ARKANSAS RICE RESEARCH AND PROMOTION BOARD MEETING

Minutes

February 8, 2024
8:00 a.m.

Member(s) Present: Joe Christian, Jay Coker, John King, Scott Matthews, Roger Pohlner, Jeff Rutledge, Jim Whitaker, Charles Williams

Member(s) present via Zoom: David Gairhan

Chair Jim Whitaker called the meeting to order and welcomed all members and guests.

Minutes of the February 1, 2024 Rice Research and Promotion Board Special Called meeting were presented for review and approval.

Motion made and seconded to approve the minutes as presented.

Motion carried.

Chair Whitaker stated he and staff are looking at ways to improve the way the budget is being utilized and would like to table the financial report until a future meeting.

Dr. Nathan Slaton, University of Arkansas System Division of Agriculture (UADA), stated the Board has been presented the breeding program review information and the Division's recommendation would be to continue the funding for the program. Dr. Slaton stated the Division would need to partner with someone to bring the hybrid seed to the marketplace. After more discussion, Chair Whitaker stated he would like to have a plan to evaluate commercialization by this fall.

Meredith Martinez, Program Manager, Arkansas Department of Agriculture, provided a presentation on Taurus rice testing data of February 2, 2024, shown as **Attachment 1**.

Dr. Mickey A. Latour, Arkansas State University, presented the proposal "Developing an Arkansas Rice and Meat Bratwurst", shown as **Attachment 2**.

Proposals submitted to Board from UADA for rice research for 2024 – 2025, shown as **Attachment 3**, were presented.

Following a short lunch break, research proposal presentations continued.

Upon conclusion of all presentations, the Board began its deliberations.

Board voting is listed below. All proposals presented, the proposed and recommended funding amounts, and the Board awarded amounts are shown as **Attachment 4.**

Moved by Rutledge, seconded by Pohlner to fund all continuation projects at the recommended level, and to develop and implement a Memorandum of Understanding (MOU) regarding the hybrid breeding program. These proposals total $2,545,341 million in funding.

Motion carried.

Moved by Whitaker, seconded by Pohlner to fund the "Developing an Arkansas Rice and Meat Bratwurst" proposal at $13,980.

Motion carried.

Motion made and seconded to fund the "Incorporating Genetic Tolerance to Reduced Irrigation into the Arkansas Rice Breeding Program" proposal at $50,000.

Motion carried.

Moved by Williams, seconded by Pohlner to fund the "Revising the Prevalence and Stability of Host Resistance of Rice Blast Races in Arkansas" proposal at $97,156.

Motion carried.

Moved by Coker, seconded by Rutledge to fund the "Integrating Host Resistance and Fungicides to Control Cercospora in Rice" proposal at $48,000.

Motion carried.

Moved by Coker, seconded by Rutledge to fund the "Developing Blast-Resistant, Water-Smart Rice Varieties Through Genomic Prediction and Marker-Assisted Selection" proposal at $78,000.

Motion carried.

Moved by Coker, seconded by Rutledge to fund the "Improving Grain Chalkiness and Grain Yield Traits of Elite Rice Through Targeted Mutagenesis" proposal at $39,000.

Motion carried.

Moved by Matthews, second was made to fund the "Validation of In-Season Tissue Sampling for Rice Nutrient Management" proposal at $55,664.

Motion carried.

Chair Whitaker stated the next Rice Research and Promotion Board meeting is set for July 31 in Stuttgart. He also encouraged all members to attend the rice field day in Stuttgart on August 1, 2024 and at the Northeast Arkansas Rice Research and Extension Center on August 8, 2024.

Chair Whitaker stated that a poll will be sent to schedule two strategic planning meetings prior to the July 31 meeting.

Motion made and seconded to adjourn.

Jim Whitaker, Chairman

Attachment 1

Taurus Rice Data from Clean, Complete Samples as of 2/2/2024

Approximate long grain allowance before standards change ~ 10 per LB. (12 for Blue Tag)

Approximate long grain allowance after standards change ~ 16 per LB. (18 for Blue Tag)

February 8, 2024

University Taurus Data

- 2022 Cleaned lots:
  - FD 758 bushels– 2 long grains per pound
- 2023 Cleaned lots:
  - FD 278 bushels – No long grain
  - FD 150 bushels – No long grain
  - FD 222 bushels – No long grain
  - FD 167 bushels – No long grain
  - FD 33 bushels – No long grain
  - FD 278 bushels – 1 long grain per pound

Company 1 Data

- 2023 Cleaned Lots:
  - BT 1575 bushels – 17 long grain in 1 LB.
  - BT 2025 bushels – 13 long grain in 1 LB.
  - BT 2025 bushels – 20 long grain in 1 LB.
    - Retest – 16 long grain in 1 LB.
  - BT 2025 bushels – 27 long grain in 1 LB.
    - Retest – 8 long grain in 1 LB.
  - BT 2025 bushels – 10 long grain in 1 LB.
  - BT 495 bushels – 9 long grain in 1 LB.
- Prior to standards adjustment:
  - 2,520 bushels pass
  - 7,650 bushels fail
- After standards adjustment:
  - All 10,170 bushels ultimately pass
    - 4,050 passed without retest
    - 6,120 bushels passed on retest

Company 2 Data

- 2023 Cleaned Lots:
  - BT 2000 bushels – 12 long grain in 1 LB.
  - REG 1244 bushels – 22 long grain in 1 LB.
    - Retest – 16 long grain in 1 LB.
  - BT 267 bushels – 22 long grain in 1 LB.
    - Not retested
    - Germination below standards

- Prior to standards adjustment:
  - 2,000 bushels pass
  - 1,511 bushels fail

- After standards adjustment:
  - 3,244 bushels ultimately pass
    - 2000 pass without retest
    - 1244 passed on retest
  - 267 bushels fail
    - No attempt to retest as of 2/2/2024
    - Germination was a factor

Company 3 Data

- 2023 Cleaned Lots:
  - REG 2133 bushels – 8 long grain in 1 LB.
  - REG 2933 bushels – 6 long grain in 1 LB.
  - REG 2933 bushels – 4 long grain in 1 LB.
  - REG 844 bushels – 7 long grain in 1 LB.
  - REG 1956 bushels – 2 long grain in 1 LB.

- Prior to standards adjustment:
  - All 10,799 bushels pass

- After standards adjustment:
  - No adjustment needed for passing

Company 4 Data

- 2023 Cleaned Lots:
  - REG 885 bushels – 14 long grain per 1 LB.
  - REG 1600 bushels – 12 long grain per 1 LB.
  - REG 1600 bushels – 9 long grain per 1 LB.
  - REG 500 bushels – 9 long grain per 1 LB.

- Prior to standards adjustment:
  - 2,100 bushels pass
  - 2,485 bushels fail

- After standards adjustment:
  - All 4,585 bushels pass

Company 5 Data

- 2023 Cleaned Lots:
  - REG 45 bushels – 6 long grain in 1 LB.
  - REG 45 bushels – 8 long grain in 1 LB.
  - REG 2970 bushels – 7 long grain in 1 LB.
  - REG 2970 bushels – 9 long grain in 1 LB.
  - REG 1755 bushels – 9 long grain in 1 LB.
  - REG 2970 bushels – 10 long grain in 1 LB.

- Prior to standards adjustment:
  - All 10,755 bushels pass

- After standards adjustment:
  - No adjustment needed for passing

Across the 5 Companies:

- 39,820 total bushels submitted for complete analysis
- 28,174 bushels passed without standards adjustments needed (~71%)
- 11,379 bushels required a standards change to pass (~28%)
- 267 bushels did not retest and did not pass (~1%)

ARKANSAS STATE UNIVERSITY

/ArkansasState

Attachment 2

Developing an Arkansas Rice and Meat Bratwurst

Mickey A. Latour and Corey Readnour

ARKANSAS STATE UNIVERSITY

/ArkansasState

Update

Total	$20,980
Remove Hobart Bowl Chopper	($10,000)
FFA Student Rice and Meat Bratwurst	$3000
New budget	$13,980

ARKANSAS STATE UNIVERSITY

/ArkansasState

Summary

1. We will develop a Rice/Meat bratwurst and promote Arkansas Rice.
2. Next, we will train three area FFA chapters to develop unique Rice/Meat bratwurst which will be available for retail/football games in the fall.
3. All work will be featured/showcased at Arkansas Grown 2025.

Attachment 3

Proposal Presentations for Funding Rice Research 2024-2025

February 8, 2024

Submitted to the

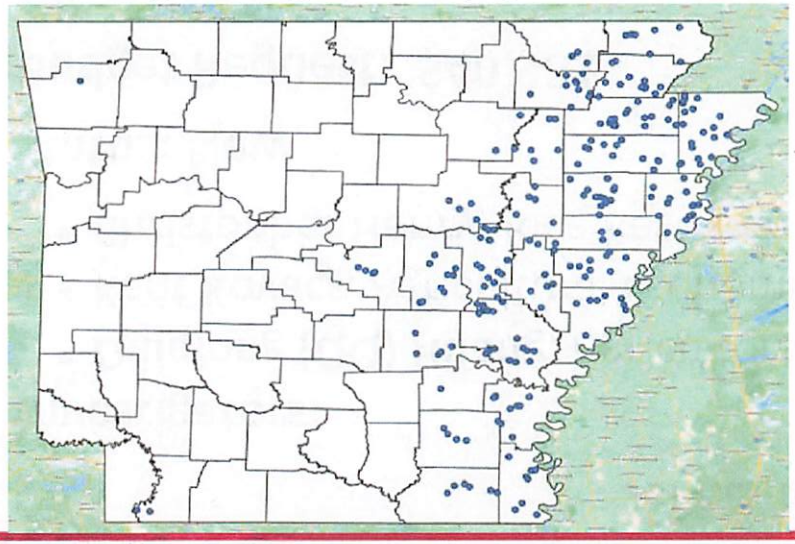
Arkansas Rice Research and Promotion Board

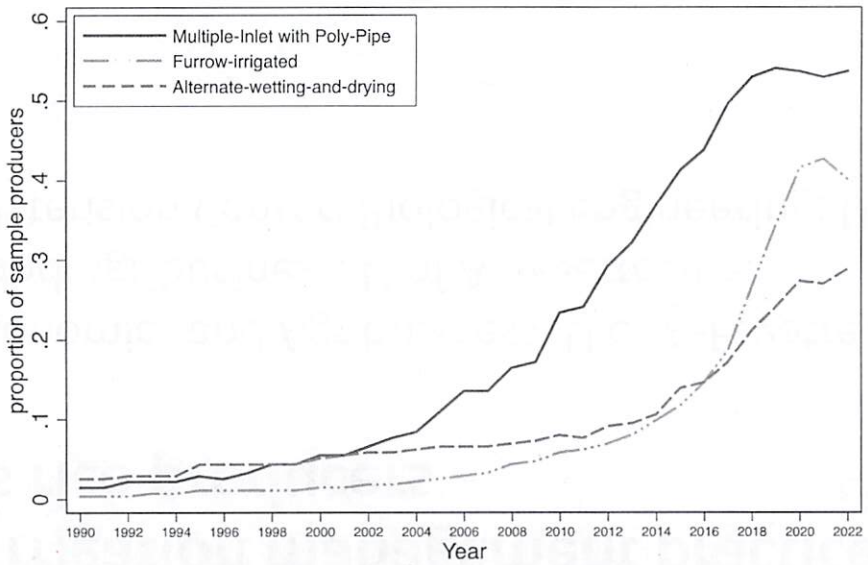
Analysis of the use of three irrigation management practices by Arkansas rice producers

- **Investigators:**
  - **Qiuqiong (QQ) Huang**, Agricultural Economics and Agribusiness, U of A-Fayetteville;
  - **Kent Kovacs**, Agricultural Economics and Agribusiness, U of A-Fayetteville;
  - **Christopher Henry**, Rice Research & Extension Center; Biological Engineering; U of A.
- **Status: New**
- **Budget Request: $40,981**
- **Objectives:**
  1. Document the use of Multiple-Inlet with Poly-Pipe Rice Irrigation (MIRI), Alternate-Wetting-and-Drying Rice (AWD) and Furrow-irrigated Rice (Row rice).
  2. Document the reasons for abandoning a practice after its initial use on farm.
  3. Identify the factors associated with the retention after initial use.
  4. Analyze the on-farm performance of MIRI, AWD and Row rice.

The 2022-2023 Arkansas Irrigated Producers Phone (AIPP) Survey

- 274 Irrigated Producers interviewed.
- 292 questions in the Survey Questionnaire
- First year of use, year stopped, reasons for abandoning, training hours.
- The amount of pumping time saved, change in required irrigation labor (higher, lower, or same), change in crop yields is stable (higher, lower, or same).





Panel c. Rice irrigation practices

U of A DIVISION OF AGRICULTURE RESEARCH & EXTENSION University of Arkansas System

AR RICE

ARKANSAS RICE CHECK-OFF

Benefits of the project

- This project will generate crucial information for rice producers to make decisions on MIRI, AWD and/or Row rice.
- Research findings on why some producers abandoned a practice while others sustained its use will provide important insights for policy makers to decide whether MIRI, AWD and/or Row rice should be scaled up in Arkansas.
- Training potential: The project will fund a Ph.D. student in Public Policy at U of A. The student worked as the project manager and led the survey efforts supervised by Dr. Huang.

Assessment of essential and toxic nutrient contents in rice grains grown under furrow irrigation

- **Dr. Arlene Adviento-Borbe and Dr. Joseph Massey**

- **Status: (New)**
- **Budget Request: $75,000 for 3 yrs.** (50% Part-time researcher and 50% research/elemental analyses)
- **Objectives:**

•Objective 1: Quantify 13 elements (As, Cd, Fe, Co, Zn, B, Se, Cu, Mo, Ca, Mn, Mg, Ni) in brown and polished grains grown under furrow irrigation and continuously flooded and in white rice commercial products.

•Objective 2: Compare the concentrations of 13 elements in polished grain to regulatory and acceptable limits set by Food and Agriculture Organization (FAO) and Codex Committee of Food Additives and Contaminants (CCFAC) for rice grain.

•Objective 3: Compare grain yield and yield components of rice grown under furrow rice cropping and continuously flooded drill seeded systems.

Method:

- Field: 9 ha (22 ac) Existing long-term furrow irrigation field experiments in NERREC
- Treatments:
  - Irrigation practice (Furrow vs Conventional),
  - Winter cover cropping-CC (with CC vs no CC),
  - Cultivars (inbred vs. Hybrids)
- Experimental samples: brown, polished grain, commercial white grain
- Target elements: 13 elements (Arsenic, Cadmium, Iron, Cobalt, Zinc, Boron, Selenium, Copper, Molybdenum, Calcium, Manganese, Nickel, Magnesium)
- Elemental analyses: Inductively coupled plasma-mass spectrometry, (ICP-MS), Danforth Institute of Plant Sciences
- Metric unit: g per kg of grain
- Comparison: FAO, Codex Committee of Food Additives and Contaminants (CCAFC)

Expected outcomes:

- Baseline field-data about the 13 elements in the grain grown under furrow irrigation and continuously flooded practice in Arkansas.
- Food information *i.e.* nutritional values, health benefits relevant to rice growers and other organizations in relation to rice grown under a climate-smart practice.
- Multiple benefits (yield gain, less water, food values) in growing rice under non-continuous flooding practice.

Measuring Rice Producers' Willingness to Participate Federal Crop Insurance Program

- Investigators: Sunjin Ahn, Eunchun Park, Hunter Biram
- Status: New
- Budget Request: $45,000
- Objectives:
  - Explore the inclination of rice farmers to engage in rice crop insurance across varying premium costs and PLC reference price levels.
  - Gain insights into rice farmers' perceptions regarding their involvement in crop insurance through a choice experiment.
  - Finally, assess the willingness of rice farmers to pay for the insurance premium.

Measuring Rice Producers' Willingness to Participate Federal Crop Insurance Program

- **Methods: Choice experiment (survey) for rice producer**
  - Conduct either in-person or online surveys.
  - These surveys will be designed to evaluate the farmers' willingness to pay crop insurance premiums.
  - Through a hypothetical choice experiment, participants will be presented with 2-4 distinct premium rates for various insurance products and coverage levels, enabling us to ascertain their preferences.
  - After collecting the data, we will analyze it using either the Random Parameter Logit (RPL) or the Latent Class Model (LCM).

Incorporating Genetic Tolerance to Reduced Irrigation into the Arkansas Rice Breeding Program

- **Investigators:** Christian Torres De Guzman, Jai Rohila, Xueyan Sha, and Paul Counce
- **Status:** New
- **Budget Request:** $50,000 (labor/Tech salary: 80%; Supplies: 14%; Chemicals: 6%)
- **Objectives:**
  - Evaluate advanced rice breeding lines under 2 regimes of reduced irrigation.
  - Identify breeding lines and target traits for stabilizing yield, quality, and milling parameters under reduced irrigation.
  - Estimate trait heritability and genomic heritability of measured traits for future.

Why Arkansas rice breeding program need this study?

FACTS:

1. Current practices of safe-AWD and furrow irrigation have established that rice can be grown under deficit irrigation.

2. All current rice varieties were bred for season-long flood irrigation and for that reason rice growers have a very small window for soil drying.

