will be evaluated in fields with a history of the southern root-knot nematode (no. one disease of soybean in the state). Emphasis will be placed on combining nematicide treatments with a range of RKN-nematode-resistant varieties. Experimental nematicides will be evaluated in the greenhouse under controlled and uniform inoculation conditions.

Objective 2. Soybean varieties reported to have nematode resistance, along with those identified through annual screening, and other promising varieties will be evaluated for field performance

in nematode-infested fields using small-plot experiments.

Objective 3. Conduct greenhouse trials to assess the aggressiveness of southern root-knot nematode isolates collected from fields with different crop-rotation histories on resistant and susceptible soybean genotypes. Assessments will include quantification of root galling and nematode reproductive potential.

Objective 4. Over the past seven cropping seasons, the Nematode Diagnostic Lab (NDL) has successfully encouraged routine sampling for soybean nematodes by providing free assays funded by the AR SPB. This initiative has been widely adopted by farmers and consultants, enabling the identification of important species that are increasing in prevalence and pose the greatest threat to grain production.

Objective 5. Assess the survival of southern RKN on RKN-resistant soybean varieties in the field and the survival of eggs in the field. Further, assess the impact of volunteer corn regrowth on southern RKN densities in soybean fields.

Objective 6. The educational platform will include traditional approaches such as experiment station publications, production, and regional meetings, complemented by digital resources. These will include electronic delivery of southern RKN-resistant varieties via AR Row Crop Blog, websites, and social media engagement to raise awareness of these resources.

Planned Milestones: Each year, information on resistant soybean varieties will be posted electronically and in the annual soybean research series publication. This information will also be presented at various regional meetings. The survey work and nematicide efficacy experiments are planned to be published in a peer-reviewed journal article.

Value to Soybean Industry: This project will deliver significant benefits to Arkansas soybean farmers by identifying effective strategies to reduce nematode-related yield losses. Both existing and newly developed soybean varieties with reported resistance to southern root-knot nematode will be evaluated under real-world field conditions, determining their performance against local races and biotypes. In addition, we will build a robust knowledge base and experimental dataset on the use and impact of nematicides, and explore integrated management approaches that combine resistant varieties, chemical treatments, and crop rotation systems (e.g., furrow-irrigated rice) for sustainable, economically viable nematode control.

Budget Justifications/Explanation of Travel and Direct Costs: Proposed funding will support personnel, including full-time associates and part-time seasonal staff, to conduct field trials, collect in-season data, harvest, and process nematode samples. Travel expenses include university vehicle mileage for field trials and transporting soil samples to the nematode diagnostic lab. Supplies would include relevant materials such as, but not limited to, sand, fuel for equipment, plots stakes, water, bleach, bags, tags, and other general supplies for greenhouse and field trials. The direct cost consists of vouchers for 400 ($15/sample) sponsored nematode assays for Arkansas farmers and consultants to monitor nematodes in a soybean-based crop rotation system.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Faske, Travis — *Integrated Management of Soybean Nematodes in Arkansas*

Year	2026/2027	**Project Year**	New, Year 1 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Faske, Travis	**Co-PI #1**	Kud, Joanna	
Co-PI #2	Riveria, Daniel	**Co-PI #3**		
Department	ENPL Entomology and Plant Pathology			
Commodity Board	Soybean Promotion Board			
Project Title	Integrated Management of Soybean Nematodes in Arkansas			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Faske, Travis	Kud, Joanna	Riveria, Daniel		Total Board Funding Requested	AES Portion	CES Portion
	Select "AES" or "CES" for each PI	CES	AES	AES	CES			
Fulltime Personnel								
Position Title	**Name** *(if position is filled)* / **% Time** / **Salaries**					**Total**	**AES**	**CES**
Program Associate		$28,000				$28,000	$0	$28,000
Program technician				$5,000		$5,000	$5,000	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
	Subtotal: Salaries	$28,000	$0	$5,000	$0	$33,000	$5,000	$28,000
Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)* / **% Time** / **Wages**					**Total**	**AES Portion**	**CES Portion**
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
	Tuition Calculator Information					$0	$0	$0
	Subtotal: Graduate Student	$0	$0	$0	$0	$0	$0	$0
Hourly								
	Wages					**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel	$11,000		$2,000		$13,000	$2,000	$11,000
	Hourly-Students		$4,000			$4,000	$4,000	$0
	Subtotal: Hourly	$11,000	$4,000	$2,000	$0	$17,000	$6,000	$11,000
Fringe Benefits								
Fringe benefits are calculated when salary and wage amounts are entered above.	**Benefits**					**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel	$7,728	$0	$1,380	$0	$9,108	$1,380	$7,728
	Graduate Students	$0	$0	$0	$0	$0	$0	$0
	Hourly Personnel	$748	$0	$136	$0	$884	$136	$748
	Hourly-Students	$0	$4	$0	$0	$4	$4	$0
	Subtotal: Fringe Benefits	$8,476	$4	$1,516	$0	$9,996	$1,520	$8,476
	Personnel Total	$47,476	$4,004	$8,516	$0	$59,996	$12,520	$47,476
Travel								
Justify out-of-state travel in proposal.	**Travel**					**Total**	**AES Portion**	**CES Portion**
	In-State	$3,000	$500			$3,500	$500	$3,000
	Out-of-State					$0	$0	$0
	Travel Total	$3,000	$500	$0	$0	$3,500	$500	$3,000

University of Arkansas System Division of Agriculture

Promotion Board Budget

Faske, Travis *Integrated Management of Soybean Nematodes in Arkansas*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$1,000	$6,500	$2,250		$9,750	$8,750	$1,000
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs				$3,375		$3,375	$3,375	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$1,000	$6,500	$5,625	$0	$13,125	$12,125	$1,000
	Total for Proposal	$51,476	$11,004	$14,141	$0	$76,621	$25,145	$51,476

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

24 - RR-09

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Soybean Weed Management: A Team Approach for Improved Control and Profitability

Project Type:
Research

Name of Project Manager:
Bob Scott

Name of Project Team Member 1:
Tom Barber

Name of Project Team Member 2:
Jason Norsworthy

Statement of Justification or Purpose of the Project (75 word maximum):
To evaluate new and emerging weed control technologies, rapidly identify herbicide-resistant weeds, determine their distribution, determine their mechanisms of resistance, and develop viable, unbiased solutions for managing these weeds. In addition, research focused on reducing the soil weed seedbank and controlling other problematic weeds for soybean producers in Arkansas will be conducted.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Over 100 trials will be conducted on-farm and on experiment stations to determine the most effective control options for problematic weeds in soybean production systems. Both, currently registered soybean herbicides and anticipated technologies will be evaluated. As well as numerous cultural and non-chemical approaches.

BUDGET

Amount of Funding Needed for Project:
$263,375.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Soybean Weed Management: A Team Approach for Improved Control and Profitability
Lead Investigator: Bob Scott
Co-Investigators: Tom Barber, Jason Norsworthy, and Nilda Burgos
Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): Year 1 of 3
Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Weeds and Education

Stated Goal: To evaluate new and emerging weed control technologies, rapidly identify herbicide-resistant weeds, determine their distribution, determine their mechanisms of resistance, and develop viable, unbiased solutions for managing these weeds. In addition, research focused on reducing the soil weed seedbank and controlling other problematic weeds for soybean producers in Arkansas will be conducted. The identification and implementation of diversified control strategies and the rapid information exchange between the grower, Extension personnel, and researchers will be prioritized.

Specific Objectives:

1. To continue testing suspected resistant weed biotypes sent from county agents and soybean producers for herbicide resistance, particularly for glufosinate and auxin herbicide resistance, documenting the level of resistance and distribution, and determining the effectiveness of alternate herbicide modes-of-action on resistant biotypes
2. To quantify the potential of multiple herbicide-resistant Palmer amaranth and other confirmed resistant weeds to spread in Arkansas by determining control programs, ecological fitness, and geographic distribution of resistant biotypes, and resistance and dispersal mechanisms likely to cause population expansion
3. To identify and evaluate effective management programs (both short-term and long-term) for multiple herbicide-resistant Palmer amaranth including glufosinate and auxin herbicide resistance
4. To evaluate the effectiveness of various agronomic practices (double crop, cover crop, etc.) for suppressing problematic weeds of Arkansas soybean production systems
5. To determine how herbicide performance and selectivity are affected by environmental conditions (such as planting date, soil texture, climatic conditions), herbicide tank-mixture, weed species, and growth stage to develop more efficient and reliable herbicide management strategies
6. To evaluate long term programs (chemical and cultural) to reduce the soil weed seedbank. These programs will include trials designed to study methods of destroying weed seed post-harvest and evaluate new harvest weed seed destruction equipment as it becomes available.
7. To evaluate the viability of new technologies (herbicides, traits, etc.) as they emerge for efficacy and the ability to safely apply in the agricultural and external environment
8. To evaluate fall-applied residual herbicides effectiveness on problematic Arkansas weeds (i.e., Italian ryegrass) and the resulting impact on spring burndown applications
9. To evaluate herbicide program costs and resulting soybean yields to determine profitability potential of weed management options
10. To develop RNAi technology for potential use as a novel tool for integrated weed management
11. To provide rapid transfer of weed control information to growers through multiple outreach methods such as the MP44, other publications, blog posts, Weeds AR Wild podcasts, videos, text messages, and many others

Methods: Approximately 100 applied research and demonstration trials will be conducted on-farm and on experiment stations at Rohwer, Newport, Stuttgart, Pine Tree, Lonoke (greenhouse), Fayetteville

(field, greenhouse, laboratory), Keiser, Marianna, and other on-farm locations as needed to determine the most effective control options for problematic weeds in soybean production systems. Both, currently registered soybean herbicides and anticipated technologies will be evaluated. Trials will include comparisons of herbicide performance in early-season, full-season, and double-cropped soybean at all application timings. Most field trials will be 15 to 30 treatments in four-row or drill-seeded plots with four replications. Further field trials determining the effectiveness of weed seed destruction methods for long-term program approaches to weed management will be conducted. Field trials will be established to evaluate fall-applied residual herbicides to investigate their effectiveness on Italian ryegrass and the impact on required herbicides and input costs for spring burndowns. All data will be statistically analyzed, and experiments will be repeated to provide accurate results to growers. Data from these trials will be applicable across soybean production systems and will be used to update the annual MP44 publication "Recommended Chemicals for Weed and Brush Control".

Suspected resistant weeds from fields where herbicide failure occurred will be evaluated relative to known susceptible standards for resistance under controlled conditions. If failure still occurs, dose response experiments will be conducted to confirm resistance and determine the level of resistance relative to susceptible populations and labeled herbicide use rates. Laboratory experiments will be conducted to investigate herbicide absorption and translocation, metabolism, and target site mutation as possible resistance mechanisms. Determining resistance mechanisms will assist the development of management strategies to slow further resistance development. Ecological fitness experiments will also be conducted to compare the relative competitiveness of resistant and susceptible biotypes. Laboratory and greenhouse experiments will be conducted to test potential RNAi agents for weed control. These agents would provide a novel tool to aid in weed management and potential herbicide resistance solutions.

Planned Milestones: Experiments will be established, evaluated, and harvested in a timely manner in accordance with established Arkansas soybean production systems. Data will be analyzed and presented to growers through multiple outreach methods and in scientific meetings each year. Refereed journal articles will be published when deemed appropriate. Data from all trials will be incorporated into annual publications, newsletters, blog posts, Weeds AR Wild podcasts, videos, fact sheets, and text message blasts wherever appropriate. In addition, results will be published in the annual Soybean Research Series.

Value to Soybean Industry: Proper weed control accounts for a significant portion of annual budgeted production expenses. The rapid adoption and widespread use of soybean weed control information has been of great value to Arkansas growers. This project will allow growers to closely follow the discovery of herbicide-resistant and new problematic weed species through timely information which will assist with the management of these weeds on their farms. The discoveries of multiple glyphosate-resistant weed species and other herbicide resistance such as PPO-inhibitor, VLCFA-inhibitor, glufosinate, and auxin-resistant Palmer amaranth in Arkansas soybean fields has been a direct result of Soybean Board Funding. Failure to adequately control these weeds can result in total crop loss. The development of herbicide resistance to new technologies is also a concern and will be addressed by this program. Finally, identifying IWM opportunities to enhance program approaches and determining best use practices of new precision technologies will help weed control and grower profitability. If the introduction of diverse strategies and scientifically-supported recommendations generated from this research can save even $10/acre of input costs, that would provide an annual savings of $35 million total for Arkansas soybean growers.

Budget Justifications/Explanation of Travel and Direct Costs: This proposal requests $263,375 for total funding to be split between 4 PI's operating in a team. Of the total requested, $210,780 (80%) is requested for personnel expenses, including partial funding of 6 full-time program associates/technicians

and funds for hourly workers. The personnel described are essential for the successful implementation of more than 100 field trials conducted at a minimum of 8 locations across Arkansas, as well as greenhouse experiments and resistance screenings of Palmer amaranth populations to 2 different sites-of-action herbicides plus a small sampling of other problematic weeds and herbicides as requested. Funding requested also includes $4,750 for in-state travel to cover expenses associated with the multi-location research conducted across the state. The remaining budget requested is for M&O including research supplies necessary to conduct the proposed research, equipment maintenance, and research station trial fees. The most efficient means to conduct an effective weed management research program in soybean is through a team approach. To facilitate the rapid development of a database for soybean herbicide recommendations, multiple project leaders at several field locations are needed to address the objectives of this weed management project.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Scott, Bob — *Soybean Weed Management: A Team Approach for Improved Control and Profitability*

Year	2026/2027	**Project Year**	New, Year 1 of 3
Lead Investigator	Scott, Bob	**Co-PI #1**	Barber, Tom
Co-PI #2	Norsworthy, Jason	**Co-PI #3**	Burgos, Nilda
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Soybean Weed Management: A Team Approach for Improved Control and Profitability		

Version: 8.0 (09/22/2025)

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Scott, Bob	Barber, Tom	Norsworthy, Jason	Burgos, Nilda	Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	AES	AES	CES	CES			

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
Program Tech	Hambrick/Chandler	80%	$32,000	$0	$35,840	$0	$67,840	$32,000	$35,840
Program Assoc.	Davis	25%	$15,000	$0	$0	$0	$15,000	$15,000	$0
Program Assoc.	Doherty	40%	$0	$29,000	$0	$0	$29,000	$29,000	$0
Program Tech	Hill	20%	$0	$10,000	$0	$0	$10,000	$10,000	$0
Program Assoc.	Rangani	70%	$0	$0	$0	$40,000	$40,000	$0	$40,000
	Subtotal: Salaries		$47,000	$39,000	$35,840	$40,000	$161,840	$86,000	$75,840

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
Tuition Calculator Information						$0	$0	$0
Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel			$4,000		$4,000	$0	$4,000
Hourly-Students					$0	$0	$0
Subtotal: Hourly	$0	$0	$4,000	$0	$4,000	$0	$4,000

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$12,972	$10,764	$9,892	$11,040	$44,668	$23,736	$20,932
Graduate Students	$0	$0	$0	$0	$0	$0	$0
Hourly Personnel	$0	$0	$272	$0	$272	$0	$272
Hourly-Students	$0	$0	$0	$0	$0	$0	$0
Subtotal: Fringe Benefits	$12,972	$10,764	$10,164	$11,040	$44,940	$23,736	$21,204
Personnel Total	$59,972	$49,764	$50,004	$51,040	$210,780	$109,736	$101,044

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State			$4,750		$4,750	$0	$4,750
Out-of-State					$0	$0	$0
Travel Total	$0	$0	$4,750	$0	$4,750	$0	$4,750

University of Arkansas System Division of Agriculture

Promotion Board Budget

Scott, Bob *Soybean Weed Management: A Team Approach for Improved Control and Profitability*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$6,000	$2,000	$9,000	$5,500	$22,500	$8,000	$14,500
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Greenhouse Fees				$3,000	$3,000	$0	$3,000
Station Maintenance	SAREC, Fayetteville	$0	$0	$1,600	$0	$1,600	$0	$1,600
	CTST, Marianna	$0	$5,775	$0	$0	$5,775	$5,775	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$2,250	$0	$2,250	$0	$2,250
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$3,750	$4,800	$0	$0	$8,550	$8,550	$0
	PTST, Colt	$0	$0	$1,440	$0	$1,440	$0	$1,440
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$2,730	$0	$0	$2,730	$2,730	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$9,750	$15,305	$14,290	$8,500	$47,845	$25,055	$22,790
	Total for Proposal	$69,722	$65,069	$69,044	$59,540	$263,375	$134,791	$128,584

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

25 - RR-10

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Soybean Enterprise Budgets and Production Economic Analysis

Project Type:
Research

Name of Project Manager:
Breana Watkins

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
The goal of this project is to provide soybean enterprise budgets that are flexible for representing alternative production practices of Arkansas producers.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Crop enterprise budgets will be developed in collaboration with crop and soil science specialists, weed scientists, entomologists, and those working in similar positions within the University of Arkansas System. Production procedures, field activities, for base budgets will represent University of Arkansas Division of Agriculture Cooperative Extension recommendations from agronomists, scientists, and crop specialists from across the state.

BUDGET

Amount of Funding Needed for Project:
$10,000.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: ***Soybean Enterprise Budgets and Production Economic Analysis***

Lead Investigators: Breana Watkins

Co-Investigators: N/A

Status and Duration of Funding: New, Year 1 of 3

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Economics

Stated Goal: The goal of this project is to provide soybean enterprise budgets that are flexible for representing alternative production practices of Arkansas producers. There are two tables included to provide summaries of the 2026 Arkansas soybean budgets.

Specific Objectives:

1) Determine base representative production activities of the most common production practices of soybean in Arkansas.
2) Collect data for input prices and equipment costs associated with the base representative production activities.
3) Establish and maintain a computational budget calculator for base representative production practices. Crop enterprise budgets are developed with methods that are consistent over all field crops. Each fall 8 soybean budgets are produced and updated on a regular basis.
4) Develop a farm budget program for financial management and public policy analysis.
5) Create a cost estimate of various farm activities to show the expenses that are incurred for each field activity associated with production.
6) Investigate the economics of conservation practices in Arkansas, specifically in concern to irrigation.

Methods: Crop enterprise budgets will be developed in collaboration with crop and soil science specialists, weed scientists, entomologists, and those working in similar positions within the University of Arkansas System. Production procedures, field activities, for base budgets will represent University of Arkansas Division of Agriculture Cooperative Extension recommendations from its agronomists, scientists, and crop specialists from across the state. Unique budgets will be customized for individuals based on Extension recommendations and data input from the individuals requesting such budgets.

Planned Milestones: The crop enterprise budget program will have a state level component for base budgets. Budgets based on Extension recommendations are standards for Arkansas crop production. The program will allow individual producers to utilize interactive computational capabilities for representing alternative production practices and determining profit potential with a range of commodity prices and yields. Producers and financial institutions will apply crop enterprise budgets in evaluating costs and returns for aspects of each production year, developing financial ratios, and determining the solvency of borrowers. Public policies affecting producers are investigated by government organizations with crop enterprise budgets that are representative of Arkansas production to determine their benefit to not only producers, but to the entire state of Arkansas. The crop enterprise budgets will become mobile with gained control and access to the budgets by users utilizing cellular devices and spreadsheets open for altering.

Value to Soybean Industry: The benefits provided by the economic analysis of alternative soybean production methods provide a significant reduction in financial risk inherent in agricultural production. Arkansas producers will benefit from economic analyses of their individual production activities. Unique crop enterprise budgets developed for individual farms are useful for determining credit requirements and evaluating financial ratios. Flexible crop enterprise budgets are beneficial for determining production methods with the greatest potential for financial success given a set of conditions. Flexible budgets enable farm financial outlooks to be revised during the production season as crop inputs, input prices, yields, and commodity prices change. Thoroughness of computational methodology and straightforward application will facilitate use of the budget calculator by research and extension specialists conducting economic analysis of water use efficiency, weed control, insect management, cover crops, and other aspects of production practices.

