

ARKANSAS RICE RESEARCH AND PROMOTION BOARD MEETING

Minutes

November 6, 2024

9:00 a.m.

The Arkansas Rice Research and Promotion Board meeting was held at the Arkansas Department of Agriculture, 1 Natural Resources Drive, Little Rock, AR.

Member(s) Present: Becton Bell, Jay Coker, David Gairhan, Scott Matthews, Carl Phillips, Jeff Rutledge, Paul Schwarz, Jim Whitaker

Member(s) present via Zoom: Charles Williams

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

Minutes of the August 8, 2024, as amended, and the August 16, 2024, Rice Research and Promotion Board meetings were presented for review and approval.

Moved by Coker, seconded by Rutledge to approve the minutes as presented.

Motion carried.

Fred Wiedower, Deputy Chief Fiscal officer, presented the financial report for July 1 through September 30, 2024, shown as **Attachment 1**.

Wiedower stated gross collections through the end of September were \$703,555. Based on collections through September, remittances made to USA Rice will be approximately \$440,000. Of the \$2 million approved to be advanced to the University of Arkansas Division of Agriculture (UADA) at the last meeting, \$900,000 was remitted to date.

Moved by Rutledge, seconded by Gairhan to approve the financial report as presented.

Motion carried.

Moved by Coker, seconded by Schwarz to approve meeting expenses up to \$12,000 for 2025.

Motion carried.

Wayne Wiggins provided an overview and an update on Col-Rice . Wiggins stated Col-Rice started with the Columbia Free Trade Agreement in 2012. As of today, based on a three-year rolling average, Arkansas receives 48.77 percent of sale proceeds. Arkansas has received \$44.8 million. Currently there is \$8.3 million in the account. **Attachment 2**

Wiggins announced that he is retiring as the Col-Rice representative.

Wiggins presented an invoice for an annual membership fee of \$15,000.

Moved by Coker, seconded by Bell to approve the annual member fee as presented.

Motion carried.

The board held a lengthy discussion about Col-Rice proceeds and the investment of the funds. Coker requested that the board be provided a report at each meeting on the amount of TRQ funding being spent on projects, similar to the TRQ report provided to the board in January 2023. After discussion, Chair Whittaker asked staff to research and present a clear definition of what the funds TRQ funds can and cannot be used for, and where and how the money can be invested.

The board discussed the research funding target for 2024-25. Dr. Slaton referred to the UADA's Fall project updates for rice research recently submitted to the board, shown as **Attachment 3**.

Moved by Schwarz, seconded by Gairhan to set the target amount for funding research proposals at \$2.7 million.

Motion carried.

Chair Whittaker presented a draft Memorandum of Understanding (MOU) regarding funding advances to the UADA, shown as **Attachment 4**.

Following discussion, Chair Whittaker asked staff for a review of Rule 2012-A, the Arkansas Department of Finance and Administration's rule for the management of cash funds, before making a final decision on the proposed MOU.

Corey Seats, Agriculture Department General Council, gave a presentation on the Arkansas Freedom of Information Act as it pertains to board members, shown as **Attachment 5**.

Wiedower presented the board an overview of Rule 2012-A. Funds are to be invested where they can earn interest and stay within the Federal Deposit Insurance Corporation (FDIC) insurance limits, which is \$250,000. If the funds go over that amount, the institution is required to collateralize the investment, which is a formal pledging of securities against deposits.

Moved by Rutledge, seconded by Williams to approve the signing of the MOU as presented.

Motion carried.

Kelly Robbins, Executive Director, Arkansas Rice made a presentation, shown as **Attachment 6**. Robbins stated Arkansas Rice exists to represent all the people who provide goods and services within the rice industry in the state. Arkansas Rice is a trade association that provides education, representation, and communication for the rice industry.

John Carlin, UADA, gave an update on the foundation seed program, shown as **Attachment 7**.

Chair Whitaker called for a working lunch.

Dr. Jarrod Hardke, UADA, presented a 2024 rice crop overview, shown as **Attachment 8**.

Dr. De Guzman, UADA, presented a review of advanced breeding lines and potential releases, shown as **Attachment 9**.

Dr. Sha, UADA, presented a rice breeding program update, shown as **Attachment 10**.

Dr. Nathan Slaton, UADA, reported on advancements of research funds from the board in the amounts of \$350,000 and \$550,000, stating those fund amounts have been invested in 6-month CDs with a 4.52 percent interest rate. The royalty balance is \$19,815.80.

Dr. Slaton stated he would like the board's input as to how they want new and continuing proposals presented in the upcoming meetings.

Discussion followed.

February 5th and 6th, 2025 were selected as tentative dates for research funding meetings in Little Rock at the Arkansas Department of Agriculture.

February 25, 2025, was selected as the promotion funding meeting in Stuttgart, AR.

Chair Whitaker asked the board for ideas to submit to the University of Arkansas as to what they would like to see in research proposals. Topics mentioned were residue burning, milling yield, and weed control.

Chair Whitaker stated the board needs to elect someone to be the Col-Rice representative to replace Wayne Wiggins. He asked members to let them know if they are interested or if they have suggestions.

Chair Whitaker stated the board has previously had three ex officio members representing the milling industry. The most recent ex officio members were Jason Brancel, Keith Glover, and Colin Holzauer. Because Brancel is no longer with Riceland, Chair Whitaker asked the board to consider a replacement.

Moved by Rutledge for the board to have Kevin McGilton, Keith Glover, and Colin Holzhauer as ex officio members. No second was made.

The board discussed the authority, purpose, and need for ex officio members.

Moved by Gairhan to table the decision on ex officio members, seconded by Williams.

Motion carried.

Chair Whitaker stated the next board meeting is scheduled for Saturday, December 7, 2024, at 5:00 p.m. for a presentation from USA Rice. The meeting will be held at the Little Rock Marriott.

Dr. Slaton stated if the board wants to participate in the National Institute of Food and Agriculture (NIFA) Commodity Board Program, they will need to select a research topic to be submitted before December 9, 2024.

University of Arkansas personnel left the meeting room for the board to discuss ideas for proposed topics.

The board discussion various funding topics and their potential impact on the rice industry.

Moved by Schwarz, seconded by Rutledge to present rice quality as a proposed topic with a funding amount of \$150,000.

Motion carried.

Motion made and seconded to adjourn.

Motion carried.

Meeting adjourned.



Jim Whitaker, Chairman

Attachment 1**Arkansas Rice Research and Promotion Board
Income, Expenses, and Accumulated Revenue
July 01, 2024 Through September 30, 2024****REVENUE:**

Beginning Fund Balance	\$ 1,065,930
Gross Collections	\$ 703,555
Producer	\$ 351,723
Buyer	\$ 351,723
Audit penalties and interest	\$ 109

DEDUCTIONS:

Less Revenue and Treas. (3.1%)	\$ 21,107
TOTAL AVAILABLE REVENUE	\$ 1,748,378

EXPENDITURES:

Board Member Expenses	\$ 237
Program Expenses:	
USA Rice Council	\$ 191,618
University of Arkansas	\$ 342,277
Producer Information	\$ -
Rice Foundation	\$ -
Coop. Ext. Service	\$ -
Total Program	\$ 533,895
TOTAL EXPENDITURES	\$ 534,132

ACCUMULATED REVENUE:

	\$ 1,214,246
Contingency Reserve	\$ -
Payable to Rice Foundation	\$ -
Payable to USA Rice Council	\$ 247,524
Payable to UofA	\$ 900,000
Unallocated Balance	\$ 66,723

Arkansas Rice Research and Promotion Board
Projection of Collections
As of September 30, 2024

	PROJECTED			Current Year Actual
	@ 100% of Max. Gross Collections	@ 95% of Max. Gross Collections	@ 90% of Max. Gross Collections	
Production, measured in bushels	241,680,000	229,596,000	217,512,000	26,057,600
Rate	\$0.027	\$0.027	\$0.027	\$0.027
Max. Gross Collections (MGC)	\$6,525,360	\$6,199,092	\$5,872,824	\$703,555
ACTUAL COLLECTIONS:				
Producer Collections	\$3,262,680	\$3,099,546	\$2,936,412	\$351,723
Buyer Collections	\$3,262,680	\$3,099,546	\$2,936,412	\$351,723
Audit Settlements (Penalties and Inter)	\$0	\$0	\$0	\$109
TOTAL COLLECTIONS	\$6,525,360	\$6,199,092	\$5,872,824	\$703,555
Percent of MGC Realized				10.78% †
Less:				
Revenue and Treasury (3.1%)	\$202,286	\$192,172	\$182,058	\$21,107
Board Expenses	\$5,000	\$5,000	\$5,000	\$237
Total	\$207,286	\$197,172	\$187,058	\$21,344
NET COLLECTIONS	\$6,323,074	\$6,006,920	\$5,690,766	\$682,449
Beginning Balance	\$1,065,930	\$1,065,930	\$1,065,930	\$1,065,930
Due USA Rice from Previous Year	\$98,036	\$98,036	\$98,036	\$98,036
Unallocated Beginning Balance (Resea	\$967,894	\$967,894	\$967,894	\$967,894
PROMOTION/MARKET DEVELOPMENT:				
AVAILABLE FUNDS	\$3,257,073	\$3,098,996	\$2,940,919	\$439,141
USA Rice Council	\$3,257,073	\$3,098,996	\$2,940,919	\$439,141
RESEARCH:				
AVAILABLE FUNDS	\$4,126,931	\$3,968,854	\$3,810,777	\$1,309,000
24-25 Research Funding	\$342,277	\$342,277	\$342,277	\$342,277
25-26 Research Funding	\$3,784,654	\$3,626,577	\$3,468,500	\$966,723
25-26 Research Funding Advance	(\$2,000,000)	(\$2,000,000)	(\$2,000,000)	(\$900,000)
Contingency Reserve	\$0	\$0	\$0	\$0
Unallocated Balance	\$1,784,654	\$1,626,577	\$1,468,500	\$66,723

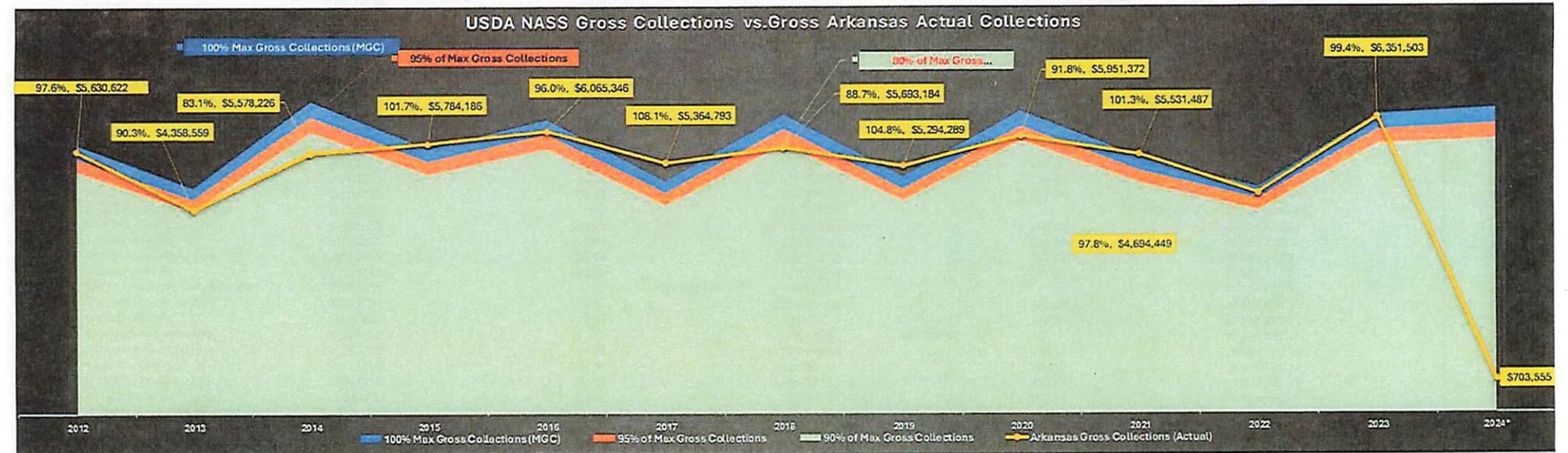
* 2024 Production est. based on September 2024 USDA/NASS Forecast. of 1.431 mil. acres harvested @ 7,600 lbs/acre

† Percent of the \$6,525,360 (MGC) realized to date.