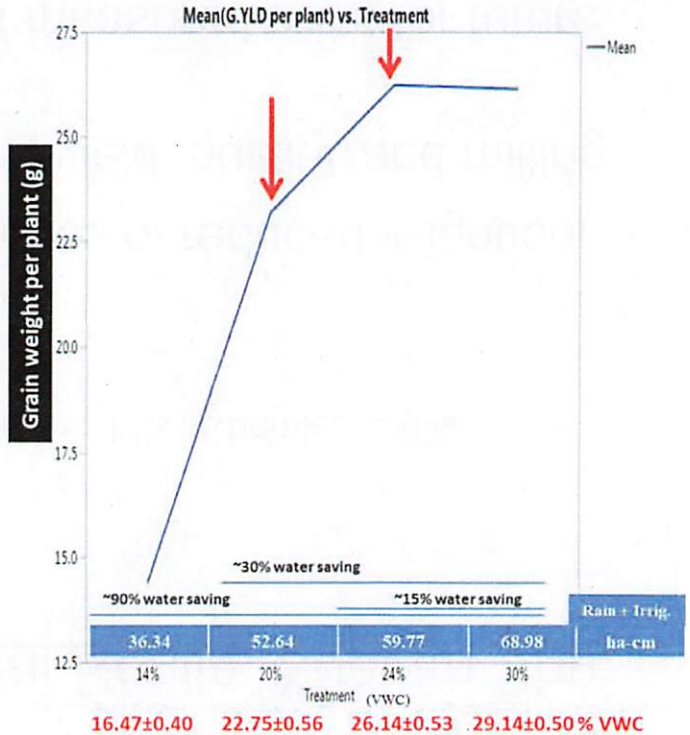
The NEED:

For water sustainability with profitability, we MUST increase the soil drying limits and at the same time provide warranty for stabilized grain yield and quality.

At present, rice breeders lacks the critical knowledge –

(i) for deficit irrigation regimes - what is the current tolerance status of their advanced breeding material.

(ii) what traits they can stack on further to improve water sustainability in their breeding line.



Overarching Goal: build a foundation for deficit irrigation breeding

Approach:

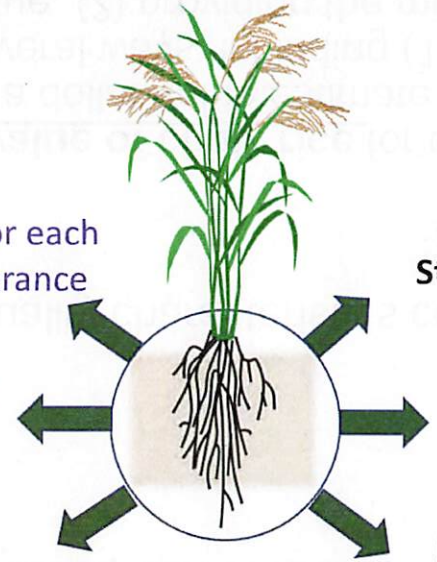
Field Experiments:
Panel of 100 advanced breeding lines, 3 irrigation regimes (continuous flood, -30CB, -60CB at 5-6 inches below the surface), split plot design, 3 reps

Data Collection:
Phenology, yield components, milling, and grain quality.
Genomic data is already available on most lines.

2024 Milestones and Future Directions:
Characterization of advanced breeding lines from three programs for tolerance to 2 levels of deficit irrigation.

Inputs from: Jarrod Hardke, Jeremy Edwards, Adam Famoso are greatly appreciated

Outcome and Impacts:



Characterization of advanced breeding lines for each breeding program under deficit irrigation tolerance

Traits discovery for deficit irrigation tolerance (Phenotypes, heritability, DNA markers)

Newly developed varieties will increase water use efficiency in AR rice production

Strengthen "low input" rice production system

Improve soil health - e.g., enhanced aeration

Improve environmental sustainability – e.g., lower runoff, save underground water

Strengthen Sustainable Rice Production with Profitability

Thank you!

Assessing the Economic Effect of Chalkiness on Arkansas Rice Export Markets

- **Investigators: Alvaro Durand-Morat, Lanier Nalley**
- **Status: New**
- **Budget Request: $32,000**
- **Overall Goal:**
  - To understand better the quality characteristics consumers value in strategic rice-importing countries.
- **Objectives:**
  - To estimate the **economic value of chalk rice** for consumers in important Arkansas rice export markets. Having a dollar value estimate for chalk percentage can help the Arkansas rice industry in several ways, including (1) defining breeding objectives based on their economic value, (2) providing the milling industry with a market-base estimate that could be used as a reference for pricing, and (3) helping rice exporters better understand the preferences and economic value of rice quality in selected export markets.

- **Methods**
  - We propose conducting this research abroad because 40-45% of Arkansas rice is exported. Better understanding the preferences of our largest importers is essential to maintaining and potentially increasing U.S. rice market share. Specifically, we selected Costa Rica and Colombia as the two export markets of interest.
    - Costa Rica was selected because the U.S. market share decreased sharply from an average of 85% in 2010-12 to 26% in 2020-22
    - Colombia is selected for its large rice market potential. Currently, Colombia is the 4th largest market for U.S. long-grain rice
- **Statement of Projected Value**
  - As Arkansas rice producers battle for crucial domestic and increasingly competitive export markets, quality concerns are becoming more pressing. This study will estimate the decrease in the value of milled rice associated with chalk percentage. The rice industry can use these estimates to guide farm rice pricing and develop export strategies tailored to the preferences of consumers in the selected markets. Furthermore, knowing the market value of chalk can be a valuable input for breeders in developing breeding objectives sensitive to consumers' preferences.

Segregating Rice Varieties for Milling and Marketing: The Potential Impact on Producer Returns and Export Market Opportunities in Arkansas

- **Investigators: Lanier Nalley, Alvaro Durand-Morat, Griffiths Atungulu, Kaushik Luthra, Robin January**
- **Status: Year 2**
- **Budget Request: $35,852**
- **Objectives:**
  - Estimate the quality and economic value of milled rice from (1) a commingled sample of all rice varieties produced in the state, (2) a commingled sample of hybrid rice varieties produced in the state, (3) a commingled sample of inbred rice varieties produced in the state, and (4) a sample of each variety produced in the state.
  - Analyze **chalk levels** and assess the differences in chalk levels in head rice and broken rice in each sample described above. Chalky head rice can have a more significant economic consequence than chalky broken kernels. Assess if there would be an economic benefit to segregate specific varieties that may contain high levels of chalk in head rice, which could jeopardize existing export markets.

- **Objectives (continued)**
  - We propose to take a closer look at the impact of commingling on chalkiness. Traditionally, the rice industry has reported chalk as a percentage of an entire sample, not disaggregated by head rice and broken percentages. If two varieties have the same percentage of chalkiness, but one has a lower percentage of its chalk in its head rice, this variety would have more export potential, all else equal. Thus, comingling varieties based on total chalkiness and not on the percentage of chalkiness in head rice could lower a sample's overall value and ultimately erode export markets.
- **Methods**
  - Rice varieties will be procured from farms in Eastern Arkansas and processed by the University of Arkansas Rice Processing Program (UARPP) following standard protocols.
- **Statement of Projected Value**
  - As Arkansas and US rice producers battle for crucial domestic and export markets, quality concerns are becoming a more pressing issue. This study hopes to illustrate the benefits to producers and the Arkansas rice industry of segregating hybrid and pure lines for milling. The rice milling industry can use the estimates to determine if comingling is justified or if the industry should pivot to some form of segregation.

Converting rice processing byproducts into high-value packaging materials

- **Investigator:** Ali Ubeyitogullari

- **Status:** New, Year 1 of 3
- **Budget Request:** $42,761
- **Objectives:**

1. Isolate polymers (i.e., cellulose, hemicellulose, starch) from defatted rice hull and bran, and generate aerogels using supercritical carbon dioxide (SC-CO_2) drying.
2. Load bioactive compounds (i.e., phytochemicals) extracted from rice hull and bran into the generated aerogels using a novel SC-CO_2 impregnation method for active packaging applications.
3. Investigate the temperature profile of fresh and frozen chicken meats packaged in the developed aerogels at different storage conditions.

Converting rice processing byproducts into high-value packaging materials

Aerogels

- Low thermal conductivity
- Lowest density solids
- High surface area and porosity

Proposed Approach

Separation

Cellulose
Starch
Protein

$SC\text{-}CO_2$ drying

High-value aerogels

Bioactive compounds

$SC\text{-}CO_2$ loading

Active packaging

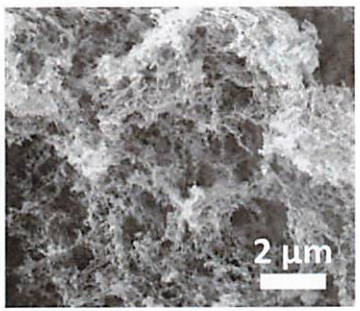
Fresh and frozen foods

Packaging application

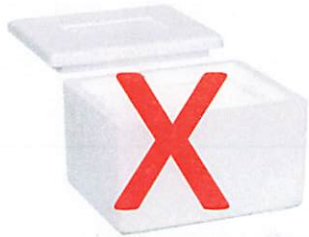
Enhanced shelf-life

Converting rice processing byproducts into high-value packaging materials

Preliminary Data



- 97% porosity
- 300 m^2/g
- Better insulator than air
- Area of 14 g = football field area



Styrofoam was $10 billion industry in 2021.

Sustainable Packaging

Projected Value

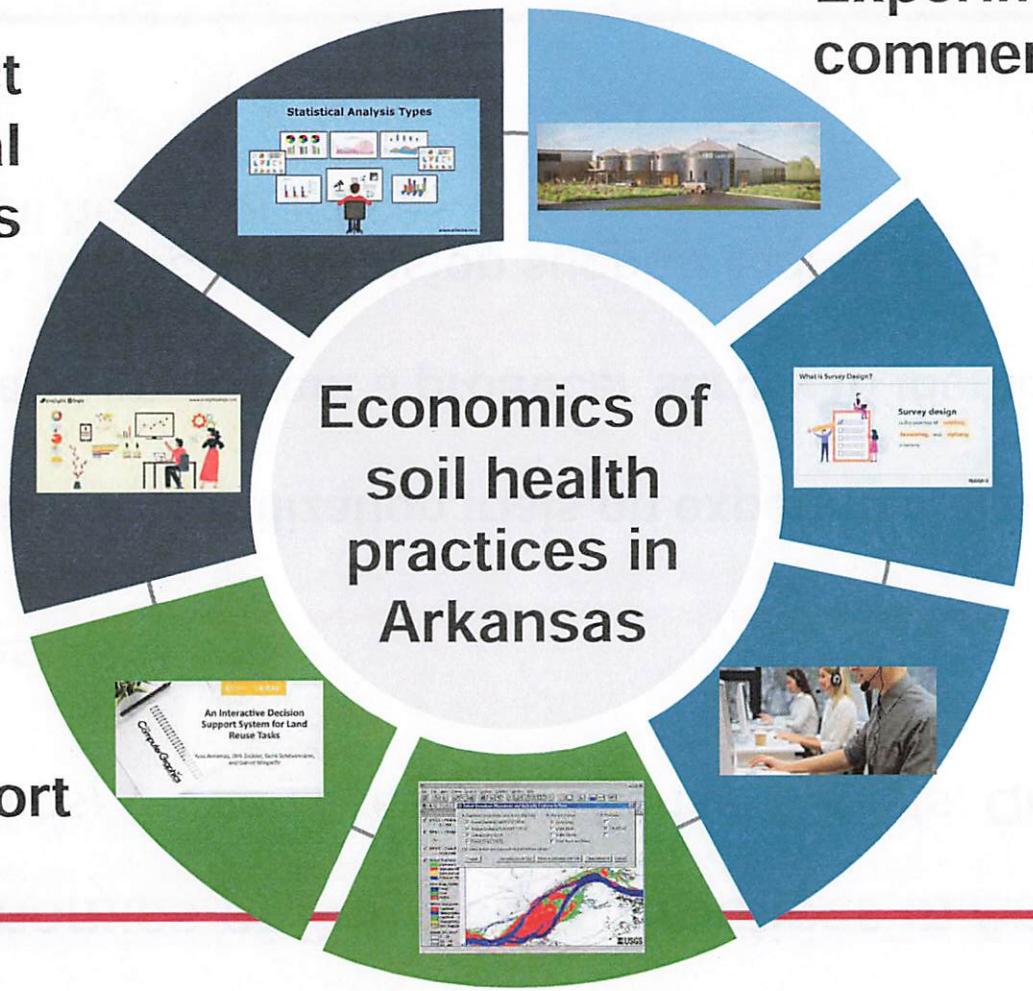
- Overcome a major disposal problem for the rice industry.
- Convert rice hulls and bran into high-value materials.
- Produce aerogels as new packaging materials with superior properties.
- Increase sustainability of rice production.

Economics of Soil Health Practices in Arkansas

- Drs. Kent Kovacs; Gerson Drescher; Michael Daniels; Qiuqiong Huang
- Status: New
- Budget Request: $53,890
- Objectives:
  - Collect data from fertilization trials on experimental and commercial fields.
  - Construct and implement a producer survey to identify soil health concerns.
  - Develop an interactive decision support tool to help farmers choose between soil health practices.

Experimental and commercial soil data

Conduct Statistical Analysis



Survey of producers

Interactive decision support tool

Economics of Soil Health Practices in Arkansas

Value to the rice industry

- Dynamic decision support tool to aid farmers in soil health practices.
- Extension documents geared toward farmers and Certified Crop Advisors that are accessible to non-scientists.
- Project information will be available at field days, such as Arkansas Soil Health Field Day, so that the impact of soil conservation practices on soil health will be demonstrated and discussed with stakeholders.
- The project will generate a large and useful dataset with the potential to answer questions beyond our objectives.

Assessing the Impact of Chalky and Climate-Smart Rice on Beer Quality

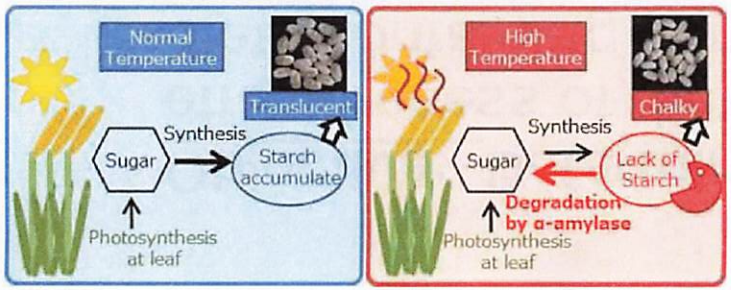
- **Investigators: Scott Lafontaine**

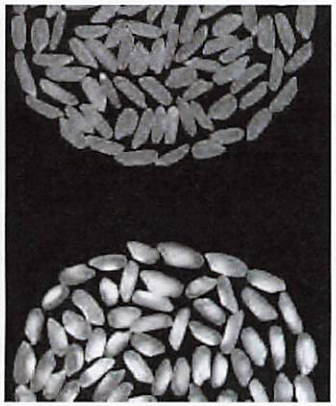
- **Status: (New)**
- **Budget Request: $36,033**
- **Objectives:**
  - Determine the impact of chalky rice and climate-smart rice on beer and NAB quality (i.e., sensory and chemistry)
  - Identify a novel solution for farmers and producers to deal with chalky rice but maintain maximum profits through malting

Research Plan

1. Mill and sort rice

Mechanism underlying grain chalkiness





Brew Beer/ NAB

Chemical and sensory analysis

Can chalk rice and climate smart rice be used in beverage production with no impact on quality?

Impacts:

- More brokens
- Leads to reduction in price of 30-50%

2. Malt Paddy Rice

Evaluation of an Arkansas-Sourced Rice By-Product (Sake Kasu) as a Novel Diet Ingredient for Koi Fish

- Rebecca Lochmann
- Status: New
- Budget Request: $32,941

- Objective: Determine koi performance and cost-effectiveness of diets containing sake kasu relative to diets containing conventional ingredients in a feeding trial

Project Overview

- Rice and fish production are both vital industries in Arkansas
- Arkansas has a new sake brewery that uses local rice. Sake production generates a by-product (kasu) that is underused
- Kasu contains nutrients (amino acids, vitamins, prebiotics and probiotics) that could be useful in fish feeds
- Koi are high-value ornamental fish with established markets
- We propose a feeding trial with koi to test different levels of sake kasu
- Growth performance, health effects and cost-of-gain will be compared to assess diet effects

Value to the Rice Industry

- The production of sake from specialty rice grown in Arkansas is relatively new, with many opportunities for expansion
- Sake is a high-value product targeted at upscale markets
- Sake kasu – a by-product that currently has no market value – could be used as a feed ingredient in diets for cultured koi and possibly other fish species
- Using a by-product of sake production as an input to produce another (fish) product reduces waste and contributes to the environmental sustainability and growth potential of both industries

Revisiting Sheath Blight Thresholds and Developing Decision-Making Aids for Modern Cultivars

- **Investigators: Camila Nicolli, UofA**
- **Collaborators:** Jarrod Hadke, UofA & Rodrigo Pedrozo, USDA
- **Status:** New
- **Budget Request:** $85,915 (77% personnel, 33% supplies & direct cost)

- **Objectives:**
  1. Update sheath blight thresholds.
  2. Evaluate economic impacts.
  3. Develop modern decision-making tools.