Budget Justifications/Explanation of Travel and Direct Costs: No travel request is included in this proposal. Personnel salary justification is as follows.

	SPB	CES
	dollars	
Personnel Salaries		
Breana Watkins		7,837.00
Other Personnel	7,837.00	
Benefits	2,163.00	2,163.00
Total Personnel	**10,000.00**	**10,000.00**
Total	**10,000.00**	**10,000.00**

Table 1. Summary of Revenue and Expenses per Acre, Enlist E3 Soybean

Receipts	Furrow	Pivot	No Irr	Flood
Yield (bu)	60	60	30	60
Price ($/bu)	10.25	10.25	10.25	10.25
Grower Share, %	100%	100%	100%	100%
Crop Revenue	**615.00**	**615.00**	**307.50**	**615.00**
Operating Expenses				
Input Costs	376.44	376.38	299.37	361.06
Other Operating Expenses	77.46	98.51	62.74	75.76
Total Operating Expenses	453.90	474.89	362.11	436.82
Post-harvest Expenses	18.08	18.08	9.04	18.08
Net Operating Expenses	**471.98**	**492.97**	**371.15**	**454.89**
Cash Land Rent	0.00	0.00	0.00	0.00
Returns to Operating Expenses	**143.02**	**122.03**	**-63.65**	**160.11**
Fixed Costs	142.39	207.62	93.97	136.46
[1]Total Specified Expenses	**614.37**	**700.58**	**465.12**	**591.35**
Returns to Specified Expenses	**0.63**	**-85.58**	**-157.62**	**23.65**
Operating Expenses/bu	7.87	8.22	12.37	7.58
Total Expenses[1]/bu	10.24	11.68	15.50	9.86
Land Expense/acre	0.00	0.00	0.00	0.00
Land Expense/bu	0.00	0.00	0.00	0.00
Operating & Land Expenses/bu	7.87	8.22	12.37	7.58
Total Cost/bu, including land	10.24	11.68	15.50	9.86

[1]Does not include land costs, management, or other expenses and fees not associated with production.

Table 2. Summary of Revenue and Expenses per Acre, RoundupReady2 XtendFlex Soybean

Receipts	Furrow	Pivot	No Irr	Flood
Yield (bu)	60	60	30	60
Price ($/bu)	10.25	10.25	10.25	10.25
Grower Share, %	100%	100%	100%	100%
Crop Revenue	**615.00**	**615.00**	**307.50**	**615.00**
Operating Expenses				
Input Costs	369.37	369.30	292.47	353.99
Other Operating Expenses	77.17	98.22	62.45	75.46
Total Operating Expenses	446.54	467.53	354.92	429.45
Post-harvest Expenses	18.08	18.08	9.04	18.08
Net Operating Expenses	**464.61**	**485.60**	**363.96**	**447.53**
Cash Land Rent	0.00	0.00	0.00	0.00
Returns to Operating Expenses	**150.39**	**129.40**	**-56.46**	**167.47**
Fixed Costs	142.39	207.62	93.97	136.46
[1]Total Specified Expenses	**607.00**	**693.22**	**457.93**	**583.99**
Returns to Specified Expenses	**8.00**	**-78.22**	**-150.43**	**31.01**
Operating Expenses/bu	7.74	8.09	12.13	7.46
Total Expenses[1]/bu	10.12	11.55	15.26	9.73
Land Expense/acre	0.00	0.00	0.00	0.00
Land Expense/bu	0.00	0.00	0.00	0.00
Operating & Land Expenses/bu	7.74	8.09	12.13	7.46
Total Cost/bu	10.12	11.55	15.26	9.73

[1]Does not include land costs, management, or other expenses and fees not associated with production.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Watkins, Breana *Soybean Enterprise Budgets and Production Economic Analysis*

Year	2026/2027	**Project Year**	New, Year 1 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Watkins, Breana	**Co-PI #1**		
Co-PI #2		**Co-PI #3**		
Department	AEAB Agricultural Economics & Agribusiness			
Commodity Board	Soybean Promotion Board			
Project Title	Soybean Enterprise Budgets and Production Economic Analysis			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Watkins, Breana				Total Board Funding Requested	AES Portion	CES Portion
	Select "AES" or "CES" for each PI	CES	AES	CES	CES			
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Instructor	Breana Watkins	30%	$7,837				$7,837	$0	$7,837
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$7,837	$0	$0	$0	$7,837	$0	$7,837
	Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information						$0	$0	$0
	Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0
	Hourly								
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel						$0	$0	$0
	Hourly-Students						$0	$0	$0
	Subtotal: Hourly		$0	$0	$0	$0	$0	$0	$0
	Fringe Benefits								
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$2,163	$0	$0	$0	$2,163	$0	$2,163
	Graduate Students		$0	$0	$0	$0	$0	$0	$0
	Hourly Personnel		$0	$0	$0	$0	$0	$0	$0
	Hourly-Students		$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits		$2,163	$0	$0	$0	$2,163	$0	$2,163
	Personnel Total		$10,000	$0	$0	$0	$10,000	$0	$10,000
	Travel								
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State						$0	$0	$0
	Out-of-State						$0	$0	$0
	Travel Total		$0	$0	$0	$0	$0	$0	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Watkins, Breana *Soybean Enterprise Budgets and Production Economic Analysis*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies					$0	$0	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$0	$0	$0	$0	$0	$0	$0
	Total for Proposal	$10,000	$0	$0	$0	$10,000	$0	$10,000

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

26 - RR-11

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Arkansas Soybean Trials

Project Type:
Research

Name of Project Manager:
John Carlin

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
To provide unbiased soybean variety performance data to Arkansas Soybean Producers and regional, national, and international seed companies for use in marketing, variety placement, and variety selection.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
1. To evaluate the performance of soybean varieties and breeding lines across eight locations within the State of Arkansas
2. To measure protein and oil composition of soybean varieties entered into the Arkansas Soybean Performance Trials
3. To enable abiotic (chloride and metribuzin) and biotic (disease screening) screening of the varieties by collaborating PIs.

BUDGET

Amount of Funding Needed for Project:
$42,491.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Arkansas Soybean Performance Trials

Lead Investigators: John Carlin

Co-Investigators:

Status (i.e., New, Year 2 of 3, Year 2 of 2, etc.): New

Research Areas (Agronomy/Alternative, Breeding, Economics, Education, Entomology, Fertility, Irrigation, Plant Pathology, Post-Harvest, Verification, Weeds): Agronomy

Stated Goal: To provide unbiased soybean variety performance data to Arkansas Soybean Producers and regional, national, and international seed companies for use in marketing, variety placement, and variety selection.

Specific Objectives:

1. To evaluate the performance of soybean varieties and breeding lines across eight locations within the State of Arkansas
2. To measure protein and oil composition of soybean varieties entered into the Arkansas Soybean Performance Trials
3. To enable abiotic (chloride and metribuzin) and biotic (disease screening) screening of the varieties by collaborating PIs.

Methods:

The Arkansas Soybean Performance Tests are conducted at the Northeast Research and Extension Center (NEREC) at Keiser, the Vegetable Research Station (VRS) near Kibler, the Lon Mann Cotton Research Station (LMCRS) near Marianna, the Jackson County Extension Center (JCEC) near Newport, the Pine Tree Research Station (PTRS) near Colt, the Rohwer Research Station (RRS) near Rohwer, and the Rice Research and Extension Center (RREC) near Stuttgart.

To allow for the identification and comparison of the performance of genetically identical lines sold under various brands and commercial names, the Soybean Performance Trial entry form will include an optional variety number field. The field will be optional to avoid discouraging entry into the Performance Tests. Variety numbers provided by participants will be published in the annual AAES research series publication and shared with the CES Soybean Agronomist for inclusion in appropriate publications.

To facilitate field operations and enable fairer comparisons between varieties and strains, entries are divided into three maturity ranges based on information provided by the originating company or institution: RM 4.0–4.4, RM 4.5–4.9, and RM 5.0–5.9. Within each test, entries are arranged as a randomized complete block design with three replications. Plots in all tests will be four rows wide and 20–21 feet long. Seeds are packaged for the recommended planting rate and will be planted using a cone or vacuum research plot planter.

Plots are managed with location-specific cultural practices to ensure quality and uniformity. In addition to standard yield trials, participants may enter an optional flood tolerance test in which soybean lines

are subjected to 5 days of flood stress at V2-V4 and then managed with normal cultural practices until harvest. Flood stress is imposed by pulling soil levees around each block and holding water approximately 1 inch above the soil surface.

Before harvest, plots will be visually rated for shattering and lodging. Shattering ratings will be carried out using the following scale: 1. no shattering, 2. 1–3% shattered, 3. 4–8% shattered, 4. 9–19% shattered, 5. 20% or more shattered Lodging ratings will be recorded on a scale from 1 to 5 based on the following criteria: 1. Almost all plants erect. 2. Either all plants are leaning slightly, or a few plants are down. 3. Either all plants are leaning moderately, or 25–50% of the plants are down. 4. Either all plants are leaning considerably, or 50-80% of the plants are down. 5. All plants are down badly. Average plant height will be recorded in inches for each plot in the first replication of each test.

The two interior rows of each 4-row plot, or the entirety of the 2-row plots, will be harvested for yield determination. Percent moisture will be recorded for all harvested seed, and plot weights were adjusted to 13% moisture. Plot weights of all tests will then be converted to yield in bushels per acre (bu./ac). Statistical analysis for grain yield (bu./ac) will be conducted using Duncan's Multiple Range Test (MRT) with GENOVIX® (AGRONOMIX Software).

Protein and Oil will be measured using a Q Sorter®, with measurements taken on samples from each plot of the Arkansas Soybean Performance Trial conducted at the Vegetable Station in Kibler, Arkansas. Protein and Oil measurements will be included in the final report.

Planned Milestones:

Prep-to-Planting

The call for entries will be sent out in Mid-January, experiments will be designed in March, and entries will be packaged and laid out in planting order in March-April. Packaged seed for the collaborative test will be provided to PIs as soon as possible. The early-planted test will have a targeted planting date of the first week of April, with the full-season test planted as soon as possible thereafter, subject to receipt of seed from participants.

Maintenance and note-taking

The plot will be walked and maintained throughout the growing season. Watermark® Moisture sensors will be installed at each location to optimize irrigation. Monthly drone images of each field (MG x location) will be provided to test participants. Notes for lodging, shattering, and plant height will be taken before harvest.

Harvest and Data analysis

Plots will be harvested at maturity, and data will be made available in Excel on the AAES website. The target for publication of preliminary data on the website is within two weeks of harvest. A research series publication will be generated and published at the end of the year.

Value to Soybean Industry: Variety selection is a key component of soybean production profitability. The data generated by the performance trials are valuable to Arkansas soybean producers because they allow them to make informed variety selection decisions. The data from the trials is also used by seed companies to market and place varieties appropriately.

Budget Justifications/Explanation of Travel and Direct Costs: Funds are being requested to partially (30%) support two positions within the variety testing program, a Program Associate and a Program Technician, both based at the Rice Research and Extension Center in Stuttgart, Arkansas. The requested salary for each position is commensurate with their duties associated with the soybean performance tests. Last year (2025) was the first time the program had two FTEs in Stuttgart, and our tests and data quality were much improved compared to previous years.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Carlin, John *Arkansas Soybean Performance Tests*

Year	2026/2027	**Project Year**	New, Year 1 of 1	**Version: 8.0 (09/22/2025)**
Lead Investigator	Carlin, John	**Co-PI #1**		
Co-PI #2		**Co-PI #3**		
Department	ACVIP Arkansas Crop Variety Improvement Program			
Commodity Board	Soybean Promotion Board			
Project Title	Arkansas Soybean Performance Tests			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Carlin, John				**Total Board Funding Requested**	**AES Portion**	**CES Portion**
	Select "AES" or "CES" for each PI	AES	CES	CES	CES			
			Fulltime Personnel					
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Jonathan McCoy		30%	$19,800				$19,800	$19,800	$0
Conrad Bulloch		30%	$13,500				$13,500	$13,500	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$33,300	$0	$0	$0	$33,300	$33,300	$0
			Graduate Student					
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information						$0	$0	$0
	Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0
			Hourly					
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel						$0	$0	$0
	Hourly-Students						$0	$0	$0
	Subtotal: Hourly		$0	$0	$0	$0	$0	$0	$0
			Fringe Benefits					
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$9,191	$0	$0	$0	$9,191	$9,191	$0
	Graduate Students		$0	$0	$0	$0	$0	$0	$0
	Hourly Personnel		$0	$0	$0	$0	$0	$0	$0
	Hourly-Students		$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits		$9,191	$0	$0	$0	$9,191	$9,191	$0
	Personnel Total		$42,491	$0	$0	$0	$42,491	$42,491	$0
			Travel					
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State						$0	$0	$0
	Out-of-State						$0	$0	$0
	Travel Total		$0	$0	$0	$0	$0	$0	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Carlin, John *Arkansas Soybean Performance Tests*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies					$0	$0	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs						$0	$0	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$0	$0	$0	$0	$0	$0	$0
	Total for Proposal	$42,491	$0	$0	$0	$42,491	$42,491	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

27 - RR-12

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Fertilization of Soybean

Project Type:
Research

Name of Project Manager:
Trent Roberts

Name of Project Team Member 1:
Gerson Drescher

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Soybean fertilization costs represent about one-fifth of the total operating expenses budgeted for full-season soybean grown on silt loam soils. Accurate identification of P- and K-deficient soils and knowledge of other yield-limiting nutrients will enable recommendations to be refined so that the correct fertilizer sources and rates are applied at the times and frequency required to maximize yield and sustain soil productivity.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
We will conduct a series of short and long term fertilization trials to ensure that producers have the information necessary to maximize soybean yield and profitability as it relates to plant nutrition.

BUDGET

Amount of Funding Needed for Project:
$85,391.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Fertilization of Soybean

Lead Investigators: Trenton Roberts

Co-Investigators: Gerson Drescher and Jeremy Ross

Status and Duration of Funding: New, Year 1 of 3

Research Areas: Fertility

Stated Goal:

The overall mission of this research is to identify potential yield limitations via soil and plant analysis and aid in the prevention of soybean yield loss attributed to insufficient (or toxic) mineral nutrition. The specific goals addressed with this project are to 1) continue short- and long-term phosphorus (P) and potassium (K) fertilization trials, 2) continue to evaluate soybean fertilization strategies with macro and micronutrients, 3) investigate remote sensing technologies, and 4) assess nutrient concentration variability at the production scale.

Specific Objectives:

1. Continue long-term P and K fertilizer rate trials established at the Pine Tree Research Station in 2000 (PTRS) and Rice Research Experiment Station in 2007 (RREC) to examine soil-test trends and crop yield responses to fertilization rates.
2. Continue to evaluate existing and develop new correlation calibration relationships between soil-test P (or K) alone and soybean yield and leaf nutrient concentration in response to P (or K) fertilization.
3. Evaluate the effects of P fertility on soybean yield, selected yield components, the pattern of leaf-P concentration across time, and seed nutrient concentration.
4. Validate in-season leaf-K concentrations to predict K fertilizer needs to maximize or recover yield during the reproductive growth stages. Assess the use of remote sensing to predict where trifoliolate leaf samples should be collected.

Methods:

1. Short- and Long-term Studies: Potassium rate studies at PTRS established in 2000 and P and K rate studies at the RREC established in 2007 will be maintained with their existing, annually applied treatments (0, 40, 80, 120, and 160 lb P_2O_5 and K_2O/acre) and grown in rotation with rice. Data will continue to be collected from the long-term corn and soybean rotational site. Soil samples will be taken annually from long-term trials and tissue nutrient concentrations and yield will continue to be evaluated. Short-term trials that evaluate new fertilizers (e.g., Aspire), evaluate nutrient application strategies, and support the needs of developing/evaluating critical leaf nutrient levels will be continued to ensure that new technology or products are fairly evaluated to advise growers on their use.

2. Replicated field trials will be established at experiment stations across the state with varying levels of soil test K to elicit varying levels of K deficiency. Treatments will include a non-treated check, a yield-maximizing K rate applied preplant, and several in-season K rates applied at 15, 30, and 45 days after R1. Leaf samples will be collected at each fertilizer application to calibrate the K rate needed to maximize soybean grain yield based on tissue-K concentration.

3. The research will be performed at the PTRS within a long-term P fertility study. The trial is a

randomized complete block design with four blocks that contain three fertilizer sources [monoammonium phosphate (MAP) without potash; MAP + muriate of potash, and MicroEssentials SZ + Aspire] with each fertilizer-P source applied at 0, 30, 60, and 120 lb P_2O_5/acre. The site is furrow-irrigated and cropped with a 1:1 soybean-corn rotation. Mature leaf samples will be collected during vegetative growth (V4-V6) and then weekly for 10 weeks beginning at the R1 stage to measure leaf-P concentrations from the MAP + muriate of potash fertilizer-P source applied at 0, 30, and 60 lb P_2O_5/acre. At maturity, the crop will be harvested to measure grain yield, and seed samples will be collected to determine seed nutrient concentration and removal in response to P fertility.

Planned Milestones:

The proposed research trials will be conducted for three years beginning in 2026. Research results will be published annually in the Wayne Sabbe Arkansas Soil Fertility Studies Research Series or Soybean Research Series to serve as a permanent, accessible record of results that will also serve to inform clientele within and outside of Arkansas. Information will also be disseminated annually via county educational meetings and at regional and international professional meetings as deemed appropriate. The outcomes of annual research results will help guide the research for subsequent years and lead to the development of new tools for Arkansas soybean producers.

Value to Soybean Industry:

Soybean fertilization costs represent about one-fifth of the total operating expenses budgeted for full-season soybean grown on silt loam soils. Accurate identification of P- and K-deficient soils and knowledge of other yield-limiting nutrients will enable recommendations to be refined so that the correct fertilizer sources and rates are applied at the times and frequency required to maximize yield and sustain soil productivity. Long-term fertilization trials are invaluable for verifying that recommended P and K fertilizer rates are sufficient for sustainable production and, as illustrated by our development of critical leaf-K concentrations for developing tissue-based interpretations to verify sufficient crop nutrition. Correlating and calibrating nutrient information from soil and tissue analyses is a long-term process that requires a large number of site-years with a wide range of soil properties to ensure soil test recommendations are as accurate and precise as possible. The ability to accurately diagnose P and K deficiency and an improved understanding of how nutrient deficiencies influence individual yield components will positively impact soybean production economics and the environment. With current advancements in remote sensing and the adaptability of new platforms to unmanned aerial systems there is the opportunity for assessing soybean nutritional status using aerial imagery. Developing tools that will allow producers to identify potential nutrient deficiencies before they can be detected through deficiency symptomology can help ensure that nutrients such as P and K are no longer yield-limiting factors in Arkansas soybean production systems.