USDA NASS Gross Collections vs Arkansas Actual Gross Collections

USDA NASS Arkansas acreage, yield, production, and price; check-off rate per bushel; USDA NASS estimated gross collections by fiscal year; and Arkansas actual gross collections by fiscal year for production years 2012 to 2024

Production Year Fiscal Year, July 1 - June 30	2012 FY-2013	2013 FY-2014	2014 FY-2015	2015 FY-2016	2016 FY-2017	2017 FY-2018	2018 FY-2019	2019 FY-2020	2020 FY-2021	2021 FY-2022	2022 FY-2023	2023 FY-2024	2024* FY-2025
Planted Acres	1,291,000	1,076,000	1,486,000	1,311,000	1,546,000	1,161,000	1,441,000	1,161,000	1,461,000	1,211,000	1,106,000	1,436,000	1,451,000
Harvested Acres	1,285,000	1,064,000	1,480,000	1,291,000	1,521,000	1,104,000	1,422,000	1,126,000	1,441,000	1,193,000	1,080,000	1,411,000	1,431,000
Yield, measured in pounds / acre	7,480	7,560	7,560	7,340	6,920	7,490	7,520	7,480	7,500	7,630	7,410	7,550	7,600
Yield, measured in bushels / acre	166	168	168	163	154	166	167	166	167	170	165	168	169
Production, measured in pounds	9,611,800,000	8,043,840,000	11,188,800,000	9,475,940,000	10,525,320,000	8,268,960,000	10,693,440,000	8,422,480,000	10,807,500,000	9,102,590,000	8,002,800,000	10,653,050,000	10,875,600,000
Production, measured in bushels	213,595,556	178,752,000	248,640,000	210,576,444	233,896,000	183,754,667	237,632,000	187,166,222	240,166,667	202,279,778	177,840,000	236,734,444	241,680,000
Price received, measured in \$ / cwt	\$ 14.30	\$ 15.20	\$ 12.00	\$ 10.90	\$ 9.39	\$ 11.10	\$ 10.70	\$ 11.90	\$ 12.50	\$ 13.50	\$ 16.70	\$ 16.00	\$ 15.10
Price received, measured in \$ / bushels	\$ 6.44	\$ 6.84	\$ 5.40	\$ 4.91	\$ 4.23	\$ 5.00	\$ 4.82	\$ 5.36	\$ 5.63	\$ 6.08	\$ 7.52	\$ 7.20	\$ 6.80
Rate	\$0.0270	\$0.0270	\$0.0270	\$0.0270	\$0.0270	\$0.0270	\$0.0270	\$0.0270	\$0.0270	\$0.0270	\$0.0270	\$0.0270	\$0.0270
Rate - Arkansas rice farmers and handlers each pay \$0.0135 per bushel sold for the Arkansas Rice Checkoff program.													
100% Max Gross Collections (MGC)	\$ 5,767,080	\$ 4,826,304	\$ 6,713,280	\$ 5,685,564	\$ 6,315,192	\$ 4,961,376	\$ 6,416,064	\$ 5,053,488	\$ 6,484,500	\$ 5,461,554	\$ 4,801,680	\$ 6,391,830	\$ 6,525,360
95% of Max Gross Collections	\$ 5,478,726	\$ 4,584,989	\$ 6,377,616	\$ 5,401,286	\$ 5,999,432	\$ 4,713,307	\$ 6,095,261	\$ 4,800,814	\$ 6,160,275	\$ 5,188,476	\$ 4,561,596	\$ 6,072,239	\$ 6,199,092
90% of Max Gross Collections	\$ 5,190,372	\$ 4,343,674	\$ 6,041,952	\$ 5,117,008	\$ 5,683,673	\$ 4,465,238	\$ 5,774,458	\$ 4,548,139	\$ 5,836,050	\$ 4,915,399	\$ 4,321,512	\$ 5,752,647	\$ 5,872,824
Arkansas Gross Collections (Actual)	\$ 5,630,622	\$ 4,358,559	\$ 5,578,226	\$ 5,784,186	\$ 6,065,346	\$ 5,364,793	\$ 5,693,184	\$ 5,294,289	\$ 5,951,372	\$ 5,531,487	\$ 4,694,449	\$ 6,351,503	\$ 703,555
Arkansas Gross Collections (Actual) % of MGC	97.6%	90.3%	83.1%	101.7%	96.0%	108.1%	88.7%	104.8%	91.8%	101.3%	97.8%	99.4%	10.78%



Attachment 2

The Rice Foundation
 TRQ-EU Arkansas Discretionary Research Funds
 TRQ-COL Arkansas Discretionary Research Funds
 September 30, 2024

	EUROPE TRQ				COLOMBIA TRQ				Grand Total Balance	* Total Interest Income Allocated
	Date	Arkansas Research funding received from AARQ/EU TRQ	Interest	Research Project Expenditures	Balance	Arkansas Research funding received from Co/Rice - Colombia TRQ	Interest	Research Project Expenditures		
Beginning balance 3/09					-					
Interest received	12/31/2021		93.67		1,204,246.01		738.27		9,491,790.56	831.94
Accrued interest on CDs	12/31/2021		47.02		1,204,293.03		370.59		9,492,161.15	417.61
Interest received	1/31/2022		101.90		1,204,394.93		803.20		9,492,964.35	905.10
Accrued interest on CDs	1/31/2022		54.02		1,204,448.95		425.79		9,493,390.14	479.81
CO-TRQ wire received	2/24/2022		-		1,204,448.95	765,206.05	-		10,258,596.19	-
Interest received	2/28/2022		88.48		1,204,535.43		736.60		10,259,332.79	823.08
Accrued interest on CDs	2/29/2022		65.81		1,204,601.24		560.53		10,259,893.32	626.34
Rice Foundation membership	3/29/2022		-	(35,000.00)	1,169,601.24		-		10,259,893.32	-
Interest received	3/31/2022		145.68		1,169,746.92		1,277.94		10,261,171.26	1,423.62
Accrued interest on CDs	3/31/2022		24.28		1,169,771.20		213.01		10,261,384.27	237.29
Interest received	4/30/2022		119.24		1,169,890.44		1,045.99		10,262,430.26	1,165.23
Accrued interest on CDs	4/30/2022		203.61		1,170,094.05		1,766.05		10,264,216.31	1,989.66
UAR-NEA research station	5/19/2022		-		1,170,094.05		-	(260,107.86)	10,004,108.45	-
Interest received	5/31/2022		303.15		1,170,397.20		2,591.86		10,006,700.31	2,895.01
Accrued interest on CDs	5/31/2022		91.74		1,170,488.94		784.36		10,007,484.67	876.10
Interest received	6/30/2022		139.29		1,170,628.23		1,190.90		10,008,675.57	1,330.19
Accrued interest on CDs	6/30/2022		294.40		1,170,922.63		2,517.08		10,011,192.65	2,811.48
CO-TRQ wire received	7/1/2022		-		1,170,922.63	427,141.26	-		10,438,333.91	-
Interest received	7/31/2022		130.47		1,171,053.10		1,163.13		10,439,497.04	1,293.60
Accrued interest on CDs	7/31/2022		518.27		1,171,571.37		4,620.21		10,444,117.25	5,138.48
Interest received	8/31/2022		369.90		1,171,941.27		3,297.50		10,447,414.75	3,667.40
Accrued interest on CDs	8/31/2022		434.69		1,172,375.96		3,875.09		10,451,289.84	4,309.78
Interest received	9/30/2022		1,057.65		1,173,433.61		9,428.58		10,460,718.42	10,486.23
Accrued interest on CDs	9/30/2022		(74.98)		1,173,358.63		(668.37)		10,460,050.05	(743.35)
Interest received	10/31/2022		878.19		1,174,236.82		7,828.73		10,467,878.78	8,706.92
Accrued interest on CDs	10/31/2022		165.28		1,174,402.10		1,473.44		10,469,352.22	1,638.72
CO-TRQ wire received	11/3/2022		-		1,174,402.10	534,339.17	-		11,003,691.39	-
Interest received	11/30/2022		534.44		1,174,936.54		5,007.52		11,008,698.91	5,541.96
Accrued interest on CDs	11/30/2022		434.12		1,175,370.66		4,067.55		11,012,766.46	4,501.67
UAR-NEA station director	12/30/2022		-		1,175,370.66		-	(134,825.37)	10,877,941.09	-
Interest received	12/31/2022		1,078.91		1,176,449.57		9,985.22		10,887,926.31	11,064.13
Accrued interest on CDs	12/31/2022		(145.60)		1,176,303.97		(1,347.52)		10,886,578.79	(1,493.12)
Interest received	1/31/2023		1,141.40		1,177,445.37		10,563.59		10,897,142.38	11,704.99
Accrued interest on CDs	1/31/2023		(260.46)		1,177,184.91		(2,410.56)		10,894,731.82	(2,671.02)
CO-TRQ wire received	2/14/2023		-		1,177,184.91	811,014.67	-		11,705,746.49	-
Interest received	2/28/2023		536.84		1,177,721.75		5,338.21		11,711,084.70	5,875.05
Accrued interest on CDs	2/28/2023		1,204.86		1,178,926.61		11,980.96		11,723,065.66	13,185.82
UAR-NEA research station	3/1/2023		-		1,178,926.61		-	(2,700,000.00)	9,023,065.66	-
Interest received	3/31/2023		2,593.74		1,181,520.35		19,851.53		9,042,917.19	22,445.27
Accrued interest on CDs	3/31/2023		(1,366.81)		1,180,153.54		(10,461.09)		9,032,456.10	(11,827.90)
UAR-NEA research station	4/13/2023		-		1,180,153.54		-	(850,000.00)	8,182,456.10	-
Interest received	4/30/2023		875.36		1,181,028.90		6,069.18		8,188,525.28	6,944.54
Accrued interest on CDs	4/30/2023		483.85		1,181,512.75		3,354.75		8,191,880.03	3,836.60
AR Producer Ed. Campaign	5/24/2023		-		1,181,512.75		-	(13,800.00)	8,178,080.03	-
Interest received	5/31/2023		711.49		1,182,224.24		4,924.69		8,183,004.72	5,636.18
Accrued interest on CDs	5/31/2023		667.96		1,182,892.20		4,623.45		8,187,628.17	5,291.41
UAR-NEA research station	6/28/2023		-		1,182,892.20		-	(750,000.00)	7,437,628.17	-
UAR-NEA research station	6/30/2023		-		1,182,892.20		-	(200,000.00)	7,237,628.17	-
AR Producer Ed. Campaign	6/30/2023		-		1,182,892.20		-	(5,861.98)	7,231,766.19	-
Interest received	6/30/2023		1,585.23		1,184,477.43		9,691.51		7,241,457.70	11,276.74
Accrued interest on CDs	6/30/2023		(102.41)		1,184,375.02		(626.13)		7,240,831.57	(728.54)
Interest received	7/31/2023		1,064.64		1,185,439.66		6,508.80		7,247,340.37	7,573.44
Accrued interest on CDs	7/31/2023		440.91		1,185,880.57		2,695.59		7,250,035.96	3,136.50
AR Producer Ed. Campaign	8/24/2023		-		1,185,880.57		-	(7,200.00)	7,242,835.96	-
UAR-NEA station director	8/31/2023		-		1,185,880.57		-	(138,363.58)	7,104,472.38	-
Rice Foundation membership	8/31/2023		-	(35,000.00)	1,150,880.57		-		7,104,472.38	-
Interest received	8/31/2023		525.34		1,151,405.91		3,242.98		7,107,715.36	3,768.32
Accrued interest on CDs	8/31/2023		975.15		1,152,381.06		6,019.64		7,113,735.00	6,994.79
Interest received	9/30/2023		1,947.47		1,154,328.53		12,021.90		7,125,756.90	13,989.37
Accrued interest on CDs	9/30/2023		(481.71)		1,153,846.82		(2,973.62)		7,122,783.28	(3,455.33)
CDARS Wire Received	10/19/2023		587.39		1,154,434.21		3,625.97		7,126,409.25	4,213.36

The Rice Foundation
TRQ-EU Arkansas Discretionary Research Funds
TRQ-COL Arkansas Discretionary Research Funds
September 30, 2024

Date	EUROPE TRQ				COLOMBIA TRQ				Grand Total Balance	* Total Interest Income Allocated
	Arkansas Research funding received from AARQ/EU TRQ	Interest	Research Project Expenditures	Balance	Arkansas Research funding received from ColRice - Colombia TRQ	Interest	Research Project Expenditures	Balance		
Beginning balance 3/99				-						
Interest received	10/31/2023	1,493.25		1,155,340.07		9,217.98		7,132,001.26		10,711.23
Accrued interest on CDs	10/31/2023	(568.26)		1,154,771.81		(3,507.90)		7,128,493.36		(4,076.16)
CO-TRQ wire received	11/1/2023	-		1,154,771.81	184,901.25	-		7,313,394.61		-
UAR-DA Research facility (\$5.3	11/9/2023	-		1,154,771.81			(800,000.00)	6,328,493.36		-
CDARS Wire Received	11/16/2023	2,923.78		1,157,695.59		18,516.85		7,331,911.46		21,440.63
Interest received	11/30/2023	562.55		1,155,334.36		3,562.77		7,316,957.38		4,125.32
Accrued interest on CDs	11/30/2023	(2,405.86)		1,152,365.95		(13,184.82)		6,315,308.54		(15,590.68)
Chain Bridge Bank Fee	12/29/2023	(0.68)		1,157,694.91		(4.32)		7,331,907.14		(5.00)
Interest received	12/31/2023	1,342.02		1,156,676.38		8,499.29		7,325,456.67		9,841.31
Accrued interest on CDs	12/31/2023	593.09		1,152,959.04		3,250.28		6,318,558.82		3,843.37
Interest received	1/31/2024	1,096.84		1,157,773.22		6,946.52		7,332,403.19		8,043.36
Accrued interest on CDs	1/31/2024	827.83		1,153,786.87		4,536.75		6,323,095.57		5,364.58
CAMP-WARD PR mgmt - AR disc/Co	2/12/2024	-		1,157,773.22		-	(2,000.00)	7,330,403.19		-
CO-TRQ wire received	2/16/2024	-		1,153,786.87	1,400,217.28	-		7,723,312.85		-
Interest received	2/29/2024	388.94		1,158,162.16		2,462.54		7,332,865.73		2,851.48
Accrued interest on CDs	2/29/2024	1,146.39		1,154,933.26		7,673.78		7,730,986.63		8,820.17
Interest received	3/31/2024	1,701.96		1,159,864.12		10,775.90		7,343,641.63		12,477.86
Accrued interest on CDs	3/31/2024	(472.44)		1,157,689.72		(2,991.21)		7,329,874.52		(3,463.65)
Rice Foundation membership	3/31/2024	-	(35,000.00)	1,119,933.26		-		7,730,986.63		-
Chain Bridge Wire Transfer Fee	3/31/2024	(3.41)		1,158,158.75		(21.59)		7,332,844.14		(25.00)
Interest received	4/30/2024	2,808.89		1,157,742.15		18,802.39		7,749,789.02		21,611.28
Accrued interest on CDs	4/30/2024	684.78		1,160,548.90		4,335.69		7,347,977.32		5,020.47
McGehee Bank Fees	4/30/2024	(443.66)		1,157,246.06		(2,809.03)		7,327,065.49		(3,252.69)
AARQ Annual Distribution	5/8/2024	75,905.73		1,195,838.99		-		7,730,986.63		-
Chain Bridge Wire Transfer Fee	5/7/2024	(3.41)		1,158,155.34		(21.59)		7,332,822.55		(25.00)
May 2024 McGehee Bank Fee	5/31/2024	(51.99)		1,157,690.16		(348.01)		7,749,441.01		(400.00)
Interest received	5/31/2024	2,030.20		1,162,579.10		12,854.18		7,360,831.50		14,884.38
Accrued interest on CDs	5/31/2024	1,134.52		1,158,380.58		7,183.20		7,334,248.69		8,317.72
CO-TRQ wire received	6/28/2024	-		1,195,838.99	382,686.46	-		8,113,673.09		-
June 2024 McGehee Bank Fee	6/30/2024	(288.81)		1,157,866.53		(1,828.57)		7,330,993.98		(2,117.38)
Interest received	6/30/2024	3,427.77		1,161,117.93		22,945.09		7,772,386.10		26,372.86
Accrued interest on CDs	6/30/2024	30.35		1,162,609.45		192.14		7,361,023.64		222.49
Chain Bridge Wire Transfer Fee	7/15/2024	(3.41)		1,158,377.17		(21.59)		7,334,227.10		(25.00)
CAMP-WARD AR Producer Ed. Camp	7/29/2024	-		1,195,838.99		-	(6,000.00)	8,107,673.09		-
CAMP-WARD AR Producer Ed. Camp	7/29/2024	-		1,157,866.53		-	(2,000.00)	7,328,993.98		-
Chain Bridge Wire Transfer Fee	7/30/2024	(3.25)		1,161,114.68		(21.75)		7,772,364.35		(25.00)
Interest received	7/31/2024	4,003.64		1,166,613.09		25,348.91		7,386,372.55		29,352.55
July 2024 McGehee Bank Fee	7/31/2024	(194.46)		1,158,182.71		(1,231.19)		7,332,995.91		(1,425.65)
Accrued interest on CDs	7/31/2024	301.58		1,196,140.57		2,044.67		8,109,717.76		2,346.25
Interest received	8/31/2024	3,854.17		1,161,720.70		24,395.93		7,353,389.91		28,250.10
August 2024 McGehee Bank Fee	8/31/2024	(77.98)		1,161,036.70		(522.02)		7,771,842.33		(600.00)
Accrued interest on CDs	8/31/2024	888.18		1,167,501.27		5,623.51		7,391,996.06		6,511.69
UAR-NEA research station	9/4/2024	-		1,158,182.71		-	(137,913.86)	7,195,082.05		-
Rice Foundation membership	9/6/2024	-	(35,000.00)	1,161,140.57		-		8,109,717.76		-
Interest received	9/30/2024	5,080.25		1,166,800.95		32,156.63		7,385,546.54		37,236.88
September 2024 McGehee Bank Fee	9/30/2024	(432.60)		1,160,604.10		(2,895.80)		7,768,946.53		(3,328.40)
Accrued interest on CDs	9/30/2024	(409.37)		1,167,091.90		(2,591.89)		7,389,404.17		(3,001.26)
Ending balance		6,236,938.67	778,203.66	(5,823,841.00)	1,191,301.33	44,891,153.21	1,352,236.64	(37,897,765.75)	8,345,624.10	9,536,925.43