Sheath blight

Tools for making-decision of fungicide application

Disease	Green Ring	PD + 7 days	Early boot	Mid-boot	Late boot	Up to 10% head out	50-75% head out	After heading
Blast					✓	✓	✓	
Sheath blight		maybe	maybe	✓	✓	maybe	maybe	
Kernel smut			✓	✓				
False smut			?	?	?			
Cercospora			?	?	?			

Fungicide application decision

NEW calculator!

Arkansas Rice Advisor

DD50 Program | Rice Seed Calculator | Drill Calibration

Rice & Advice | N-P-K Fertilizer Calculator | Rate Calculator

Rice Management Guide | Rice Cultivar Snapshots | Greenseeker Calculator for Midseason N

Economic Impact calculator

NEW calculator!

1. **Justification/Problem:**

   No resistant cultivar available. Limited availability of fungicides may lead to potential fungicide resistance. Sheath blight remains a significant challenge in rice cultivation, and, if not effectively managed, the impact of sheath blight on rice crops can lead to substantial yield losses.

2. **Solution:** research trials

   2023: 1 field trial with 18 treatments: 2 timings application (PD+7days and boot) and 3 cultivars.

   2024: 1 field trials with 18 treatments: 6 timings application (PD+7days, early, mid, late boot and heading) and 3 cultivars; Rice Variety trials and On-farm trials.

Revising the Prevalence and Stability of host resistance of Rice Blast Races in Arkansas

- **Investigators: Camila Nicolli, UofA**
- **Collaborators:** Xueyan Sha, UofA, Yulin Jia & Rodrigo Pedrozo, USDA Dale Bumpers National Rice Research Center
- **Status:** New
- **Budget Request:** $97,156 (58% personnel, 42% supplies & direct cost)

- **Objectives:**
  1. Survey rice blast pathogen in the state of Arkansas.
  2. Genetic characterization of blast population in the state
  3. Establish the success of deployed rice blast resistance genes in growing regions and evaluate advanced breeding lines.

Leaf/Neck Blast

Justification/Problem:

1. Prevent further blast devastation from occurring.
2. No known the actual prevalence, distribution and diversity of blast pathogens, last survey was 15 years ago.
3. Supporting breeding program with information about the pathogen race diversity to avoid blind breeding.

Solution:

1. Identify the pathogen races & explore the genetic diversity within the new population.
2. Evaluate the resistance levels of advanced breeding lines.
3. Incorporate effective resistance genes into new high-yielding varieties to provide growers with sustainable disease management option.

Managing Sheath Blight in Rice through Improved N and K Fertilization and Fungicide Application

- **Investigators: Camila Nicolli & Gerson Drescher, UofA**
- **Collaborators:** Jarrod Hadke, Trenton Roberts, UofA & Rodrigo Pedrozo, USDA
- **Status:** New
- **Budget Request:** $56,009 (65% personnel, 35% supplies & direct cost)

- **Objectives:**
  1. Evaluate the influence of varying N and K fertilization levels.
  2. Study the fungicide efficacy of different active ingredients.
  3. Formulate recommendations for optimizing the application of N & K fertilizers, and fungicides to control sheath blight in rice cultivars.

Sheath blight

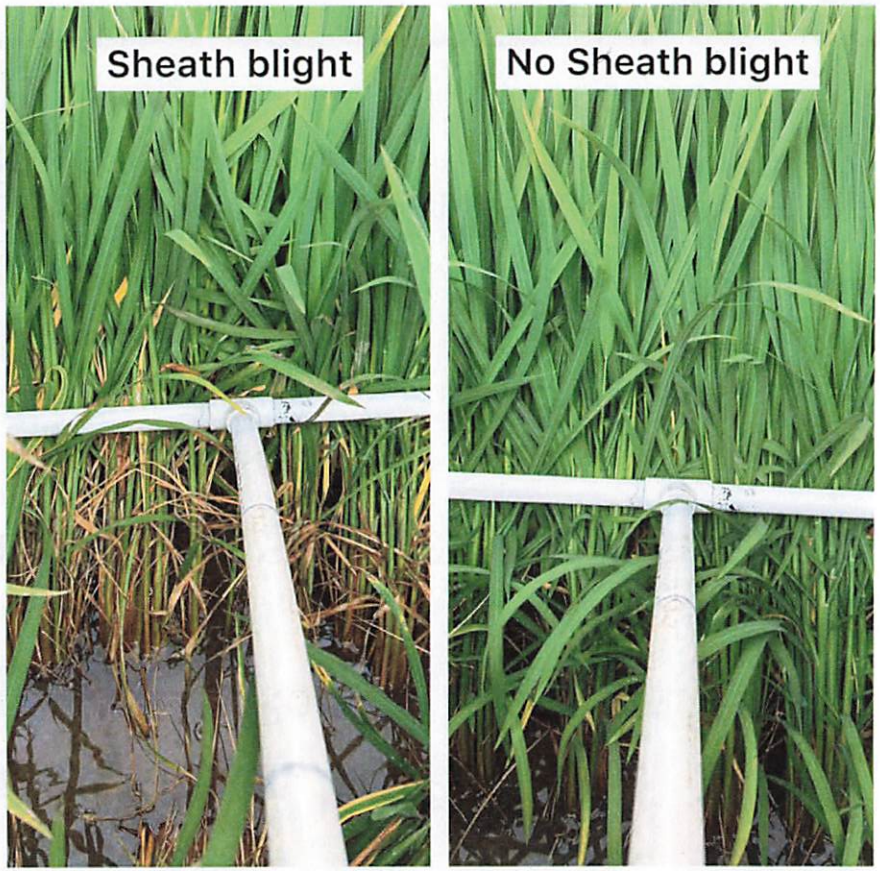
Justification/Problem:

1. Sheath blight is the most economically important disease in the Midsouth.
2. No resistant cultivars available.
3. Fungicide resistance is confirmed in Louisiana.

Solution: integrating host resistance, fertilizer and fungicide applications.

1. **2023:** diseases evaluation in long-term trials
2. **2024: field trial**

   N (0, 45, 90, 135, 180, 225 lb N acre-1)
   K (0, 30, 60, 90, 120, 150 lb K2O acre-1)
   fungicide effectiveness of single or combination active ingredients.



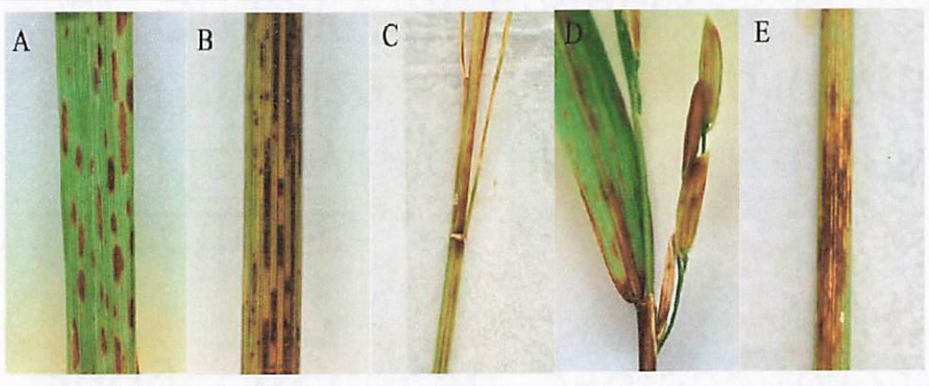
Integrating Host Resistance and Fungicides to Control Cercospora in Rice

- **Investigators: Camila Nicolli, UofA**
- **Collaborators:** Jarrod Hadke, UofA & Rodrigo Pedrozo, USDA
- **Status:** New
- **Budget Request:** $48,993 (61% personnel, 39% supplies & direct cost)

- **Objectives:**
  1. Identify and characterize Cercospora-resistant rice varieties.
  2. Optimize fungicide application timing for Cercospora control.
  3. Quantify the impact of Cercospora on crop yield.

Goal # 1

Narrow brown leaf spot => Cercospora



Goal # 2

Resistance Rice Varieties & Fungicide Timing Application

Disease	Green Ring	PD +7 days	Early boot	Mid-boot	Late boot	Up to 10% head out	50-75% head out	After heading
Blast					✓	✓	✓	
Sheath blight		maybe	maybe	✓	✓	maybe	maybe	
Kernel smut			✓	✓				
False smut			?	?	?			
Cercospora			?	?	?			

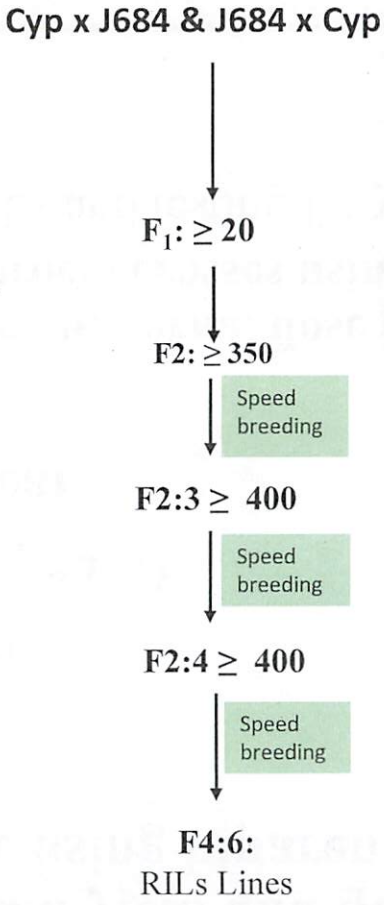
- **Justification/Problem:**
  Cercospora symptoms are beginning to appear on various parts of the plant (sheath, panicle, and grains). Lack of data on Cercospora susceptibility/resistance in rice varieties; Limited availability of fungicides for control.
- **Solution:** research trials
  2023: 1 field trial with 11 treatments: 2 timings application (early boot and late boot) and 5 cultivars.
  2024: 3 fields trials (RREC, PTRS, NEREC) with 12 treatments: 3 timings application (early boot , mid-boot and late boot) and 3 cultivars.

Parental selection based on maternal and paternal GxE inheritance in endosperm to boost grain yield and quality under Hight Night Temperature using biparental population

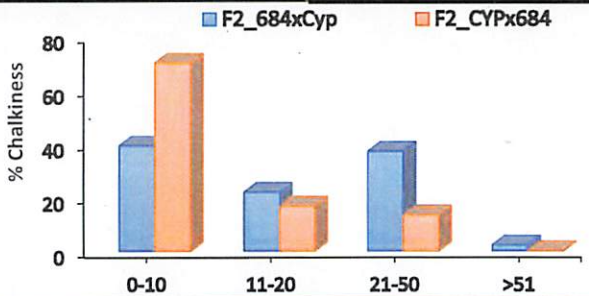
- **Investigators-** Andy Pereira
- **Co-Investigator**- Xueyan Sha
- **Status: (New) – Duration(3 years)**
- **Budget Request: $40,000/Year**
- **Objectives:**
  - **Trait-seq analysis to determine maternal dose effect contributing to grain yield and chalkiness in direct and reciprocal crosses using Multi-Omic and AI approaches.**
  - **Speed breeding to** develop RILs and testing for yield trials

Methods/Results

1. **Phenotypic screening** of 300 $F_{2:3}$ derived population of each cross.
2. Determine the **maternal inheritance** of endospermic related gene via **transcriptomic** analysis of parents and direct and reciprocal F_1s
3. Screening and **sequencing** of 400 F_4 population of each cross under HNT condition to map QTLs for grain yield and chalkiness.
4. **Integration** of **Multi-Omic** with **AI** to predict **maternal dose effect**.
5. Speed breeding to develop **RILs** population and uniform lines



F1	Cypress x J684		J684 x Cypress	
Trait	Control	HNT	Control	HNT
Sterility	Medium	High	low	low to medium
Chalk	low	low	low	Core chalk
Grain shape	Cypress (slander and small)		J684(Long and thick)	
Grain length	Cypress		J684	
Response	Sensitive		Tolerant	



Genomic Selection and Prediction, Identification of SNPs, Developing the KASP maker and validate by F2:3 population.

Selected line will test yield trials 2025 for variety or germplasm development.

2023-24

2024-25

2025-26

Statement of Projected Value

The main objective of our proposed project is the improvement *of* ***tropical japonica*** varieties, which are adapted to the US rice growing areas. **Improvement of the gene pool** of germplasm available for breeding will continuously improve **the grain quality and environmental stability** of US rice in the world market. This project addresses improvement of rice varieties to be tolerant to climate change causing **increased nighttime temperature**, thus stabilizing rice production under the changing environment.

Study the attributes of Arkansas rice to create distinctive plant-based protein and products

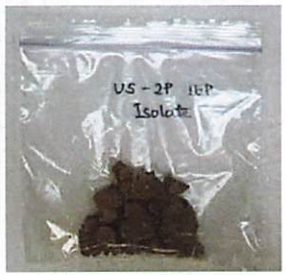
- Investigators: Mahfuzur Rahman and Griffiths Atungulu
- Status: New
- Budget Request: $49,996
- Objectives:
  - Develop and optimize methods for protein isolation from bran, brown rice, and broken rice of long-grain pure line, long-grain hybrid, and medium-grain rice.
  - Study the functionality of isolated proteins and impacts of rice blending (comingling)
  - Innovate new rice-protein based products such as (vegan) rice protein-based cheese and meat

Significance of the study

- In the year 2021, the state of Arkansas produced approximately 91,136 thousand CWT of rice.
- 9,113.6 thousand CWT of bran (with an average 10% bran content) Currently, all the bran is sold as pet food for ~10 cents per pound.
- 15% protein in bran = 1,367.04 thousand CWT of protein (~ 136.70 million pounds).
- 95.69 million pounds can be fractionated from the bran
- It would generate revenue of **478.46 million dollars** (based on an average price of $5 per pound of protein).

Preliminary Study

Method of Soy Protein Extraction		Yield (%)
Alkaline extraction-Isoelectric precipitation		49.09%

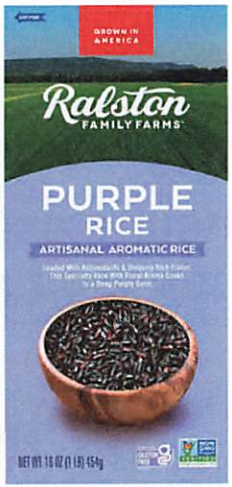
Developed a new Method		Yield (%)
2- pH extraction-Isoelectric precipitation-Heat coagulation		78.18%

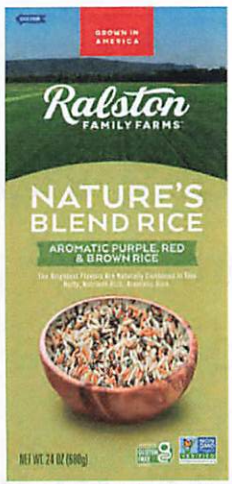
Unlocking the Potential of Colored Rice Varieties in Arkansas

- Investigators: Han-Seok Seo (PI), Griffiths Atungulu (Co-PI), Darryl Holiday (Co-PI), Scott Lafontaine (Co-PI), Mahfuzur Rahman (Co-PI), Ya-Jane Wang (Co-PI), Hallie Shoffner (Collaborator)
- Status: New
- Budget Request: $59,725
- <u>Objectives:</u>
  - To furnish a proof of concept illustrating how colored rice can be harnessed to maximize consumer acceptability and increase purchase rates in the U.S.

(Source: https://livelytable.com/forbidden-rice/)

(Source: https://seonkyounglongest.com/korean-purple-multigrain-rice/)





SPECIFIC AIMS

- **Aim 1:** Identify consumer perception, acceptance, and purchase intent for colored rice, and segment consumers
- **Aim 2:** Determine the physicochemical properties and functional activities of colored rice
- **Aim 3:** Develop value-added products using colored rice

TEAM PURPLE

(PI: Han-Seok Seo)

Pre- and Post-Harvesting

- Griffiths Atungulu
- Post-harvesting

- Hallie Shoffner
- CEO, SFRSEED
- Pre- and post-harvesting

AR

- Other rice farmers and breeders in Arkansas

Physicochemical Properties

- Scott Lafontaine
- Flavor compound profiling

- Mahfuzur Rahman
- Functional properties

- Ya-Jane Wang
- Chemical properties

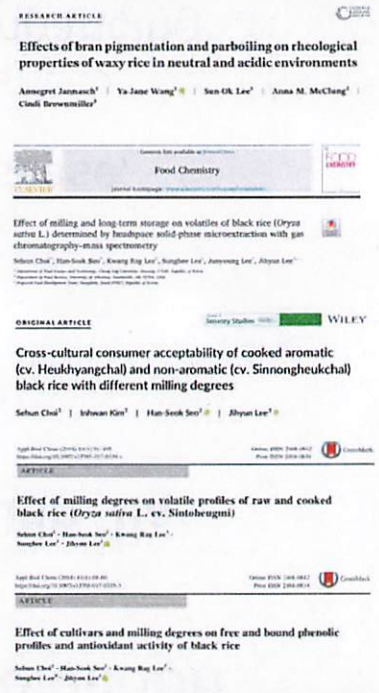
Product Development and Sensory Aspects

- Darryl Holiday
- Cooking properties
- Product development

- Mahfuzur Rahman
- Product development

- Han-Seok Seo
- Sensory attributes and Consumer behavior

Past Experiences About Purple Rice



RESEARCH ARTICLE

Effects of bran pigmentation and parboiling on rheological properties of waxy rice in neutral and acidic environments

Food Chemistry

Effect of milling and long-term storage on volatiles of black rice (*Oryza sativa* L.) determined by headspace solid-phase microextraction with gas chromatography–mass spectrometry

ORIGINAL ARTICLE

Cross-cultural consumer acceptability of cooked aromatic (cv. Heukhyangchal) and non-aromatic (cv. Sinnongheukchal) black rice with different milling degrees

ARTICLE

Effect of milling degrees on volatile profiles of raw and cooked black rice (*Oryza sativa* L. cv. Sintoheugmi)

ARTICLE

Effect of cultivars and milling degrees on free and bound phenolic profiles and antioxidant activity of black rice

UofA DIVISION OF AGRICULTURE RESEARCH & EXTENSION University of Arkansas System

AR RICE

ARKANSAS RICE CHECK-OFF

Developing Blast-Resistant, Water-Smart Rice Varieties Through Genomic Prediction and Marker-Assisted Selection

- Investigators
- Xueyan Sha, Jeremy Edwards, Christian De Guzman, Yulin Jia

- Status: (New)
- Budget Request: $78,696
- Objectives:
  - Create new rice varieties with enhanced resistance to blast disease, suitable for water-efficient farming methods.
  - Integrate advanced molecular breeding and genomic selection techniques from DB NRRC into UA's rice breeding program, enhancing the efficiency and effectiveness of variety development.
  - Develop rice varieties that are not only profitable for farmers but also contribute to environmental conservation efforts in Arkansas.