Budget Justifications/Explanation of Travel and Direct Costs:

The out-of-state travel included in this proposal is to cover a portion of the cost for graduate students to attend professional scientific meetings, which in this calendar year will include the international annual agronomy meetings in Portland, OR. Attendance at these meetings allows presentations to be made concerning the research work conducted and for increased education by attending other scientific presentations and workshops. In-state travel and salary are budgeted for field data collection.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Roberts, Trenton *Fertilization of Soybean*

Year	2026/2027	**Project Year**	New, Year 1 of 3
Lead Investigator	Roberts, Trenton	**Co-PI #1**	Drescher, Gerson
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Fertilization of Soybean		

Version: 8.0 (09/22/2025)

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Roberts, Trenton	Drescher, Gerson			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI		AES	AES	CES	CES			
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Program Associate	Joe Shafer	25%	$18,000				$18,000	$18,000	$0
Program Associate	Stephanie Williamson	10%	$7,000				$7,000	$7,000	$0
Program Associate	Qamar Sarfaraz	10%		$5,200			$5,200	$5,200	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$25,000	$5,200	$0	$0	$30,200	$30,200	$0
Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
	New MS student	50%		$11,500			$11,500	$11,500	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information			$3,398			$3,398	$3,398	$0
	Subtotal: Graduate Student		$0	$14,898	$0	$0	$14,898	$14,898	$0
Hourly								
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel						$0	$0	$0
	Hourly-Students		$2,000				$2,000	$2,000	$0
	Subtotal: Hourly		$2,000	$0	$0	$0	$2,000	$2,000	$0
Fringe Benefits								
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$6,900	$1,435	$0	$0	$8,335	$8,335	$0
	Graduate Students		$0	$736	$0	$0	$736	$736	$0
	Hourly Personnel		$0	$0	$0	$0	$0	$0	$0
	Hourly-Students		$2	$0	$0	$0	$2	$2	$0
	Subtotal: Fringe Benefits		$6,902	$2,171	$0	$0	$9,073	$9,073	$0
	Personnel Total		$33,902	$22,269	$0	$0	$56,171	$56,171	$0
Travel								
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State		$4,500	$2,000			$6,500	$6,500	$0
	Out-of-State		$1,500	$1,000			$2,500	$2,500	$0
	Travel Total		$6,000	$3,000	$0	$0	$9,000	$9,000	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Roberts, Trenton *Fertilization of Soybean*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$1,500	$1,000			$2,500	$2,500	$0
	Fertilizer/Chemicals	$1,000				$1,000	$1,000	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Analysis	$4,000	$3,000			$7,000	$7,000	$0
Station Maintenance	SAREC, Fayetteville	$1,520	$0	$0	$0	$1,520	$1,520	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$6,950	$0	$0	$0	$6,950	$6,950	$0
	RIRE, Stuttgart	$1,250	$0	$0	$0	$1,250	$1,250	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$16,220	$4,000	$0	$0	$20,220	$20,220	$0
	Total for Proposal	$56,122	$29,269	$0	$0	$85,391	$85,391	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

27 - RR-13

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Field-based determination of chloride tolerance in soybean

Project Type:
Research

Name of Project Manager:
Trent Roberts

Name of Project Team Member 1:

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Clarifying whether a variety is truly a Cl includer or excluder is important to soybeans produced on poorly drained soils in areas with irrigation water having high Cl (most of eastern Arkansas). The current greenhouse screening method does not provide a robust rating system for varieties. A field screening technique is logical, time efficient, and a method that can be easily adopted by any seed company for in-house variety screening.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
We will screen soybean cultivars submitted to the OVT at the Rohwer Research Station.

BUDGET

Amount of Funding Needed for Project:
$52,179.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Field-based determination of chloride tolerance in soybean

Lead Investigators: Trenton Roberts and Jeremy Ross

Co-Investigators: John Carlin

Status: New, Year 1 of 3

Research Areas: Agronomy and Breeding

Stated Goal:

Implement a field-based assessment of chloride tolerance in soybean which will provide a more accurate representation of which soybean cultivars are classified as includers, excluders and mixed reaction types.

Specific Objectives:

1. Implement a field-based leaf sampling protocol for rating soybean varieties as an includer or excluder.
2. Provide annual evaluation of soybean cultivar reaction to chloride both as a categorical response of includer, excluder and mixed as well as a numerical rating system that indicate the relative degree of chloride tolerance amongst varieties.
3. Rate the degree of mixed reaction soybean populations so that producers can make informed cultivar selections that best fit their production systems and desired soybean characteristics.

Methods:

1. **Leaf Cl samples from field trials for categorizing variety Cl ratings:** Leaf samples will be collected from all maturity groups at a single location hosting Arkansas Soybean Variety Yield Trials (e.g., Rohwer). The leaf-Cl concentrations and uniformity among replicates and site-years will indicate whether variety leaf-Cl concentration behaves uniformly and is a good indicator or Cl inclusion or exclusion by the root system. To determine whether varieties are mixed populations of includers and excluders, individual plants (up to 16 plants per plot) will be sampled individually and the tissue analyzed for Cl. This type of sampling and analysis is needed to determine whether individual plants have the same Cl inclusion/exclusion mechanism. Once varieties are accurately characterized and ‘standard varieties’ identified field trials can eventually be initiated to examine management effects (row spacings, flat planted vs beds, etc…) on Cl uptake. Information will be included in the variety trial summary.

Planned Milestones:

The proposed research trials will be conducted for three years beginning in 2023, this will be the third year of the trial. Annual chloride tolerance ratings will be provided to the Extension soybean agronomist which will be added to official variety trial results and posted online. Research results will be published annually in the Soybean Research Series to serve as a permanent, accessible record of results that will also serve to inform clientele within and outside of Arkansas. Information will also be disseminated annually via county educational meetings and at regional and international professional meetings as deemed appropriate.

Value to Soybean Industry:

Clarifying whether a variety is truly a Cl includer or excluder is important to soybeans produced on poorly drained soils in areas with irrigation water having high Cl (most of eastern Arkansas). The current greenhouse screening method does not provide a robust rating system for varieties. A field screening technique is logical, time efficient, and a method that can be easily adopted by any seed company for in-house variety screening. The data collected from these trials will be compiled with other cultivar evaluation to provide Arkansas soybean producers with reliable field-based information to make well informed cultivar section decisions.

Budget Justifications/Explanation of Travel and Direct Costs:

In-state travel and salary are budgeted for field data collections.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Roberts, Trenton *Field-based determination of chloride tolerance in soybean*

Year	2026/2027	**Project Year**	New, Year 1 of 3	**Version: 8.0 (09/22/2025)**
Lead Investigator	Roberts, Trenton	**Co-PI #1**		
Co-PI #2		**Co-PI #3**		
Department	CSES Crop, Soil, Environmental Science			
Commodity Board	Soybean Promotion Board			
Project Title	Field-based determination of chloride tolerance in soybean			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Roberts, Trenton						
	Select "AES" or "CES" for each PI	AES	AES	CES	CES	Total Board Funding Requested	AES Portion	CES Portion
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Program Tech	Carri Scott	50%	$26,000				$26,000	$26,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$26,000	$0	$0	$0	$26,000	$26,000	$0
	Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information						$0	$0	$0
	Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0
			Hourly						
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel						$0	$0	$0
	Hourly-Students		$3,000				$3,000	$3,000	$0
	Subtotal: Hourly		$3,000	$0	$0	$0	$3,000	$3,000	$0
			Fringe Benefits						
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$7,176	$0	$0	$0	$7,176	$7,176	$0
	Graduate Students		$0	$0	$0	$0	$0	$0	$0
	Hourly Personnel		$0	$0	$0	$0	$0	$0	$0
	Hourly-Students		$3	$0	$0	$0	$3	$3	$0
	Subtotal: Fringe Benefits		$7,179	$0	$0	$0	$7,179	$7,179	$0
	Personnel Total		$36,179	$0	$0	$0	$36,179	$36,179	$0
			Travel						
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State		$4,500				$4,500	$4,500	$0
	Out-of-State						$0	$0	$0
	Travel Total		$4,500	$0	$0	$0	$4,500	$4,500	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Roberts, Trenton *Field-based determination of chloride tolerance in soybean*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$2,500				$2,500	$2,500	$0
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Analysis	$9,000				$9,000	$9,000	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$11,500	$0	$0	$0	$11,500	$11,500	$0
	Total for Proposal	$52,179	$0	$0	$0	$52,179	$52,179	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

27 - RR-14

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Influence of Cover Crops and Soil Health on Soybean

Project Type:
Research

Name of Project Manager:
Trent Roberts

Name of Project Team Member 1:
Gerson Drescher

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Costs and challenges of winter cover crops will be easily offset by 1) the potential decrease in fertilizer needs, 2) improved soil conditions that lead to better growth or reduced irrigation needs, and 3) a reduction in environmental impacts that threaten the long-term sustainability of Arkansas corn and soybean production. Inclusion of winter cover crops can have both short-term and long-term impacts on corn and soybean production.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Our goal is to take the data collected from the previous year's of this trial and develop a soybean specific Arkansas soil health tool.

BUDGET

Amount of Funding Needed for Project:
$65,325.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2025-2026 Proposal

Title: Influence of Cover Crops and Soil Health on Soybean

Lead Investigators: Trenton Roberts

Co-Investigators: Gerson Drescher and Jeremy Ross

Status: Year 1

Research Areas: Agronomy and Fertility

Stated Goal: To investigate the short-term and long-term benefits of cover crop implementation on corn and soybean yield, nutrient use efficiency, water use efficiency and soil health.

Specific Objectives:

1. Identify how winter cover crop species influence corn and soybean yield performance and soil physical characteristics related to water holding capacity and irrigation.
2. Monitor soil physical and chemical parameters related to soil health and productivity as influenced by a corn-soybean rotation with varying winter cover crop species.
3. Evaluate the effects of soil sample collection timing on soil health results and their interpretation.

Methods:

1 & 2. Field-scale, large-block trials will be implemented to look at the influence of cover crop species on soil health, soil physical and chemical characteristics specifically related to soil water holding capacity and irrigation. Implementation of cover crops and no-till production practices will influence the amount of soil organic matter and ultimately the crop performance and water use efficiency. Soil samples will be taken annually within the trial to gain baseline information of characteristics such as soil texture, organic C, organic N, soil organic matter via weight loss on ignition, and basic soil fertility levels. During the initiation of the trial, samples will be taken prior to cash crop planting each season to monitor the effects of the cover crop treatments within the corn and soybean rotations. In order to gain information on the influence of winter cover crop species selection on soybean yield and irrigation efficiency, data will be collected each year over the course of the experiment to determine both the long and short-term effects. Conversion to no-till and introduction of cover crops can lead to initial yield lags, but over time often lead to yield increases due to improve soil properties and increased soil health.

3. Soil samples for soil health analysis will be collected each month for an entire year to determine how the time of sampling impacts soil health results. Samples will be collected from all four of the soybean cover crop trials located across the state. Only selected treatments will be sampled, but the same treatments will be sampled at all

locations. Soil health results will be compared to see how crop rotation and cover crop species influence the soil health index across the season. Statistical analysis will help determine which cover crop treatment has the greatest influence on soil health over both the short and long-term and help indicate the best soil sampling timing to monitor soil health in soybean production systems.

Planned Milestones:

Data will be collected annually and compiled over time to compare the short-term and long-term effects of winter cover crop species selection. It may take several years for these systems to reach equilibrium due to the changes of both cover cropping and no-till management practices. Our goal is to monitor these changes to help aid producers in nutrient management for soybean through the implementation of cover crops into a corn soybean rotation and explain performance of the overall field system by describing indicators of soil health such as soil microbial communities and soil physical properties. Results will be reported annually at county and regional meetings and in the peer-reviewed scientific literature upon completion of the study.

Value to Soybean Industry: Winter cover crops have been promoted based on the environmental benefits of reduced erosion and nutrient loss. Limited work has been done to date on species selection and cultural management practices for effective use of winter cover crops in Arkansas corn and soybean rotational systems. Identifying the correct species, planting date, and fertilization needs are essential for effective cover crop use and the continued profitability of our soybean production systems. Costs and challenges of winter cover crops will be easily offset by 1) the potential decrease in fertilizer needs, 2) improved soil conditions that lead to better growth or reduced irrigation needs, and 3) a reduction in environmental impacts that threaten the long-term sustainability of Arkansas corn and soybean production. Inclusion of winter cover crops can have both short-term and long-term impacts on corn and soybean production. Understanding how cover crop species selection and cultural management practices is one of the most important steps in realizing the benefits of their effective use.

Budget Justifications/Explanation of Travel and Direct Costs: The out-of-state travel included in this proposal is to cover a portion of the cost for graduate students to attend professional scientific meetings, which in this calendar year will include the international annual agronomy meetings in Portland, OR. The attendance at these meetings allows presentations to be made concerning the research work conducted, and also for increased education by attending other scientific presentations and workshops. In-state travel and salary are budgeted for field data collections.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Roberts, Trenton *Influence of Cover Crops and Soil Health on Soybean*

Year	2026/2027	**Project Year**	New, Year 1 of 3
Lead Investigator	Roberts, Trenton	**Co-PI #1**	Drescher, Gerson
Co-PI #2		**Co-PI #3**	
Department	CSES Crop, Soil, Environmental Science		
Commodity Board	Soybean Promotion Board		
Project Title	Influence of Cover Crops and Soil Health on Soybean		

Version: 8.0 (09/22/2025)

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

	Roberts, Trenton	Drescher, Gerson			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI	AES	AES					

Fulltime Personnel

Position Title	Name *(if position is filled)*	% Time	Salaries				Total	AES	CES
Program Tech	Carri Scott	10%	$5,000				$5,000	$5,000	$0
Program Associate	Daniel Mesa	20%	$10,000				$10,000	$10,000	$0
Post Doc	Prashasti Agarwal	25%		$13,000			$13,000	$13,000	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$15,000	$13,000	$0	$0	$28,000	$28,000	$0

Graduate Student

Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.

Name *(if position is filled)*	% Time	Wages				Total	AES Portion	CES Portion
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
						$0	$0	$0
Tuition Calculator Information						$0	$0	$0
Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0

Hourly

	Wages				Total	AES Portion	CES Portion
Hourly-Personnel					$0	$0	$0
Hourly-Students	$2,000				$2,000	$2,000	$0
Subtotal: Hourly	$2,000	$0	$0	$0	$2,000	$2,000	$0

Fringe Benefits

Fringe benefits are calculated when salary and wage amounts are entered above.

	Benefits				Total	AES Portion	CES Portion
Fulltime Personnel	$4,140	$3,588	$0	$0	$7,728	$7,728	$0
Graduate Students	$0	$0	$0	$0	$0	$0	$0
Hourly Personnel	$0	$0	$0	$0	$0	$0	$0
Hourly-Students	$2	$0	$0	$0	$2	$2	$0
Subtotal: Fringe Benefits	$4,142	$3,588	$0	$0	$7,730	$7,730	$0
Personnel Total	$21,142	$16,588	$0	$0	$37,730	$37,730	$0

Travel

Justify out-of-state travel in proposal.

	Travel				Total	AES Portion	CES Portion
In-State	$5,500				$5,500	$5,500	$0
Out-of-State	$1,500				$1,500	$1,500	$0
Travel Total	$7,000	$0	$0	$0	$7,000	$7,000	$0

University of Arkansas System Division of Agriculture

Promotion Board Budget

Roberts, Trenton *Influence of Cover Crops and Soil Health on Soybean*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$2,000				$2,000	$2,000	$0
	Fertilizer/Chemicals	$2,000				$2,000	$2,000	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Analysis	$6,000				$6,000	$6,000	$0
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$4,075	$0	$0	$0	$4,075	$4,075	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$3,260	$0	$0	$0	$3,260	$3,260	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$3,260	$0	$0	$0	$3,260	$3,260	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$20,595	$0	$0	$0	$20,595	$20,595	$0
	Total for Proposal	$48,737	$16,588	$0	$0	$65,325	$65,325	$0

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

27 - RR-15

Organization/Institution Submitting Proposal:
University of Arkansas Division of Agriculture

Project Title:
Monitoring the Extent of Potassium Deficiency and Chloride Toxicity in Arkansas Soybean Fields

Project Type:
Research

Name of Project Manager:
Trent Roberts

Name of Project Team Member 1:
Jeremy Ross

Name of Project Team Member 2:

Statement of Justification or Purpose of the Project (75 word maximum):
Research has suggested that hidden hunger in soybean may be more widespread than currently thought and leading to a significant loss in soybean yield potential and producer profit. There are many areas of the state that are either not fertilized properly or are intentionally under fertilized due to budget constraints. The results of this monitoring program will help us identify the extent to which hidden hunger is costing Arkansas farmers.

Explanation of Activities/Actions to be Taken in Executing Project (75 word maximum):
Our goal is to work directly with county agents, producers and consultants to collect soybean leaf samples at the R2 and R4 growth stage to assess potential nutrient deficiencies and toxicities across the state.

BUDGET

Amount of Funding Needed for Project:
$37,760.00

Contribution Amount (from organization or sponsor):
$0.00

Arkansas Soybean Promotion Board – 2026-2027 Proposal

Title: Monitoring the Extent of Potassium Deficiency and Chloride Toxicity in Arkansas Soybean Fields

Lead Investigators: Trenton Roberts and Jeremy Ross

Co-Investigators: Gerson Drescher

Status: New Year 1 of 1

Research Areas: Agronomy, Fertility, Verification

Stated Goal: Determine the extent of potassium deficiency and chloride toxicity in Arkansas soybean production fields and identify potential yield gaps caused by these two yield limiting factors.

Specific Objectives:

1) Identify the magnitude and extent of potassium deficiency, including hidden hunger, across a wide range of Arkansas soybean production systems and estimate the associated yield loss.
2) Identify the magnitude and extent of chloride toxicity across a wide range of Arkansas soybean production systems and estimate the associated yield loss.

Methods:

1) Fields will be selected in conjunction with the county extension agents and Soybean Verification coordinators that have a history of "yield lag", exhibit unknown yield limitations or the producer has shown interest in using in-season tissue monitoring as a management tool. Trifoliolate leaf samples will be collected from the uppermost fully expanded leaf at the R2 and R4 growth stages. Selected fields will be grid sampled to provide additional information on the variability of both potassium deficiency and chloride toxicity. However, most fields will be sampled using a composite analysis from predetermined management zones. These zones will be delineated based on soil textural changes, yield maps or other reliable information. At least 18 trifoliolate leaves will be collected and composited from each management zone. In the event that fields are grid sampled, at least 12 leaves will be collected to form a composite sample within each grid cell. Data will be collected from the producer including but not limited to, soil texture, planting date, cultivation practices, water source, soil test values, fertilization practices, previous crop history with yield where available, cultivar planted and chloride toxicity rating. A report will be provided to the county agent as well as the producer that outlines the potential of potassium deficiency or chloride toxicity reducing their overall yield potential with an associated projected yield and profit loss. The statewide data will be combined over years to identify areas of the state where fertilization practices or cultivar selection can be altered to increase producer yield and profitability. Areas where yields are reduced by either of these two yield limiting factors will be targeted with educational programs to help mitigate their effects on soybean yield.

Planned Milestones:

The proposed monitoring project will be conducted for three years beginning in 2023, this will be the first year of the trial. Annual reports will be provided to the county extension agents, producers, and the Extension soybean agronomist. Results will be published annually in the Soybean Research Series to serve as a permanent, accessible record of results that will also serve to inform clientele within and outside of Arkansas. Information will also be disseminated

annually via county educational meetings and at regional and international professional meetings as deemed appropriate. This additional year of information will be targeted at areas of the state where no samples have been collected or submitted. We hope to work with producers and consultants to collect samples in underrepresented areas of the state.

Value to Soybean Industry:

Recent research has suggested that hidden hunger of potassium in soybean may be more widespread than currently thought and leading to a significant loss in soybean yield potential and producer profit. There are many areas of the state that are either not fertilized properly or are intentionally under fertilized due to budget constraints. The results of this monitoring program will help us identify the extent to which hidden hunger is costing Arkansas soybean producers and help target educational activities where they are most needed and will have the greatest net impact. In many areas where producers are not happy with their soybean yields there is a chance that chloride toxicity may be the underlying cause of their poor yields. With irrigation water quality and quantity continuing to decline across the state the problem of chloride toxicity will only continue to grow. Based on our work with hidden hunger of potassium in soybean we believe there is the potential that we are experiencing some hidden toxicity with chloride that is lowering our soybean yield potential without the obvious visual deficiency symptoms that we typically associate with chloride toxicity. The implementation of this monitoring program will help us identify problem areas of chloride toxicity, areas that may become problematic in future and provide soybean producers with some insight as to whether improved variety selection could help with their soybean yields.