DIVISION OF AGRICULTURE
RESEARCH & EXTENSION

University of Arkansas System

Fall Project Updates for
Rice Research
2024-2025

October 22, 2024

Submitted to the
Arkansas Rice Research and
Promotion Board



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

Lead Investigators: Xueyan Sha

Co-Investigators: Jeremy Edwards, Christian De Guzman, Yulin Jia

Status: Year 1 of 3

Objectives:

1. **Innovative Variety Development:** Create new rice varieties with enhanced resistance to blast disease, suitable for water-efficient farming methods.
2. **Genomic Technology Integration:** Seamlessly 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.
3. **Economic and Environmental Sustainability:** Develop rice varieties that are not only cost-effective for farmers but also contribute to environmental conservation efforts in Arkansas.

Progress/Accomplishments:

This year, we successfully recruited and hired a postdoctoral researcher in October. The recruitment process was particularly challenging due to the highly specialized nature of the skills required, including both advanced data science expertise and a deep understanding of plant genetics. These competencies are in high demand across multiple sectors, which added complexity to the search.

Despite these challenges, we made significant progress prior to the postdoc's appointment. Specifically, we developed comprehensive databases of genomic sequence variants for U.S. rice varieties, which serve as foundational resources for ongoing research. Additionally, we created tools to leverage these databases in designing a single nucleotide polymorphism (SNP) panel that is optimized for use in genomic selection with Arkansas rice breeding lines.

Upcoming Actions/Activities:

In the coming year, our primary focus will be on the following activities:

1. **Creation and testing of an optimized SNP panel:** Building on the tools and databases developed, we will finalize and test a new optimized SNP panel tailored to Arkansas rice breeding lines. This panel will be fine-tuned for maximal efficiency in genomic selection, enabling precise and accelerated selection for desired traits.
2. **Curation of breeding records:** We will curate breeding records from recent past seasons to populate our breeding database. This process will ensure that comprehensive historical data is available for the development of predictive models and the evaluation of breeding progress.
3. **Design of a genomic selection experiment:** We will design a genomic selection experiment with distinct training, testing, and validation subsets. These subsets will be planted and evaluated during the 2025 field season. This experiment will involve collecting phenotypic data on key agronomic traits and genotyping the experimental population using the new SNP panel. This

experiment will provide critical data to validate the panel's efficacy in genomic selection and enhance breeding strategies.

- 4. Marker-assisted selection for blast resistance:** We will advance marker-assisted selection efforts to introduce effective and new blast resistance genes into elite breeding lines. Using molecular markers associated with blast resistance previously developed by ARS, we will accelerate the incorporation of these valuable genes into high-yielding lines, with the goal of developing improved, disease-resistant varieties that maintain or enhance agronomic performance.

These future activities are critical for advancing our genomic selection pipeline and enhancing disease resistance in Arkansas rice breeding programs.

CONFIDENTIAL

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

Lead Investigators: Vibha Srivastava

Co-Investigators: None

Status: Year 1

Objectives: Develop *V-PPase* knock-down (*kd*) lines using rice cultivars, Diamond, RoyJ, LaGrue

Progress/Accomplishments: The goal of this project is to validate the effects of *vpp5* knock-down (*kd*) mutation in elite rice by (1) developing *kd* lines in elite rice background, and (2) analyze grain characteristics of the *kd* lines in a controlled environment study.

(1) Validate the effect of *vpp5* knock-down (*kd*) mutation in elite rice:

- We developed a CRISPR/Cas9 vector, pJU43, for *Agrobacterium*-mediated transformation of rice.
- We tested tissue culture response of a few different Arkansas cultivars and selected Diamond based on its callus induction efficiency (72%: % seeds producing compact callus within 4 weeks). The intensive work on tissue culture prevents us from using more than 1 – 2 cultivars but we are planning to include LaGrue in subsequent experiments. In the meantime, we included Kitaake as the model, easy-to-transform rice variety and carried out a small-scale experiment.
- We developed 7 and 5 transformed callus events on Diamond and Kitaake, respectively. While Kitaake lines have regenerated plants, Diamond appears to be slow to regenerate (Fig. 1A-B).
- DNA analysis of 3 Diamond lines (callus) confirmed the presence of mutations in each. One line (DA1) contained biallelic homozygous mutations at targeted *vpp5* sites (Fig. 1C), while the other 2 (DA2, DA3) contained chimeric mutations. Overall, this analysis validated our methods including the effectiveness of the vector in targeting *VPP5* gene in rice.

(2) Analyze grain characteristics of the Nipponbare plants carrying *vpp5-kd* mutation (Nip-*kd* lines) in a controlled environment study:

- Since elite rice *kd* lines were not available, plant phenotyping was done using the Nipponbare-*kd* lines, previously developed in our lab. Primarily, the high nighttime temperature (HNT) response was determined using the protocol described by Dr. Counce. Thirty plants each of Nip-*kd* and Nip-wildtype (WT) were grown in the greenhouse. At R2 stage, 15 plants of each genotype were transferred to the HNT chamber set at 30°C daytime and 28°C nighttime with 14 hours of daytime from 6am to 8pm and allowed grow until maturity.
- Following traits were evaluated: plant height, days to flowering, panicle number and length, % sterility (filled vs empty spikelets), weight of 100 grains, length of grain, and % chalk.
- Nip-*kd* lines were shorter than WT and took approx. 5 more days to flower. There was no significant difference in panicle number and panicle length. There was a significant difference in the number of empty spikelets in the two genotypes, indicating lower % sterility in Nip-*Kd* line in both greenhouse and HNT conditions (Fig. 2A). However, weight of 100 grains was not different between the two genotypes in either condition.
- % chalkiness and grain length were significantly different between the two genotypes. WT grains showed 12 – 14% chalkiness in the greenhouse and HNT; whereas, Nip-*kd* lines showed only 4 - 5% grain chalk (Fig. 2B).

Upcoming Actions/Activities:

1. In the upcoming months and Year 2, our emphasis will be on scaling up tissue culture and transformation of Diamond rice. Our goal will be to develop at least 3 independent lines to analyze the effect of the mutation.
2. These lines will be analyzed by PCR-sequencing to determine the presence of mutations and subjected to *VPP5* gene expression analysis using caryopses at 5 and 10 days after fertilization.
3. The selected lines will be grown in the greenhouse and the progeny will be analyzed to identify Cas9 (-) lines harboring homozygous mutations.

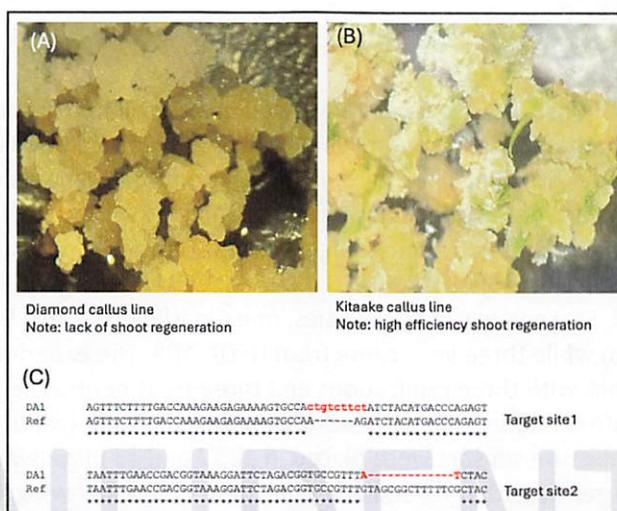


Fig. 1: Development of kd lines in elite rice background. (A-B) Callus characteristics of elite rice, Diamond, and the tissue culture model rice, Kitaake. (C) DNA analysis of Diamond line (DA1) showing targeted mutations (red).

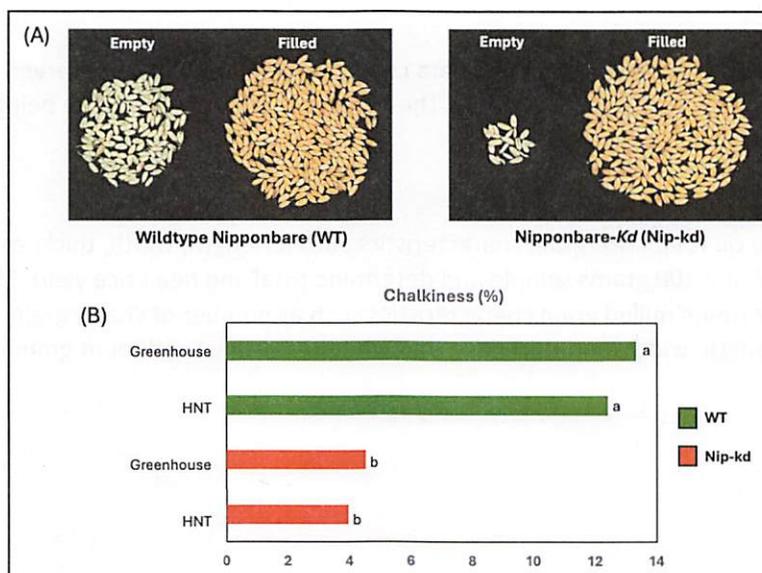


Fig. 2: Grain characteristics of wildtype (WT) and *vpp5* knockdown (*kd*) lines in Nipponbare background. (A) Number of empty and filled spikelets indicating higher sterility in WT under HNT environment. (B) % chalk in the grains of WT and *kd* lines grown in the greenhouse or HNT chamber

Title: Incorporating Genetic Tolerance to Reduced Irrigation into the Arkansas Rice Breeding Program
Lead Investigators: Christian De Guzman, Jai Rohila
Co-Investigators: Xueyan Sha, Pual Counce
Status: Year 1 of 3
Objectives: Identifying component traits for grain yield and quality of long grain advanced breeding rice lines under deficit irrigation system.

Progress/Accomplishments:

Our goal in the first year of this trial is to assess advanced breeding lines for tolerance to deficit irrigation, estimate trait heritability and genomic heritability of measured traits and identify strengths and weaknesses of advanced breeding lines for deficit irrigation. Our team planted a total of 100 entries of advanced and released varieties. 80 lines came from advance experimental lines from the long grain Clearfield and Conventional Arkansas rice breeding program. Two conventional checks Diamond and Ozark, five Clearfield varieties CLL19, CLL18, CLL16, CLHA02, CLHA03 and two Provisia varieties PVL03 and PVL04 were included. Five conventional varieties, one Clearfield and two Provisia line came from the LSU breeding program while three lines came from USDA ARS. The experimental design is a randomized complete block with three replications and three treatments. The treatments are three irrigation regimes T1-control: flooded, T2: soil matric potential of -30CB (centibars) and T3: soil matric potential of -60CB. Soil moisture sensors were placed in all T2 and T3 block while control was flooded until maturity. We are currently gathering and analyzing data of the following: Emergence, 50% days to heading, plant height at maturity, lodging, grain yield, chlorophyll content, 1000 grain weight, total rice, head rice, milling degree, whiteness, grain chalk, biomass and harvest index.

Upcoming Actions/Activities:Plant characteristics

We are still in the process of harvesting and data collection of this trial. We observed differences in maturities under different treatment regimes. The harvested rows are currently being dried, weighted for biomass yield and panicle treshed.

Grain characteristics

We will obtain data on rough rice grain characteristics such as length, width, thickness and 1000 grain weight. We will mill the 100 grams sample and determine total and head rice yield. 15 grams of sample will be used to determine milled grain characteristics such as number of chalky grain, % chalk (chalk impact), average length, width, and thickness, and whiteness using SeedCount grain imager.