Molecular Breeding for Blast Resistance

Make crosses between blast resistance gene sources (*Pi9* and *Pi42*) and pre-release advanced UA breeding lines.

Marker-assisted backcrossing (MABC) to rapidly transfer resistance to elite breeding lines.

Conduct field evaluations.

Outcomes:

- New blast resistant rice variety candidates for future release.
- Improved breeding lines with blast resistance to use as parents in crossing.

Genomic Selection

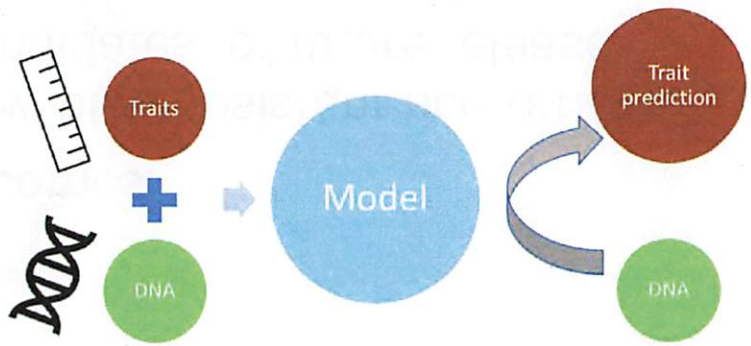
Create, curate and customize a breeding database (using BreedBase).

Design and conduct a genomic selection pilot experiment. Validate results.

Evaluate gains achieved through genomic selection.

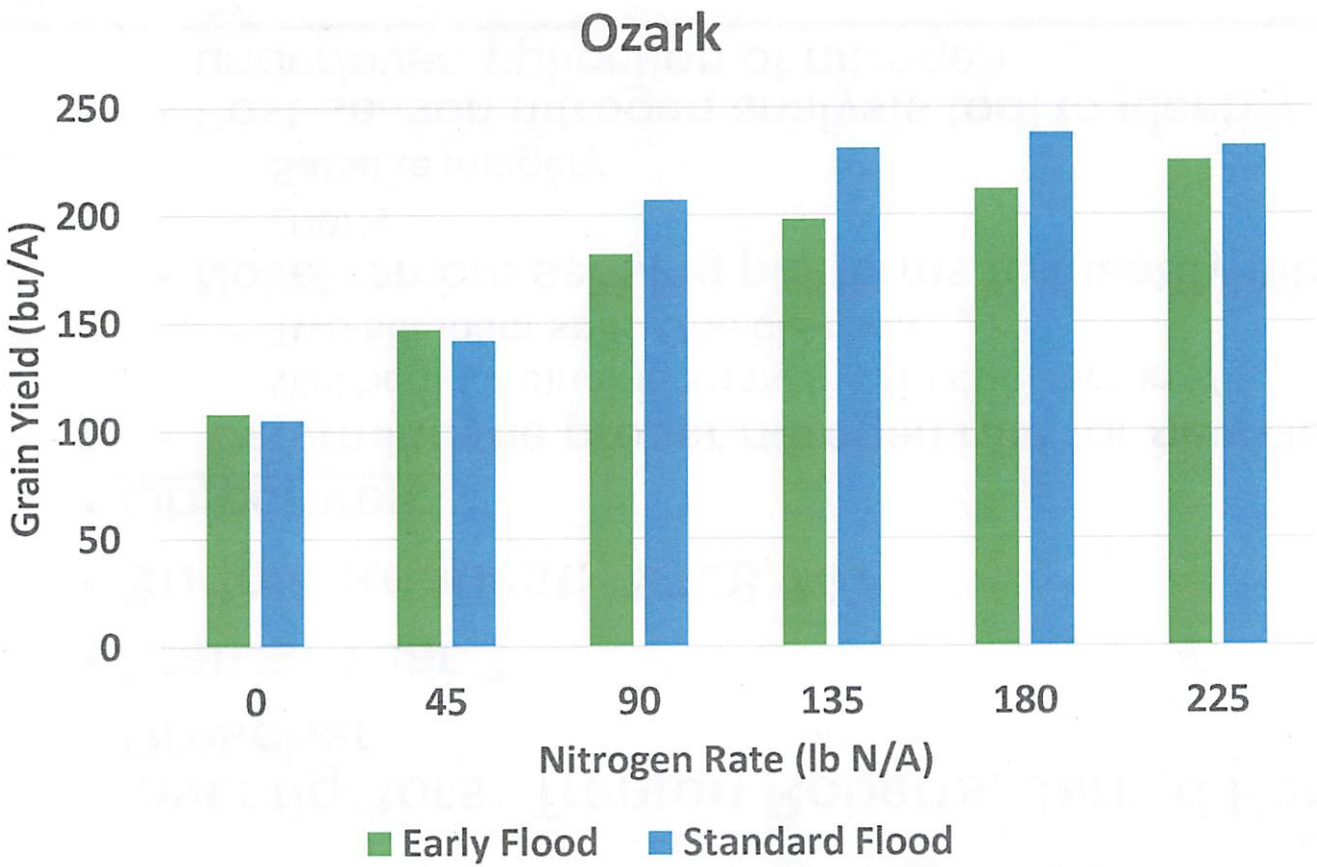
Outcomes:

- Breeding program optimizations for speed, accuracy, and higher rates of genetic gain.
- A collaborative framework to implement future advanced breeding methods.



Nitrogen Management Tools for Arkansas Rice Producers

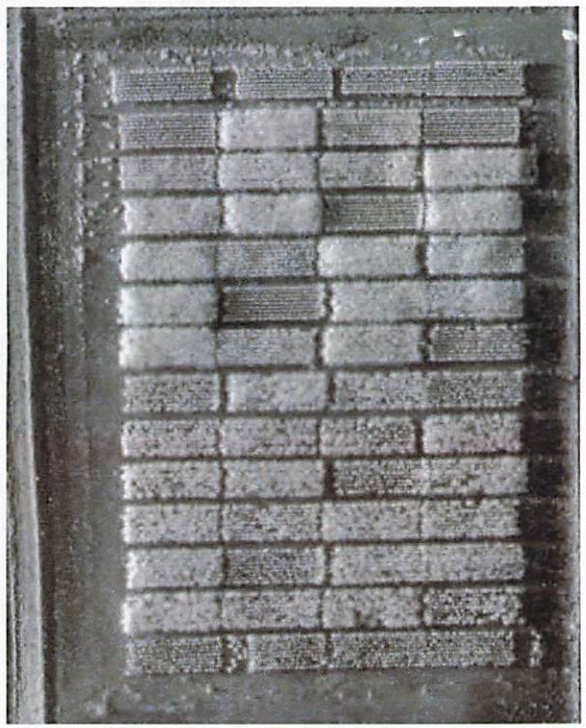
- Investigators: Trenton Roberts, Jarrod Hardke, Gerson Drescher
- Status: Year 3
- Budget Request: $128,747
- Objectives:
  - Determine the proper nitrogen rate for new rice cultivars (V x N)
    - Will begin including some hybrid cultivars in 2022
    - Two silt loam soils One clay soil
  - Novel remote sensing platforms to identify nitrogen deficiency
    - UAV's
    - Satellite imagery
  - Post-season nitrogen analysis tool to identify under/overapplication of nitrogen



Early Flood Treatment-
Applied N and permanent flood at 2 leaf stage. Remained submerged for ~10 days.

Standard Flood Treatment-
Applied N and permanent flood at 5-6 leaf stage. No submergence.

Novel Sensing Platforms/Tools for Nitrogen



Improving grain chalkiness and grain yield traits of elite rice through targeted mutagenesis

- **Investigators:** Vibha Srivastava
- **Status:** New
- **Budget Request:** $39,190
- **Objectives:**

(1) Develop *V-PPase* knock-down (*kd*) lines using three rice cultivars, Diamond, LaGrue, and Roy J

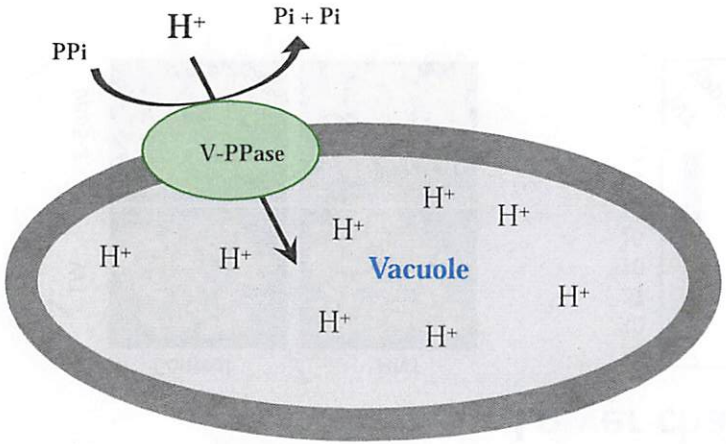
(2) Characterize the mutations and determine *V-PPase* gene expression in the *kd* lines.

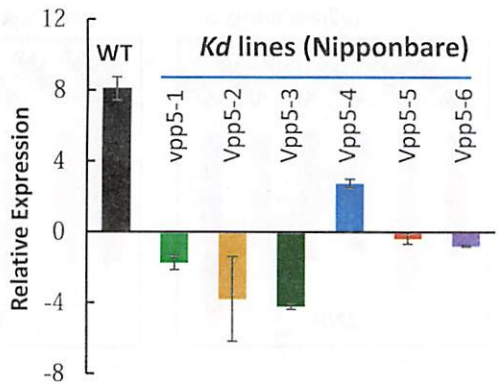
(3) Determine grain chalk, seeds per panicle, and 1000 seeds weight in the characterized *kd* lines and their high nighttime temperature (HNT) response using the facilities at the Rosen Center

(4) Determine key metabolites in mature and developing grains towards understanding the mechanism.

Proof-of-concept: knockdown of *VPPase* leads to reduced grain chalkiness under HNT

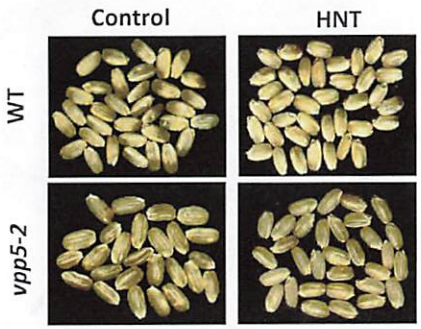
Grain chalkiness in *indica* rice (Teqing, Zhe 733, Z97) is associated with hyperactivity of VPPase gene

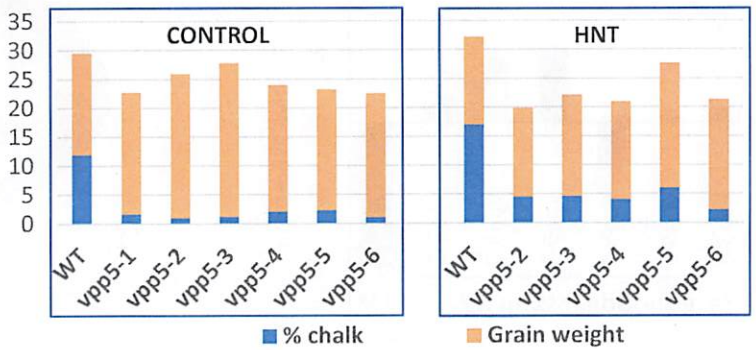




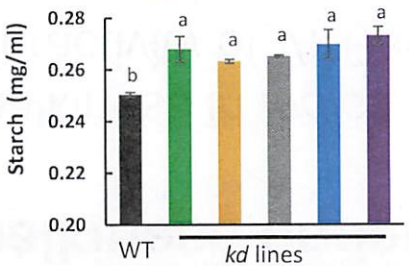
Reduced grain chalkiness and other favorable characteristics in Nipponbare *kd* lines

Lower chalk

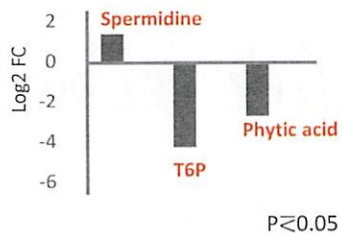




Higher starch



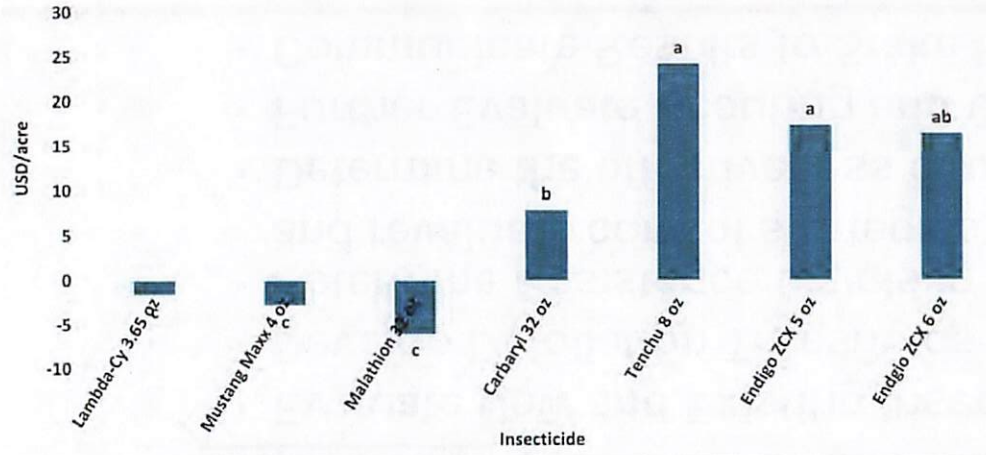
Key metabolites



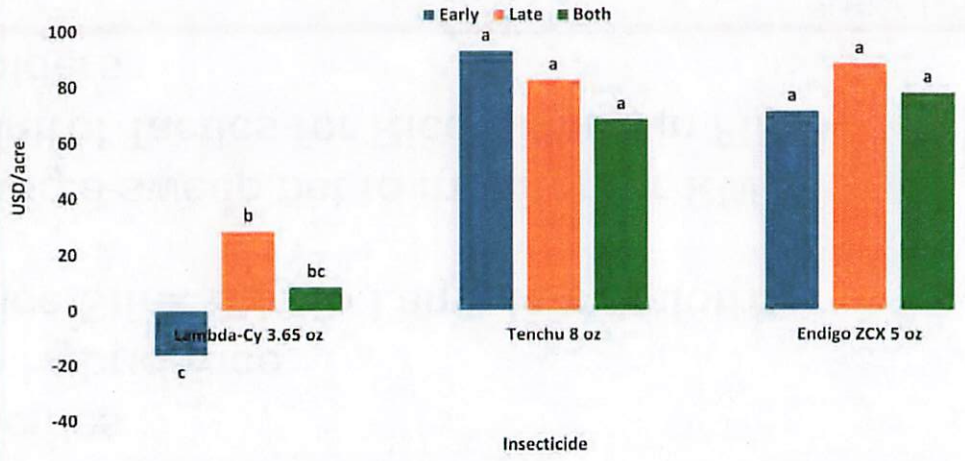
Rice Insect Management

- Investigators: Nick Bateman, Ben Thrash, Rupesh Kariyat, and Jarrod Hardke
- Status: Year 3
- Budget Request: $143,651
- <u>Objectives:</u>
  - Evaluate New and Existing Insecticides
  - Develop Defoliation Thresholds in Hybrid Rice
  - Determine Resistance Levels in Rice Stink Bug to Lambda-cyhalothrin and revaluate control strategies
  - Determine the effectiveness of using a sweep net to monitor for RWW
  - Further Evaluate Scouting and Control Tactics for Rice Billbug in FIR
  - Communicate Results to Stake Holders