Budget Justifications/Explanation of Travel and Direct Costs:

In-state travel and salary are budgeted for field data collections.

University of Arkansas System Division of Agriculture

Promotion Board Budget

Roberts, Trenton — *Monitoring the Extent of Potassium Deficiency and Chloride Toxicity in Arkansas Soybean Fields*

Year	2026/2027	**Project Year**	New, Year 1 of 1	**Version: 8.0 (09/22/2025)**
Lead Investigator	Roberts, Trenton	**Co-PI #1**	Ross, Jeremy	
Co-PI #2		**Co-PI #3**		
Department	CSES Crop, Soil, Environmental Science			
Commodity Board	Soybean Promotion Board			
Project Title	Monitoring the Extent of Potassium Deficiency and Chloride Toxicity in Arkansas Soybean Fields			

Budgets are requested in separate columns if separate Worktags for AES and CES will be needed.

Budget for Personnel

		Roberts, Trenton	Ross, Jeremy			Total Board Funding Requested	AES Portion	CES Portion
Select "AES" or "CES" for each PI		AES	CES	CES	CES			
Fulltime Personnel								
Position Title	**Name** *(if position is filled)*	**% Time**	**Salaries**				**Total**	**AES**	**CES**
Program Tech	Carri Scott	20%	$10,000				$10,000	$10,000	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Subtotal: Salaries		$10,000	$0	$0	$0	$10,000	$10,000	$0
	Graduate Student								
Tuition to be budgeted in the same ratio as GA stipend time, e.g., full time GA stipend, full year's tuition.	**Name** *(if position is filled)*	**% Time**	**Wages**				**Total**	**AES Portion**	**CES Portion**
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
							$0	$0	$0
	Tuition Calculator Information						$0	$0	$0
	Subtotal: Graduate Student		$0	$0	$0	$0	$0	$0	$0
			Hourly						
			Wages				**Total**	**AES Portion**	**CES Portion**
	Hourly-Personnel						$0	$0	$0
	Hourly-Students						$0	$0	$0
	Subtotal: Hourly		$0	$0	$0	$0	$0	$0	$0
			Fringe Benefits						
Fringe benefits are calculated when salary and wage amounts are entered above.			**Benefits**				**Total**	**AES Portion**	**CES Portion**
	Fulltime Personnel		$2,760	$0	$0	$0	$2,760	$2,760	$0
	Graduate Students		$0	$0	$0	$0	$0	$0	$0
	Hourly Personnel		$0	$0	$0	$0	$0	$0	$0
	Hourly-Students		$0	$0	$0	$0	$0	$0	$0
	Subtotal: Fringe Benefits		$2,760	$0	$0	$0	$2,760	$2,760	$0
	Personnel Total		$12,760	$0	$0	$0	$12,760	$12,760	$0
			Travel						
Justify out-of-state travel in proposal.			**Travel**				**Total**	**AES Portion**	**CES Portion**
	In-State		$2,500	$2,500			$5,000	$2,500	$2,500
	Out-of-State						$0	$0	$0
	Travel Total		$2,500	$2,500	$0	$0	$5,000	$2,500	$2,500

University of Arkansas System Division of Agriculture

Promotion Board Budget

Roberts, Trenton *Monitoring the Extent of Potassium Deficiency and Chloride Toxicity in Arkansas Soybean Fields*

		Maintenance & Operations						
		M&O				Total	AES Portion	CES Portion
	Supplies	$1,500	$1,500			$3,000	$1,500	$1,500
	Fertilizer/Chemicals					$0	$0	$0
	Publication					$0	$0	$0
	Statistical Consulting					$0	$0	$0
Other Direct Costs	Analysis and Shipping	$13,000	$4,000			$17,000	$13,000	$4,000
Station Maintenance	SAREC, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	CTST, Marianna	$0	$0	$0	$0	$0	$0	$0
	Lonoke County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	NERE, Keiser	$0	$0	$0	$0	$0	$0	$0
	NERREC, Harrisburg	$0	$0	$0	$0	$0	$0	$0
	Jackson County Ext. Center	$0	$0	$0	$0	$0	$0	$0
	PTST, Colt	$0	$0	$0	$0	$0	$0	$0
	RIRE, Stuttgart	$0	$0	$0	$0	$0	$0	$0
	Rosen Center	$0	$0	$0	$0	$0	$0	$0
	SEST, Rohwer	$0	$0	$0	$0	$0	$0	$0
	SWRE, Hope	$0	$0	$0	$0	$0	$0	$0
	VGSS, Kibler	$0	$0	$0	$0	$0	$0	$0
	FRSS, Clarksville	$0	$0	$0	$0	$0	$0	$0
	LFST, Batesville	$0	$0	$0	$0	$0	$0	$0
	CSES Greenhouse, Fayetteville	$0	$0	$0	$0	$0	$0	$0
	M & O Total	$14,500	$5,500	$0	$0	$20,000	$14,500	$5,500
	Total for Proposal	$29,760	$8,000	$0	$0	$37,760	$29,760	$8,000

Budget errors delay submission of your proposal. Any proposal submitted with errors in the budget cannot be guaranteed accurate presentation for funding. Please check budgets for accuracy.

Fringe Benefit Rates (as of 7/1/2025)				
Campus	Fulltime	Temp/Hourly	Graduate	Student
AES	27.60%	6.80%	6.40%	0.10%
CES	27.60%	6.80%	6.40%	0.10%

ATTACHMENT 24

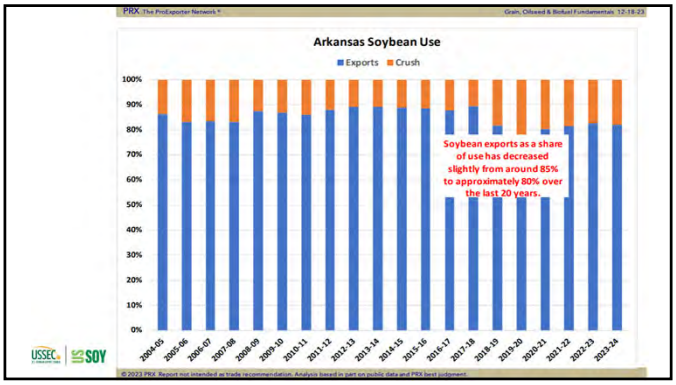
USSEC FY26 Proposals

Arkansas Soybean Promotion Board

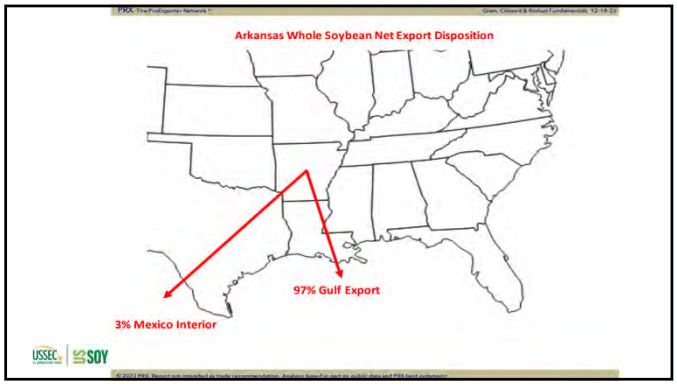
Brianna Metts, Industry Affairs Manager
U.S. Soybean Export Council

March 13, 2026

1



2



3

Proposals



4

USSEC Regions



5

Utilization of U.S. Soy in the Americas

Funding Request: $25,000

Who	What	How
• Importers • Animal producers • Feed industry	• Education • Highlight advantages of U.S. soy	• Trade Teams • Conferences • Workshops & seminars • One-on-One meetings

6

U.S. Soy Promotion in Europe

Funding Request: $25,000

Who	What	How
• Soy value chain • Animal producers & feed manufacturers	• Education • Highlight advantages of U.S. soy	• Trade Teams • Technical programming • Workshops & seminars • Material development

7

Japan Soy Foods

Funding Request: $15,000

Who	What	How
• Natto industry	• Benefits of U.S. soy source natto • Maintain & grow market share • Promote soy health halo	• Industry collaboration • Marketing campaigns • Events

8

Support of the Soy Excellence Centers

Funding Request: $15,000

Who	What	How
• Emerging markets • Entry level employees • Global Advisory Panel (GAP)	• Education & trainings • Early awareness and intro to U.S. soy • Relationships • Address protein challenges	• SEC courses • Creating & updating learning modules • Subject matter exporters • Continuing education and engagement

9



10

Soy Connext Sponsorship

Requested Funding: $5,000

Sponsorship at this level:
- Registrations: 1 complimentary
- Exposure in all conference materials
- Dedicated networking space
- Other sponsorship levels are available*



11

USSEC U.S. SOYBEAN EXPORT COUNCIL | US SOY

12

ATTACHMENT 25

Research Projects

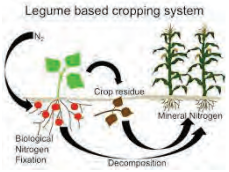
Quantifying Potential Gaseous N Losses and Soil Health Implications from Non-Nodulating Soybean

- **Investigators:** Dr. K. Brye, Dr. C. Vieira, and Dr. D. Della Lunga (CSES)
- **Status:** New (Year 1 of 1)
- **Budget Request:** $38,240

Objectives:

Quantify N and C cycles
- Standard variety
- Non-nodulating
- Bare soil

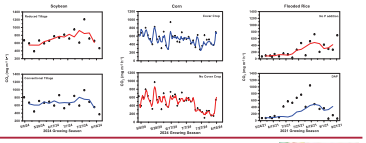
Key parameters
- N-gas losses
- C-gas losses
- Plant nutrient uptake
- Change in soil properties



Multidisciplinary research to determine recommendations for fertilizer and soil health management



- Implementation of Dr. Vieira's field evaluation
- One full growing season at Rohwer Research Station
- Two fertilizer-N rates for non-nodulating variety
- Two varieties currently under study
- Treatments replicated four times for 16 plots



Temporary Flooding Effects on Soil Respiration in Tolerant and Susceptible Soybean Varieties in the Greenhouse

- **Investigators:** Dr. K. Brye, Dr. C. Vieira, and Dr. D. Della Lunga (CSES)
- **Status:** New (Year 1 of 1)
- **Budget Request:** $40,000

Objectives:

Biogeochemical processes to assess plant metabolic rate
- Flood-tolerant
- Flood-sensitive

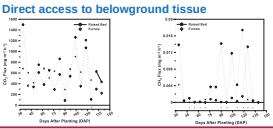
Key parameters
- Aerobic respiration
- Anaerobic respiration
- Nutrient uptake
- Change in soil properties
- Plant damage



Interdisciplinary approach to assess management practices in relation to flood-related plant-soil nutrient cycles



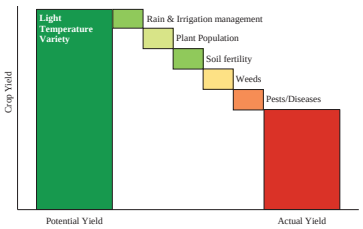
- Implementation of Dr. Vieira's field evaluation of flood tolerance
- 2-month experiment repeated twice
- Tubs designed to contain the flood
- Controlled environment
  - Reduce risk of random factors
  - Direct access to belowground tissue



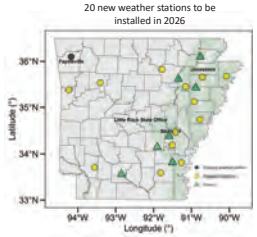
Soybean potential yield map and yield gap analysis for Arkansas

- **Investigators:** Elvis Elli, Jeremy Ross
- **Status:** New, Year 1 of 3
- **Budget Request:** $54,255
- **Objectives:**
  1) Create a soybean potential yield map for Arkansas at a fine resolution
  2) Quantify the yield gaps and their major causes and identify strategies to close the gaps

- The average Arkansas soybean yield is well below what is biologically attainable
- Yield gap analysis can help understand factors limiting yields
- The first step is to determine yield potential across the state



20 new weather stations to be installed in 2026



How we envision the yield potential map



Deliverables and value to the soybean industry
- A soybean yield potential map available in a web tool
- Identification of major yield gap causes across AR
- Synthesis of results in educational and extension materials
- Find ways to reduce input costs, focus investments on the most limiting factors, and generate practical guides for AR farmers to increase yields

Insect Frass for Plant Growth Promotion and Enhanced Soybean Yields

- **Investigators:** Gerson Drescher, Helen Amorim, Amanda Ashworth (USDA ARS), Trenton Roberts, Mark McDonald, Prashasti Agarwal
- **Status:** Initial – New Proposal (Year 1 of 3)
- **Budget Request:** $42,969
- **Objectives:**

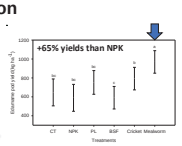
1. Establish field trials to evaluate the impacts of increasing frass rates (0, 2.5, 5, 10, and 25% chitin) as a soybean fertilizer complement to enhance soil health, plant growth, and grain yields.

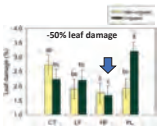
2. Assess soil nutrients, soil microbiome, plant nutritional status, leaf damage, nutrient use efficiency, and grain yields as affected by frass inclusion in soybean fertilization.

3. Develop recommendations to integrate insect frass into soybean production systems, complementing conventional fertilization and improving long-term soil health and productivity.

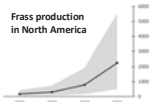
Project Justification







Frass production in North America



Frass is the mixture of insect excreta, leftover feed, and exuviae resulting from insect mass production

Contains N-P-K and plant growth-promoting organisms

Details & deliverables to AR growers

Treatments
1. NPK (control)
2. NPK + 2.5% frass
3. NPK + 5% frass
4. NPK + 10% frass
5. NPK + 25% frass

Field Experiments
- ✓ SAREC – Fayetteville, AR
- ✓ PTRS – Colt, AR

Measurements & Analyses
- ✓ Soil properties (0-6 in)
- ✓ Nodulation and rhizosphere organisms (R2-R5)
- ✓ Leaf damage 30, 60, and 90 days DAP
- ✓ Leaf N, P, and K (R2)
- ✓ Grain yield, quality, and nutrient removal



Expected end products:
1. Knowledge on how to include insect frass as a biostimulant in soybean production for greater grain quality, yield, and soil health.
2. Better understand frass effects on insect suppression.
3. Information to support frass registration as a low-cost biostimulant (AAPFCO).

Role of the soil microbiome in conferring flooding tolerance in soybean

- **Investigators:** Mark McDonald, Caio Vieria, Elvis Elli
- **Status: Initial – New Proposal (Year 1 of 2)**
- **Budget Request:** $74,712
- **Objectives:**
  - Investigate the relationship between soil microbial communities and function and crop recovery from flooding stress to determine whether tolerant varieties' recovery is enhanced by specific microbial partners compared to non-tolerant varieties

Methods

- Study location: active flooding-tolerance (vegetative stage) variety trials at the Rice Research & Extension Center (RREC) in Stuttgart, AR - Dr. Vieira
  - Two varieties will be assessed in this research a non-tolerant variety (R23PR-00068) and a flood-tolerant variety (R21KB-05522)
- Sample collection
  - 1) pre-flooding – soil + plant + growth
  - 2) flooding (2 days) – soil + growth
  - 3) flooding (4-days) – soil + growth
  - 4) 7 days post-flood – soil + plant + growth
- Analyses
  - DNA and RNA sequencing – what microbes are there and what are they doing differently during flood with tolerant and non-tolerant varieties
  - Plant and soil nutrients – shift in nutrient cycling initiated by flooding
  - Plant growth – changes in plant health/growth associated with flooding

Study Objectives and Benchmarks	Year 1 (2026)				Year 2 (2027)				Post Project
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	
Graduate Student Hired	x	x							
Soil Sampling	x	x			x	x			
Plant Sampling	x	x			x	x			
Soil and plant analyses			x	x	x	x	x	x	
Presentation of results			x	x			x	x	x
Publication of work									x

Rationale and Value

- Rhizobia and bulk soil microbes contribute to soybean growth
  - Plant's "second genome"
  - Flooding causes changes in soil microbiome and impacts rhizobial supply of nitrogen to the plant
  - Tolerant, or resilient, varieties of soybeans may be leveraging these microbial relationships to survive flood
- Understanding these relationships can help guide variety development and soil/field management to enhance flood recovery
  - Potential for improvements for rhizobia/microbes to encourage tolerance of non-tolerant varieties
  - Integration of microbiome data with plant genetics to enhance productivity of AR soybeans

Establishing a Long-Term Rotational Study

PI: Justin Chlapecka

Co-PIs: Jeremy Ross, Ana Ona, Kristiina Ala-Kokko, Jarrod Hardke, Jason Kelley

Status: New

Budget Request: $18,980

Objectives:

Yield performance: To evaluate the yield performance of rice, soybean, and corn in a continuous monoculture and in various rotational intervals between the three crops.

Soil effects: To determine the effect of crop rotation on soil properties, including pH, organic matter, nutrient content, and native soil nitrogen availability.

Pest effects: To determine the pest profile of rice, soybean, and corn under different systems.

Objectives 1-5

- **Economic analyses:** To examine the economics of each crop rotational system, including profitability and opportunity cost.
- **Facilitating the future:** To allow for future studies that take into account the cropping system and field history as factors that may influence the effect of other variables.