Title: Integrating Host Resistance and Fungicides to Control *Cercospora* in Rice

Lead Investigators: Camila Nicolli, UA System Division of Agriculture

Co-Investigators: Jarrod Hardke, UA System Division of Agriculture

Rodrigo Pedrozo, USDA Agricultural Research Service

Status: New (Year 1 of 3)

Objectives:

1. Identify and Characterize *Cercospora*-Resistant Rice Varieties: Conduct a comprehensive assessment of existing rice varieties to identify cultivars exhibiting resistance to *Cercospora*.
2. Optimize Fungicide Application Timing for *Cercospora* Control: Determine the most effective timing and frequency of fungicide applications to manage *Cercospora* in rice crops. Evaluate the impact of different application schedules on disease suppression, crop health, and overall yield under varying environmental conditions.
3. Quantify the impact of *Cercospora* on crop yield: Implement on-farm trials to validate the synergistic effects of combining host-resistant rice varieties with strategic fungicide applications. Evaluate the practicality and efficacy of the integrated approach in real-world agricultural settings, considering factors such as disease severity, crop productivity, and economic viability.
4. Enhance communication and end-user education/outreach for farms, agricultural advisors, research community, and grain processors through resources and recommendations related to the integrated management of *Cercospora* in rice.

Progress/Accomplishments:

Integration of genetic resistance and fungicides

In 2024, field trials were established at the Rice Research & Extension Center (RREC) in Stuttgart, the Pine Tree Research Station in Colt, and the Northeast Rice Research & Extension Center (NERREC) in Harrisburg, Arkansas. The study aimed to evaluate the effectiveness of integrating *Cercospora*-resistant rice cultivars and fungicides in managing diseases caused by the fungus *Cercospora janseana*, specifically **Narrow Brown Leaf Spot (leaf symptoms)**, ***Cercospora* Net Blotch (sheath symptoms)**, and ***Cercospora* Panicle Blight (panicle symptoms)**. The study also sought to optimize fungicide application timing and assess the impact of these diseases on rice yield. The experimental setup followed a randomized complete block design, with plot sizes of 6 ft by 15 ft and four replicates per treatment. The rice cultivars used in the study were PVL03, CLL19, and RT 7521 FP, while the fungicides applied were propiconazole (Tilt®) and prothioconazole (Phobos™). Fungicide treatments were administered at three distinct stages of rice plant development: early boot (2-inch panicle length), mid-boot (4-inch panicle length), and late boot (greater than 5-inch panicle length). Disease symptoms were monitored, and the incidence was estimated in the experimental plots. At the end of the crop cycle, the trials were harvested to gather yield data in bushels per acre. During the assessment on the 2024 trials, ***Cercospora* net blotch was the only disease symptom observed**, specifically affecting the sheath.

Quantification the impact of *Cercospora* on rice crop yield

In 2024, data analysis was conducted based on experiments established at two locations: the Rice Research & Extension Center (RREC) in Stuttgart and the Pine Tree Research Station in Colt. Since, challenges with

fungicide applications were encountered at the Harrisburg location, which affected the consistency of disease control efforts. Despite these issues, the analysis enabled the quantification of the impact of ***Cercospora net blotch*** (lesions affecting the sheath was the only disease symptom observed) on the yield of three widely used rice cultivars in Arkansas (PVL03, CLL19, and RT 7521 FP). The data gathered provides valuable insights for future research aimed at validating the synergistic effects of combining host genetic resistance with fungicide applications at different growth stages of the rice crop.

Identification and characterization of *Cercospora*-Resistant Rice Varieties

To identify and characterize *Cercospora*-resistant rice varieties, the plant pathology team conducted evaluations on the Arkansas Rice Variety Advance Trials, planted by Dr. Jarrod Hardke's group, across seven counties in Arkansas (Jefferson, Lawrence, Desha, Arkansas North, Arkansas South, St. Francis, and Crittenden). Symptomology was observed on multiple plant structures, including leaves, tillers, and panicles, providing valuable information on the resistance and susceptibility of rice breeding lines, varieties, and hybrids cultivated in the state of Arkansas.

Participation in events and extension activities

The Plant Pathology Program participated in four field days: the first was the Wheat Field Day in Marianna, followed by the Rice Research & Extension Center in Stuttgart, the Rice Field Day at LSU AgCenter in Louisiana, and lastly, the Northeast Rice Research and Extension Center in Harrisburg. In addition to these events, the program also participated in Innovations in Rice Production in Jonesboro, the 2024 Corn College at the Lon Mann Cotton Research Station in Marianna, and the International Symposium on Rice Functional Genomics in Little Rock. We were invited to visit RiceTec in Alvin, Texas, to gain a better understanding of the challenges related to plant diseases. During the 2024 season, the program published articles on disease management on the Arkansas Row Crops blog and launched the Rice Crop Care page, increasing the program's visibility. Furthermore, we conducted the first open public workshop on rice disease training, allowing everyone to learn and clarify their questions about rice diseases. The Plant Pathology Program also participated in APS Plant Health 2024 and ITRC 2024, where we presented the results of our research and took the opportunity to gain further knowledge to apply in our studies.

Upcoming Actions/Activities:

Field experiments will be conducted again during the 2025 growing season to evaluate the incidence of the pathogen over time and the effectiveness of integrated control strategies (genetic resistance and fungicides) across various scenarios at the same research stations. Optimizations of cultivar and fungicide combinations will be tested based on the results from the 2024 trials. One optimization already identified involves conducting experiments with both early and late planting dates to assess the effectiveness of integrated management and the timing of fungicide applications under different conditions, aligning with producers' needs. This approach aims to ensure precise recommendations and long-term control of *Cercospora* in rice cultivation. Additionally, ongoing monitoring of counties across Arkansas will continue to track disease progress and evaluate the performance of current cultivars, as well in the nursery plantings.

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

Lead Investigators: Dr. Camila Nicolli, University of Arkansas System Division of Agriculture

Co-Investigators:

Dr. Yulin Jia, Dr. Rodrigo Pedrozo, Southeast Dale Bumpers National Rice Research Center, USDA

Dr. Xueyan Sha, University of Arkansas System Division of Agriculture

Status: New (Year 1 of 3)

Objectives:

1. **Survey Rice Blast pathogens in the state of Arkansas:** Conduct a comprehensive survey to assess the currently prevalence and distribution of Blast races pathogen in various regions of Arkansas. Identify affected rice crops and document the severity of the blast infection.
2. **Genetic characterization of blast population in the state:** Characterize changes of the blast population through race assignment assays and determine the genetic diversity of the blast population in Arkansas through polymorphic SSR marker.
3. **Establish the success of deployed rice blast resistant genes in growing regions:** Determine the effectiveness of deployed resistance genes and genetic changes of rice blast in the Southern U.S. through *AVR* genotyping and sequencing. Assist breeding programs to confirm deployed blast resistance genes in advanced breeding materials.
4. **Evaluate advanced breeding lines under greenhouse conditions:** Implement controlled experiments to quantify the level of resistance in each variety or breeding line to be released.

Progress/Accomplishments:

1. From April to October 2024, Rice Blast sampling was carried out in twelve different counties across Arkansas (Arkansas, Clay, Cross, Jackson, Jefferson, Drew (Monticello), Independence (Newark), Poinsett, Randolph (Pocahontas), Prairie, Searcy, and Woodruff) (Figure 1). A total of 22 samples were obtained from blast-symptomatic plants and submitted to isolation techniques. Fifty isolates were obtained and purified through a single spore protocol. These isolates were preserved in sterile filter paper and stored at -20 °C for race assignment, genetic characterization, and resistance of rice lines. A rice blast outbreak was observed on the hybrid RT7521FP, suggesting a potential pathogen race shift. Several isolates were obtained from RT7521FP and are under characterization.
2. The race assignment assays are performed using eight differential varieties that exhibit distinct reactions (susceptible or resistant) depending on the pathogen race. From April to October 2024, the seeds of the eight varieties were obtained from USDA and multiplied in the field. New seeds were harvested and stored in a cold room for the upcoming tests.
3. A Postdoctoral Fellow was hired and started to work on the project in September. A molecular laboratory is being set up in the Plant Pathology group at Rice Research & Extension Center (RREC). DNA from 7 new isolates was already extracted in this new laboratory. Isolated DNA was stored and will be used to assess the genetic diversity of the blast population in Arkansas through polymorphic SSR marker.

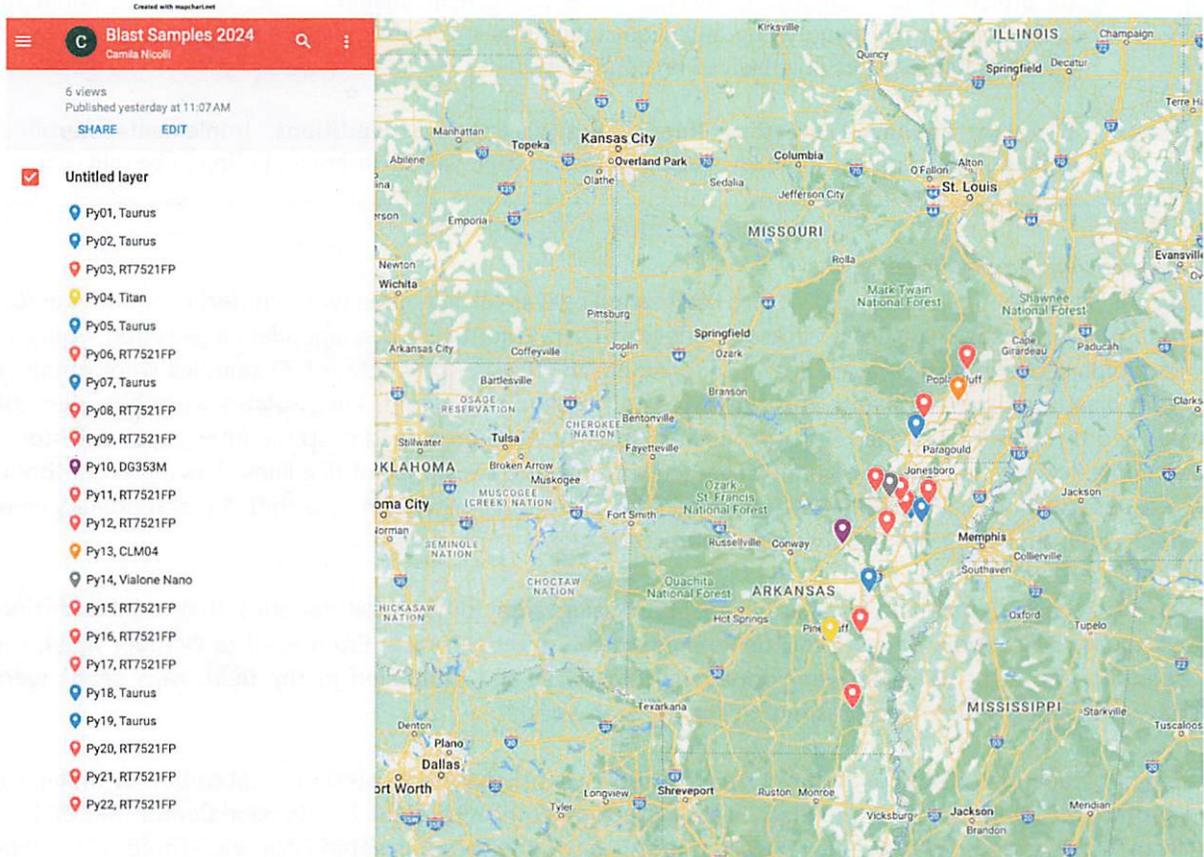
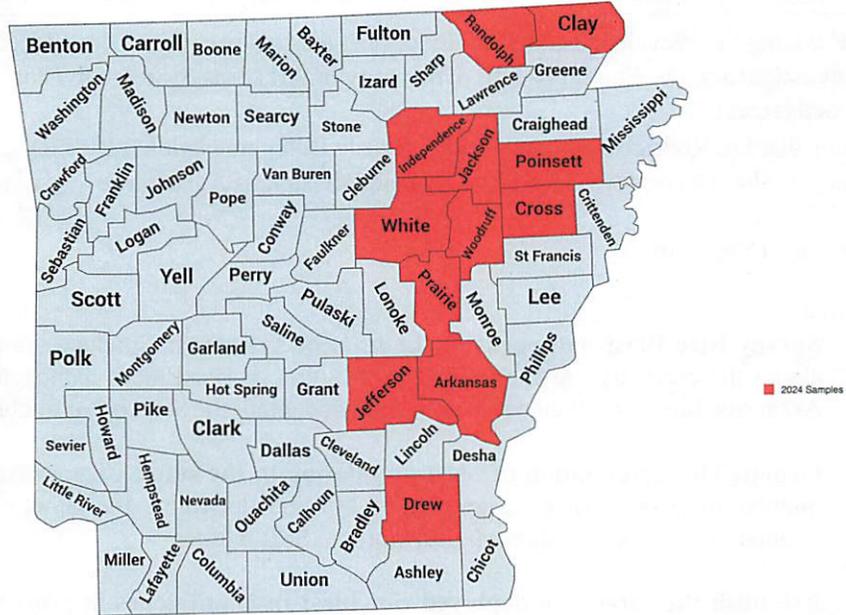


Figure 1. Distribution of blast samples collected across Arkansas state from April to September 2024.

4. The Plant Pathology Program participated in several key events throughout the year, starting with the Wheat Field Day in Marianna, followed by the Rice Research & Extension Center Field Day in Stuttgart, the Rice Field Day at LSU AgCenter in Louisiana, and concluding with the Northeast Rice Research and Extension Center Field Day in Harrisburg. The program also took part in Innovations in Rice Production in Jonesboro, the 2024 Corn College at the Lon Mann Cotton Research Station in Marianna, and the International Symposium on Rice Functional Genomics in Little Rock. Additionally, following an invitation from RiceTec in Alvin, TX, there was a visit aiming to understand the challenges related to plant diseases. During the 2024 season, the program expanded its outreach by publishing articles on disease management on the Arkansas Row Crops blog and launching the Rice Crop Care webpage, enhancing our visibility. Also, the Plant Pathology program held the first public workshop on rice disease training, providing an opportunity for participants to learn about and discuss rice disease issues. Furthermore, the Plant Pathology Program presented research findings at APS Plant Health 2024 and ITRC 2024, while also using these conferences as opportunities to gather insights for future studies. From October 11 to October 19, Dr. Camila Nicolli is going to present at the International Rice Research Institute, in Philippines and she is looking for to learn new strategies for manage and control rice diseases.