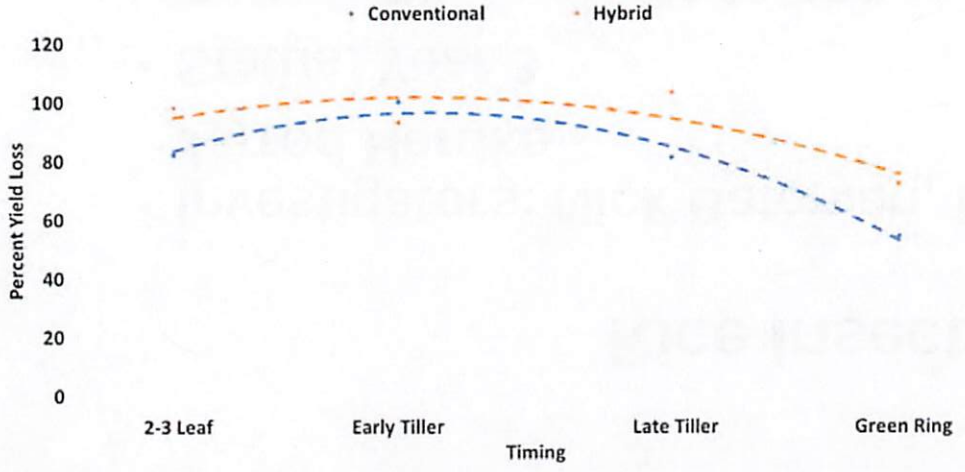
ROI Compared to UTC



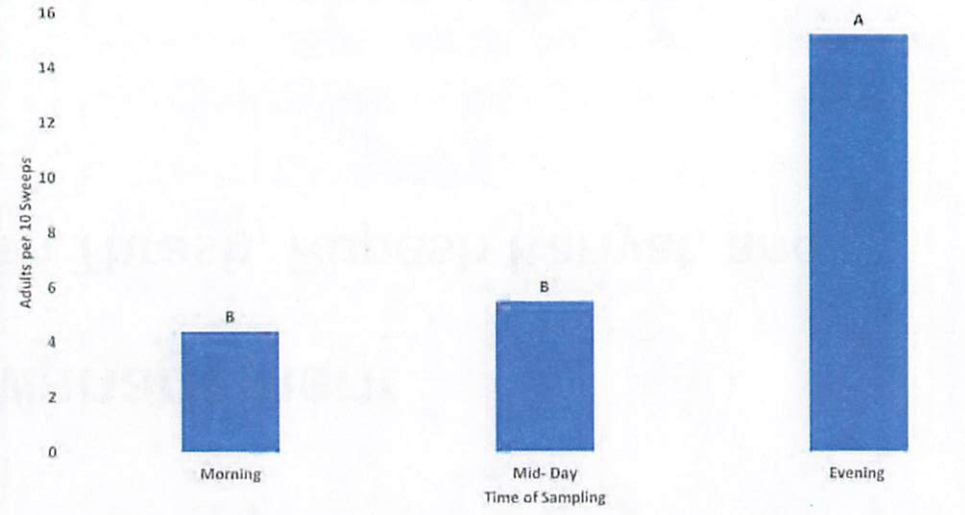
ROI Compared to UTC



Conventional vs Hybrid Defoliation-April Planting



Best Time of Day for Sampling



A Team Approach to Improved Weed Management in Rice

Investigator(s): Robert Scott, Tom Barber, and Jason Norsworthy
Status: Year 3 of 3
Budget Request: $299,844

Objectives:

1. To screen barnyardgrass populations and other weeds (weedy rice, rice flatsedge, and smartweed, among others) for suspected herbicide resistance.
2. To supplement recommendations for weed control in furrow-irrigated (row) rice.
3. Evaluate options for ALS-inhibitor-resistant sedges and white-margined flatsedge control and map their distribution across the state.
4. To further evaluate new herbicides alone and in combination with existing technologies for improved and more economical control of weeds in rice.
5. To conduct applied studies on the prevention & control of Newpath/Preface-resistant and Provisia/Highcard-resistant weedy rice because of out-crossing or over-use.
6. To provide rapid transfer of weed control information & recommendations to stakeholders through multiple outreach methods (MP44, blog posts, Slicktext, Weeds AR Wild podcast, etc.).

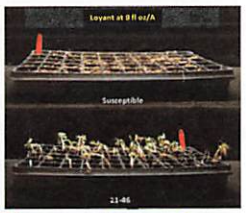
Objectives (cont.):

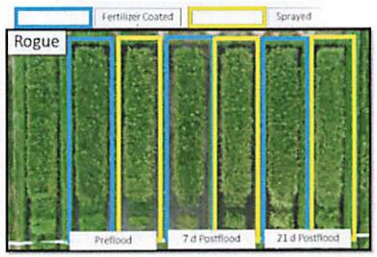
7. To determine if a combine equipped with a RedeKop Seed Destructor will effectively harvest rice and determine the potential for weed seed bank reduction.
8. To further develop post-flood weed control recommendations for Rogue (benzobicyclon), Loyant coated on urea, and salvage barnyardgrass control.
9. To develop new residual strategies for monitoring and controlling multiple-resistant barnyardgrass and Italian ryegrass.
10. To further develop post-flood weed control recommendations for Rogue (benzobicyclon), Loyant coated on urea, and salvage barnyardgrass control.
11. To evaluate weed control programs for emerging situations affecting rice production, such as early-planted rice, limited water, reduced tillage, high pH soils, and special weed problems.
12. To assess competition, yield, and milling quality impacts of volunteer and off-type weedy rice.

A Team Approach to Improved Weed Management in Rice

Research (last year):

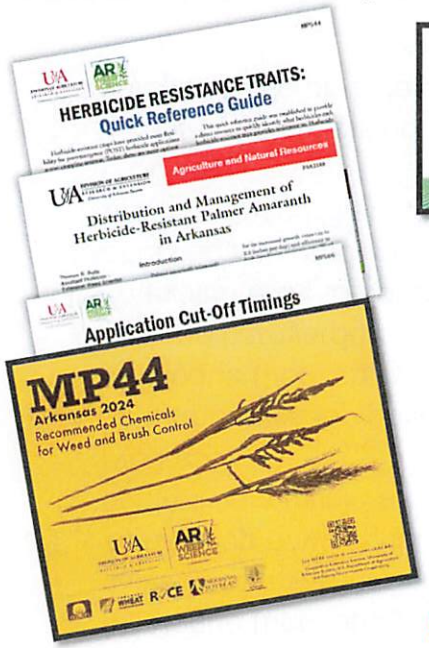
- 100+ rice field trials
  - Fayetteville, Newport, Lonoke, Marianna, Keiser, Pine Tree, Rohwer, and Tillar, AR.
- Resistance screening (~$900 per sample if ran somewhere else)
  - Identified & mapped distribution of HR rice weeds (barnyardgrass, weedy rice, rice flatsedge, etc.) **106 populations.**
  - In a 2020 survey, **93%** of respondents reported the screening service **aided in making more informed weed management decisions**, indicating **substantial value to this program**
- **New technologies**
  - Herbicides & traits
  - Redekop seed destructor
  - Application methods





ROGUE SC HERBICIDE | MAX-ACE RICE CROPPING SOLUTION | Provisia Rice System | FULL PAGE Rice Cropping Solution

Extension & Outreach (last year):



ARKANSAS ROW CROPS RADIO

SCAN ME

http://bit.ly/ARWeedsVideos

Visit our website: https://www.uaex.uada.edu/weeds

YIELD OF DREAMS

Get weed control updates directly on your phone.

Opt-in to our UAEX Field Crop Extension Specialist Text Service!

Text "**weeds**" to: (501) 300-8883.

Other outreach (last year):

- B.R. Wells Rice Research Series Reports **(19)**
- Journal Publications **(8)**
- Media Outlets (Successful Farming, Delta Farm Press, etc.)
- Regional, National, and International Presentations
- Weeds AR Wild podcast **(19 total episodes, 8,000+ downloads)**
- Field Days and Personal Interactions **(~30,000 direct contacts)**

UofA DIVISION OF AGRICULTURE RESEARCH & EXTENSION University of Arkansas System | AR RICE

UofA DIVISION OF AGRICULTURE RESEARCH & EXTENSION University of Arkansas System | AR WEED SCIENCE

ARKANSAS RICE CHECK-OFF

Nitrogen Recommendations for New Rice Cultivars

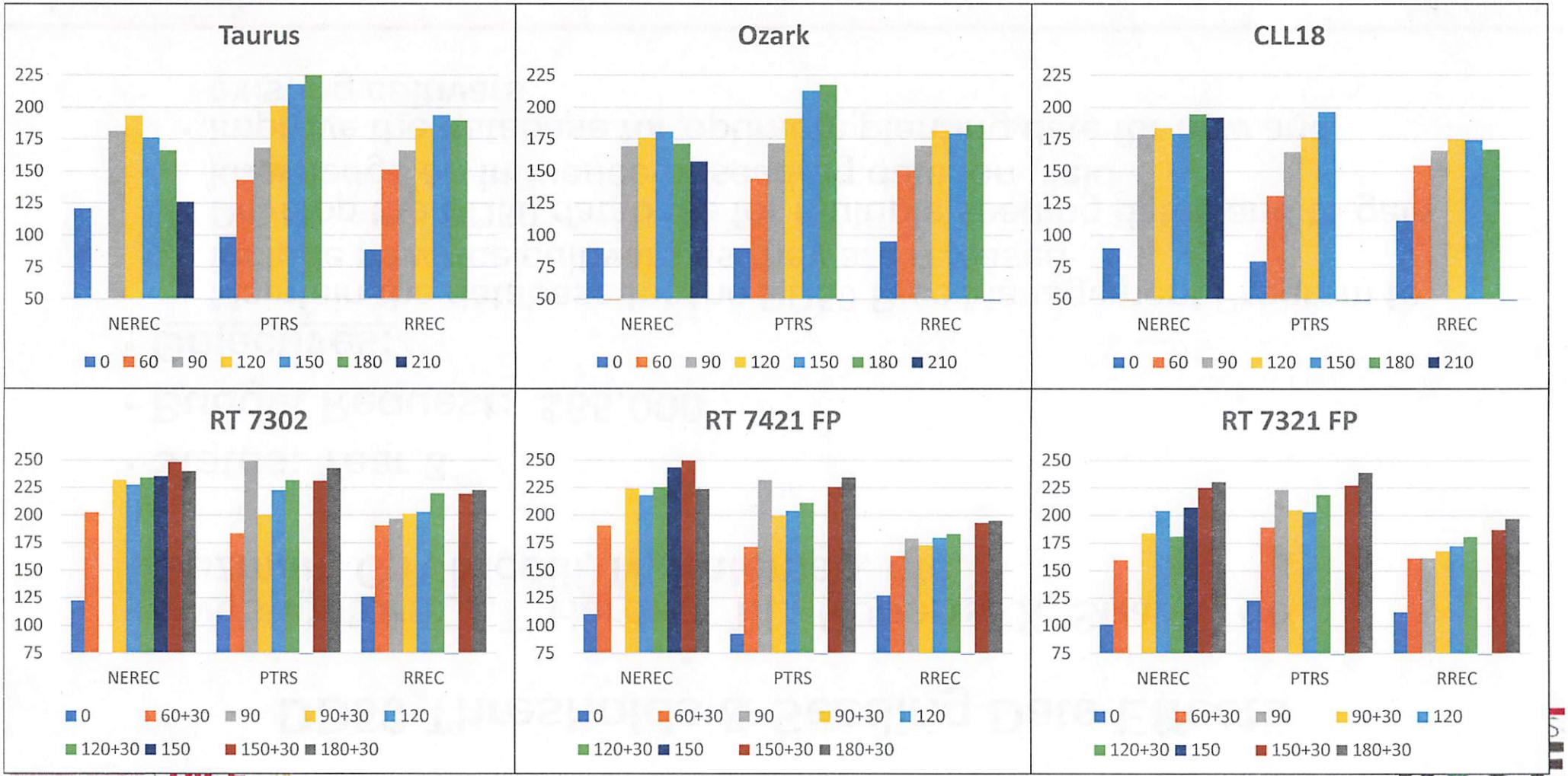
- Investigators: J.T. Hardke, T.L. Roberts, X. Sha, C. de Guzman, C.P. Nicolli, N. Bateman, etc.

- Status: Year 3
- Budget Request: $64,000
- Objectives:
  - Develop N fertilizer response curves for new rice cultivars on representative rice-producing soils in eastern AR
  - Use response curves to generate N rate recommendations for producers based on cultivar and soil type
  -

Nitrogen Recommendations for New Rice Cultivars

- Locations:
  - Stuttgart, silt loam soil, Rice Research & Extension Center
  - Colt, silt loam soil, Pine Tree Research Station
  - Keiser, clay soil, Northeast Research & Extension Center
- Tentative Cultivars:
  - Diamond (check), Taurus, Ozark, CLL18, PVL03, ARoma22, RTv7231 MA, CLL19, PVL04, CLM05, ProGold M3
  - RT 7331 MA, RT 7302, RT 7421 FP, RT 7521 FP, RT 3202

Nitrogen Recommendations for New Rice Cultivars



DD50 Thresholds & Seeding Date Effects

- Investigators: J.T. Hardke, T.L. Roberts, X. Sha, C. de Guzman, C.P. Nicolli, N. Bateman, etc.

- Status: Year 3
- Budget Request: $65,000
- Objectives:
  - Maintain the database for the DD50 Rice Management Program to include new rice cultivars as they are released
  - Develop the DD50 database for multiple seeding dates and to gain knowledge on influence of seeding date on yield
  - Improve the database for optimum planting date for new and existing cultivars

DD50 Thresholds & Seeding Date Effects

- Locations:
  - Stuttgart, silt loam soil, Rice Research & Extension Center
  - Colt, silt loam soil, Pine Tree Research Station
  - Keiser, clay soil, Northeast Research & Extension Center
- Tentative Cultivars:
  - Diamond (check), Taurus, Ozark, CLL18, PVL03, ARoma22, RTv7231 MA, CLL19, PVL04, CLM05, ProGold M3
  - RT 7331 MA, RT 7302, RT 7421 FP, RT 7521 FP, RT 3202

Agronomic Production Practices for Rice

- Investigators: J.T. Hardke, T.L. Roberts, X. Sha, C. de Guzman, C.P. Nicolli, N. Bateman, etc.

- Status: Year 3
- Budget Request: $103,000

Agronomic Production Practices for Rice

- Objectives:
  - Evaluate seeding rates of new pureline varieties and hybrids
  - Evaluate new cultivars for herbicide tolerance
  - Evaluate new seed treatment options in rice
  - Evaluate new fertilizer product options in rice
  - Supplement recommendations for furrow-irrigated rice
  - Evaluate emerging grower issues
  - Evaluate precision planting equipment for utility in rice
  - Provide rapid transfer of rice production information and recommendations via newsletters, podcasts, blog posts, etc.

Economic analysis of Arkansas rice farms

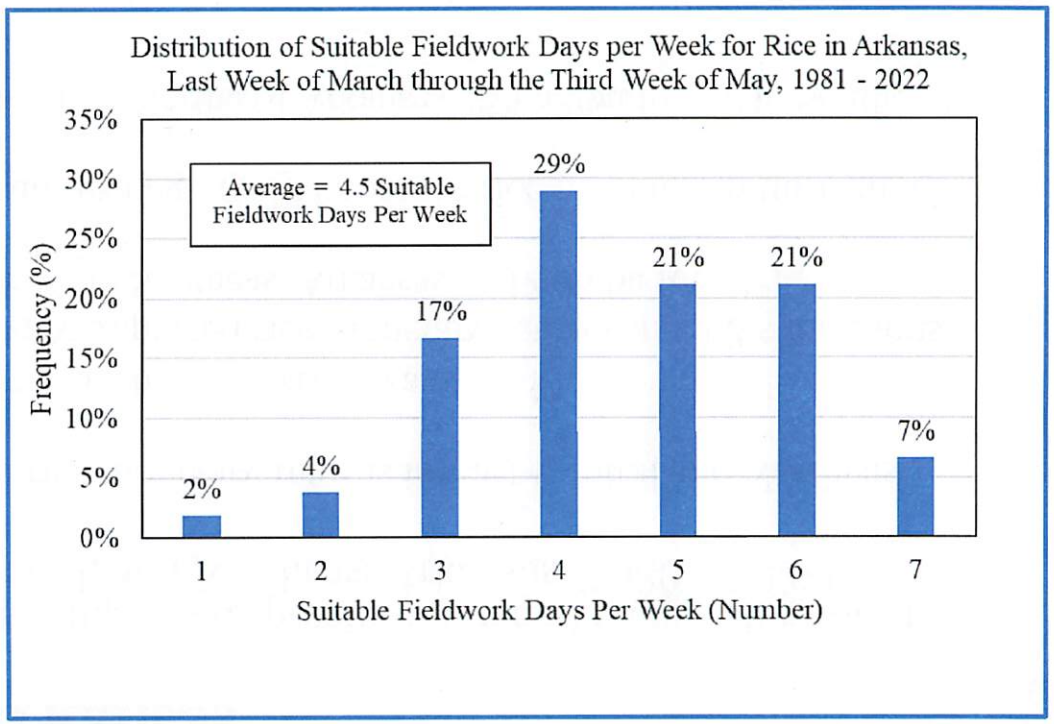
- **Investigators:** Brad Watkins, Alvaro Durand-Morat, Ranjit Mane
- **Status: (Year 3)**
- **Budget Request: $61,772**
- **Objectives:**
  - Conduct economic analysis of specific experiment station projects and other Rice Research and Promotion Board funded projects.
  - Determine impacts of farm size, tenure, labor availability, water availability, fieldwork days, and other important production constraints on Arkansas rice farm profitability in a whole farm framework.
  - Determine representative Arkansas rice farms' economic viability for a five-year time horizon, 2021 to 2026, by evaluating these farms using a stochastic simulation framework.