Methods

- **Establish plots 20 ft wide x 200 ft long**
  - **Leaves plenty of room for side projects and drift concerns**

Planned Treatment Structure:

Treatments	2026	2027	2028	2029	2030	2031
Cont. Rice	Rice	Rice	Rice	Rice	Rice	Rice
Cont. Soy	Soybean	Soybean	Soybean	Soybean	Soybean	Soybean
Cont. Corn	Corn	Corn	Corn	Corn	Corn	Corn
1 Rice : 1 Soy	Rice	Soybean	Rice	Soybean	Rice	Soybean
2 Rice :1 Soy	Rice	Rice	Soybean	Rice	Rice	Soybean
2 Soy : 1 Rice	Soybean	Soybean	Rice	Soybean	Soybean	Rice
1 Corn: 1 Soy	Corn	Soybean	Corn	Soybean	Corn	Soybean
1 Soy : 1 Corn : 1 Rice	Soybean	Corn	Rice	Soybean	Corn	Rice
1 Corn: 1 Rice	Corn	Rice	Corn	Rice	Corn	Rice

Developing a Screening Pipeline and Candidate Gene Pool for Nematode Resistance in Soybean



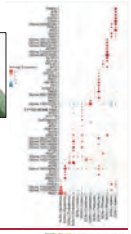
- **Investigator: Fiona Goggin**
  - **Collaborator: Gunvant Patil, Texas Tech University**
- **Status:**
  - Initial – New Proposal
- **Budget Request: $30,767**
- **Objective:** Optimize a biotechnology pipeline to:
  - ID potential nematode resistance genes using single-cell RNA sequencing, in vitro transient gene expression, and high-throughput nematode bioassays
  - Introduce these genes into elite germplasm through gene editing



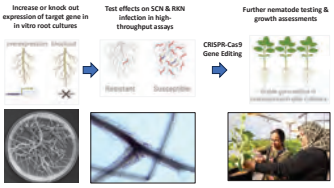
Foundation for Project

- Most Soybean Cyst Nematode (SCN) resistant cultivars derived from only 2 genetic sources (PI88788 & Peking), resulting in many resistance-breaking races
- PI437654: strong, broad-spectrum SCN resistance
  - Patil Lab---used single-cell RNAseq to ID SCN-responsive genes that may contribute to resistance in PI437654
  - Patil & Goggin labs---confocal microscopy to confirm these genes are induced by SCN & ID location of expression





Proposed Next Steps



Anticipated Outcomes

- ID of new genetic sources for nematode resistance
- Improved rapid screening methods for nematode resistance

Assessment of Soybean Arthropod Community Dynamics across Arkansas

- **Investigators: Dr. Rupesh Kariyat, Glen Studebaker, Ben Thrash and Nick Bateman**
- **Status: Initial – New Proposal**
  - **Recompete – Current Proposal requesting a new funding cycle**
- **Budget Request: $49,000**
- **Objectives:**
  - **Determine seasonal shift in arthropod community composition across soybean growing regions of Arkansas**
  - **Evaluate how agronomic practices (early and late planting, irrigation, pesticidal spray) influence pest activity and beneficial insects in Arkansas soybean fields**
  - **Document regions with the economically important pest activities and determine periods when the natural enemies are most active in these regions**
  - **Use the extensive arthropod community data to develop Arkansas based long term IPM recommendations supporting informed management decisions for soybean growers in the state**

The Need for Data-Driven Pest Management

- **Problem**: No statewide database on pest and beneficial arthropod dynamics
- Growers lack region- and season-specific scouting guidance
- Insecticide applications are often calendar-based instead of need-based
- Limited understanding of how different agronomic practices influence pest pressure and natural enemies
- Results in higher input costs, loss of beneficial insects, and yield risk
- **Solution:** To develop a statewide database of soybean pests and natural enemies to enable timing-based IPM and reduce unnecessary insecticide use





Project Outcomes for Arkansas Soybean Growers

Task 1: Track seasonal pest and beneficial insect dynamics across Arkansas

Task 2: Evaluate how production practices influence arthropod pressure

Task 3: Identify pest hotspots and peak beneficial activity periods

Task 4: Convert these data into Arkansas-specific IPM strategies

2026 (Year 1)

1. Establish multi-location monitoring sites
2. Conduct seasonal sampling across soybean growth stages

Step 1: Baseline Monitoring

2027 (Year 2)

1. Continue statewide monitoring
2. Implement agronomic practice treatments (early vs late • irrigation • spray programs)

Step 2: Management Effects

2028 (Year 3)

1. Identify pest hotspots & beneficial activity windows
2. Develop predictive models & IPM recommendations

Step 3: IPM Decision-Support Tools

Soybean as a conversion crop within integrated crop-livestock systems

- **Investigators: Jonathan Kubesch, Jeremy Ross, Harley Warren, Kenny Simon, Daniel Rivera, Flint Harrelson**
- **Status: Initial – New Proposal**
- **Budget Request: $39,839**
- **Objectives:**
  - Develop in-state evidence that soybean can be used as a break crop to eliminate unproductive pasture stands.
  - Showcase the production expectations of soybean planted into terminated pasture sods.

What's the best option for this ground?

- **Control:** pasture is left as-is and fertilized to the appropriate soil test recommendations
- **Burndown:** pasture is eliminated with a 2 qt/acre rate of glyphosate and then planted to the new forage
- **Soybean:** pasture is eliminated then planted to soybean
- **Sorghum-sudangrass:** pasture is eliminated then planted to sorghum-sudangrass

How can we pivot between grain and livestock/hay markets?

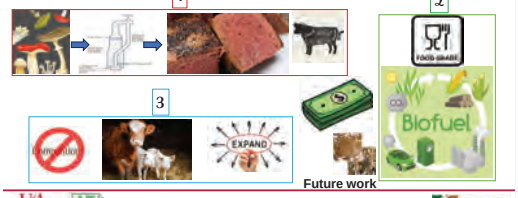
- Anticipated results
  - Are soybeans a good break crop between pasture sods?
  - What can soybeans do on former pasture ground?
- **Planned Milestones:**
  - **2026:** 2026 sites are planted and converted.
  - **2027:** Soybean and sorghum-sudangrass plots are planted to the new forage (either bermudagrass or bahiagrass) in the 2026 site. 2027 sites are planted and converted.
  - **2028:** Soybean and sorghum-sudangrass plots are planted to the new forage in the 2027 site.

Valorizing Soy By-products into Mycoprotein via Acid/Alkaline/Enzymatic Treatment and Biomass Fermentation

- **Sungil Ferreira – FDSC AES Fayetteville**
- **Status: New Proposal (Year 1)**
- **Budget Request: $48,868 (Year 1/3); GA salary, hourly undergrad, travel including visit farms, publications and supplies.**

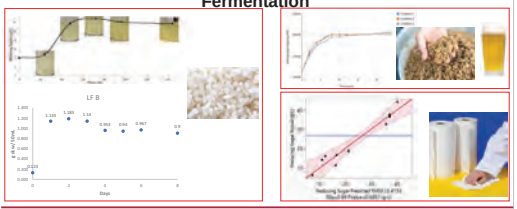
- **Objective 1 (Years 1 and 2): Establish a proof-of-concept for using soy molasses from aqueous ethanol soy protein concentrate (SPC) production as the primary carbon source -> mycoprotein + TEA.**
- **Objective 2 (Years 2 and 3): Develop a practical pathway to convert insoluble fiber from SPC/SPI manufacturing into fermentable sugars via chemical and biochemical process -> mycoprotein + TEA.**

Valorizing Soy By-products into Mycoprotein via Acid/Alkaline/Enzymatic Treatment and Biomass Fermentation



Future work

Valorizing Soy By-products into Mycoprotein via Acid/Alkaline/Enzymatic Treatment and Biomass Fermentation



Field Variability, Harvest Moisture, and Advanced Storage Monitoring to Improve Arkansas Soybean Quality

- **Investigators-** PI: Kaushik Luthra, co-PI: Ana Smith
- **Status:** Initial – New Proposal (Year 1 of 3)
- **Budget Request:** $64,083 (Year 1)
- **Objectives:**
  1. **Year 1:** Quantify how soil properties, landscape position, and in-season crop variability influence spatial differences in soybean grain quality when harvested at the recommended 13% moisture content.
  2. **Year 2:** Determine the role of harvest moisture content on soybean physical damage (cracks, splits, and seed coat integrity), overall grain quality, and susceptibility to spoilage and insect infestation during storage under Arkansas environmental conditions.
  3. **Year 3:** Evaluate the use of carbon dioxide (CO_2) and volatile organic compound (VOC) sensing as early-warning indicators for spoilage and insect activity in stored soybeans.

Project Details

Year 1: Field variability vs grain quality



Year 2: Imagery guided harvest optimization



Year 3: Enhanced storage studies





Integrated Strategies for Safe, Efficient, and Profitable Rewetting of Over-Dried Soybeans Using Advanced Bin Aeration Systems

- **Investigators-** PI: Kaushik Luthra, co-PI: Chris Henry
- **Status:** Initial – New Proposal (Year 1 of 3)
- **Budget Request:** 59,140 (Year 1)
- **Objectives:**
  1. **Year 1:** Document Arkansas soybean bin infrastructure, aeration systems, and current practices related to over drying and moisture management.
  2. **Year 2:** Experimentally evaluate safe soybean rewetting strategies under Arkansas relevant temperature and humidity conditions using instrumented laboratory scale bin systems.
  3. **Year 3:** Quantify the effects of controlled rewetting on soybean quality, storability, and economic returns to Arkansas producers.

Project Details

Year 1: Assessment and Structual Risk Documentation

- **Survey** Arkansas soybean bin infrastructure and aeration systems
- Document producer rewetting and moisture management practices
- **Identify structural vulnerabilities** in commonly used bin systems
- Analyze risks of grain swelling and wall stress during rehydration
- Establish **baseline** engineering thresholds for safe moisture gain



Year 2: Controlled Laboratory Rewetting and Engineering Thresholds

- Construct instrumented laboratory scale bin system
- Measure grain expansion forces using strain gauges
- Evaluate airflow rates and moisture migration patterns
- Define safe rewetting limits under Arkansas temperature and humidity conditions
- Develop preliminary fan control logic for safe operation

Year 3: Quality Validation and Economic Implementation

- Evaluate germination, oil, protein, seed integrity, and storability
- Quantify recovered grain weight and shrink reduction
- Conduct economic return analysis for Arkansas
- Develop producer-ready rewetting guidelines



Project Deliverables and Farmer Benefits

1. **Safe rewetting thresholds & engineering guidelines** for Mid-South bin systems
2. **Soybean quality & storability benchmarks** (germination, oil, protein, seed integrity)
3. **Extension resources** – journal manuscripts, factsheets, webinars, and field days to ensure adoption
4. **Direct farmer benefits** – reduced shrink loss, safer bins, improved marketability, and higher profitability

Effects on carcass characteristics, meat quality, and consumer acceptability of inclusion of raw whole soybeans in growing and finishing diets for farm finished beef

- **Investigators: Beth Kegley and Zena Herrera**
- **Status: Initial**
- **Budget Request: $36,250 (Year 1) and $20,300 (Year 2)**
- **Objectives:**
  1. **To determine the effect of supplementing raw soybeans to beef stocker cattle during the growing phase**
  2. **To determine the effect of feeding raw whole soybeans in diets for farm finished beef**
  3. **To determine the interaction of these treatments on carcass characteristics and beef quality**

Background and Goal

- Whole raw soybeans are an acceptable source of protein and energy in cattle rations
  - Rumen microbes detoxify the trypsin inhibitor that limits unheated soybeans use in poultry and swine diets
- Cattle fed diets containing whole soybeans had greater hot carcass weights and larger longissimus muscle area.
- These studies failed to look at the impact soybeans had on beef quality
- The goal is to assess how feeding diets containing raw whole soybeans to steers in growing and/or finishing phases will impact growth performance, carcass yield and quality, economics, and beef fatty acid composition, antioxidant capacity, tenderness, and consumer acceptability

Methods

- Year 1
  - 40 Angus crossbred steers (≈ 600 lb) – July 2026
  - Growing phase – 4 pastures
    - Offered supplements with no soy or raw whole soybeans at a rate of 0.3% of body weight
  - Finishing phase – September 2026
    - Moved to 8 pens and fed rations with no soy or 15% raw whole soybeans
    - ½ the steers on each growing phase treatment will be fed each of the finishing diets = 10 steers for each of the 4 dietary treatments
  - Steers harvested at 1,300 lb – February 2027
    - Carcass data and loins obtained
- Year 2
  - ½ of each loin either wet or dry aged for 28 days
  - Cut into 1-inch steaks
    - Assessing retail color and oxidation across a 7-day display period, tenderness, fatty acid composition, pH, volatile compound analysis, and sensory attributes.

Transforming Arkansas soybean hulls into high-value probiotic silage: improved digestibility and reduced post-weaning diarrhea in piglets

- **Investigators: Amir Mani, Tsung-Cheng Tsai**
- **Status: Initial – New Proposal**
- **Budget Request: $30,000**
- **Objectives:**

1. **Create a high value probiotic soybean hull silage for nursery pigs using *Lactiplantibacillus plantarum* and *Pediococcus pentosaceus* as inoculants.**
2. **Define how probiotic fermentation reshapes the microbial community and suppresses pathogens associated with post-weaning diarrhea in piglets.**
3. **Transform tough hull fiber into pig friendly fermentable fiber to increase nutrient bioavailability in nursery pigs.**
4. **Quantify the dollars, and cents value of probiotic soybean hull silage for Arkansas soybean growers and swine producers.**

Ensiling soy hulls with swine probiotics: a new strategy against post-weaning diarrhea



- 3 million acres
- 5.0 million tons
- Source of protein & fat
- $400 – $600/ton



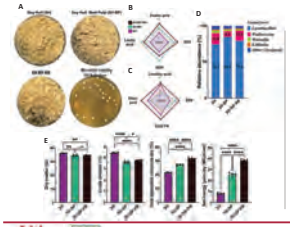
- 250,000 tons
- $40/ton
- High in fiber
- Yet lots of potential!

- Sw ne: an untapped market for ensiled soy hulls.





Probiotic soy-hull silage: what we've done and what your support will deliver



With your support, we will…

Test ensiled soy hulls as a potential alternative to antibiotics …



Why your support matters for Arkansas soybeans …

- Turn 250,000 tons of hulls into high-value feed.
- Provide a soy-based tool against post-weaning diarrhea.
- Deliver a silage recipe and ROI numbers in one year.

Thank you, Arkansas Soybean Board for your support

Immunomodulatory effects of isoflavones from soybean meal in broilers challenged with coccidiosis

- **Investigators: Shawna Weimer, Danielle Graham**
- **Status: Initial – New Proposal**
- **Budget Request: $41,788**
- **Objectives:**
  1. **Evaluate the effect of dietary soy isoflavone supplementation on broiler performance, immune response, and gut health.**
  2. **Determine the impact of soy isoflavone supplementation on broiler response to coccidiosis, including disease severity, immunomodulation, and antioxidant status.**

Experimental Design & Methods

- Day-of-hatch broiler chicks will be assigned to 5 dietary treatments:
  1. Negative control (no SBM)
  2. Positive control (high SBM)
  3. Low SBM diet
  4. Low SBM + ~70 ppm soy isoflavones
  5. Low SBM + ~140 ppm soy isoflavones
  - Isoflavone inclusion will be verified by laboratory analysis
- Coccidiosis challenge on day 14
  - 1 mL oral dose of 10x Coccivac-B52, saline controls
- Measures (days 0-28)
  - Growth performance: weekly body weight & feed intake
  - Immune response: leukocyte profiles, pro- and anti-inflammatory cytokine gene expression, secretory IgA
  - Coccidiosis response: weekly post-challenge oocyst shedding, intestinal lesion scores
  - Antioxidant status: liver MDA and SOD activity

Group	Diet	Coccidiosis challenge	Pens
1	Negative control (no SBM)	Control (no challenge)	8
2	Positive control (high SBM)	Control (no challenge)	8
3	Low SBM	Control (no challenge)	8
4	As 3 + ~70 ppm soy isoflavones	Control (no challenge)	8
5	As 3 + ~140 ppm soy isoflavones	Control (no challenge)	8
6	Negative control (no SBM)	Challenge	8
7	Positive control (high SBM)	Challenge	8
8	Low SBM diet	Challenge	8
9	As 3 + ~70 ppm soy isoflavones	Challenge	8
10	As 3 + ~140 ppm soy isoflavones	Challenge	8

Measures, Outcomes, Industry Value

- Anticipated Outcomes
  - Isoflavone-supplemented diets will
    - Improve performance, particularly under coccidiosis challenge
    - Improve immune and antioxidant responses (coccidiosis resistance)
- Value to the Soybean Industry
  - Value-added health benefits of soy components
  - Development of soy-based nutritional strategies for poultry health
  - Potential to increase demand for U.S. soybean meal as a poultry feed ingredient and profitability for soybean farmers

Development of Highly Digestible Protein Cultivars with Reduced Antinutritional Factors

- **Investigators:** Mahfuzur Rahman and Caio Canella Vieira
- **Status: New Proposal, 1 of 3**
- **Budget Request: $79, 880**
- **Objectives:**

1. Determine the protein digestibility and antinutritional factors in a subset of 200 soybean breeding lines representing the genetic diversity available in the Arkansas Soybean Breeding program.

2. Characterize the genetic architecture of protein digestibility and antinutritional factors through genome-wide association studies and functional genomics.

Status of Arkansas soybean protein

- Egg and milk proteins exhibit very high digestibility (often ≥98%) and a PDCAAS of 1.0, as they are largely free of potent antinutritional factors such as Trypsin inhibitor and phytic acid.

In high-protein Arkansas soybean lines from our previous work:

- In vitro protein digestibility ranged from 81% to 87%,
- PDCAAS values of 0.71 to 0.86.
- The major reason for the reduced digestibility is Trypsin inhibitor activity (≈3.3–3.7 TIU/mg) and phytic acid (≈0.52–0.62 g/kg)

Sample code	Protein digestibility (%)	PDCAAS	Trypsin inhibitor (TIU/mg)	Phytic acid (g/kg)
SP1	82.63 ± 1.28^{c}	0.859±0.013^{b}	3.65 ± 0.03^{a}	0.56 ± 0.01^{abc}
SP2	81.63 ± 1.31^{c}	0.749±0.012^{de}	3.33 ± 0.08^{bc}	0.53 ± 0.01^{bc}
SP3	82.11 ± 1.14^{c}	0.753±0.011^{de}	3.42 ± 0.01^{b}	0.62 ± 0.02^{a}
SP4	84.59 ± 1.51^{abc}	0.843±0.015^{b}	3.34 ± 0.04^{bc}	0.61 ± 0.01^{ab}
SP5	87.58 ± 1.73^{a}	0.779±0.015^{cd}	3.60 ± 0.04^{a}	0.59 ± 0.06^{abc}
SP6	83.10 ± 1.76^{bc}	0.711±0.015^{ef}	3.42 ± 0.01^{b}	0.58 ± 0.00^{abc}
SP7	83.82 ± 1.36^{bc}	0.749±0.012^{de}	3.42 ± 0.04^{b}	0.52 ± 0.00^{c}
SP8	86.21 ± 1.47^{ab}	0.740±0.012^{ef}	3.69 ± 0.03^{a}	0.58 ± 0.00^{abc}

Statement of projected value

- The global soy protein market is currently valued at approximately $ 8–9 billion
- This value will approximately double by around 2032–2034, reaching about 14–15 billion US dollars as demand for plant-based and sustainable proteins continues to rise.
- This project, which delivers cultivars with higher protein digestibility and reduced antinutritional factors, directly enhances the value of every Arkansas bushel by improving nutritional quality for both livestock and human food markets.
- This will ensure that Arkansas soybeans remain competitive and preferred in the rapidly growing plant-based protein market.

Increasing Adoption of Elevation Data and Irrigation Scheduling on Furrow-Irrigated Soybeans

- **Investigators: Mike Hamilton - Irrigation Instructor**
- **Status: New**
- **Budget Request: $28,520**
- **Objectives:Objective 1: Improve irrigation efficiency and reduce water, labor, and fuel use in furrow-irrigated soybean systems by integrating elevation data and sensor-informed irrigation scheduling into current producer practices.**
- **Objective 2: Increase the accuracy and effectiveness of poly-tubing layout and water delivery by generating field-specific elevation data and flow-based irrigation designs tailored to individual soybean fields.**
- **Objective 3: Support education, demonstration, and adoption of improved irrigation practices by assisting producers, consultants, and University of Arkansas Division of Agriculture and NRCS personnel with field-level examples, technical guidance, and data-driven decision tools.**

Increasing Adoption of Elevation Data and Irrigation Scheduling on Furrow-Irrigated Soybeans

- Benefit to Growers
  - Financial savings to growers because increased accuracy of irrigation designs with elevation data incorporated will increase distribution uniformity.
  - Sensor-informed scheduling can reduce unnecessary irrigation, lower fuel and labor demands, and improve water-use efficiency in furrow-irrigated soybean systems.
  - Increased trainings and education for growers, county agents, NRCS staff, and crop consultants on utilizing sensors and incorporating elevation data in furrow irrigated soybean designs.