Upcoming Actions/Activities:

During the winter, plants from the eight differential varieties will be grown in the greenhouse and inoculated with the 50 isolates for the race assignment test. Simultaneously, DNA will be extracted from the other 43 *Pyricularia oryzae* isolates. Also, protocols for *avirulence* gene identification will be developed. Activities from objectives 3 and 4 will be performed as soon as objective 2 is complete.

Title: Validation of In-Season Tissue Sampling for Rice Nutrient Management

Lead Investigators: J.T. Hardke

Co-Investigators: T.L. Roberts, G. Drescher, D.L. Frizzell, E. Castaneda-Gonzalez, T.L. Clayton, H. Hartley

Status: Year 1 of 3

Objectives:

- 1. Evaluation of rice response to in-season corrective fertilizer applications based on plant-tissue concentrations for nitrogen (N), phosphorus (P), and potassium (K).**
- 2. Validate critical plant-tissue concentration thresholds to justify fertilizer applications for N, P, and K.**
- 3. Examine feasibility of proactive in-season nutrient monitoring.**
- 4. Determine the economic value of in-season fertilizer applications based on described thresholds.**

Progress/Accomplishments:

Fertilizer response trials based on tissue sampling during reproductive growth stages for nitrogen (N), phosphorus (P), and potassium (K) were planted at the Rice Research & Extension Center (RREC; Stuttgart), the Pine Tree Research Station (PTRS; Colt), and the Northeast Research & Extension Center (NEREC, Keiser). The variety Ozark was utilized for all trials. Sites did not receive preplant fertilizer. Blanket N fertilizer rates were applied to all trials pre-flood.

Beginning at panicle initiation (PI) and continuing weekly until just prior to heading, tissue samples were collected from each plot by collecting a sample of the uppermost fully expanded leaf (Y-leaf). One set of plots received a fertilizer application while a paired plot remained unfertilized. After harvest, plant tissue concentrations for N, P, and K will be compared to grain yield and milling yield response levels to validate at what plant tissue concentration responses occur.

Data is still being processed at this time.

Upcoming Actions/Activities:

Complete data analysis and report summaries.

Rice Research and Promotion Board 2023-2024 Report Date of Report: October 4, 2023

Project Title A Team Approach to Improved Weed Management in Rice

Lead Investigator Bob Scott

Co-Investigator(s) Tom Barber and Jason Norsworthy

Status Year 3 of 3

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.).
7. To determine if a combine equipped with a RedeKop Seed Destructor will effectively harvest rice and determine 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.

Progress/Accomplishments/Upcoming Activities:

Approximately 110 trials have been conducted at Fayetteville, Keiser, Harrisburg, Lonoke, Stuttgart, Pine Tree, and Rohwer, Arkansas. Rice weed control plot harvest at most locations is complete. Following harvest, data will be combined and included in the year-end report.

Tetflupyrolimet is one of several herbicides being evaluated in this project. It continues to look promising for barnyardgrass control and enhanced control of sprangletop with excellent crop safety. This product will be marketed by FMC and likely sold in a CoPak with Command. Our combinations with Command have looked excellent across all locations. In all, six non-labeled, experimental herbicides were evaluated in rice; two of which would be new modes of action in rice. Some of these showed excellent crop safety and appeared to provide effective control of the most troublesome weeds of Arkansas rice. Research in the subsequent growing season will focus on a number of new promising herbicide technologies.

Max-Ace rice tolerance to Highcard herbicide and reduced efficacy observed on barnyardgrass and weedy rice continue to be a concern. Research projects continued to investigate this technology and identify methods to maximize its effectiveness and place it in a position for success. Based on data from these trials the 2024 and 2025 recommendations in the MP-44 have been adjusted. Two populations of weedy rice were confirmed resistant to quizalofop (Provisia and Highcard) from 2022, and to date over 50 barnyardgrass and weedy rice seed samples have already been collected to be screened for Provisia/Highcard resistance this winter to further map its distribution. It is likely that 50% or more of the rice flatsedge and smallflower umbrellasedge in Arkansas are resistant to ALS herbicides, and three populations of ALS-

resistant yellow nutsedge have been confirmed. A number of sedge population samples have been submitted for evaluation this winter.

Other areas of research include the evaluation of pigweed control, residual programs and Brake herbicide in furrow irrigated rice. We have also now confirmed glyphosate resistant bluegrass in fields in a rice/soybean rotation. The mechanism of resistance is the over expression of the target enzyme.

The RedeKop seed destructor has been evaluated for weed seed control in rice. Although effective at destroying any weed seed that goes through the combine, this technology needs engineering advancements in handling larger amounts of materials and higher moisture to be an effective economic option.

In addition, both barnyardgrass and weedy rice tend to shatter before entering the combine. Multiple avenues have been and will continue to be used to quickly disseminate generated information including blog posts, publications, face-to-face interactions, and the relatively new outlets: the texting service and Weeds AR Wild podcast series.

Statement of Projected Value: New herbicide technologies offer the potential to increase yields and the quality of harvested grains. Weed control costs are continuously being evaluated for profitability both short-term and long-term. A reduction in herbicide cost of \$10/A results in approximately \$13 million savings to Arkansas rice producers. The main focus of this project as stated in the above goal is to lower weed control costs for producers while maintaining yields to increase profitability. Weed control is the most important pest management issue in rice because all other recommendations are based on a weed-free crop.

Herbicides are required on 100% of the rice acreage grown in Arkansas and results from a 2020 survey indicated average herbicide costs in rice are over \$110/A. Additionally, the 2020 survey revealed barnyardgrass, sedges, weedy rice, and Palmer amaranth (row rice) are the primary rice weed concerns in Arkansas. Further, 60% of respondents indicated an average of 5 to 19 bu/A yield loss due to barnyardgrass leading to the primary focus of research on these weed species. Additionally, of the survey respondents that stated they had submitted weed samples to the herbicide resistance screening program operated under this team project, 93% reported the screening service aided them in making more informed weed management decisions in subsequent years, indicating substantial value to this program.

We continue to offer the resistance screening service and will continue to focus our research efforts as directed by our surveys and feedback from county agents, consultants and grower feedback.

Title: Agronomic Production Practices in Rice**Lead Investigators: J.T. Hardke****Co-Investigators: T.L. Roberts, X. Sha, C. de Guzman, N. Bateman, D.L. Frizzell, E. Castaneda-Gonzalez, T.L. Clayton, H. Hartley****Status: Year 3 of 3****Objectives:**

1. To evaluate the influence of seeding rate on new rice cultivars.
2. To evaluate the influence of row spacing on rice performance.
3. To evaluate precision planting equipment to traditional drill seeding for rice.
4. To evaluate management of furrow-irrigated rice.
5. To evaluate emerging grower issues related to all aspects of rice production.
6. To collaborate with rice researchers in related disciplines to improve existing recommendations.

Progress/Accomplishments:

Seeding rate studies were conducted to determine the optimum seeding rate for new cultivars. In 2024, seeding rate trials were conducted at RREC, NERREC, and NEREC. Cultivars evaluated included the varieties CLL18, CLL19, CLM05, PVL04, ProGold M3, ARoma 22, ProGold L4, and RTv7303 seeded at 5, 10, 20, 30, and 40 seed/ft²; and the hybrids RT 7521 FP and RT 3202 seeded at 4, 6, 8, 10, and 12 seed/ft². Results from these studies are still being analyzed. These results will be used to update the rice seeding rate calculator program and seeding rate recommendations.

Trials were conducted to evaluate the influence of late application inputs such as fertilizers and fungicides on rice milling yields. Trials were conducted at RREC and NERREC on two popular hybrids. Various fertilizer inputs and a fungicide were applied at the late boot growth stage. Results are still being analyzed. More in-depth, focused evaluation will be conducted next season in the event any inputs significantly improve or preserve milling yields.

Starter fertilizer applications to young, sick rice were evaluated at RREC and NERREC at 1- and 2-leaf rice growth stages. Urea, DAP, and AMS were evaluated to determine rice response to these fertilizers under conditions that were less than optimal for plant growth. No changes in appearance or growth were observed for these trials. Grain yield was increased by any treatment at only 1 of 4 sites.

Numerous foliar and seed treatment products were evaluated for their utility in rice. Results from these studies are still being analyzed.

A variety trial was conducted at an on-farm furrow-irrigated rice location to compare the performance of popular cultivars in a row rice management system. Plots were planted at both the top and bottom areas of the field to compare performance between true upland and flooded conditions. Results from these studies are still being analyzed.

Upcoming Actions/Activities:

Complete data analysis and report summaries.

Title: Analysis of farm policy programs and competitiveness of Arkansas Rice

Lead Investigators: Dr. Alvaro Durand-Morat

Co-Investigators: Dr. Brad Watkins and Dr. Ranjit Mane

Status: Year 1 of 3

Objectives:

Progress/Accomplishments:

We have updated the latest versions of the five Arkansas representative panel farm models (RepFarms).

We are updating our partial modeling frameworks, more specifically: (1) We have updated the Arkansas Global Rice Model (AGRM) to WASDE's August baseline and used the AGRM model to estimate the 10-international rice baseline. The AGRM model disaggregates the global rice market into more than 70 countries and two rice types (long grain and medium and short grain).

We are updating the RiceFlow spatial partial equilibrium model to a newer 2020-22 baseline (the current database is from 2013-15). The RiceFlow database includes 70 countries and 9 rice products from the combination of 3 rice types (long, medium, and fragrant rice), and 3 milling degrees (paddy, brown, and white). A PhD student plans to use the RiceFlow model to simulate the impact of different free-trade agreements, including CAFTA-DR.

We are finishing building a spatial price equilibrium (SPEM) model consisting of 50 countries and regions. Each country's rice market is defined by a supply and demand function calibrated to 2022 market data and elasticities. We plan to use the model to assess the impact of alternative policy scenarios regarding DR-CAFTA, with particular interest in evaluating the impact of Central American countries extending free-trade preferential access to all countries. For example, Costa Rica adopted this approach in 2022, and Guatemala also opened a rice TRQ to all exporting countries.

Upcoming Actions/Activities:

We expect to use the AGRM model to re-estimate the 1-year baseline projections in conjunction with the Food and Agricultural Policy Research Institute (FAPRI), and present the results to the USDA Office of the Chief Economist.

We also expect to continue working on the RiceFlow model database.

Finally, we plan to finish building the SPEM model and use it to assess the impact of AFTA-DR on the US long-grain sector. We expect to present the results at the Rice Technical Working Group meeting.

Title: Arkansas Rice Performance Trials

Lead Investigators: J.T. Hardke

Co-Investigators: T.L. Roberts, X. Sha, C. de Guzman, C.P. Nicolli, N. Bateman, D.L. Frizzell, E. Castaneda-Gonzalez, T.L. Clayton, H. Hartley

Status: Year 3 of 3

Objectives:

1. To monitor performance, disease reaction, and insect pressure of commercially available long-grain and medium-grain rice cultivars in different environments at both research station and on-farm locations across the state and educate local agricultural personnel on new disease and insect management technology and develop a database for cultivar performance under varying environmental conditions.
2. To improve technology transfer through publications, etc.

Progress/Accomplishments:

The 2024 Arkansas Rice Performance Trials (ARPT) were planted within commercial rice fields in Arkansas, Clay, Desha, Faulkner, Greene, Jackson, and Lawrence Counties; and at research stations including RREC (Arkansas Co.), PTRS (St. Francis Co.), NEREC (Mississippi Co.), and NERREC (Poinsett Co.). Yield information from these trials provides valuable information on how cultivars perform across the state when subjected to different environments and management practices. Cultivar disease reaction data from these trials are used to help establish disease susceptibility ratings. Cultivars in the ARPT included CLL16, CLL18, CLL19, CLHA03, DG263L, DG563PVL, Diamond, Ozark, ProGold L4, PVL03, PVL04, RTv7231 MA, RTv7303, RT 7331 MA, RT 7421, RT 7521 FP, RT 7302, RT 7401, RT XP753, DG3H2004, DG3H2007, Titan, Taurus, DG353M, ProGold M3, RT 3202, CLM04, and CLM05.

Preliminary results show RT 7401, RT 7302, RT 7421 FP, RT 3202, and RT XP753 to be the highest yielding cultivars. The highest yielding non-hybrids were DG263L, CLM05, CLL18, Titan, and RTv7231 MA.

Upcoming Actions/Activities:

Complete data analysis and report summaries.

Title: Arkansas Rice Variety Advancement Trials

Lead Investigators: J.T. Hardke

Co-Investigators: T.L. Roberts, X. Sha, C. de Guzman, C.P. Nicolli, N. Bateman, D.L. Frizzell, E. Castaneda-Gonzalez, T.L. Clayton, H. Hartley

Status: Year 3 of 3

Objectives:

1. To evaluate the yield performance, agronomic traits, and disease reaction of advanced conventional long-grain experimental lines in different environments across the state.
2. To evaluate the yield performance, agronomic traits, and disease reaction of advanced Clearfield long-grain experimental lines in different environments across the state.
3. To evaluate the yield performance, agronomic traits, and disease reaction of advanced Provisia long-grain experimental lines in different environments across the state.
4. To evaluate the yield performance, agronomic traits, and disease reaction of advanced conventional and Clearfield medium-grain experimental lines in different environments across the state.
5. To evaluate the yield performance, agronomic traits, and disease reaction of advanced conventional and Clearfield long-grain aromatic experimental lines in different environments across the state.

Progress/Accomplishments:

Lead experimental lines and commercial checks in the 2024 Arkansas Rice Variety Advancement Trials (ARVAT) were evaluated at the Rice Research & Extension Center (RREC) near Stuttgart; the Pine Tree Research Station (PTRS) near Colt; the Northeast Research & Extension Center (NERREC) near Harrisburg; the Northeast Research & Extension Center (NEREC) near Keiser; the Bowers Farm in Clay Co. near McDougal; and the Whitaker Farm in Desha Co. near McGehee. The studies were seeded April 5, April 24, April 23, May 29, April 5, and May 21, respectively.