Weather Impacts of Rice Monetary Returns in Eastern Arkansas

- Used econometric models to evaluate the impacts of precipitation and temperature on rice monetary returns in Southeast, East-Central, and Northeast Arkansas (1980 – 2022). Select Findings:
  - April precipitation negatively impacted rice monetary returns in East-Central and Northeast Arkansas:
    - East-Central Arkansas: -$3.75/bu for +1 inch: Northeast Arkansas: -$4.43/bu for +1 inch
  - High July average temperatures negatively impacted rice monetary returns in all 3 subregions
    - East-Central Arkansas: -$9.77/bu for +1°F: Southeast Arkansas: -$12.86/bu for +1°F; Northeast Arkansas: -$14.16/bu for +1°F
  - High August average minimum temperatures negatively impacted rice monetary returns in all 3 subregions
    - East-Central Arkansas: -$4.59/bu for +1°F: Northeast Arkansas: -$5.53/bu for +1°F; Southeast Arkansas: -$7.17/bu for +1°F
- Ongoing study

Days Suitable for Planting Rice in Arkansas

- Evaluate the number of suitable fieldwork days per week for planting rice in Arkansas.
- USDA weekly Crop Progress and Condition Report data from 1981 to 2022.
- Rice planting window – First week of March through the third week of May.



Rice Breeding and Pathology Tech Support

- **Investigators:** Christian De Guzman, Camila Nicolli, Xueyan Sha
  - **Cooperators:** Jarrod Hardke
- **Status:** Year 3
- **Budget Request:** $170,339 (90% personnel, 10% supplies & direct cost)
  - Full time: 2 Program Technicians

- **Objectives:**
  1. Develop rice disease resistant/tolerant varieties and germplasm

     Collaborative partnership between plant breeders and plant pathologists, overseeing the screening and selection of novel varieties within the rice breeding program.

  2. Supports the Extension Plant Pathology Program

     Engaging in screening, laboratory tasks, monitoring, and data collection related to diseases in the state of Arkansas.

Rice Breeding and Pathology Tech Support

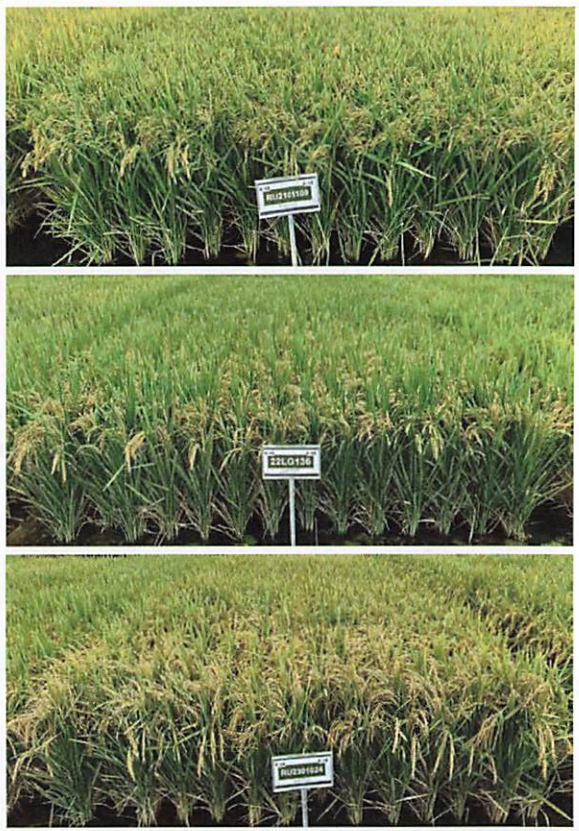
- **Progress/Accomplishment in 2023**
  - **Field**
    - Sheath blight: 2,050 hill plots (URRN, ARVAT, De Guzman advanced lines, total of 410)
    - Neck blast: 2,050 hill plots (URRN, ARVAT, De Guzman advanced lines, total of 410)
  - **Greenhouse**
    - Leaf blast: 10,250 plants (URRN, ARVAT, De Guzman advanced lines, total of 410 lines)
  - **Extension program**
    - Over 678 field plots: inoculum production, plot management, chemical applications, inoculation, data collection, harvest
    - Assessed major diseases in 362 plots of ARVAT and ARPT at Rice Variety Test across RREC, PTRS, and other counties in Arkansas.
- **Justification**
  - Disease resistance into a breeding program is a fundamental element.
  - Project focuses on addressing rice blast and sheath blight, which persist as significant diseases in Arkansas.
  - The project provides rice producers with information and management options, addressing new disease issues.
  - Project requires activities to be carried out exclusively by highly experienced and trained personnel.

Breeding and Development of Improved Long Grain and Aromatic Rice Varieties

- **Investigator: Christian De Guzman**
- **Status: (Yr 3 of 3)**
- **Budget Request: $344,141**
  - 78% for salaries, 8% Puerto Rico nursery, 8% for supplies and other direct costs, 4% for station maintenance, 2% for travel.
- **Objectives:**
  - To develop new long grain rice (conventional and herbicide tolerant) with increased grain and milling yields, desirable plant type, greater disease resistance, and improved grain quality.
  - To develop specialty rice such as Aromatic varieties and high amylose rice for Arkansas rice producers.
  - To work on the development/incorporation of resistance and/or tolerance to the major rice diseases.
  - To establish and apply new breeding methods and practices to speed up the process, such as rapid generation advance, genomic selection and genome-wide association in identifying superior germplasm, parents and potential varieties.
  - To maintain high quality and pure head row and breeder seed for foundation seed production.
  - To cooperate with the Rice Extension Specialist on conducting a comprehensive rice variety testing program (ARVAT).
  - To collaborate with the U.S. rice breeding programs in California, Louisiana, Mississippi, and Texas through the Uniform Regional Rice Nursery.

Breeding and Development of Improved Long Grain and Aromatic Rice Varieties

- **Progress/Accomplishments 2023** (potential rice lines)
  - **RU2101109:** Aromatic high grain yield and milling conventional rice line - will propose to release in 2024
  - **RU2301045 (22LG136)**: Advanced experimental conventional long grain with high yield and milling potential, with PiTa blast resistance gene
  - **RU2301024**: Advanced experimental clearfield long grain with high yield potential, early season, with PiTa blast resistance gene
  - **23PV2513**: Early generation provisia line with higher and/or comparable yield and 3 days earlier in maturity to PVL03
- **Justification**
  - Breeding program and new varieties must remain competitive.
  - Improved grain and milling yields are main focus.
    - Expand and utilize the use of current and new technologies (rapid advance, MAS/genomewide/genomic selection).
    - Increase population and early generation testing for high grain yield.
    - Strengthen grain quality analysis, incorporate disease resistance and abiotic stress tolerance.
    - Expand population, selection and trial size for aromatic breeding focused on grain quality.
    - High amylose rice incorporated in the breeding program.



Arkansas Rice Variety Advancement Trials (ARVAT)

- Investigators: J.T. Hardke, T.L. Roberts, X. Sha, C. de Guzman, C.P. Nicolli, N. Bateman, etc.

- Status: Year 3
- Budget Request: $102,000
- Objectives:
  - Evaluate yield, agronomics, & disease reaction of advanced lines in different environments across the state for release decisions

Arkansas Rice Variety Advancement Trials (ARVAT)

- Varieties
  - Conventional long-grain
  - Clearfield long-grain
  - Provisia long-grain
  - Conventional medium-grain
  - Clearfield medium-grain
  - Provisia medium-grain
  - Conventional aromatic
  - Clearfield aromatic
- Hybrids
  - Conventional long-grain
  - Clearfield long-grain

- 25 CV long-grain
- 25 CL long-grain
- 11 CV/CL/PV medium-grain
- 16 PV long-grain
- 6 aromatic long-grain
- 6 CV/CL hybrid long-grain

Arkansas Rice Performance Trials (ARPT)

- Investigators: J.T. Hardke, T.L. Roberts, X. Sha, C. de Guzman, C.P. Nicolli, N. Bateman, etc.

- Status: Year 3
- Budget Request: $96,000
- Objectives:
  - Monitor performance, disease rxn, and insect pressure of commercially available long-grain and medium-grain rice cultivars in different environments at both research stations (4) and on-farm (~8) locations across the state
  - Transfer info via publications, online, meetings, etc.

Arkansas Rice Performance Trials (ARPT)

Cultivar	RREC	PTRS	NEREC	NERREC	CLAY	DES	GRE	JAC	LAW	ARK	AVG
Diamond	156	178	162	174	170	176	182	166	193	175	173
Ozark	168	188	174	178	177	172	202	187	208	189	184
DG263L	170	198	165	203	215	187	202	181	210	178	191
CLL16	163	174	156	165	177	184	198	172	186	188	176
CLL18	170	185	169	184	188	190	197	186	196	201	187
CLL19	164	184	161	162	186	187	196	163	207	207	182
PVL03	146	163	126	161	155	176	167	151	158	200	160
PVL04	135	174	153	162	157	151	192	144	180	176	162
RTv7231MA	170	185	171	170	196	191	178	180	197	175	181
RT 7331 MA	210	212	197	200	215	204	213	191	235	226	210
RT 7431 MA	207	216	190	207	201	202	200	209	201	207	204
RT 7321 FP	211	209	194	219	223	213	211	210	237	223	215
RT 7421 FP	219	229	210	217	205	203	219	215	223	204	214
RT 7521 FP	215	226	171	209	241	230	229	187	211	228	215
RT 7523 FP	208	212	190	210	195	204	188	219	231	201	206
RT 7302	232	222	221	230	231	229	219	225	236	228	227
RT 7401	206	218	203	214	194	201	201	211	218	213	208
RT XP753	215	209	200	217	208	211	220	213	231	218	214

Arkansas Rice Performance Trials (ARPT)

Cultivar	RREC	PTRS	NEREC	NERREC	CLAY	DES	GRE	JAC	LAW	ARK	AVG
Jupiter	118	146	149	150	147	159	166	175	167	146	152
Titan	130	167	132	155	171	155	173	169	195	159	161
Taurus	169	180	153	178	187	197	200	185	206	207	186
DG353M	118	160	128	151	132	163	173	184	172	149	153
ProGold M3	158	173	193	172	172	190	204	186	181	196	183
RT 3202	211	220	207	229	218	201	224	204	230	225	217
CLM04	128	169	135	163	167	177	169	181	165	165	162
CLM05	151	173	146	179	204	175	183	168	199	201	178

Breeding Hybrid Rice Varieties for Arkansas and Southern US

- Investigators: Xueyan Sha
- Status: Year 3
- Budget Request: $200,000
- Objectives:
  - To breed adapted semi-dwarf temperature sensitive genic male sterile (TGMS) lines used in 2-line hybrid rice
  - To breed adapted semi-dwarf cytoplasmic male sterile (CMS) lines used in 3-line hybrid rice
  - To develop adapted restorer (R) and/or pollinator lines by incorporating relevant traits from various sources into elite semi-dwarf Arkansas long-grain genotypes
  - To develop competitive hybrid rice varieties through extensive test crossing and field evaluation

- **Objectives** (continued)
  - To study the best physiological and cultural practices (planting date, synchronization, seeding rate, GA, and fertilization) to optimize propagation of both TGMS and CMS lines and the production of hybrid seeds in Arkansas and Puerto Rico

Yield trial	Goal	2021	2022	2023	2024
OYT	500 Testcrosses	62	318	**519**	171
SIT	50 prelim entries	na	24	19	
AYT	20 elite exp hybrids	na	13	**15**	
ARVAT	10 exp hybrids	2*	4	**9**	

Seed yield of selected experimental hybrids

Exp Hybrid	23HX101 CL	23HX102 CL	23HX103
Seed yield (lb/500 ft^2)	22.03	9.36	12.78

Development of Superior Medium-Grain and Long-Grain Rice Varieties for Arkansas and the Mid-South

- Investigators: Xueyan Sha
- Status: Year 3
- Budget Request: $330,807
- Objectives:
  - To develop improved conventional, Clearfield, and Provisia medium-grain rice varieties
  - To develop superior conventional, Clearfield, and Provisia long-grain rice varieties
  - To conduct breeding studies including genomic selection (GS) and marker-assisted selection (MAS) to improve selection efficiency and effectiveness
  - To maintain high quality and pure breeder headrow and breeder seed for the foundation seed production

- **Objectives** (continued)
  - To conduct the annual Cooperative Uniform Regional Rice Nursery (URRN), as well as the Pre-commercial Yield Trial (PC)

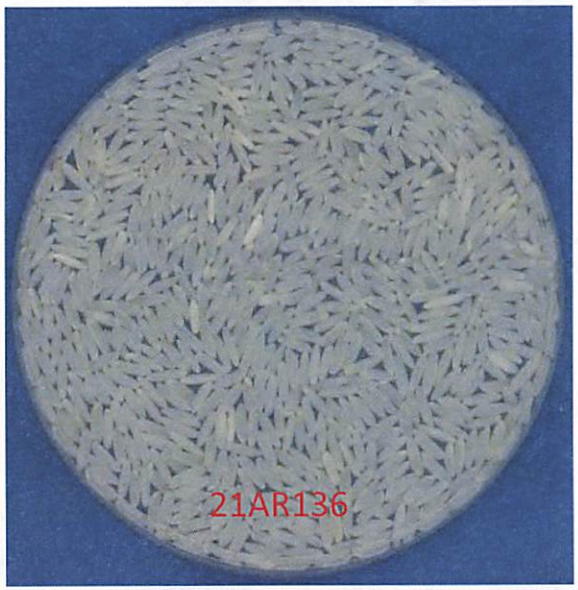
Performance of selected conventional long grain (LG), Clearfield long grain (CL LG), Provisia long grain (PV LG), conventional medium grain (MG), Clearfield medium grain (CL MG), and Provisia medium grain (PV MG) lines and checks in the Arkansas Rice Variety Advancement Trials (ARVAT), 2023. (Courtesy of Dr. Jarrod Hardke).

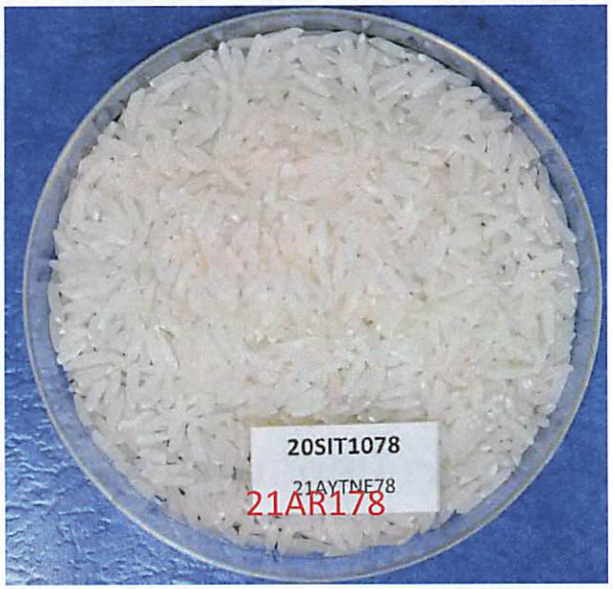
Line/var	Grain Type	Clay	Desha	NEREC	PTRS	RREC	NERREC	Mean	Milling
22AR147	LG	188	180	168	180	177	198	182	53/71
22AR159	LG	186	162	168	177	181	191	177	56/70
Ozark	LG	193	155	176	169	175	191	176	55/69
22AR1121	CL LG	206	173	167	169	183	173	179	59/70
CLL19	CL LG	191	167	137	169	167	162	166	57/70
23AR2134	PV LG	na	157	182	172	175	184	174	55/68
PVL03	PV LG	174	165	136	156	147	146	154	55/70
21AR1217	CL MG	206	176	200	178	172	186	186	59/69
23AR2205	PV MG	182	168	174	165	147	179	169	63/68
Taurus	MG	199	171	198	181	172	179	183	60/70

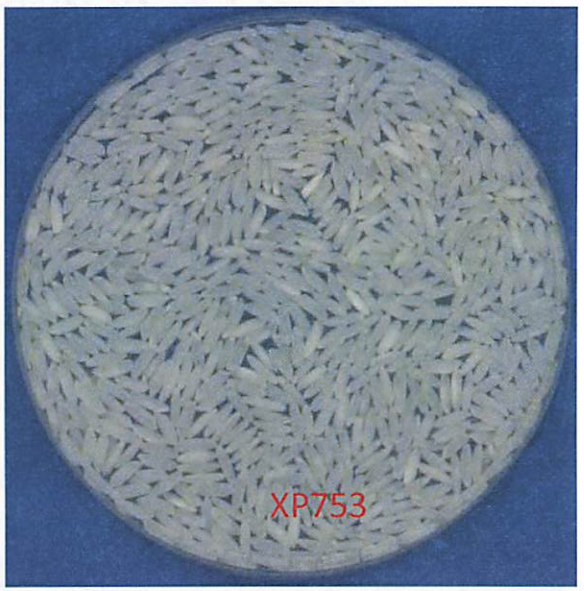
Quality Analysis for Rice Breeding and Genetics

- Investigators: Xueyan Sha, Christian De Guzman, and Jarrod Hardke
  - Co-Investigator: Dean Oliver (Riceland Foods)
- Status: Year 3
- Budget Request: $118,202
- Objectives:
  - To analyze 1,500 samples of the Arkansas Rice Performance Trial (ARPT), the Commercial Rice Trial (CRT), and the Pre-Commercial Trial (PC) for the following attributes (these would come from 2 replications from each of 6 locations around the state): chalkiness, gelatinization temperature, RVA profile, moisture content, kernel dimensions, kernel weight, degree of milling, and amylose content.