Water Management Advancements for Irrigated Soybeans

- **CG Henry; T. Burcham; N. Newberry; J. Carlin; V. Caio**
- **Status: Year 1 of 3**
- **Budget Request: $230,057**
- **Objectives:**
  1. **Document water savings, yield improvements, profitability improvements using an Irrigation Contest. Compare yield and water use differences to document the efficacy and improved profitability of conservation practices.**
  2. **Deliver irrigation schools in the winter months. (new) migrate, support and collaborate on a Master Irrigator Curriculum and Program.**
  3. **Further develop recommendations for surge irrigation and soil moisture sensors. Improve soil water information about Arkansas and mobile app development for sensors. Test new ideas on how to improve water retention curve development methods. Specifically develop intake families for Arkansas Irrigated Soils and max irrigation set times.**
  4. **Improve ability to measure and document water use through new cloud meter telematics. delivered to the irrigator during the season.**
  5. **Test pit-less tailwater recovery water savings on paired soybean fields at NERREC and automation valves and pump controls for automated management.**

Soybean Irrigation with the Pitless Pump

- Paired 50 acre fields at NERREC
- Reduced water use by 31%, 4.2 ac-in/ac
- Reduced yield by 2.7 BPA (p=0.005)
- Better soaking, catch rain
- Flood tolerant variety selection
- Test irrigation set times at RREC of 12, 18, 24, 30, 36, 48 and 60 hours. How long should set times be?
- Are there varieties that can withstand longer set times?(Carlin and Caio)



Treatment	Water Use (ac-in/ac)	# Irrigations	Yield
Control	13.2	7	70.7
Pit-less	9	4	68

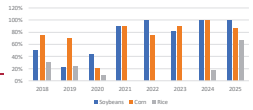
Irrigation Contest, Mobile app, valves and meters



Technology Adoption by Contest Participants

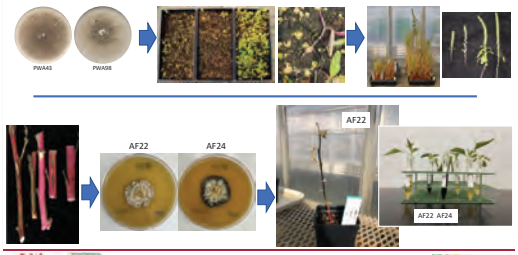
	Soil Moisture Sensors	Computerized Hole Selection	Furrow Irrigated Rice	Surge Valves
2025	87%	87%	60%	4%
2024	85%	89%	38%	13%
2023	85%	100%	54%	22%
2022	81%	79%	64%	12%
2021	87%	97%	80%	35%
2020	42%	100%	73%	16%
2019	40%	43%	38%	28%
2018	50%	73%	50%	44%

Use of Moisture Sensors



Field Testing and Optimization of Biocontrol Products Targeting Palmer amaranth (Pigweed)

- **Investigators**
  - **Dr. Burt Bluhm, UADA-Fayetteville (PI)**
  - **Dr. Kelly Cartwright, ARI, Inc. (Collaborator)**
- **Status:**
  - **Recompete – Current Proposal requesting a new funding cycle**
- **Budget Request: $45,000**
- **Objectives:**
  1. **Determine the optimal parameters to maximize pigweed lethality from bioherbicide applications**
  2. **Evaluate the stability, persistence, and overwintering of bioherbicides**
  3. **Assess methods to apply phytotoxins produced by biocontrol organisms to chemically control pigweed**



Activities in this project will focus on:

Optimizing mycoherbicide efficacy in field conditions
- Application timing, schedule
- Formulation
- 'Tank mixes' with other biologicals/conventional herbicides

Studying key traits of the mycoherbicides (required for commercialization/EPA approval)
- Further define host specificity
- Persistence in a season
- Overwintering
- Optimizing inoculum production

Refining the application of the phytotoxin produced by AF22 and AF24 as an herbicide
- Delivery method(s)
- Application timing, schedule

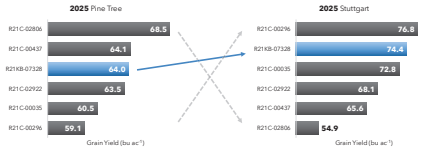
Improving Grain Yield Stability in Arkansas Soybean

- **Investigators: Caio Canella Vieira**
- **Status: New, Year 1 of 3**
- **Budget Request: $50,108**
- **Objectives:**
  - **Evaluate soybean genotypes for grain yield and stability across representative Arkansas production environments**
  - **Quantify within-season phenotypic stability and plasticity using UAV-based phenotyping across vegetative and reproductive growth stages**
  - **Identify traits and genomic regions associated with grain yield stability**

Rationale

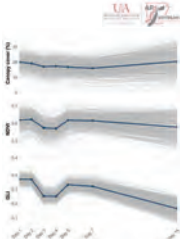
G×E is the differential performance of individuals across environments

- It prevents **any variety** from having the best performance in all locations



2026-28 Gameplan

- >300 soybean genetics evaluated across **four representative** Arkansas locations
- UAV data throughout the season to **assess stability** based on high-resolution imaging
- Grain yield and agronomic traits at maturity
- Integration of phenomics and genomics to identify traits and genomic regions associated with season stability
- **Support the development of high-yielding and stable soybean genetics adapted to Arkansas**



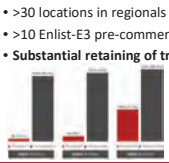
Development of High-yielding Soybean Cultivars with Broad Resilience to Stressors

- **Investigators: Caio Canella Vieira**
- **Status: Recompete**
- **Budget Request: $199,526**
- **Objectives:**
  - **Targeted hybridization based on genetic characterization of parental lines**
  - **Utilize off-season nursery for population advancement**
  - **Integrated phenotypic and genomic evaluation for yield, stress tolerance, and adaptation using extensive multi-location testing across Arkansas environments**
  - **Supply Arkansans growers with soybean cultivars tailored to their specific needs**

2025-2026 Outlook

Largest year in testing genotypes, population development, and sites

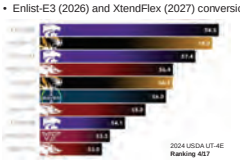
- >200 bi-parental populations developed
- >30 locations in regionals
- >10 Enlist-E3 pre-commercial
- **Substantial retaining of traits**





R19C-1035

- Conventional, **flood-tolerant cultivar**
- Enlist-E3 (2026) and XtendFlex (2027) conversion



2024 USDA UT-4E Ranking 4/17

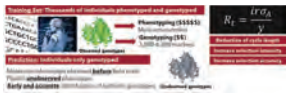
Stage	# Env	R19C-1035	Checks	XtendFlex	Enlist-E3	Win Rate (%)
PYT	3	66.0	0.4 (100.2%)	-1.2 (97.8%)	6.9 (111.3%)	33.3
AYT	5	69.8	-3.4 (95.8%)	-7.0 (92.5%)	0.2 (100.6%)	20.0
PCM	22	68.1	2.1 (103.5%)	0.5 (102.5%)	2.7 (104.3%)	72.7
UP	8	58.8	3.5 (106.1%)	1.5 (104.5%)	4.5 (107.3%)	50.0
UT	9	56.4	2.4 (105.0%)	2.3 (107.0%)	2.5 (104.3%)	55.6
OVT	23	60.5	-3.2 (96.8%)	-5.8 (93.1%)	-0.9 (100.6%)	30.4
OVT-ET	5	75.8	2.1 (103.5%)	1.2 (102.3%)	3.7 (105.8%)	60.0
Overall	**75**	**64.1**	**0.2** (101.2%)	**-1.6** (97.6%)	**1.8** (103.6%)	**48.9%**

Genomic Prediction and Biological Insight to Enhance the Efficiency of Soybean Breeding

- **Investigators: Caio Canella Vieira**
- **Status: Recompete**
- **Budget Request: $104,180**
- **Objectives:**
  - **Expanding genomic data on breeding lines entering yield trials**
  - **Refine and validate genomic prediction models for key economically important traits**
  - **Integrate bioinformatics and functional genomics to support selection decisions**

2023-25 Achievements

- **Over 4,500 breeding lines genotyped and phenotyped for multiple traits, including grain yield, stress resilience, and seed composition**
  - 3,000-6,000 SNPs across the soybean genome
- Genomic prediction models developed for multiple applications, including population development, breeding decisions, and trait-specific predictions



2026-28 Gameplan

- **Expand beyond SNPs** – integrate bioinformatics and functional genomics to support breeding decisions
- '**Which lines should we advance?** to '**Why does this line perform better?**'
- Continue development of a robust genomic dataset of Arkansas genetics



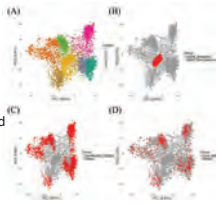
Soybean Germplasm Enhancement Using Genetic Diversity

- **Investigators: Caio Canella Vieira**
- **Status: Recompete**
- **Budget Request: $189,826**
- **Objectives:**
  - **Introduction of novel genetic backgrounds to strengthen the genetic pool of the Arkansas Soybean Breeding program**
  - **Incorporation of unique economically important traits using targeted breeding and selection schemes**
  - **Discovery Breeding: the foundation of genetic diversity needed in the soybean breeding program**

2025-2026 Outlook

Foundation of genetic diversity in Arkansas

- >110 crossing involving 13 diverse parents
- Genomic-based crossing to maximize V_g
- >1,600 progeny rows selected for testing in 2026
- >500 untapped diverse accessions identified
- Field testing in 2026, followed by hybridization in 2027



>1,800,000 populations simulated using genomics

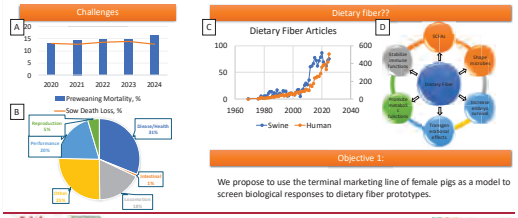
- Estimation of combining ability and genetic variance
- Incorporation of novel genetics and recycling of elite breeding lines



Evaluating the impact of high-fiber grains coproducts on slowing the growth of gilts during development period on body iron status, microbiome, and reproductive efficiency

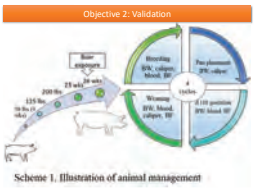
- **Investigators: Brittni Littlejohn, Tsungcheng Tsai, Samatha Howe**
- **Status: Year 1 of 3**
- **Budget Request: A total of $35,000/year**
- **Objectives:**
  1. **Define the ideal mixture of dietary fibers using the marketing of female pigs.**
  2. **Validating the predefined dietary fiber mixture in reproducing gilts, and promoting the usage of crop coproducts in swine diets.**

Objective 1:Define the effect of combining defatted rice bran, corn germ meal, and soybean hulls on body iron status and blood metabolic parameters in female pigs.



We propose to use the terminal marketing line of female pigs as a model to screen biological responses to dietary fiber prototypes.

Objective 2:The ideal prototype from objective 1 will be used to assess its impact on female pigs during development and to monitor its effects on metabolic function, iron status, and reproductive performance.



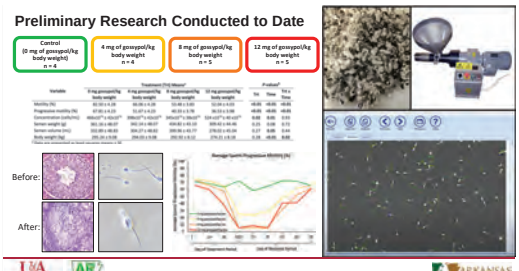
Scheme 1. Illustration of animal management

- ❑ **Define an ideal mixture of high fiber coproducts:**
  1. **Improve the health of sows**
  2. **Increase value and promote the usage of crop coproducts in swine diets**
- ❑ Training the future Animal Scientists.
- ❑ Results will be presented and shared at national conferences.

Use of gossypol to inhibit reproduction as a model for feral swine control

- **Investigators: B. P. Littlejohn, T. C. Tsai, D. White, Jr.**
- **Status: Recompete; Year 1 of 3**
- **Budget Request: A total of $90,000/year across contributing boards**
- **Objectives:**
  1. Using domestic and/or feral swine to conduct a series of experiments to evaluate the use of feed containing gossypol to inhibit reproductive function
  2. Obtain input from 1) state and federal agencies and 2) collaborators in wildlife biology/population management to prepare for ongoing and future research phases

Preliminary Research Conducted to Date



Proposed Research

Pending implementation of necessary improvements identified in ongoing phases, we plan to pursue 3 potential lines of research in the proposed 3-year study:

Experiment 1:
- Objective: to evaluate the effectiveness of *intermittent* feeding of the developed bait over a 42-day period in domestic boars to mimic expected feeding behavior of feral hogs in a field setting.

Experiment 2:
- Objective: to determine the effectiveness of the developed bait to inhibit cyclicity of domestic gilts. Pending outcomes of the primary objective, a secondary objective will evaluate impacts on pregnancy rates.

Experiment 3:
- Objective: to determine the effectiveness of the developed bait to reduce pregnancy rates and litter size in feral hogs in a field setting.

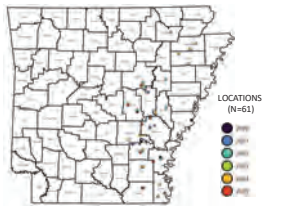


Determining the value of fungicide application using on-farm trials

- **Investigators:**
  Dr. Terry Spurlock, Extension Plant Pathologist
  Dr. Jason Davis, Spray Application Technology Specialist
- **Status: Recompete**
- **Budget Request: $62,000**
- **Objectives:**
  To cooperate with farmers, consultants, and county agents to determine when and where a **fungicide application or fungicide + product(s) marketed to improve plant health** protects a soybean crop and adds value to the crop above the input cost.

Determining the value of fungicide application using on-farm trials

Specific Objectives:
- Work with farmers or consultants on their farms to determine the value of fungicide applications. (Spurlock).
- Test products that the farmer and consultants would like to see. They guide the test. (Spurlock).
- Develop spray threshold for Septoria brown spot, a disease that has become much more economically important in the last five years. (1/2 MS student & Spurlock).
- Utilize American-made drones to apply products and determine the best application parameters using traditional ground applications as the standard (Davis).



Determining the value of fungicide application using on-farm trials



Septoria has caused significant yield losses in on-farm trials since 2020. Developing fungicide efficacy data and a spray threshold is necessary.

Lincoln County trial data below:
+ 4 bu/A triazole + SDHI
Triazole only = nontreated (due to Septoria)

TREATMENT	YLD	FLS_INC	SEP_INC
DOMARK 5 OZ	64.6 b	1.1 b	2.1 b
MIRAVIS TOP 13.7 OZ	68.6 a	0.8 c	1.2 c
NONTREATED	63.9 b	4.4 a	2.8 a
MEAN	65.7	2.1	2.0
PR(>F)	0.0484	0.0207	0.0075
LSD	2.6	1.63	0.47
CORR TO YIELD	1.00	-0.15	-0.72

Understanding Taproot decline, Septoria brown spot, and orange leaf spot; soybean diseases of increasing importance in Arkansas

- **Investigator:**
  Dr. Terry Spurlock, Extension Plant Pathologist
- **Status: Recompete**
- **Budget Request: $40,154**



- **Objectives:**
  To determine management strategies for taproot decline and Septoria brown spot and determine the causal agent for orange leaf spot, a disease generating questions by consultants and industry representatives.

Understanding Taproot decline, Septoria brown spot, and orange leaf spot; soybean diseases of increasing importance in Arkansas

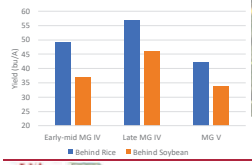
Specific Objectives:
- Monitor the regional distribution of taproot decline and determine the disease's impact on yield.
- Determine management strategies for taproot decline (variety, seed treatment, and in-furrow fungicides).
- Develop an integrated management plan for Septoria brown spot and report on varietal susceptibility, varietal resistance, and fungicide efficacy. **(1/2 MS student)**
- Determine the causal agent of orange leaf spot and its impact on yield.



Significant disease (stand loss and chlorosis) caused by taproot decline.

Trials at Jerome, AR

- No resistant varieties – some better than others
- Disease varied by variety
  - Foliar symptom expression – different by variety
  - Stand loss – significant at 40+ days after emergence
  - Delayed emergence
- Crop rotation is helpful – yield increase behind row rice





Foliar symptoms expression of taproot decline in the early-mid MG IV trial A) DG43XF9S, B) Stine 45FF92, C) NK46-D2E5, D) NK43-W1XF5, E) AG43XF5.

Images: Alyssa Foley, Jerome, AR, 2025

Investigating Emerging Production Recommendations for Sustainable Soybean Production

- **Investigators – Jeremy Ross and Ben Thrash**
- **Status:**
  - Recompete – Current Proposal requesting a new funding cycle
- **Budget Request: $232,136**
- **Objectives:**
  1. Continue to initiate test demonstrations for controlling economically damaging insect pest.
  2. Investigate deer deterrent options and commercially available products.
  3. Examine the potential of using new and innovative production factors, and how they influence soybean yields and profitability.
  4. Conduct the Soybean OVT at the Jackson County Extension Center.

Planned Milestones

- Planned Research
  - Small plot/on-farm commercially available products evaluation
  - OVT location at Jackson County Extension Center
  - Supplemental product application to enhance yield
  - Insect Control Studies
  - Others…….
- Field Days/County Agent Trainings
- Articles, Factsheets, and Meetings





Improving Technology Transfer for Profitable and Sustainable Soybean Production

- **Investigators – Jeremy Ross**
- **Status:**
  - Recompete – Current Proposal requesting a new funding cycle
- **Budget Request: $75,527**
- **Objectives:**
  1. To ensure timely development and distribution of the Soybean Update publications.
  2, To improve the rate of technology transfer and adaption by the implementation of educational programs that impart critical decision-making information at advisory and producer level for improved profitability for sustainable soybean production systems (non-irrigated and irrigated).
  3. Continue to coordinate state and regional meetings to facilitate the latest soybean production updates. These will include the Arkansas Soybean Research Summit, Tri-State Soybean Forum, as well as other events deemed necessary.
  4. To increase the awareness of county extension agents, consultants, agribusiness representatives, concerned producers of the status, direction, and value of current soybean research and Extension efforts.
  5. Publication of the Soybean Research Series.

Planned Milestones

- 2025 Soybean Research Series
  - Articles due March 1, 2026
- Documents
  - 2026 Soybean Update
  - 2026 Metribuzin Ratings
  - 2027 Soybean Cross Reference Guide
  - 2026 Flooding Results
- 2027 Tri-State Soybean Forum
  - Delhi, LA January 8, 2027



Science for Success – Arkansas Support for National Soybean Research and Extension Program

- **Investigators – Jeremy Ross**
- **Status:**
  - Recompete – Current Proposal requesting a new funding cycle
- **Budget Request: $137,615**
- **Objectives:**
  1. Develop and distribute research-based information to soybean farmers in Arkansas and across the U.S. on emerging best management practices.
  2. Expanding previously successful efforts with the continued development of soybean best management practices through both effective summarization of existing data and the generation of new data.
  3. Develop educational materials.

Planned Research/Results



- N-credit Study
- Potassium Management Study
- Others……
- Extension Educational Materials
  - Spring Webinars
  - Topic videos
  - Peer-reviewed journal articles
  - Extension Factsheets
  - NEW Website (https://soybeanscienceforsuccess.org/)

Soybean Research Verification Program

- **Investigators – Jeremy Ross and Brian Deaton**
- **Status:**
  - Recompete – Current Proposal requesting a new funding cycle
- **Budget Request: $210,672**
- **Objectives:**

1. To conduct field trials to verify that high yields can be profitably produced by coordinating the implementation of all research-based recommendations.
2. To aid researches in identifying areas of soybean production and marketing that need further study.
3. To improve recommendations which contribute to profitable soybean production .
4. To utilize the SRVP concept to maintain and improve producers', County Extension Agents' and other crop advisors' soybean production expertise.

2026 SRVP



- Approximately 20 fields
- Weekly field visits
- Evaluate field progress/make production recommendations
- Collect economic data and develop budget summaries
- Publish reports and present at meetings

Integrated Management of Soybean Nematodes in Arkansas



Investigator(s): Travis Faske, Joanna Kud, and Daniel Riveria

Year: 1 of 3

Amount Requested: $76,621

Objectives:

1. Determine field efficacy of nematicides (Faske)
2. Evaluate varieties for resistance to the southern RKN (Faske/Kud)
3. Characterize the mechanism and durability of resistance (Kud/Faske)
4. Promote sampling by SPB-sponsored nematode assays (Riveria)
5. Extend and educate clientele… blog articles, production meetings. (All)

Integrated Management of Nematodes in Arkansas



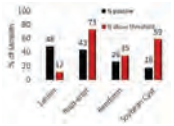
1. **Nematicides:**
   - Very few programs evaluate (unbiased information) nematicide efficacy. Does it pay?
   - New nematicides are marketed every few years (2026 – Victrato), and multiple years of data are needed to understand efficacy.
2. **Resistance:**
   - Calling a variety "resistant" is not standardized.
   - Screen varieties market as resistant in the field.
   - Data shared with farmers.