Preliminary results, averaged across locations:

- The conventional long-grain cultivars 22AR181 (184 bu/ac), RU2301023 (182 bu/ac), 23LG133 (184 bu/ac), and 23LG331 (184 bu/ac) outperformed the Ozark check (181 bu/ac). The DG263L and RT XP753 checks were 190 and 213 bu/ac, respectively.
- The Clearfield long-grain cultivars 23CL1529 (187 bu/ac) and 24AR1134 (184 bu/ac) were the highest yielding experimental lines, but did not outyield the CLL18 check (187 bu/ac). The CLL19 and RT 7521 FP checks yielded 167 and 201 bu/ac, respectively.
- The Provisia long grain cultivars 23AR2114 (188 bu/ac), 24AR2142 (188 bu/ac), 23AR2104 (186 bu/ac), 23AR2110 (184 bu/ac), 24AR2141 (184 bu/ac), 23AR2111 (181 bu/ac), 23AR2133 (181 bu/ac), 23AR2134 (180 bu/ac) outperformed the check PVL04 (171 bu/ac).
- The medium grain cultivars 22AR241 (195 bu/ac), 23AR219 (194 bu/ac), and 23AR238 (190 bu/ac) outperformed the Taurus check (189 bu/ac). The Titan and Taurus checks yielded 181 and 196 bu/ac, respectively.
- The Clearfield medium grain cultivar 21AR1217 (188 bu/ac) outperformed the check CLM05 (185 bu/ac).
- For Provisia medium grain there are no current commercial checks. However, the cultivar 23AR2205 (184 bu/ac) outperformed the Titan (181 bu/ac) check; though not the Taurus (189 bu/ac) and CLM05 (185 bu/ac) checks.

- The aromatic lines 23AR3736 (176 bu/ac) and 23AR3703 (160 bu/ac) outperformed the check ARoma22 (153 bu/ac).

Disease ratings were made at ARVAT locations to assist breeders in selecting the best lines for advancement in addition to agronomic traits.

Upcoming Actions/Activities:

Complete data analysis and report summaries.



Title: Breeding and Development of Improved Long Grain and Aromatic Rice Varieties

Lead Investigators: Christian T. De Guzman, Assistant Professor U of A Division of Agriculture

Co-Investigators: Xueyan Sha, Jarrod Hardke, Camila Nicolli

Status: Year 3 of 3 - Ongoing

Objectives: The development of improved varieties for the Arkansas producers. These varieties can be improved for rough rice grain and milling yield, disease resistance or tolerance, plant characteristics, and grain quality characteristics.

Yield trials

2024 Conventional Long Grain Advanced Yield Trial in 3 locations (24LGAYT)

We harvested a total of 67 entries including 4 checks in a randomized complete block design with three replicates. These trials were planted in three locations across Arkansas. The locations include Rice Research Station in Stuttgart, AR (RIRE), Pine Tree Research Station in Colt, AR (PTRS) and Northeast Research and Extension Center in Keiser, AR (NEC). Our fourth (NERREC- Northeast Rice Research and Extension Center in Harrisburg, AR) location experienced prolonged wet/flooded soil thus late harvesting and wind damaged due to the storms and black bird damage reducing yields of most entries. The NERREC averages will be excluded in this overall total means. Using the Analysis of Variance, all three locations showed statistically significant differences in yield. Average yields on three locations showed 23LG162 and DG263L both have the highest mean yield of 208 bu/ac followed by Ozark with 189 bu/ac and 23LG115 with 188 bu/ac which ranked 1st, 2nd, and 3rd respectively. Our RIRE location have the highest yields compared to two other locations with 23LG162 having 259 bu/ac compared to DG263L at 248 bu/ac and Ozark at 232 bu/ac.

2024 Clearfield Long Grain Advanced Yield Trial in 3 locations (24CLAYT)

We harvested a total of 60 entries including 4 checks in a randomized complete block design with three replicates. These trials were planted in four locations across Arkansas (RIRE, NERREC, NEC, PT). NERREC will be excluded from the overall average due to poor plot conditions as described in 24LGAYT. The top 3 (ranked 1st - 3rd) entries across all three locations are entries CL2302444, CL2302471 and CL2302094 with 202, 200 and 198 bu/ ac respectively. CLL18 ranked 18th with 186 bu/ac and CLL16 ranked 24th with 183 bu/ac.

2024 Conventional Long Grain Preliminary Yield Trial (24LGPYT)

We harvested and evaluated a large test consisting of 366 entries with 5 checks in a randomized complete block design with two replicates in RIRE. The top four entries in the ranking includes entry L2301786 with 216 bu/ac, L2301794 with 213 bu/ac, L2301098 with 211 bu/ac and L2301913 with 211 bu/ac. In comparison, check variety Ozark yields 194 bu/ac and Diamond with 193 bu/ac. Ozark ranked 65th while Diamond ranked 71st out of 366 entries tested for yield.

2024 Clearfield Long Grain Preliminary Yield Trial (24CLPYT)

We harvested and evaluated a large test consisting of 400 entries with 6 checks in a randomized complete block design with two replicates. The top 4 entries that have the highest yields (ranked 1st- 4th) are CL2301334, CL2302050, CL2300266, and CL2300545 with 214 bu/ac, 209 bu/ac, 208 bu/ac and 208 bu/ac, respectively. In comparison, the check variety CLL16 ranked 122nd, CLL18 ranked 155th with yields of 191 bu/ac and 189 bu/ac consecutively.

2024 Aromatic Conventional Preliminary yield trial (24AROPYT)

We harvested and evaluated conventional aromatic lines with 214 entries and three checks in RIRE in a randomized complete block design with two replications. The top 3 entries in yield are entry ARO2300345, L2303533 and ARO2300249 tied with ARO2300409. The yields are 206 bu/ac, 204 bu/ac, 203 bu/ac, and 203 bu/ac respectively. checked varieties ARoma22 and Jazzman ranked 116th and 213th with 177 bu/ac and 127.8 bu/ac respectively. The highest yielding line have more than 20 bu/ac compared to the check variety ARoma22.

2024 Provisia Long Grain Preliminary Yield Trial 24 PVYT

We harvested and evaluated a total of 105 entries including 3 checks in the 24PVPYT in a randomized complete block design in two replicates. Our top three entries in yield are entries PV2301578, PV2301542, and PV2301508 with 188 bu/ac, 169 bu/ac and 166 bu/ac respectively. The checks PVL03 and PVL04 ranked 11th and 57th with yields of 153 and 124 bu/ac respectively. Unfortunately, this trial was damaged by black birds after planting which reduced the number of germinated plants in majority of the plots thus showing significantly low yields. Although yields are lower, the top lines showed better agronomic characteristics, good straw strength and longer panicles compared to the check variety PVL03 and PVL04.

Panicle rows (F₃, F₄, F₅ and inbred lines)

We planted a total of 15,349 panicle rows in F₃, F₄ and F₅ generation in RIRE:

8,674 Conventional long grain, aromatic and short/medium grain

5,628 Clearfield Long Grain

1,047 Provisia Long grain

We are currently selecting for plant type, milling and grain appearance to advance in Puerto Rico and bulk harvest for the next year's preliminary yield trials.

Breeder head rows

We planted and harvested breeder head rows to supply foundation seeds with pure breeder seeds of the following: Diamond Titan, RU9601099, PVL04, CLM05, CLL18, CLL16, experimental entries RU2301023, 21A136 and RU2301024.

Crossing Block and Crosses

We planted a total of 60 entries as parents for crossing block in three different dates, 10 days apart. We made approximately 1,000 combined crosses of Conventional, Clearfield, Provisia, Aromatic and Roxy long grain rice.

F₁ nursery

We planted and harvested 421 F₁ rows of Clearfield, Conventional, Provisia and Aromatic long grain crosses. The selected 165 F₂ seeds harvested will be advanced to 2024-2025 Puerto Rico Nursery.

F₂ populations in greenhouse

We planted and harvested 40 F₂ populations in the greenhouse in seedling trays. Each population has approximately 280 individual plants which totals 11,200 F₂ single plants. These plants were planted for rapid generation advance using single seed descent (SSD) method. F₃ seeds will be harvested and will be planted in F₃ panicle rows in Stuttgart.

Upcoming Actions/Activities:

Puerto Rico Nursery

We sent a total of 165 F₂ population to be planted in rows in Puerto Rico Nursery for November 2024 planting. 1,500 rows will be planted for each Conventional, Clearfield and Provisia for a total of 4,500 rows. An additional 1,500 rows will be planted for bulk seed increase of selected lines and F₅ generation advancement of Clearfield, Conventional and Provisia long grain entries.

DNA molecular markers

We will genotype all entries consisting of 1,145 entries in the yield trials 24CLAYT, 24LGAYT, 24CLPYT, 24LGPYT, 24AROPYT, 24PVPYT and Crossing block using the LSU550 genotyping panel. This will provide over 600k data points that will help us select for traits that is tightly linked to the DNA markers such as resistance to blast, amylose content, gelatinization temperature and other economically and agronomically important traits. Data can also be used for genomic prediction of other important traits.

Grain quality analysis

We are currently milling and evaluating grain quality of all yield trials. We currently use a Zaccaria PAZ 100 milling machine for milling and SeedCount grain imager to determine grain dimensions and chalk.

F₂ single seed descent in greenhouse

A set of 40 F₂ populations that were not planted in the PR nursery will be planted in the greenhouse using single seed descent (SSD) method. Approximately 10,000 plants from aromatic and conventional long grain crosses from 40 populations will be planted in November to advance to F₃ lines and then will be planted as F₄ panicle rows in RIRE for 2025:

Title: Breeding and Developing Hybrid Rice Cultivars for the Southern USA

Lead Investigators: Xueyan Sha, Professor

Co-Investigators:

Status: Year 3 of 3

Objectives:

1. To breed adapted semi-dwarf temperature sensitive genic male sterile (TGMS) lines with the typical US long grain cooking quality, good combining ability, and superior outcrossing characteristics for the development of the 2-line hybrid rice.
2. To breed adapted semi-dwarf cytoplasmic male sterile (CMS) lines with the typical US long grain cooking characteristics, good combining ability, good hybrid seed potential for the development of 3-line hybrid rice.
3. To develop adapted restorer (R) and/or pollinator lines by incorporating relevant hybrid rice traits from various sources into elite semi-dwarf Arkansas long-grain genotypes.
4. To develop competitive hybrid rice varieties through extensive test crossing and field evaluation and with superior yield potential, acceptable seed productivity, good and stable milling and grain quality, good standability, and the standard US long grain cooking.
5. To study the best cultural practices (locations, timing, synchronization, seeding rate, and fertility) for the propagation of both TGMS and CMS lines and the production of hybrid seeds.

Progress/Accomplishments:

Steady progresses have been made in 2024 in the revamped hybrid rice breeding program, including rapid development and purification of new male sterile lines at RREC and Puerto Rico, intensified selection of seed production potential, dramatic expansion of testcrossing and trials, targeted and highly successful seed production of experimental hybrids for intensive yield trials at multiple locations. 2024 breeding activities included 222 testcrosses that were made in 2023 evaluated in the newly established observational yield trial (OYT), 35 F1 populations, 78 space-planted F2 populations, 8,000 pedigree panicle rows ranging from F3 to F9 for the selection of new restorer/pollinator and maintainer lines, and 3,520 panicle rows of F3-F7 for S line development and evaluation. Nine new experimental hybrids were tested in the new Advanced Elite Hybrid Yield Trial (HAYT) at 5 locations, 4 of them were also concurrently tested in the ARVAT at 6 locations. Even though still inferior to RiceTec checks, yields of these new hybrid combinations have continuously improved over the previous hybrids and pureline checks. Averaged across 5 locations, experimental hybrid 23HX106 and 22HX105CL have a rough rice yield of 200 and 201 bu/A, as compared with 243, 236, and 201 bu/A of RT XP753, RT7521FP, and DG263L, respectively. Seed production of 9 new experimental hybrids were carried out, and the harvested seeds will be tested in advanced trials across the state in 2025. Breeding for next generation of S lines has been ramped up, in 2024 an unprecedented 3,520 panicle rows of F3-F7 for S line progenies were and evaluated. Over 200 male sterile plants from F2 populations were selected, sterility verified, transplanted and treated in the custom-built Cool Shed, and selfed seeds will be planted in Puerto Rico for advancement and field observation in next few weeks. The goal is to fast-track development of new S lines that can significantly elevate the current heterosis for yield, meanwhile retain the favorable agronomic characteristics such as smooth leaves and grains, blast resistance, grain quality, and consistent and higher milling yields. We have so far produced 399 successful crosses (253 testcrosses and 146 single crosses for breeding of new and improved restorer lines and pollinators), and they will be field evaluated and advanced in 2025.

Upcoming Actions/Activities:

Further purification and propagation of the new male sterile lines will be conducted off-season in Puerto Rico winter nursery. Yield trial of the new experimental hybrids will be conducted across the state in 2025.

CONFIDENTIAL

Project Title	Climate Smart 300 Bushel Row Rice on 12 inches of Automated Irrigation
Lead Investigator	C. G. Henry, Ph.D., PE, Professor and Water Management Engineer
Co-Investigator(s)	Russ Parker, Irrigation Program Associate; Nathan Blankenship, Irrigation Program Specialist; Shruti Vaman, Mobile App Developer;
Status	Year 3
EcoZone(s)	All
Objectives	<ol style="list-style-type: none"> 1. 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. 2. EVALUATE FERTIGATION AND PLANTER APPLIED N as techniques to improve yields in a FIR system. 3. NITROGEN AND WATER INTERACTION IN FIR: Evaluate irrigation timing (allowable depletions) and urea application for furrow irrigated rice to maximize yield, WUE, and profitability. Improve irrigation recommendations for furrow irrigated and AWD rice. 4. 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. 5. CLIMATE SMART FIR: Evaluate ways to reduce fossil fuel inputs in FIR. Document cover crop benefit, solar energy offset, biodiesel, and no-till in reducing carbon and how carbon reductions could be further achieved.

Progress/Accomplishments:

Two paired fields were planted to RT 7521 at NERREC. One field had the pitless pump and was fertigated with UCAN23 a liquid fertilizer and the second field was a control furrow irrigated field with urea. The site at NERREC was selected because ARS was able to monitor the emissions from the field to measure the methane, carbon dioxide and nitrous oxide from the two field treatments.

A hub and valve have been developed for the tailwater pump. Printed circuit boards were developed for the hub and valve. A new valve was developed that seals better than the first valve design. It was not possible to test the system in 2024 because of the late delivery of PCB boards and late delivery of valve parts. Work on the firmware continues.