- **Objectives** (continued)
  - To analyze samples from pureline and hybrid breeding programs for chalkiness, amylose content, gelatinization temperature, RVA profile, kernel dimensions, and kernel weight; numbers would vary from year to year based on the funding availability.







Puerto Rico Winter Nursery

- Investigators: Xueyan Sha, Christian De Guzman
- Status: Year 2
- Budget Request: $73,500
- Objectives:
  1. To continue the rapid advancement of the early generation (F2-F4) breeding materials.
  2. To enhance the off-season purification and increase of seed stocks of promising breeding lines for fast-tracked variety release.
  3. To conduct seed increase of outstanding breeding lines for the expedited advanced yield trials.

Expedited breeder seed production

Generation advancement in offseason to shorten the turnaround time

It only takes 2 years from crossing to yield trial, which otherwise takes 4 years without the winter nursery.

Harvested seeds to be shipped back to Stuttgart for on-time planting

Monitoring and Management of Fungicide Resistance of Sheath Blight in Arkansas

- **Investigators: Camila Nicolli, UofA**
- **Collaborators:** Jarrod Hadke, UofA & Rodrigo Pedrozo, USDA
- **Status:** Year 2 of 3
- **Budget Request:** $35,513 (61% personnel, 39% supplies & direct cost)

- **Objectives:**
  1. Mapping resistance of sheath blight of azoxystrobin in Arkansas.
  2. Refined the rice sheath blight management recommendations.
  3. Improve rice sheath blight management techniques through an interdisciplinary approach & enhance communication.

Justification/Problem:

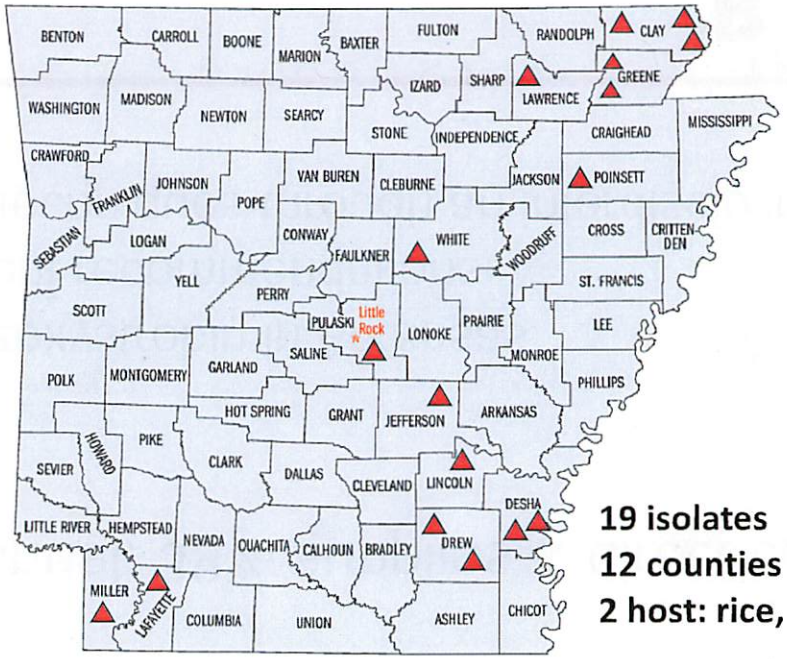
1. Sheath blight is one of the most economically important diseases in rice.
2. No resistant cultivars are known.
3. Fungicide resistance is confirmed in Louisiana.

Accomplishments in 2023:

1. 12 counties in Arkansas: pathogen was isolated.
2. 19 isolates are currently being tested with azoxystrobin (Quadris® fungicide).
3. Field trial consisting of 18 treatments was conducted to assess fungicide efficacy.

Call to action in 2024:

1. Mapping sheath blight resistance across Arkansas & recurring fungicide efficacy trial.
2. Formulating a strategic plan to address fungicide resistance management in AR.



19 isolates
12 counties
2 host: rice, soybean

Azoxystrobin (Quadris® fungicide):

Rice Research Verification Program

- Investigators: J.T. Hardke & K.B. Watkins

- Status: Year 3
- Budget Request: $116,639
- Objectives:
  - Field trials on commercial rice farms using interdisciplinary approach of resource management to maximize net returns
  - Identify gaps in production technology
  - Accumulate database for budgets, programs, practices, resource utilization, and support statewide extension programs
  - Provide hands-on training of agents, consultants, & growers
  - Verify current and new research-based recommendations

Rice Research Verification Program

County	Cultivar	Seed Rate	Stand	Plant Date	Harvest Date	Yield	Milling	Moisture
Clark	RT 7321 FP	25 lb/ac	3	April 17	Sept 4	136	37/64	18%
Cross	RT 7321 FP	22 lb/ac	6	April 12	Aug 24	195	62/72	18%
Drew	RT 7521 FP	22 lb/ac	11	May 4	Sept 15	175	48/69	14%
Jefferson	DG263L	45 lb/ac	9	March 29	Sept 5	190	36/64	15%
Mississippi	RT 7321 FP	22 lb/ac	8	April 12	Sept 26	193	48/69	18%
Phillips	Titan	75 lb/ac	19	May 6	Sept 7	206	46/67	19%
Pulaski	RT 7521 FP	22 lb/ac	10	May 12	Aug 29	187	43/64	18%
White	RT 7321 FP	22 lb/ac	6	April 12	Sept 4	236	51/67	18%
Woodruff	DG263L	55 lb/ac	7	April 20	Sept 15	194	58/69	14%

Study of cultivar attributes and their measurements to improve rice milling and functional characteristics

- **Investigator:** Griffiths Atungulu
- **Collaborators:** Dongyi Wang, Mahfuzur Rahman
- **Supporting students & Staff:** & Kaushik Luthra Evans Owusu, Samuel Olaoni, Christabel Tachie
- **Status:** (Year 3 of 3)
- **Budget Request:** $63,000
- **Objectives:**
- **Year 1:** Measurement of glass transition characteristics of current long- and medium-grain rice cultivars grown in Arkansas.
- **Year 2:** Standardization of milling yield assessment methods for contemporary long- and medium-grain rice cultivars grown in Arkansas.
- **Year 3:** Assessment of a new nondestructive methods to measure rice chalk content based on rough rice properties and machine learning tools.

Year 3 Objective focus: nondestructive methods to measure rice chalk

- We will be acquiring forty-three rice lots harvested from RiceTec show plots in Harrisburg, AR, and University of Arkansas Rice Research and Extension Center in Stuttgart, AR.

- These lots will represent a range of popular long-grain, pure-line, and hybrid rice cultivars, in addition to medium-grain rice varieties cultivated by Arkansas farmers.

- Data and properties for rough rice physicochemical properties (size, shape, mass, moisture content, amylose content) will be collected.

- We will generate hyperspectral images of rough rice kernels, and that of their corresponding husk and brown rice fractions. Following this, UARPP standard protocols for measuring chalk will be used to determine chalk values for each kernel.

Year 3 Objective focus: nondestructive methods to measure rice chalk

- Hyperspectral image data on rough rice, rice husk and brown rice fractions will be determined.
- FTIR data representing chemical signatures of the rough rice, brown rice and rice husk will be generated and correlated with hyperspectral data and matched to chalk data.
- Machine learning models supporting the application of artificial intelligence in distinguishing between chalk and non-chalk kernels before dehulling will be developed and experimentally validated.
- Equipment needed for this research are all available at the UARPP.

IMPACT

- **A non-destructive tool or approach for segregating chalky versus non-chalky kernels of unhusked rice grain will allow the industry to improve processing efficiency, head rice, rice quality and save cost on milling.**

Analysis of farm policy programs and competitiveness of Arkansas and U.S. Rice

- **Investigators: Alvaro Durand-Morat, Brad Watkins and Ranjit Mane**
- **Status: Year 2 of 3**
- **Budget Request: $21,723**
- **Objectives:**
  - Support the rice industry in analyzing policy options and the consequences of farm programs included in the 2023 farm bill.
  - Assess the potential impact of changes in domestic and trade policies in other countries on Arkansas rice. Specifically, we propose to assess the potential market consequences of China's management of rice stocks and domestic support. The latest projections suggest China's total rice consumption will plateau in the next decade. If this happens, it can have consequences for how China manages production subsidies and stocks, which can have ripple effects throughout the global rice market.

- **Methods**
  - We will use the five Arkansas representative panel farm models (RepFarms) to assess the impact of alternative commodity programs and crop insurance formulations of interest to the Arkansas rice industry.
  - We propose to use a spatial equilibrium model to assess the impact of China's management of rice stocks and domestic support. The spatial equilibrium model will be calibrated to the most recent market conditions and disaggregated regionally to include the largest global and regional rice exporters.
- **Statement of Projected Value**
  - This study will provide industry stakeholders and policymakers with valuable information about the expected impact of alternative PLC formulations. It will also help Arkansas rice stakeholders and policymakers understand the challenges they face in export markets and provide recommendations on how to maintain and enhance competitiveness.

Title of Project

- Breana Watkins
- Dr. Vic Ford

- Status: Year 3 of 3
- Budget Request: $7,500
- <u>Objectives:</u>
  - The goal of this project is to provide crop enterprise budgets that are flexible for representing alternative production practices of Arkansas producers.

Estimated costs and returns per acre

Clearfield Rice

Flood irrigated, 30 ac-in., Arkansas, 2024

ITEM	UNIT	PRICE	QUANTITY	Total Amount	Landlord Share %	Landlord Share	Tenant Share
INCOME							
Rice	bu	$ 6.70	170	$ 1,139.00	0.0%	$ -	$ 1,139.00
TOTAL INCOME				$ 1,139.00		$ -	$ 1,139.00
DIRECT EXPENSES							
LAND EXPENSE							
Cash Land Rent	acre			$ -			$ -
SEED/PLANTS							
Rice Seed	lb	$ 1.14	72	$ 82.08	0.0%	$ -	$ 82.08
Rice Seed Cv (Levees)	lb	$ 0.67	13.6	$ 9.11	0.0%	$ -	$ 9.11
Rice Seed Trt/Insect	lb	$ 0.29	72	$ 20.88	0.0%	$ -	$ 20.88
CUSTOM SPRAY AND FERTILIZER							
Ground App[1,2]	appl	$ 8.00	2	$ 16.00	0.0%	$ -	$ 16.00
Aerial App Chem[3,4,5,8,9]	appl	$ 8.50	5	$ 42.50	0.0%	$ -	$ 42.50
Aerial App Fert[6,7]	lbs	$ 0.085	330	$ 28.05	0.0%	$ -	$ 28.05
FERTILIZERS							
Phosphate (0-40-0)[2]	lbs	$ 0.45	87	$ 38.72	0.0%	$ -	$ 38.72
Potash (0-0-60)[2]	lbs	$ 0.41	100	$ 41.00	0.0%	$ -	$ 41.00
Urea (46-0-0)[7]	lbs	$ 0.30	100	$ 29.75	0.0%	$ -	$ 29.75
Urea, agrotain treated[6]	lbs	$ 0.38	230	$ 87.74	0.0%	$ -	$ 87.74
HERBICIDES							
Glyphosate[1]	pt	$ 5.38	2	$ 10.76	0.0%	$ -	$ 10.76
Command[3]	oz	$ 1.13	12.8	$ 14.40	0.0%	$ -	$ 14.40
Newpath[3]	oz	$ 4.15	5	$ 20.75	0.0%	$ -	$ 20.75
Glyphosate[3]	pt	$ 5.38	2	$ 10.76	0.0%	$ -	$ 10.76
Prowl[4]	pt	$ 6.63	2.1	$ 13.92	0.0%	$ -	$ 13.92
Newpath[4]	oz	$ 4.15	5	$ 20.75	0.0%	$ -	$ 20.75
Permit Plus[4]	oz	$ 22.22	0.75	$ 16.67	0.0%	$ -	$ 16.67
Beyond[5]	oz	$ 4.66	7.5	$ 34.95	0.0%	$ -	$ 34.95
Basagran[5]	pt	$ 5.43	1.5	$ 8.15	0.0%	$ -	$ 8.15
INSECTICIDES							
Tenchu[8]	oz	$ 1.13	8	$ 9.04	0.0%	$ -	$ 9.04
FUNGICIDES							
Aframe Plus[9]	oz	$ 0.54	10.5	$ 5.66	0.0%	$ -	$ 5.66
ADJUVANTS							
HAULING							
Haul Rice	bu	$ 0.35	170	$ 59.50	0.0%	$ -	$ 59.50
DRYING							

Climate Smart 300 Bushel Row Rice in 12 inches of Automated Irrigation

C.G. Henry; R. Parker; N. Blankenship; S. Vaman; K. Brye; T. Clark; R. Mane

Status: Year 3 of 3

Budget Request: $85,000

Objectives:

- FURROW IRRIGATED RICE AUTOMATION: Fully automate the Variable Flow Tail Water Recovery system for the furrow irrigated rice concept. Demonstrate recovery systems on four recently installed systems on working farms.
- EVALUATE FERTIGATION AND PLANTER APPLIED N (ESN) as techniques to improve yields in a FIR system.
- NITROGEN AND WATER INTERACTION IN FIR: Evaluate irrigation timing (allowable depletions) and N application for furrow irrigated rice to maximize yield, WUE, and profitability. Improve irrigation recommendations for furrow irrigated and AWD rice.
- IRRIGATION CONTEST and SCHOOLS: Measure yields and WUE of FIR, AWD, and flooded rice. Conduct irrigation schools on MIRI, soil moisture monitoring and surge irrigation.
- CLIMATE SMART FIR: Evaluate ways to reduce fossil fuel inputs and reduce GWP in FIR.

240 bpa, 13.5 ac-in/ac, 9.7 bu/in

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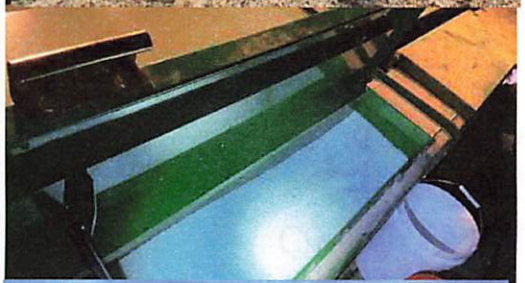
AR RICE

ARKANSAS RICE CHECK-OFF



NEREC Tailwater Study Field Scale

Treatment	Lbs N applied	Yield (BPA)	Irrigation Water Use (ac-in/ac)
Conventional Furrow Irrigated Rice	78 lbs as UAN32% and UCAN23%	173a	25.6
Continuous Tailwater System	180 lbs N urea	178a	9.7

ESN on-Farm Study with Great Plains Drill Fertilizer Box

Treatment	Yield
40 ESN-80 Urea	222.0a
10 ESN-100 Urea	213.6ab
20 ESN-100 Urea	208.6ab
MIX (20 ESN IF)	208.3ab
0 ESN-120 Urea	207.1ab
60 ESN-60 Urea	205.0ab
10 ESN-110 Urea	204.7ab
120 ESN-0 Urea	190.4b

Treatment	HRY
0 ESN-120 Urea	57.1a
MIX (20 ESN IF)	56.6ab
10 ESN-110 Urea	55.2ab
40 ESN-80 Urea	54.7ab
20 ESN-100 Urea	54.7ab
10 ESN-100 Urea	53.3ab
60 ESN-60 Urea	53.0b
120 ESN 0 Urea	51.4b

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AR RICE

ARKANSAS RICE CHECK-OFF

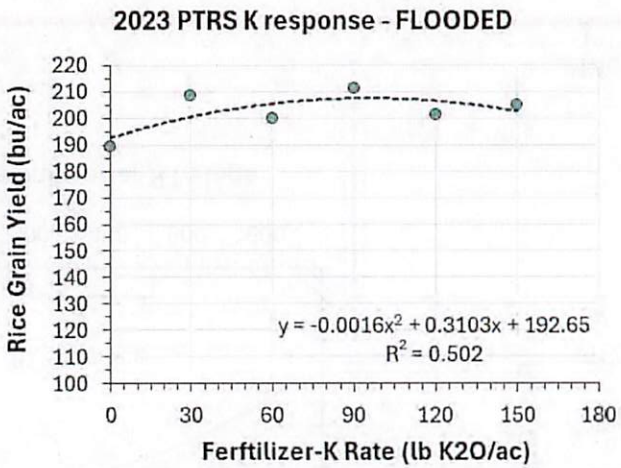
Rice Fertilization - Developing novel methods to assess nutrient availability to Arkansas rice