Integrated Management of Nematodes in Arkansas



3. **Characterization of Resistance:**
   - Assess aggressiveness (level of reproduction) of multiple RKN isolates on soybean.
4. **Promote sampling:**
   - Highlight important soybean nematodes in the state
   - Encourage sampling for early management decisions.
5. **Extend** information to farmers: Blog, meetings, reports…



Soybean Weed Management: A Team Approach for Improved Control and Profitability

- **Investigators**
  - Bob Scott
  - Tom Barber
  - Jason Norsworthy
  - Nilda Burgos
- **Status: New year 1 of 3**
- **Budget Request: $263,375**
- **Objectives:**
  - 1) Herbicide resistance screening and control options
  - 2) Continue work on multiple herbicide resistant biotypes of pigweed
  - 3) Glufosinate and Auxin herbicide programs for resistant weeds
  - 4) Evaluate production systems for most effective weed control (row spacing etc.)
  - 5) Evaluate herbicide performance is affected by temp, soil texture, pH, tank-mixtures, weed species, weed size, and other environmental factors.

Objectives Continued

- 6) Long term studies to evaluate impact on weed seed bank, including post harvest options
- 7)Evaluate all new soybean herbicide chemistry as it becomes available to us.
- 8) Fall applied herbicides for ryegrass and other winter weeds. Measure the impact if any these fall treatments have on spring weeds like pigweed.
- 9)Include evaluation of herbicide costs
- 10) Provide rapid turn around of data from over 100 trials- MP-44, county meetings, blog posts, podcasts (WeedsARwild), professional meetings, etc.

Soybean Enterprise Budgets and Production Economic Analysis

- **Breana Watkins, Instructor**
- **Status: Recompete**
- **Budget Request: $10,000**
- **Objectives:**

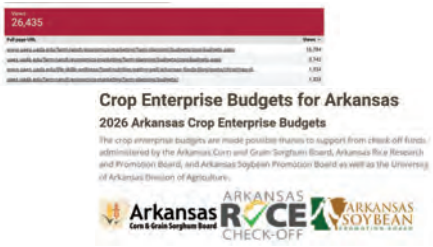
Provide soybean enterprise budgets representative of production practices and inputs commonly used in Arkansas production.

The crop budgets are designed to allow for costs and returns analysis providing a method for investigating managerial decisions impacting the profitability of crop production.

Table 1. Summary of Revenue and Expenses per Acre, Enlist E3 Soybean

Receipts	Furrow 2026	No Irr 2026	Flood 2026	March 2026	Furrow 2025
Yield (bu)	60	30	60	60	60
Price ($/bu)	10.25	10.25	10.25	12.00	9.50
Grower Share, %	100%	100%	100%	100%	100%
Crop Revenue	**615.00**	**307.50**	**615.00**	**720.00**	**570.00**
Operating Expenses					
Input Costs	376.44	299.37	361.08	376.44	446.85
Other Operating Expenses	77.46	62.74	75.76	77.46	71.44
Total Operating Expenses	453.90	362.11	436.82	453.90	518.30
Post-harvest Expenses	18.08	9.04	18.08	18.08	17.85
Net Operating Expenses	**471.98**	**371.15**	**454.89**	**472.50**	**536.15**
Cash Land Rent	0.00	0.00	0.00	0.00	0.00
Returns to Operating Expenses	**143.02**	**-63.65**	**160.11**	**247.50**	**33.85**
Fixed Costs	142.39	93.97	136.48	142.39	111.67
[1]Total Specified Expenses	**614.37**	**465.12**	**591.35**	**614.89**	**647.82**
Returns to Specified Expenses	**0.63**	**-157.62**	**23.65**	**105.11**	**-77.82**
Operating Expenses/bu	7.87	12.37	7.58	7.88	7.58
Total Expenses[1]/bu	10.24	15.50	9.86	10.25	9.86

[1]Does not include land costs, management, or other expenses and fees not associated with production.



Arkansas Soybean Performance Trials

- **John Carlin**
- **Status: Recompete – New Cycle**
- **Budget Request: $42,491**
- **Objectives:**
  - To evaluate the performance of soybean varieties and breeding lines across eight locations within the State of Arkansas
  - To enable abiotic (chloride and metribuzin) and biotic screening (disease screening) of the varieties by collaborating PIs.
  - To evaluate the tolerance of soybean varieties to water-logging at the vegetative stage.

Six Testing Locations (2026)

• Marianna • Keiser • Harrisburg • Pine Tree • Stuttgart • Rohwer • Kibler •Newport

Early Planted Tests Locations

• Harrisburg • Stuttgart

Flood Tests

• Harrisburg • Pine Tree • Stuttgart

Deliverables

• Targeted posting of preliminary data within 10 days of harvest

• Final data will be emailed directly to participants, posted on the website, and included in a final report

• Data included in Soybean Update and presented at county meetings

Program Improvements

• Watermark® moisture sensors at all locations

• Drone imagery for stand counts and plot quality

• Improved field visit frequency due to two Stuttgart-based positions

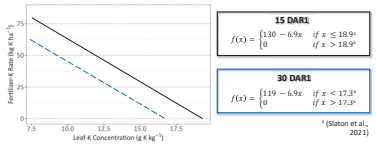
Value to Soybean Industry:

• The variety testing program provides and/or enables other programs to provide a suite of data ranging from yield, disease resistance, herbicide tolerance, and flood tolerance. That allows soybean producers to best select varieties for their fields.

Fertilization of Soybean

- **Investigators:** Trent Roberts and Gerson Drescher
- **Status: Year 1 of 3**
- **Budget Request: $85,391**
- **Objectives:**
  - Continue long-term P and K trials
  - Evaluate new and existing relationships between soil nutrient availability, soybean tissue concentration and soybean yield
  - Evaluate the effects of P fertility on soybean yield, selected yield components, the pattern of leaf-P concentration across time, and seed nutrient concentration among nodes.
  - Calibrate in season leaf tissue-K concentrations to predict K fertilizer needs to maximize or recover yield during the reproductive growth stages. Assess the use of remote sensing to predict where trifoliolate leaf samples should be collected.

Calibrated In-Season K Rates



[a] (Slaton et al., 2021)

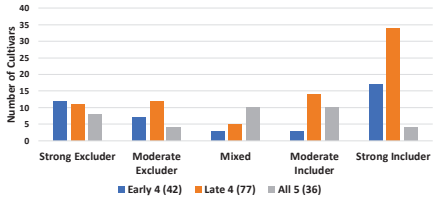
Calibrated K Rates Based on Leaf Tissue-K at R2

Treatment	R2 Tissue (%K)	R2 Rate (lb K2O/ac)	Yield (bu/ac)
Check	1.25	-	41 c
120 lb K_2O/ac preplant	1.91	-	61 a
30 lb K_2O/ac preplant	1.36	-	47 bc
60 lb K_2O/ac preplant	1.42	-	49 b
30 lb K_2O/ac preplant + 60 lb K_2O/ac R2	1.35	60 (Automatic)	57 ab
30 lb K_2O/ac preplant + R2 Prediction	1.39	30 (Pred. Rate)	55 ab
60 lb K_2O/ac preplant + 60 lb K_2O/ac R2	1.44	60 (Automatic)	59 ab
60 lb K_2O/ac preplant + R2 Prediction	1.42	25 (Pred. Rate)	58 ab

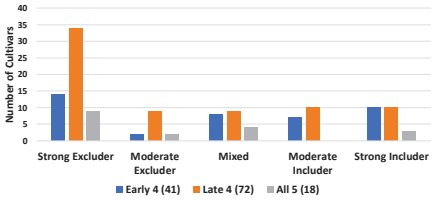
Field-based Determination of Chloride Tolerance in Soybean

- **Investigators:** Trent Roberts, John Carlin, and Jeremy Ross
- **Status: Year 1 of 3**
- **Budget Request: $52,179**
- **Objectives:**
  - Implement a field-based leaf sampling protocol for rating soybean varieties as an includer or excluder.
  - Provide categorical and numerical response ratings for each cultivar
  - Rate degree of mixed reaction soybean cultivars to provide more detailed information

2024 OVT Chloride Rating Results



2025 OVT Chloride Rating Results



Influence of Cover Crops and Soil Health on Soybean

- **Investigators:** Trent Roberts, Gerson Drescher, and Jeremy Ross
- **Status: Year 1 of 3**
- **Budget Request: $65,325**
- **Objectives:**
  - Evaluate the effects of soil sample collection timing on soil health results and their interpretation.
  - Identify how winter cover crop species influences corn and soybean yield performance and soil physical characteristics related to water holding capacity and irrigation.
  - Monitor soil physical and chemical parameters related to soil health and productivity as influenced by a corn and soybean rotation with varying winter cover crop species.

Major Changes in Agronomic Inputs

• Herbicide Application Reduction
  • Able to remove 1-2 post emergence herbicide applications depending on cover crop growth

• Wet Aggregate Stability- greater macroaggregate stability
  • Increased water holding capacity and infiltration rates
  • Potential for greater irrigation water use efficiency

• Irrigation Set Reductions
  • Average number of annual irrigations is 4 sets less than adjacent, conventional soybean

Impacts on Soybean Performance

• ΔYield increase from no-till and cover crops across 4 locations is 5.2 bu/ac or +$55/ac

• Estimated input cost savings $91/ac (herbicide, fertilizer, tillage, irrigation)

• Cover crop cost $30/ac

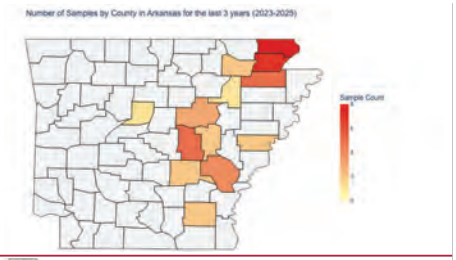
• Net return $116/ac

Monitoring the Extent of Potassium Deficiency and Chloride Toxicity in Arkansas Soybean Fields

- **Investigators:** Trent Roberts and Jeremy Ross
- **Status: Renew Year 1 of 1**
- **Budget Request: $33,760**
- **Objectives:**
  - Identify the magnitude and extent of potassium deficiency, including hidden hunger, across a wide range of Arkansas soybean production systems and estimate the associated yield loss.
  - Identify the magnitude and extent of chloride toxicity across a wide range of Arkansas soybean production systems and estimate the associated yield loss.

2023-2025 K and Cl Monitoring Program

- County Agents sampled ~48 soybean production fields at R2 and R4
- At R2 21/44 locations were deficient in K
  - Anticipated yield loss of 10-23%
- At R4 25/48 locations were deficient in K
  - Anticipated yield loss of 12-22%



ATTACHMENT 26

2026-2027 Soybean Funding Proposals

Row Labels	Sum of Amount of Funding Needed for Project:	Sum of 2026-2027 Appproved Board Amount:	2025-2026 Funding Variance
Promotion	**$ 754,378.00**	**$ 669,378.00**	$498,257.06 $171,120.94
Ag Learning Center at Four States Fair & Rodeo	$ 20,000.00	$ 10,000.00	
American Soybean Association	$ 42,450.00	$ 42,450.00	
Arkansas 4-H Foundation and Arkansas FFA Foundation	$ 15,000.00	$ 15,000.00	
Arkansas FFA Foundation	$ 100,000.00	$ 25,000.00	
Arkansas Soybean Association	$ 206,900.00	$ 206,900.00	
Arkansas State University Newport- Agriculture Technology Department	$ 11,000.00	$ 11,000.00	
Botanical Garden of the Ozarks	$ 6,500.00	$ 6,500.00	
Clean Fuels Alliance America (Clean Fuels)	$ 40,000.00	$ 40,000.00	
Cross County Farm Bureau Women's Leadership Committee	$ 10,000.00	$ 10,000.00	
Soy Aquaculture Alliance	$ 25,000.00	$ 25,000.00	
Three County Fair	$ 13,840.00	$ 13,840.00	
U.S. Meat Export Federation	$ 8,600.00	$ 8,600.00	
U.S. Soybean Export Council	$ 95,000.00	$ 95,000.00	
UADA	$ 110,088.00	$ 110,088.00	
WISHH program of ASA	$ 50,000.00	$ 50,000.00	
Research	**$ 4,509,750.35**	**$ 3,717,654.75**	$3,351,275.50 $366,379.25
Chicot Insights, LLC	$ 210,352.60	$ 111,040.00	
Iowa Soybean Association	$ 15,000.00	$ 15,000.00	
Mid-South Soybean Board	$ 155,916.75	$ 155,916.75	
NASA Acres / University of Maryland	$ 97,547.00	$ 97,547.00	
Soy Aquaculture Alliance	$ 75,000.00		
UADA	$ 3,955,934.00	$ 3,338,151.00	
Grand Total	**$ 5,264,128.35**	**$ 4,387,032.75**	$3,849,532.56 $537,500.19

TRACKING ID#	Organization/Institution Submitting Proposal:	Project Title:	Project Type:	Name of Project Manager:	Amount of Funding Needed for Project:	2026-2027 Apppproved Board Amount:	DEPARTMENT DESIGNATED STATUS:	PROJECT ID#	Text
35	UADA	Soybean Science Challenge	Promotion	Julie Robinson	$87,018.00	$87,018.00	ACTIVE; YEAR 3 OF 3	PA-01	
34	UADA	Arkansas Future Agriculture Leaders Tours	Promotion	Julie Robinson	$5,000.00	$5,000.00	ACTIVE; YEAR 2 OF 3	PA-02	
74	UADA	Assessment of soybean arthropod community dynamics across Arkansas for IPM	Research	Rupesh Kariyat	$49,036.00		INITIAL; YEAR 1 OF 3	RI-27	ENTOMOLOGY
42	UADA	Field Variability, Harvest Moisture, and Advanced Storage Monitoring to Improve Arkansas Soybean Quality	Research	Kaushik Luthra	$64,083.00		INITIAL; YEAR 1 OF 3	RI-30	POST-HARVEST
43	UADA	Integrated Strategies for Safe, Efficient, and Profitable Rewetting of Over-Dried Soybeans Using Advanced Bin Aeration Systems	Research	Kaushik Luthra	$73,796.00		INITIAL; YEAR 1 OF 3	RI-31	POST-HARVEST
45	UADA	Transforming Arkansas soybean hulls into high-value probiotic silage: improved digestibility and reduced post-weaning diarrhea in piglets.	Research	Amir Mani	$30,000.00		INITIAL; YEAR 1 OF 1	RI-33	POST-HARVEST / ALTERNATIVE USES / ECONOMICS
73	UADA	Development of Highly Digestible Protein Cultivars with Reduced Antinutritional Factors	Research	Mahfuzur Rahman	$79,880.00		INITIAL; YEAR 1 OF 3	RI-35	POST-HARVEST / BREEDING
69	UADA	Evaluating the influence of high-fiber grain coproducts on slowing the growth of gilts during the development period: impacts on iron status, microbiome, and reproductive efficiency	Research	Brittni Littlejohn	$35,000.00		INITIAL; YEAR 1 OF 3	RI-43	ECONOMICS *BOARD SPLIT
62	UADA	Improving Grain Yield Stability in Arkansas Soybean	Research	Caio Vieira	$50,108.00	$50,108.00	INITIAL; YEAR 1 OF 3	RI-39	BREEDING
70	UADA	Use of gossypol to inhibit reproduction as a model for feral swine control	Research	Brittni Littlejohn	$60,000.00	$60,000.00	RECOMPETE; YEAR 1 OF 3	RR-01	ECONOMICS *BOARD SPLIT
61-3	Mid-South Soybean Board	Expanding potential market demand for and Access to Whole Soy Foods through Nutrition Education	Research	Dawn Howe	$7,500.00	$7,500.00	ACTIVE; YEAR 2 OF 3	RA-01	
61-10	Mid-South Soybean Board	Leveraging Photosynthetic Efficiency traits for improving soybean productivity in the Mid-South	Research	Dawn Howe	$7,500.00	$7,500.00	ACTIVE; YEAR 2 OF 3	RA-02	
61-15	Mid-South Soybean Board	Enhanced synthetic microbiome communities to manage sudden death	Research	Dawn Howe	$6,277.25	$6,277.25	ACTIVE; YEAR 2 OF 2	RA-03	
61-16	Mid-South Soybean Board	Breeding maturity group 4 soybean with enhanced resistance to suthern root-knot nematode by reducing galling and nematode reproduction	Research	Dawn Howe	$26,667.00	$26,667.00	ACTIVE; YEAR 2 OF 3	RA-04	
49	UADA	Evaluating Planting Date Decisions in the Soybean/Rice Rotation	Research	Justin Chlapecka	$26,956.00	$26,956.00	ACTIVE; YEAR 2 OF 3	RA-05	AGRONOMY / ECONOMICS
50	UADA	Investigating the effect of growth regulators on soybean plant architecture and yield	Research	Justin Chlapecka	$31,674.00	$31,674.00	ACTIVE; YEAR 2 OF 3	RA-06	AGRONOMY
75	UADA	Screening Arkansas Soybean Cultivars for Protein Quality as a Novel Food Preservative	Research	Mahfuzur Rahman	$55,677.00	$55,677.00	ACTIVE; YEAR 3 OF 3	RA-07	POST-HARVEST / BREEDING
48	UADA	Development, Evaluation and Production of Agricultural Biologicals for Arkansas Crop Production	Research	Burt Bluhm	$24,020.00	$24,020.00	ACTIVE; YEAR 2 OF 3	RA-08	PHYSIOLOGY / ENVIRONMENT / PATHOLOGY
65	UADA	Utilization of Winter Nursery for Soybean Line Development through Backcrossing	Research	Caio Vieira	$51,000.00	$51,000.00	ACTIVE; YEAR 2 OF 3	RA-09	BREEDING
64	UADA	Overcoming Soybean Yield Plateau by Leveraging Physiology-Efficient and Yield-Formation Traits	Research	Caio Vieira	$83,790.00	$83,790.00	ACTIVE; YEAR 3 OF 3	RA-10	BREEDING / PHYSIOLOGY
63	UADA	Fast-tracking MG4 cultivars with southern root-knot nematode resistance	Research	Caio Vieira	$50,504.00	$50,504.00	ACTIVE; YEAR 3 OF 3	RA-11	BREEDING / PLANT PATHOLOGY
16	UADA	The Arkansas Discovery Farm	Research	Mike Daniels	$28,561.00	$28,561.00	ACTIVE; YEAR 2 OF 3	RA-12	MISC PROJECT
21	UADA	Economics of Automatic Applications in Arkansas Soybean	Research	Ben Thrash	$43,610.00	$43,610.00	ACTIVE; YEAR 2 OF 3	RA-13	ENTOMOLOGY