A final version of the lid was re-engineered to help commercialize the pumps for farmers. We have trained NRCS engineers and civil engineering technicians and worked with NRCS so that the tailwater pumps can be available to farmers through the Environmental Quality Incentives Program. An additional 5 pitless systems were installed in 2024 on farmer fields.

Irrigation Yield Contest

Meters were sealed for rice in 23 fields. Nine were levee rice, six were zero grade, and nine were furrow irrigated rice. There are a total of 58 fields across all crops entered in the overall contest. Conditions were favorable for contest participation. RiceTec provides seed valued at \$14,000 for first place, \$9,450 for second place, and \$4,550 for third place for each rice category (Levee, zero grade, and furrow). Seametrics, Trellis, Delta Plastics, Irrrometer, Agsense, Farm Logs, and CropX have committed to providing prizes for the winner. The rules and materials are posted on the www.uaex.edu/irrigation website. Rainfall is being tracked using "Farmlogs" and NOAA programs. Eighteen fields were harvested with yields ranging from 251 bpa to 182 bpa. Seven fields withdrew prior to harvest, primarily due to concerns about the hurricane.

Title: DD50 Thermal Unit Thresholds and Seeding Date Effects for New Cultivars

Lead Investigators: J.T. Hardke

Co-Investigators: T.L. Roberts, X. Sha, C. de Guzman, N. Bateman, D.L. Frizzell, E. Castaneda-Gonzalez, T.L. Clayton, H. Hartley

Status: Year 3 of 3

Objectives:

- 1. To maintain the present database for the DD50 Rice Management Program to include new rice cultivars as they are released.**
- 2. To develop the DD50 database for seeding dates on the grain yield and milling yield of new cultivars.**
- 3. To develop an improved database on the optimum planting date for new and existing cultivars on grain yield and milling yield.**

Progress/Accomplishments:

Seeding date studies in 2024 were drill-seeded March 20 or 21, April 3, April 15, April 30, May 16, and June 5 or 6 at the Rice Research & Extension Center (RREC; Stuttgart) and at the Northeast Rice Research & Extension Center (NERREC; Harrisburg).

Trials were fertilized with a single pre-flood N application and flooded at the 5-leaf stage. DD50 measurements were recorded on selected seeding dates at the RREC. DD50 thresholds are being established for Diamond (check), Ozark, CLL18, CLL19, RT 7331 MA, RT 7421 FP, RT 7302, Taurus, RT 3202, CLM05, PVL04, and RTv7303. DG263L, CLL16, PVL03, RTv7231 MA, RT 7521 FP, RT 7401, RT XP753, Titan, and CLM04 were included for planting date effects.

At RREC, averaged across the first five planting dates, RT 7302, RT 7401, RT XP753, RT 7521 FP, and RTv7303 were the highest yielding cultivars. Planting date effects are skewed this year due to a mistaken midseason aerial application on the field.

At NERREC, averaged across the first four planting dates, Taurus, CLM05, RT 7302, RT 7421 FP, and DG263L were the highest yielding cultivars. Early and mid-April were the highest yielding planting dates.

While the data for RREC for planting dates is skewed, the results for NERREC continue to support previous data and recommendations that planting dates in April perform better than dates in March or May and June.

Upcoming Actions/Activities:

Complete data analysis and report summaries.

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

Lead Investigators: Xueyan Sha, Professor

Co-Investigators:

Status: Year 3 of 3

Objectives:

1. To develop improved conventional, Clearfield, and Provisia medium-grain rice varieties with increased rough rice and head rice yields, disease resistance, improved processing and cooking characteristics, and improved semi-dwarf plant type.
2. To develop superior conventional, Clearfield, and Provisia long-grain rice varieties with emphasis on the improvement in yield potential, milling and grain quality, disease resistance, seedling vigor, and early maturity.
3. To develop adapted male sterile, maintainer, and restorer lines by the introgression of hybrid traits of various sources into elite semi-dwarf Arkansas long-grain genotypes.
4. To conduct plant breeding studies including genomic selection (GS) and marker-assisted selection (MAS) to improve the selection efficiency for such important traits as blast resistance, cooking and processing quality, and milling yields.
5. To maintain high quality and pure head row and breeder seed for foundation seed production at Rice Research and Extension Center (RREC).
6. To conduct the annual Cooperative Uniform Regional Rice Nursery (URRN), which has long been a platform for public rice breeding programs in Mid-South for sharing germplasm and joint evaluation of their potential breeding lines for potential release to rice growers in participating states.

Progress/Accomplishments:

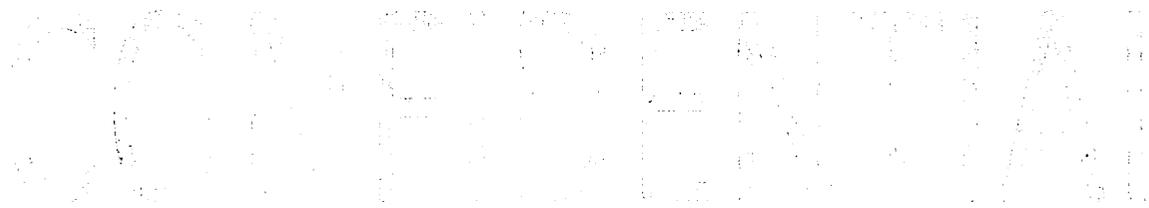
Field researches of medium-grain breeding program in 2024 included 853 F1 populations, 1,111 space-planted F2 populations, and 95,000 pedigree panicle rows ranging from F3 to F7. 1,713 new breeding lines were tested in the replicated Stuttgart Initial Trial (SIT), which include 594 conventional long-grain and medium-grain lines, 548 Clearfield (CL) long-grain and medium-grain lines, and 571 Provisia (PV) long-grain and medium-grain lines. Fifty-five elite long-grain and medium-grain lines were tested in the Advanced Elite Line Yield Trial (AYT), 37 elite CL long-grain and medium-grain lines in the Clearfield AYT trials, and 47 elite PV long-grain and medium-grain lines in the Provisia AYT trials conducted at experiment stations in Harrisburg, Keiser, Pine Tree, and Stuttgart. Forty-three advanced medium-grain and long-grain experimental lines were included in the Arkansas Rice Variety Advancement Trials (ARVAT) and Uniform Regional Rice Nursery (URRN) trials. Furthermore, 5 experimental Provisia or Clearfield long-grain and medium-grain lines were also tested in the newly established Pre-Commercial (PC) trial conducted in Arkansas, Louisiana, Mississippi, Missouri, and Texas. A total of 230 promising breeding lines (67 conventional long-grain and 15 conventional medium-grain; 68 CL long-grain and 5 CL medium-grain; 70 PV long-grain and 5 PV medium-grain lines) that outperformed commercial checks in all yield trials were selected for the advancement and/or increase. A total of 1,154 new single crosses and backcrosses were successfully made, which is significantly more than previous years. Much of the newly added crosses are targeted for the improvement of milling yields, as well as blast resistance esp. in medium-grain rice.

The conventional long-grain line 21AR136 has been released and licensed to an Arkansas seed company in 2024. In the pipeline, several long-grain and medium-grain lines showed an outstanding yield potential in all advanced yield trials, including conventional long-grain lines 22AR147, 22AR159, and 22AR182, CL medium-grain line 21AR1217, Provisia long-grain lines 23AR2114, 23AR2133, and 23AR2134, and

Provisia medium-grain line 23AR2205. Breeder headrow increase of these lines are planned for the potential release in the near future.

Upcoming Actions/Activities:

Breeder seed of 21AR1217, 23AR2133, and 23AR2134 have been produced. Meanwhile, breeder headrow seed increase of conventional long-grain lines 22AR147, 22AR182, 22AR159, Provisia long-grain line 23AR2114, and Provisia medium-grain line 23AR2205 have also produced for potential foundation seed production in 2025.



Title: Economic Analysis of Arkansas Rice Farms

Lead Investigators: Brad Watkins

Co-Investigators: Alvaro Durand-Morat, Ranjit Mane

Status: 3 of 3

Objectives:

1. Conduct economic analysis of specific experiment station projects and other Rice Research and Promotion Board funded projects that would benefit from such analysis.
2. Determine the impacts of farm size, tenure, water availability, and other important production constraints on Arkansas rice farm profitability in a whole farm framework.
3. Determine representative Arkansas rice farms' economic viability for a five-year time horizon, 2019 to 2024, by evaluating these farms using a stochastic simulation.

Factors Affecting Irrigation Water Application in Arkansas Rice Production: Sustainable rice production in Arkansas depends heavily on continued groundwater availability. However, this important resource is declining in much of Arkansas. Therefore, knowledge of the factors affecting applied irrigation water in rice production is essential for continued rice sustainability. This study used regression analysis to evaluate the impacts of weather and field characteristics on applied irrigation water in Arkansas rice production. The results show that precipitation reduces applied irrigation water in rice production and provides evidence that rice producers take advantage of timely precipitation when irrigating their rice crop. The results also indicate that planting rice on marginal fields can result in significant wastage in applied water. The results of this study were presented at the 2024 International Temperate Rice Conference in New Orleans, Louisiana and were also published in *B.R. Wells Arkansas Rice Research Studies 2023* in a paper entitled "Factors Affecting Irrigation Water Application in Arkansas Rice Production".

Irrigation Water Pumping Costs for Rice Production: Irrigation water pumping costs vary greatly depending on the crop grown, the mode of power used to pump the water, and the pumping depth of water. A study was conducted looking at the cost of pumping irrigation water on rice and other field crops grown in Eastern Arkansas and the Mid-South. Pumping costs were estimated for both diesel power and electric power motors and were presented for varying pump lifts. Less groundwater translates into deeper pumping depths, making irrigation water more expensive in locations where water is more limiting. This was exhibited geographically in a figure showing average rice irrigation water pumping costs by county in Eastern Arkansas assuming one-half diesel and one-half electric power. Grand Prairie counties and counties with significant area west of Crawley's Ridge exhibiting the largest rice pumping costs. The results of this analysis were published in a *Southern Ag Today* online newsletter entitled "Irrigation Water Pumping Costs in the Mid-South" (September 4, 2024).

Trend Analysis of Harvested Rice Acres in Eastern Arkansas: Arkansas rice area has changed since the 1980s with the prevailing perception that rice area has moved northward within the state. This study used trend analysis to examine the movement of rice harvested area for all counties in Eastern Arkansas during the period 1980 through 2023 to determine which counties have expanded, leveled off, or declined in rice harvested area during this period. The results indicate that rice harvested area has been

declining at a constant rate per year since 1980 in four counties in Southeast Arkansas (Desha, Ashley, Chicot, and Drew Counties), has reached a historical maximum during the 44-year period and is currently declining in six counties in East-Central Arkansas (Arkansas, Cross, Monroe, Phillips, Prairie, and St. Francis Counties), and has been expanding at a constant rate per year since 1980 in four counties in Northeast Arkansas (Mississippi, Greene, Jackson, and Independence Counties). The results of this study are reported in *B.R. Wells Arkansas Rice Research Studies 2023* in a paper entitled “Trend Analysis of Harvested Rice Acres in Northeast, East-Central, and Southeast Arkansas”.

Upcoming Actions/Activities:

Economic Risk Assessment of Irrigation Systems used in Rice Production: Groundwater is the primary source of irrigation water in Eastern Arkansas. Rice accounts for a significant portion of all groundwater withdrawn in the region. A study was initiated this year to conduct an economic risk assessment of net returns generated for rice irrigation systems varying in relative water conservation. The objective of this study will be to determine the amount of monetary return to be paid to a risk-averse rice producer to justify a switch from a less water conserving irrigation system to a more water conserving irrigation system. Preliminary results of this study will be presented at the 2025 Rice Technical Working Group meetings in February of next year as well as in the upcoming *B.R. Wells Arkansas Rice Research Studies 2024*.

Economic Risk Assessment of Cropland Rental in Rice Production: Rice is particularly vulnerable to high input expenses. Higher fertilizer and fuel expenses have significantly reduced profit margins for rice in the last few years. The negative impact of tightening profit margins has been felt most acutely by rice producers renting cropland. Many rice producers found that gross returns barely covered production expenses on owned land and fell well short of covering both production expenses and the value of the crop share paid to the landlord on rented land. A study will be conducted this year to assess the net return risk of different crop share arrangements used in Arkansas rice production. We plan to present the results of this study in the upcoming *B.R. Wells Arkansas Rice Research Studies 2024*.

Title: Monitoring and management of fungicide resistance of Sheath Blight in Arkansas

Lead Investigators: Camila Nicolli, UA System Division of Agriculture

Co-Investigators:

Jarrold Hardke, University of Arkansas System Division of Agriculture

Rodrigo Pedrozo, Southeast Dale Bumpers National Rice Research Center, USDA

Status: Year 2 of Year 3

Objectives:

1. Mapping resistance of sheath blight isolates for most used fungicides in rice fields with an emphasis on azoxystrobin.
2. Refined the rice sheath blight management recommendations based on demonstration plot trials evaluating efficacy of fungicide.
3. Improved rice sheath blight management techniques through an interdisciplinary approach.
4. Enhance communication and end-user education/outreach for farms, agricultural advisors, research community, and grain processors through resources and recommendations related to the integrated management of rice sheath blight on the Arkansas Row Crops Blog, Rice Advisor, and Extension Plant Pathologist website and field days.

Progress/Accomplishments on the 2023 Isolates:

Seventeen isolates of *Rhizoctonia solani* obtained in 12 counties in 2023 were tested for resistance to azoxystrobin (Qol – FRAC 11). The isolates were cultured on media amended with six different concentrations of azoxystrobin, the active ingredient in Quadri's fungicide, ranging from 0 ppm to 10 ppm. Additionally, all isolates were sent for DNA sequencing and anastomosis group identification. The results showed that all isolates belonged to the AG-1 anastomosis group, with one isolate from Arkansas County displaying resistance to azoxystrobin. This isolate with less sensitivity to the fungicide was selected for the 2024 field trials.