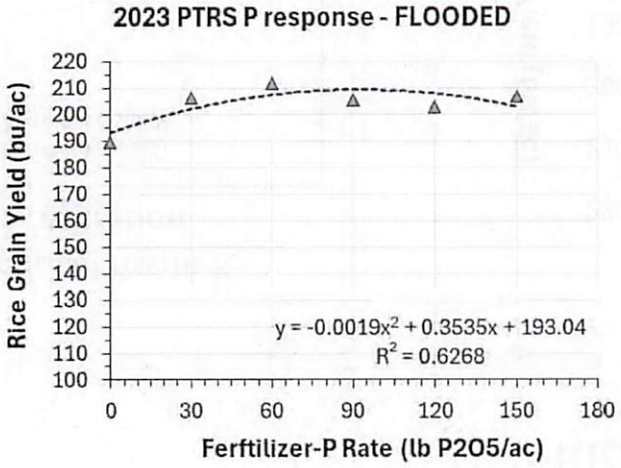
- **Investigators:** Gerson Drescher, Trenton Roberts, Jarrod Hardke
- **Status: (Year 3)**
- **Budget Request: $65,995**
- **Objectives:**
  - Continue long-term, P and K fertilization trials at RREC and PTRS
    - Focus on STK, STP, and soil organic matter changes over time
    - Cultivar response (hybrid vs. pureline)
  - Nutrient uptake dynamics across cultivars
    - Hybrid, pureline semi-dwarf, pureline standard stature, pureline medium grain
    - Herbicide tolerance?
  - Evaluation of in-season tissue-K monitoring to prevent hidden hunger
    - In-season fertilization to rescue yield potential

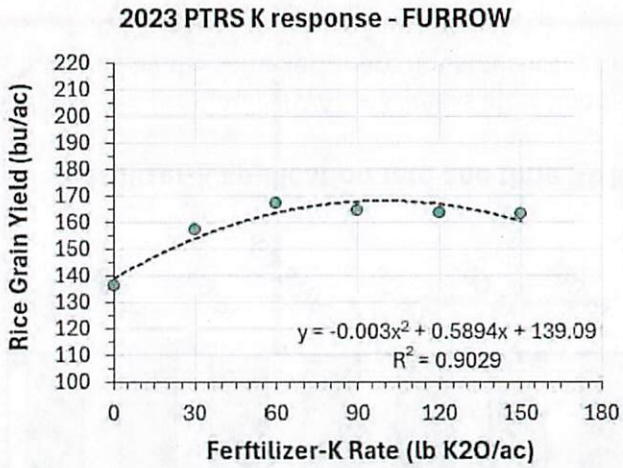
Rice response to P and K fertilization in flood- and furrow-irrigated production systems

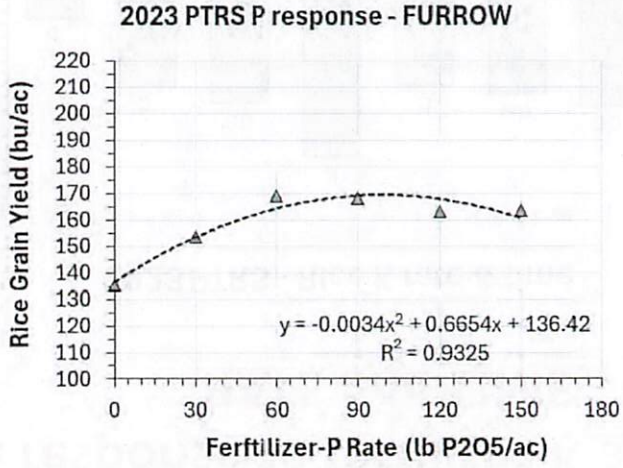
Flooded rice

- PTRS, Calloway silt loam
- Low soil-test P and K
- Diamond cultivar









Furrow rice

- PTRS, Calhoun silt loam
- Very Low soil-test P and K
- RT7521 cultivar

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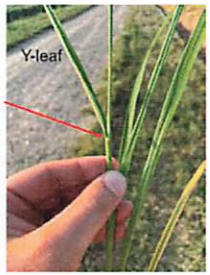
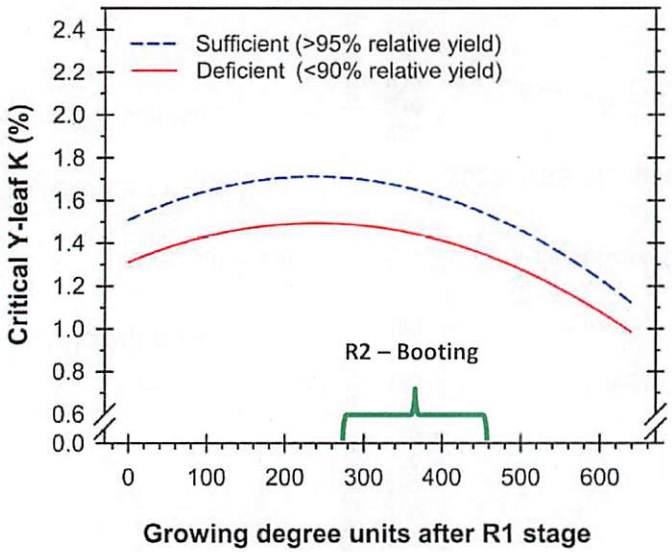
ARKANSAS RICE CHECK-OFF

Rice response to fertilizer-K application RATE and TIME

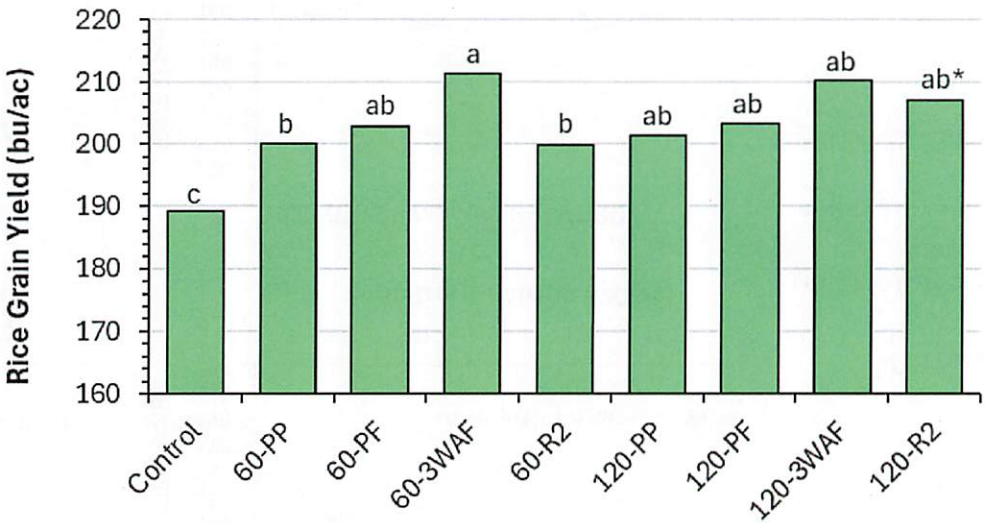


Rice critical tissue-K concentration



Greuner et al. (2022).
Agrosyst Geosci Environ. 2022;5:e20248.
https://doi.org/10.1002/agg2.20248

2023 PTRS - Rice K rate & time



PP = preplant, PF = pre-flood, 3WAF = 3 weeks after flood, R2 = Booting.
*Means followed by the same letter are not statistically different at alpha = 0.10.

Validation of In-Season Tissue Sampling for Rice Nutrient Management

- Investigators: J.T. Hardke, T.L. Roberts, G. Drescher, etc.

- Status: Year 1 (new)
- Budget Request: $55,664
- Objectives:
  - Evaluation of rice response to in-season corrective fertilizer applications based on plant tissue concentrations for nitrogen (N), phosphorus (P), and potassium (K)
  - Validate critical plant-tissue concentration thresholds to justify fertilizer applications for N, P, K
  - Examine feasibility of proactive in-season nutrient monitoring
  - Determine economic value of in-season fertilizer applications based on described thresholds

Validation of In-Season Tissue Sampling for Rice Nutrient Management

- Sample Timings:
  - Panicle Initiation (PI)
  - PI + 7 days
  - PI + 14 days
  - PI + 21 days
  - PI + 28 days
- Treatments:
  - Paired plot; regardless of tissue concentration, one plot fertilized, one not
- Validation based on grain yield / milling yield response

Attachment 4

			2023-2024	2024-2025	2024-2025	2024-2025
				Proposed	Recommendations	Board Awarded Amount
	Request Type	Project Title	Awarded Amount			
	New	Developing an Arkansas Rice and Meat Bratwurst	$ -	$ 13,980.00		$ 13,980.00
	New	Analysis of the Use of Three Irrigation Management Practices by Arkansas Rice Producers (New, Year 1 of 3)	$ -	$ 40,981.00		$ -
	New	Assessing Essential and Toxic Elements in Rice Grains Under Furrow Irrigation (New, Year 1 of 3).	$ -	$ 29,500.00		$ -
	New	Measuring Rice Producers' Willingness to Participate in Federal Crop Insurance Program (New, Year 1 of 1).	$ -	$ 45,000.00		$ -
	New	Incorporating Genetic Tolerance to Reduced Irrigation into the Arkansas Rice Breeding Program (New, Year 1 of 3)	$ -	$ 50,000.00		$ 50,000.00
	New	Assessing the Economic Effect of Chalkiness on Arkansas Rice Export Markets (New, Year 1 of 1)	$ -	$ 32,000.00		$ -
	New	Converting Rice Processing Byproducts into High-Value Packaging Materials (New, Year 1 of 3)	$ -	$ 42,761.00	$ 40,000.00	$ -
	New	Economics of Soil Health Practices in the Arkansas Delta (New, Year 1 of 3).	$ -	$ 53,890.00		$ -
	New	Assessing the Impact of Chalky and Climate Smart Rice in Beer Quality (New, Year 1 of 1).	$ -	$ 36,033.00		$ -
	New	Evaluation of an Arkansas-Sourced Rice By-Product (Sake Kasu) as a Novel Diet Ingredient for Koi Fish (New, Year 1 of 1)	$ -	$ 32,941.00		$ -
	New	Revisiting Sheath Blight Thresholds and Developing Decision-Making Aids for Modern Cultivars (New, Year 1 of 3)	$ -	$ 85,915.00		$ -
	New	Revising the Prevalence and Stability of host resistance of Rice Blast Races in Arkansas (New, Year 1 of 3)	$ -	$ 97,156.00		$ 97,156.00
	New	Managing Sheath Blight in Rice through Improved N and K Fertilization and Fungicide Application (New, Year 1 of 3)	$ -	$ 56,009.00		$ -
	New	Integrating Host Resistance and Fungicides to Control Cercospora in Rice (New, Year 1 of 3)	$ -	$ 48,993.00	$ 48,000.00	$ 48,000.00
	New	Parental Selection Based on Maternal and Paternal GxE Inheritance in Endosperm to Boost Grain Yield and Quality Under High Night Temperature Using Biparental Population (New, Year 1 of 1).	$ -	$ 40,000.00		$ -
	New	Study the Attributes of Arkansas Rice to Create Distinctive Plant-Based Protein and Products (New, Year 1 of 3)	$ -	$ 49,996.00		$ -
	New	Unlocking the Potential of Colored Rice Varieties in Arkansas (New, Year 1 of 3)	$ -	$ 59,725.00		$ -
	New	Developing Blast-Resistant, Water-Smart Rice Varieties Through Genomic Prediction and Marker-Assisted Selection (New, Year 1 of 3)	$ -	$ 78,696.00	$ 78,000.00	$ 78,000.00
	New	Improving Grain Chalkiness and Grain Yield Traits of Elite Rice Through Targeted Mutagenesis (New, Year 1 of 3)	$ -	$ 39,190.00	$ 39,000.00	$ 39,000.00
	New	Validation of In-Season Tissue Sampling for Rice Nutrient Management (New, Year 1 of 3). All ecosystems.	$ -	$ 55,664.00		$ 55,664.00
	New	Segregating Rice Varieties for Milling and Marketing: The Potential Impact on Producer Returns and Export Market Opportunities in Arkansas (New, Year 1 of 3).	$ 35,852.00	$ 35,852.00	$ 32,000.00	$ -
New Total	0		**$ 35,852.00**	**$ 1,024,282.00**	**$ 237,000.00**	**$ 381,800.00**
	N/A	Improving Grain Yield and Quality under High Nighttime Temperature using Functional Gene Markers.	$ 40,000.00	$ -		$ -
	N/A	Investigating the Impact of Rice Variety on the Volatile Profiles and Quality of Rice Malt, Rice, and beverages (i.e. Beer, Nonalcoholic Beer, Etc.).	$ 23,457.00	$ -		$ -
	N/A	Biochar Effects on Greenhouse Gas Emissions from Simulated Furrow- Irrigated Rice in the Greenhouse.	$ 16,978.00	$ -		$ -
	N/A	Struvite Effects on N2O Emissions From Row Rice in a P-Deficient Silt- Loam Soil.	$ 17,475.00	$ -		$ -
N/A Total	0		**$ 97,910.00**	**$ -**	**$ -**	**$ -**
	Continuation	Nitrogen Management Tools for Arkansas Rice Producers (Year 3 of 3). All ecosystems.	$ 115,000.00	$ 128,747.00	$ 115,000.00	$ 115,000.00
	Continuation	Rice Insect Management (Year 3 of 3). All ecosystems	$ 130,000.00	$ 143,651.00	$ 135,000.00	$ 135,000.00
	Continuation	A Team Approach to Improved Weed Management in Rice (Year 3 of 3). All ecosystems.	$ 250,000.00	$ 299,844.00	$ 255,000.00	$ 255,000.00
	Continuation	Nitrogen Recommendations for New Rice Cultivars (Year 3 of 3). All ecosystems.	$ 59,000.00	$ 64,000.00	$ 64,000.00	$ 64,000.00
	Continuation	DD50 Thermal Unit Thresholds and Seeding Date Effects for New Rice Cultivars (Year 3 of 3). All ecosystems.	$ 63,000.00	$ 65,000.00	$ 65,000.00	$ 65,000.00
	Continuation	Agronomic Production Practices for Rice (Year 3 of 3). All Ecosystems.	$ 99,500.00	$ 103,000.00	$ 103,000.00	$ 103,000.00
	Continuation	Economic Analysis of Arkansas Rice Farms (Year 3 of 3). Grand Prairie Ecosystem.	$ 55,000.00	$ 61,772.00	$ 55,000.00	$ 55,000.00
	Continuation	Rice Breeding and Pathology Tech Support (Year 3 of 3)	$ 145,000.00	$ 170,339.00	$ 160,000.00	$ 160,000.00
	Continuation	Breeding and Development of Improved Long Grain and Aromatic Rice Varieties (Year 3 of 3).	$ 310,000.00	$ 344,141.00	$ 310,000.00	$ 310,000.00
	Continuation	Arkansas Rice Variety Advancement Trials (Year 3 of 3).	$ 94,000.00	$ 102,000.00	$ 102,000.00	$ 102,000.00
	Continuation	Arkansas Rice Performance Trials (Year 3 of 3).	$ 100,000.00	$ 96,000.00	$ 96,000.00	$ 96,000.00
	Continuation	Breeding Hybrid Rice Varieties for Arkansas and Southern US (Year 3 of 3).	$ 190,000.00	$ 200,000.00	$ 195,000.00	$ 195,000.00
	Continuation	Development of Superior Medium-Grain and Long-Grain Rice Varieties for Arkansas and the Mid-South (Year 3 of 3).	$ 315,000.00	$ 330,807.00	$ 315,000.00	$ 315,000.00
	Continuation	Quality Analysis for Rice Breeding and Genetics (Year 3 of 3).	$ 117,247.00	$ 118,202.00	$ 118,202.00	$ 118,202.00
	Continuation	Puerto Rico Winter Nursery (Year 2 of 3)	$ 70,000.00	$ 73,500.00	$ 73,500.00	$ 73,500.00
	Continuation	Monitoring and Management of Fungicide Resistance of Sheath Blight in Arkansas (Year 2 of 3).	$ 22,000.00	$ 35,513.00	$ 35,500.00	$ 35,500.00
	Continuation	Rice Research Verification Program (Year 3 of 3).	$ 111,296.00	$ 116,639.00	$ 116,639.00	$ 116,639.00
	Continuation	Study of Cultivar Attributes and Their Measurements to Improve Rice Milling and Functional Characteristics (Year 3 of 3)	$ 60,000.00	$ 63,000.00	$ 61,000.00	$ 61,000.00
	Continuation	Analysis of Farm Policy Programs and Competitiveness of Arkansas and U.S. Rice (Year 2 of 3).	$ 20,000.00	$ 21,723.00	$ 20,000.00	$ 20,000.00
	Continuation	Rice Enterprise Budgets and Production Economic Analysis (Year 3 of 3).	$ 7,500.00	$ 7,500.00	$ 7,500.00	$ 7,500.00
	Continuation	Climate Smart 300 Bushel Row Rice on 12 inches of Automated Irrigation (Year 3 of 3).	$ 85,000.00	$ 85,000.00	$ 85,000.00	$ 85,000.00
	Continuation	Rice Fertilization- Developing Novel Methods to Assess Nutrient Availability to Arkansas Rice (Year 3 of 3). All ecosystems.	$ 58,000.00	$ 65,995.00	$ 58,000.00	$ 58,000.00
Continuation Total	0		$ 2,476,543.00	$ 2,696,373.00	$ 2,545,341.00	$ 2,545,341.00
Grand Total	0		**$ 2,610,305.00**	**$ 3,720,655.00**	**$ 2,782,341.00**	**$ 2,927,141.00**

U of A Carry-over $ (66,395.29)