22	UADA	Educating Growers and Consultants on Insect Monitoring and Control	Research	Ben Thrash	$3,000.00	$3,000.00	ACTIVE; YEAR 2 OF 3	RA-14	**ENTOMOLOGY**
94	American Soybean Association	2027 Arkansas Biomass-Based Diesel Initiative (BBDI) Funding Proposal	Promotion	Kate Maher	$5,000.00	$5,000.00	INITIAL; YEAR 1 OF 1	PI-01	
93	American Soybean Association	2027 ASA Action Partnership (ASAAP) Membership Proposal	Promotion	Kate Maher	$6,000.00	$6,000.00	INITIAL; YEAR 1 OF 1	PI-02	
90	American Soybean Association	2027 ASA Awards Celebration Sponsorship Proposal	Promotion	Kate Maher	$6,000.00	$6,000.00	RECOMPETE; YEAR 1 OF 1	PR-01	
89	American Soybean Association	2027 Innovation to Market (I2M) Work Group Membership Proposal	Promotion	Kate Maher	$7,500.00	$7,500.00	RECOMPETE; YEAR 1 OF 1	PR-02	
88	American Soybean Association	2027 Soybean Leadership Academy Proposal	Promotion	Kate Maher	$3,000.00	$3,000.00	RECOMPETE; YEAR 1 OF 1	PR-03	
87	American Soybean Association	2027 Young Leaders Program Proposal	Promotion	Kate Maher	$9,200.00	$9,200.00	RECOMPETE; YEAR 1 OF 1	PR-04	
86	American Soybean Association	2027 SoyStats Funding Proposal	Promotion	Kate Maher	$750.00	$750.00	RECOMPETE; YEAR 1 OF 1	PR-05	
85	American Soybean Association	2027 ASA Economic Analysis and Support Proposal - Arkansas	Promotion	Kate Maher	$5,000.00	$5,000.00	RECOMPETE; YEAR 1 OF 1	PR-06	
84	U.S. Soybean Export Council	2026 Soy Connext Sponsorship	Promotion	Lyndsey Erb	$5,000.00	$5,000.00	INITIAL; YEAR 1 OF 1	PI-03	
82	U.S. Soybean Export Council	Japan Soy Foods Support	Promotion	Lyndsey Erb	$15,000.00	$15,000.00	INITIAL; YEAR 1 OF 1	PI-04	
81	U.S. Soybean Export Council	Support of Soy Excellence Centers	Promotion	Lyndsey Erb	$15,000.00	$15,000.00	INITIAL; YEAR 1 OF 1	PI-05	
79	U.S. Soybean Export Council	Utilization of U.S. Soy in the Americas	Promotion	Lyndsey Erb	$25,000.00	$25,000.00	INITIAL; YEAR 1 OF 1	PI-06	
83	U.S. Soybean Export Council	2026 USSEC Membership	Promotion	Lyndsey Erb	$10,000.00	$10,000.00	RECOMPETE; YEAR 1 OF 1	PR-07	
80	U.S. Soybean Export Council	U.S. Soy Promotion in Europe	Promotion	Lyndsey Erb	$25,000.00	$25,000.00	RECOMPETE; YEAR 1 OF 1	PR-08	
78	Clean Fuels Alliance America (Clean Fuels)	State Market and Environmental Support	Promotion	Brad Shimmens	$20,000.00	$20,000.00	INITIAL; YEAR 1 OF 1	PI-07	
77	Clean Fuels Alliance America (Clean Fuels)	Market Expansion Drive	Promotion	Brad Shimmens	$20,000.00	$20,000.00	RECOMPETE; YEAR 1 OF 1	PR-09	
76	WISHH program of ASA	WISHH Markets: Building Demand for U.S. Soy Trade Together	Promotion	Gena Perry	$50,000.00	$50,000.00	RECOMPETE; YEAR 1 OF 1	PR-10	
10	U.S. Meat Export Federation	USMEF Membership: A U.S. Pork Promotion Partnership	Promotion	John Hinners	$8,600.00	$8,600.00	INITIAL; YEAR 1 OF 1	PI-08	
60	Arkansas Soybean Association	Recognizing Soybean Production Excellence by the continuance of the "Grow for the Green & Race for 100" Soybean Yield Challenge Contests	Promotion	Dawn Howe	$206,900.00	$206,900.00	RECOMPETE; YEAR 16 OF 1	PR-11	
72	Arkansas State University Newport-Agriculture Technology Department	Soy to Soil- Community Agriculture Day at ASUN	Promotion	Lindley Gilliaum	$11,000.00	$11,000.00	INITIAL; YEAR 1 OF 1	PI-09	
36	UADA	Poinsett County Ag Day	Promotion	Christie Wagley	$8,070.00	$8,070.00	RECOMPETE; YEAR 1 OF 1	PR-12	
33	UADA	The Arkansas Irrigation Yield Contest	Promotion	Chris Henry	$10,000.00	$10,000.00	RECOMPETE; YEAR 9 OF 1	PR-13	
11	Arkansas FFA Foundation	Investment the Future of Arkansas Agriculture – Agricultural Education, Career Success, and FFA	Promotion	Taylor Wiseman	$100,000.00	$25,000.00	INITIAL; YEAR 1 OF 1	PI-10	
9	Arkansas 4-H Foundation and Arkansas FFA Foundation	Joint Funding Proposal for Promotion of Education on Corn, Sorghum, and Soybeans for Arkansas 4-H and FFA Youth	Promotion	Taylor Wiseman (FFA)	$15,000.00	$15,000.00	RECOMPETE; YEAR 1 OF 1	PR-14	
92	Three County Fair	All Things Soybeans	Promotion	Cathy Helton	$13,840.00	$13,840.00	INITIAL; YEAR 1 OF 1	PI-11	
8	Cross County Farm Bureau Women's Leadership Committee	Cross County Youth Ag Day	Promotion	Stacy Witcher	$10,000.00	$10,000.00	INITIAL; YEAR 1 OF 1	PI-12	
5	Botanical Garden of the Ozarks	Chefs in the Garden	Promotion	Ashley Wardlow	$6,500.00	$6,500.00	INITIAL; YEAR 1 OF 1	PI-13	
2	Ag Learning Center at Four States Fair & Rodeo	Ag Learning Center Educational Program	Promotion	Kristen Larey	$20,000.00	$10,000.00	RECOMPETE; YEAR 1 OF 1	PR-15	
95-1	Soy Aquaculture Alliance	SAA QSSB Membership	Promotion	Katie Hall	$25,000.00	$25,000.00	INITIAL; YEAR 1 OF 1	PI-15	
23	UADA	Refining insect thresholds in Arkansas soybeans	Research	Ben Thrash	$67,456.00	$67,456.00	ACTIVE; YEAR 2 OF 3	RA-15	**ENTOMOLOGY**
20	UADA	Determining factors associated with poor grain quality in soybean and management options	Research	Terry Spurlock	$55,000.00	$55,000.00	ACTIVE; YEAR 2 OF 3	RA-16	**ENTOMOLOGY / PLANT PATHOLOGY / IPM**

19	UADA	Development of data-driven recommendations for variable soybean seeding rate in Arkansas	Research	Jeremy Ross	$47,051.00	$47,051.00	ACTIVE; YEAR 3 OF 3	RA-17	**AGRONOMY**
52	UADA	Screening for soybean tolerance to metribuzin	Research	Jason Norsworthy	$16,212.00	$16,212.00	ACTIVE; YEAR 2 OF 3	RA-18	**WEED SCIENCE**
51	UADA	Phenotypic Selection Assisted by Seed-Level Near-Infrared Information	Research	Samuel Fernandes	$52,670.00	$52,670.00	ACTIVE; YEAR 3 OF 3	RA-19	**BREEDING**
71	UADA	Development of a turn-row soybean vegetative health analysis software tool using UAS imagery for production decision support	Research	Jason Davis	$19,605.00	$19,605.00	ACTIVE; YEAR 3 OF 3	RA-20	**AGRONOMY / ALTERNATIVE**
17	UADA	Comprehensive disease screening soybean varieties in Arkansas	Research	Travis Faske	$132,094.00	$132,094.00	ACTIVE; YEAR 3 OF 3	RA-21	**PLANT PATHOLOGY**
18	UADA	Monitor and management of fungicide-resistant soybean disease in Arkansas	Research	Travis Faske	$59,338.00	$59,338.00	ACTIVE; YEAR 2 OF 3	RA-22	**PLANT PATHOLOGY**
95-2	Soy Aquaculture Alliance	SAA Aquaculture Feed Reseach Contribution	Research	Katie Hall	$75,000.00		INITIAL; YEAR 1 OF 1	RI-01	
96	Iowa Soybean Association	Farmers Fueling the Future	Research	Matt Herman	$15,000.00	$15,000.00	INITIAL; YEAR 1 OF 1	RI-02	
91	NASA Acres / University of Maryland	Collaborative AgMet Graphics for Within-Season Crop Condition & Progress Tracking	Research	Alyssa Whitcraft	$97,547.00	$97,547.00	INITIAL; YEAR 1 OF 1	RI-03	
7	Chicot Insights, LLC	Utilization of Precision Agricultural Technology Along with Machine Learning to Optimize Fertility Applications While Improving Soybean Productivity and Profitability at the Field Scale.	Research	Zach Reynolds	$38,320.60	$0.00	INITIAL; YEAR 1 OF 3	RI-04	
6	Chicot Insights, LLC	Developing Overhead Irrigation Recommendations for Arkansas Soybean Production	Research	L. Jason Krutz	$41,020.00	$41,020.00	INITIAL; YEAR 1 OF 3	RI-05	
4	Chicot Insights, LLC	Automated Irrigation Technologies that Improve Soybean Productivity, Profitability, and Aquifer Stability	Research	Zach Reynolds	$60,992.00	$0.00	INITIAL; YEAR 1 OF 3	RI-06	
3	Chicot Insights, LLC	Structural Irrigation Strategies that Improve Soybean Productivity, Profitability, and Aquifer Stability	Research	Jason Krutz	$70,020.00	$70,020.00	INITIAL; YEAR 1 OF 3	RI-07	
61-1	Mid-South Soybean Board	Beating the Rot: Improving Soybean Resistance to Phytophthora Root and Stem Root in the Mid-south	Research	Dawn Howe	$3,750.00	$3,750.00	INITIAL; YEAR 1 OF 3	RI-08	
61-2	Mid-South Soybean Board	Novel Genetic Resources to Improve Soybean Seed Quality	Research	Dawn Howe	$8,454.00	$8,454.00	INITIAL; YEAR 1 OF 3	RI-09	
61-4	Mid-South Soybean Board	Spray application of double stranded RNA for simultaneous management of multiple soybean fungal and insect disease	Research	Dawn Howe	$11,956.00	$11,956.00	INITIAL; YEAR 1 OF 1	RI-10	
61-5	Mid-South Soybean Board	Evaluating early soybean for productivity and herbicide efficacy	Research	Dawn Howe	$3,015.50	$3,015.50	INITIAL; YEAR 1 OF 1	RI-11	
61-6	Mid-South Soybean Board	Unlocking novel genetic pathways involved in syncytia development for durable soybean cyst nematode resistance	Research	Dawn Howe	$13,544.00	$13,544.00	INITIAL; YEAR 1 OF 3	RI-12	
61-7	Mid-South Soybean Board	Modernizing Phosphorus and Potassium Recommendations and Improving Return on Investment for Climate-Smart Corn - Cover Crop - Soybean Cropping System	Research	Dawn Howe	$10,000.00	$10,000.00	INITIAL; YEAR 1 OF 3	RI-13	
61-8	Mid-South Soybean Board	Porous soy proteins for the delivery of vitamins	Research	Dawn Howe	$5,500.00	$5,500.00	INITIAL; YEAR 1 OF 3	RI-14	
61-9	Mid-South Soybean Board	Characterizing Soybean Genotypes for Phosphorus Efficiency	Research	Dawn Howe	$14,253.00	$14,253.00	INITIAL; YEAR 1 OF 3	RI-15	
61-11	Mid-South Soybean Board	Screening elite soybean lines for drought tolerance and developing high-throughput drought screening methodologies for the Mid-south	Research	Dawn Howe	$16,250.00	$16,250.00	INITIAL; YEAR 1 OF 3	RI-16	
61-12	Mid-South Soybean Board	Initiative of a Soybean Mutation Breeding Pipeline: Creation of Superior Traits Towards Quick Releasing Improved Soybean Varieties	Research	Dawn Howe	$3,750.00	$3,750.00	INITIAL; YEAR 1 OF 3	RI-17	

61-13	Mid-South Soybean Board	Foliar boron application to minimize flowers abortion and improve yield in soybean under drought/ranfed conditions	Research	Dawn Howe	$7,500.00	$7,500.00	INITIAL; YEAR 1 OF 1	RI-18	
61-14	Mid-South Soybean Board	Genetic Approaches for Enhancing Salt Tolerance in Soybean	Research	Dawn Howe	$10,000.00	$10,000.00	INITIAL; YEAR 1 OF 1	RI-19	
13	UADA	Quantifying potential gaseous N losses and soil health implications from non-nodulating soybean	Research	Kris Brye	$38,240.00	$0.00	INITIAL; YEAR 1 OF 1	RI-20	**AGRONOMY / ALTERNATIVE BREEDING**
14	UADA	Temporary flooding effects on soil respiration in tolerant and susceptible soybean varieties in the greenhouse	Research	Kris Brye	$40,000.00	$0.00	INITIAL; YEAR 1 OF 1	RI-21	**AGRONOMY / ALTERNATIVE, WATER MANAGEMENT, AND BREEDING**
39	UADA	Soybean potential yield map and yield gap analysis for Arkansas	Research	Elvis Elli	$54,255.00	$54,255.00	INITIAL; YEAR 1 OF 3	RI-22	**AGRONOMY**
38	UADA	Insect frass for plant growth promotion and enhanced soybean yields	Research	Gerson Drescher	$44,829.00	$0.00	INITIAL; YEAR 1 OF 3	RI-23	**AGRONOMY / ALTERNATIVE, FERTILITY**
46	UADA	Role of the soil microbiome in conferring flooding tolerance in soybean	Research	Mark McDonald	$74,712.00	$0.00	INITIAL; YEAR 1 OF 2	RI-24	**AGRONOMY / ALTERNATIVE**
37	UADA	Establishing a long-term rotational study	Research	Justin Chlapecka	$18,980.00	$18,980.00	INITIAL; YEAR 1 OF 3	RI-25	**ROTATIONAL STUDY ?**
41	UADA	Developing a Screening Pipeline and Candidate Gene Pool for Nematode Resistance in Soybean	Research	Fiona Goggin	$30,767.00	$30,767.00	INITIAL; YEAR 1 OF 3	RI-26	**PLANT PATHOLOGY**
59	UADA	Soybean as a conversion crop within integrated crop-livestock systems	Research	Jonathan Kubesch	$39,339.00	$0.00	INITIAL; YEAR 1 OF 3	RI-28	**ALTERNATIVE**
40	UADA	Valorizing Soy By-products into Mycoprotein via Acid/Alkaline/Enzymatic Treatment and Biomass Fermentation	Research	Sungil Ferreira	$48,868.00	$0.00	INITIAL; YEAR 1 OF 3	RI-29	**POST-HARVEST / APPLICATION**
44	UADA	Effects on carcass characteristics, meat quality, and consumer acceptability of inclusion of raw whole soybeans in growing and finishing diets for farm finished beef	Research	Beth Kegley	$36,250.00	$36,250.00	INITIAL; YEAR 1 OF 2	RI-32	**POST-HARVEST**
47	UADA	Immunomodulatory effects of isoflavones from soybean meal in broilers challenged with coccidiosis	Research	Shawna Weimer	$41,788.00	$41,788.00	INITIAL; YEAR 1 OF 1	RI-34	**POST-HARVEST**
15	UADA	Increasing Adoption of Elevation Data and Irrigation Scheduling on Furrow-Irrigated Soybeans	Research	Mike Hamilton	$28,520.00	$28,520.00	INITIAL; YEAR 1 OF 3	RI-36	**IRRIGATION**
54	UADA	Water Management Advancements for Irrigated Soybeans	Research	Chris Henry	$239,487.00	$239,487.00	INITIAL; YEAR 1 OF 3	RI-37	**IRRIGATION / WATER MANAGEMENT**
12	UADA	Field testing and optimization of biocontrol products targeting Palmer amaranth (pigweed)	Research	Burt Bluhm	$45,000.00	$45,000.00	INITIAL; YEAR 1 OF 3	RI-38	**WEEDS / ECONOMICS**
66	UADA	Development of High-yielding Soybean Cultivars with Broad Resilience to Stressors	Research	Caio Vieira	$199,526.00	$199,526.00	RECOMPETE	RI-40	**BREEDING**
67	UADA	Genomic Prediction and Biological Insight to Enhance the Efficiency of Soybean Breeding	Research	Caio Vieira	$104,180.00	$104,180.00	RECOMPETE	RI-41	**BREEDING**
68	UADA	Soybean Germplasm Enhancement Using Genetic Diversity	Research	Caio Vieira	$189,826.00	$189,826.00	RECOMPETE	RI-42	**BREEDING**
30	UADA	Determining the value of fungicide application using on-farm trials	Research	Terry Spurlock	$62,000.00	$62,000.00	RECOMPETE; YEAR 1 OF 3	RR-02	**PLANT PATHOLOGY / IPM / AG TECHNOLOGY**
31	UADA	Understanding Taproot decline, Septoria brown spot, and orange leaf spot; soybean diseases of increasing importance in Arkansas	Research	Terry Spurlock	$40,154.00	$40,154.00	RECOMPETE; YEAR 1 OF 3	RR-03	**PLANT PATHOLOGY / IPM**
26	UADA	Investigating Emerging Production Recommendations for Sustainable Soybean Production	Research	Jeremy Ross	$232,136.00	$232,136.00	RECOMPETE; YEAR 1 OF 3	RR-04	**AGRONOMY / ENTOMOLOGY**
25	UADA	Improving technology transfer in profitable and sustainable soybean	Research	Jeremy Ross	$75,527.00	$75,527.00	RECOMPETE; YEAR 1 OF 3	RR-05	**AGRONOMY**

27	UADA	Science for Success – Arkansas Support for National Soybean Research and Extension Program	Research	Jeremy Ross	$137,615.00	$137,615.00	RECOMPETE; YEAR 1 OF 3	RR-06	**AGRONOMY**
28	UADA	Soybean Research Verification Program	Research	Jeremy Ross	$210,672.00	$210,672.00	RECOMPETE; YEAR 1 OF 3	RR-07	**VERIFICATION**
24	UADA	Integrated management of soybean nematodes in Arkansas	Research	Travis Faske	$76,621.00	$76,621.00	RECOMPETE; YEAR 1 OF 3	RR-08	**PLANT PATHOLOGY**
29	UADA	Soybean Weed Management: A Team Approach for Improved Control and Profitability	Research	Bob Scott	$263,375.00	$263,375.00	RECOMPETE; YEAR 1 OF 3	RR-09	**WEEDS / EDUCATION**
32	UADA	Soybean Enterprise Budgets and Production Economic Analysis	Research	Breana Watkins	$10,000.00	$10,000.00	RECOMPETE; YEAR 1 OF 3	RR-10	**ECONOMICS**
53	UADA	Arkansas Soybean Performance Trials	Research	John Carlin	$42,491.00	$42,491.00	RECOMPETE; YEAR 1 OF 1	RR-11	**AGRONOMY**
55	UADA	Fertilization of Soybean	Research	Trent Roberts	$85,391.00	$85,391.00	RECOMPETE; YEAR 1 OF 3	RR-12	**FERTILITY**
56	UADA	Field-based determination of chloride tolerance in soybean	Research	Trent Roberts	$52,179.00	$52,179.00	RECOMPETE; YEAR 1 OF 3	RR-13	**AGRONOMY / BREEDING**
57	UADA	Influence of Cover Crops and Soil Health on Soybean	Research	Trent Roberts	$65,325.00	$65,325.00	RECOMPETE; YEAR 1 OF 3	RR-14	**AGRONOMY / FERTILITY**
58	UADA	Monitoring the Extent of Potassium Deficiency and Chloride Toxicity in Arkansas Soybean Fields	Research	Trent Roberts	$37,760.00	$37,760.00	RECOMPETE; YEAR 1 OF 1	RR-15	**AGRONOMY / FERTILITY / VERIFICATION**