Field Trial 1: Demonstration plot trials were carried out at the Rice Research & Extension Center (RREC) to assess the effectiveness of various fungicide treatments. The inoculum used in the field was derived from the isolate exhibiting the highest sensitivity in Petri dish fungicide tests. This study aimed to compare the effectiveness of 15 different treatments, including both individual fungicides and combinations. The trial was designed as a completely randomized block design, utilizing the highly susceptible cultivar PVL03 and inoculating it with the isolate PP060 (*Rhizoctonia solani* AG1-IA). Each plot measured 7 feet by 15 feet, with four replicates for each treatment. The individual products tested included azoxystrobin, flutolanil, fluxapyroxad, and propiconazole, along with the following combinations: azoxystrobin + propiconazole, azoxystrobin + difenoconazole, trifloxystrobin + propiconazole, azoxystrobin + flutolanil, and azoxystrobin + fluxapyroxad.

Field Trial 2: An interdisciplinary trial was conducted at the Rice Research & Extension Center (RREC) to evaluate host resistance, fungicide efficacy, and various application timings. The same *Rhizoctonia solani* isolate (PP060, which showed the highest sensitivity) was used in this study. The trial utilized a complete randomized block design with three cultivars: DG263L (susceptible), RT XP753 (moderately susceptible), and PVL03 (very susceptible). Each plot was 7 feet by 15 feet, with four repetitions for each treatment. The objective was to compare the efficacy of different fungicides across the various cultivars and application timings. The fungicides tested included azoxystrobin and flutolanil.

Field Trial 3: This interdisciplinary trial, also conducted at the Rice Research & Extension Center (RREC), aimed to evaluate host resistance, fungicide efficacy, and various application timings. In this case, the isolate used was PP071, which displayed lower sensitivity to azoxystrobin. The trial followed a complete randomized block design, employing the same three cultivars: DG263L (susceptible), RT XP753 (moderately susceptible), and PVL03 (very susceptible). The plot size was 7 feet by 15 feet, with four repetitions for each treatment. The goal of this study was to compare the efficacy of different fungicides across various cultivars and application timings, particularly in the context of fungicide resistance. The fungicides tested included azoxystrobin and flutolanil.

Progress/Accomplishments on Enhance Communication and End-user Education

The Plant Pathology Program participated in several key events throughout the year, starting with the Wheat Field Day in Marianna, followed by the Rice Research & Extension Center Field Day in Stuttgart, the Rice Field Day at LSU AgCenter in Louisiana, and concluding with the Northeast Rice Research and Extension Center Field Day in Harrisburg. The program also took part in Innovations in Rice Production in Jonesboro, the 2024 Corn College at the Lon Mann Cotton Research Station in Marianna, and the International Symposium on Rice Functional Genomics in Little Rock. Additionally, we were invited to visit RiceTec in Alvin, Texas, to gain a deeper understanding of the challenges associated with plant diseases. During the 2024 season, the program expanded its outreach by publishing articles on disease management on the Arkansas Row Crops blog and launching the Rice Crop Care webpage, enhancing our visibility. We also held our first public workshop on rice disease training, providing an opportunity for participants to learn about and discuss rice disease issues. Furthermore, the Plant Pathology Program presented research findings at APS Plant Health 2024 and ITRC 2024, while also using these conferences as opportunities to gather insights for future studies.

Progress/Accomplishments on the sampling Sheath blight in 2024:

Sheath blight samples were collected from twelve different counties in Arkansas, including Arkansas, Clay, Conway, Cross, Dauphin, Desha, Jackson, Jefferson, Lawrence, Monroe, Poinsett, and Randolph. A total of 24 samples of infected plants were collected, resulting in the isolation of 8 isolates.

Upcoming Actions/Activities:

The new set of isolates collected during the 2024 season will be sent for molecular diagnostics to determine their anastomosis group. Meanwhile, we will begin assessing the fungicide resistance of these isolates, starting with azoxystrobin (Quadris) and then moving on to flutolanil (Elegia). We will also test the 2023 isolates for flutolanil to determine their EC50 values.

Title: Nitrogen Management Tools for Arkansas Rice Producers

Lead Investigators: Trenton Roberts

Co-Investigators: Jarrod Hardke

Status: 3 of 3

Objectives:

1. Continue variety by nitrogen trials on one to two silt loam soils within the ecosystem to help provide standard nitrogen rate recommendations and guide N-STaR season total nitrogen rates for new cultivar releases.
2. Focus on new and novel sensing platforms for use with UAV's to help assess in season rice nitrogen concentration and predict responses to in season nitrogen applications.
3. Continue work on post-season plant analysis tools that can determine whether there was sufficient nitrogen in the rice plant to maximize yield or if nitrogen was a yield limiting factor. Next steps will focus on sample timing and field variability.
4. Conduct studies focused specifically on late-season nitrogen application (boot application timing) to determine what effects this additional nitrogen has specifically on rice stalk strength and milling yield.

Progress/Accomplishments: A key component of this project is the continuation of the variety by nitrogen (N) trials that are conducted across the state to determine the standard N rates required for newly developed rice cultivars. During 2024 there were a total of 12 varieties that were included in the variety by N trials at the Northeast Research and Extension Center (NEREC) near Keiser, AR; at the Northeast Rice Research and Extension Center (NERREC) near Harrisburg, AR; at the Pinetree Research Station (PTRS) near Colt, AR and at the Rice Research and Extension Center (RREC) near Stuttgart, AR. These locations allow us to evaluate the N rates across the predominate soils used for rice production in the state. The 12 varieties included this season were Diamond (check variety for comparison), Aroma22, Taurus, Ozark, CLL19, CLL18, PVL03, PVL04, RTv7231 MA, RTv7303, CLM05, and ProGold M3. In addition to the variety by N trials, work was conducted on several new hybrids to ensure that our recommendations are sound for the newly released cultivars and included RT 7331 MA, RT 7302, and RT 75821 FP. Additional work with the Greenseeker response indices was conducted for CLL 18, CLL 19, RTv7303, and PVL04. Like previous years we are testing leaf tissue-N concentration and a handheld N sensor (like a SPAD meter) to determine if they could accurately predict rice N status and predict the need for additional N applications in-season. Following this season, we should have enough data to provide rice producers with a critical N concentration that can be used from 3-4 weeks post flood through early boot to assess N status in the plant and adjust as needed. The same samples that are collected to assess N status in the plant can also be used for P, K, S, and Zn allowing more robust nutrient management in-season. We completed a second year of the "early flood" trial where rice was fertilized and flooded (submerged) at the 2-leaf growth stage to monitor the effects. The cultivars included in the early flood trial were Ozark, RT 7302 CLL 19 and RT 7521. Surprisingly the rice has been able to withstand prolonged submergence and still produce acceptable yields. This data is important to help prepare management recommendations for future scenarios where extreme precipitation events may result in rice flooding and submergence early in the season prior to when we would apply the permanent flood. Future work should consider adding another level of in-season tissue testing and nutrient applications to see if potential yield loss associated with submergence is related to nutrient loss or some other factor such as lack of tillering or tiller mortality.

Upcoming Actions/Activities: All of our trials have been harvested, we are currently reviewing and analyzing the data. We are waiting on tissue analysis and over the next two months we will process data to make suggested changes to N rates for new cultivars that should be included in soil test reports and any potential changes that need to be made to rice management guides for the 2025 season. We currently have 4 presentations related to this project planned for our upcoming American Society of Agronomy meeting and plan to submit 5 related abstracts to the upcoming Rice Technical Working Group Meeting next spring.

Title: Nitrogen Recommendations for New Rice Cultivars

Lead Investigators: J.T. Hardke and T.L. Roberts

Co-Investigators: X. Sha, C. de Guzman, N. Bateman, D.L. Frizzell, E. Castaneda-Gonzalez, T.L. Clayton, H. Hartley

Status: Year 3 of 3

Objectives:

- 1. Develop N fertilizer response curves to provide N fertilizer rate recommendations for promising new rice selections and commercially important cultivars on representative rice-producing soils in eastern Arkansas.**
- 2. Use response curves to generate N rate recommendations for producers based on cultivar and soil type.**

Progress/Accomplishments:

Nitrogen (N) fertilizer response trials were planted at the Rice Research & Extension Center (RREC; Stuttgart), the Pine Tree Research Station (PTRS; Colt), and the Northeast Research & Extension Center (NEREC, Keiser). Fertilizer rates at RREC and PTRS were 0, 60, 90, 120, 150, and 180 lbs N/ac; while at NEREC rates were 0, 90, 120, 150, 180, and 210 lbs N/ac. Cultivars evaluated included Diamond, Taurus, Ozark, CLL18, PVL03, ARoma22, CLL19, RTv7231 MA, PVL04, CLM05, ProGold M3, and RTv7303.

Hybrid response to N rate and boot N application were also evaluated at RREC, PTRS, and NEREC. Fertilizer rates were 0, 60, 90, 120, 150, and 180 lbs N/ac pre-flood followed by 30 lbs N/ac at late boot. Two additional treatments of 90 and 120 lbs N/ac without boot N were also included at RREC and PTRS; and 120 and 150 lbs N/ac without boot N included at NEREC. Cultivars evaluated included RT 7331 MA, RT 7302, and RT 7521 FP.

Upcoming Actions/Activities:

Complete data analysis and report summaries.

Title: Puerto Rico Winter Nursery

Lead Investigators: Xueyan Sha, Professor

Co-Investigators: Christian DeGuzman

Status: Year New

Objectives:

1. To continue the advancement of the early generation (F2-F4) breeding materials of both pureline and hybrid.
2. To enhance the off-season purification and increase of seed stocks of promising breeding lines for the fast-track variety release.
3. To conduct seed increase of outstanding breeding lines for the expedited advanced yield trials.
4. To select, purify, and seed increase of new and current S lines for hybrid rice breeding.

Progress/Accomplishments:

Puerto Rico winter nursery is an essential component of any productive rice breeding program in southern US, public or private. When the cooperative winter nursery was initially established, Arkansas, like other participating states, only had one rice breeder/program. Since then additional breeders/programs have been added at RREC, the same nursery capacity has to be shared/divided among multiple breeders/programs. The critical winter nursery research traditionally had been a part of each breeder's overall breeding objectives and collectively funded by the board in her/his primary breeding project. A Puerto Rico winter nursery enhancement project was created and funded by the Arkansas Rice Research and Promotion Board using the TRQ fund from 2017-2022. This allowed each program had the much-needed additional resource and capability that contributed to the fast-track development, purification, and increasing of several new varieties, including Ozark, Taurus, CLL16, CLL18, PVL04, and CLM05. Furthermore, it allowed the first ever field evaluation, purification, and propagation of several newly developed S lines of the hybrid rice breeding program. This new grant will allow us to continue that effort.

Since the annual Puerto Rico winter nursery starts on October 1 and finishes on September 30 of the following year, research activities covered by this project (grant) only include harvesting of the additional breeding population of 2023-2024 nursery, planting of additional materials of 2024-2025 regular nursery, selection, on-site processing/preparation, and planting of an additional turnaround nursery. Except for breeder seed increases that are seeded with an old 12-row drill of LSU, all other breeding materials are seeded with a 6-row Hege magazine planter, therefore, the size of our nursery or breeding population mentioned hereafter are described by number of rows (7-ft in length and 10-in row space with a 3-ft alley).

The flood caused by 2023 Hurricane Fiona significantly delayed the planting of the extra nursery that normally plants in early October. As the results, we made selection on unprecedented 12,000 rows of breeding materials, including the turnaround nursery in late spring 2024. A great number of breeding materials were harvested for generation advancement, purification and increase lines for potential release, and S line evaluation, purification and propagation. The first 2024 winter nursery of 4,500 rows was already planted on July 22 for generation advancement, and a trip is planned for middle November to select, harvest, on-site process, and prepare for growing the turnaround nursery. Unfortunately, the delayed planting prevented us to conduct the routine grow-out evaluation of 9 new experimental hybrids produced in 2023 for seed purity and potential.

Upcoming Actions/Activities:

Newly selected S lines of F3-F5 generation will be planted and field-evaluated for rapid generation advancement. Breeder headrow increase of promising conventional long grain lines 23AR143, 23AR148, and 23AR151, and Provisia long grain line 23AR2111 will be grown for purification and increase purposes. Six best performing CL long grain lines will also be increased for expedited advanced yield trial. A turnaround nursery of 4,500 rows will be prepared on-site and planted in middle November.

Title: Quality Analysis for Rice Breeding and Genetics	
Lead Investigators:	Xueyan Sha, Professor Christian De Guzman, Assistant Professor Jarrod Hardke, Professor
Co-Investigators:	Dean Oliver, Riceland Foods, Inc.
Status: Year 3 of 3	
Objectives:	
1) To analyze 1,500 samples of Arkansas Rice Variety Advancement Trials (ARVAT) and the Arkansas Rice Performance Trial (ARPT) for the following attributes (these would come from 2 replications from each of 5-6 locations around the state): chalkiness, gelatinization temperature, RVA profile, moisture content, kernel dimensions, kernel weight, degree of milling, and amylose content.	
2) To analyze samples from pureline and hybrid programs for chalkiness, gelatinization temperature, RVA profile, amylose and kernel dimensions and kernel weight, numbers would vary from year to year based on the funding availability.	

Progress/Accomplishments:

Rice milling, cooking and processing characteristics are very important in the world market today. In order to release marketable varieties for the future the breeding and genetics program at the University of Arkansas, Division of Agriculture requires information on the grain quality of lines with commercial potential. It is very important when we release a variety that we have reliable non-biased information on its cooking quality and milled kernel characteristics. Head rice yield, kernel dimensions, chalkiness, gelatinization temperature, and starch characteristics (determined by amylose content or RVA) are all very important characteristics in today’s discriminating market place. Early generation lines in the breeding program need to be screened for these characteristics if we are to efficiently and effectively maintain rice quality in new varieties and select the best parental material for future crosses.

The Riceland Rice Screening Laboratory preformed the following activities as requested by the rice breeding group. They have completed the screening of the 2023 ARPT (547) and ARVAT (978) for a total of 1,525 samples.

Source of Samples	Tests Performed
2023-Crop approximately 1,525 samples from Advanced Yield Tests have been analyzed from the 2023 Crop. These include the ARVAT and ARPT samples. These tests are complete.	Kernel Sizing (length, width, thickness & weight), Chalk, Milling Degree, Moisture, Gel Temp, amylose, DSC and RVA

This data allows the rice breeders to pick parents for future crossing and select only the lines which have the correct cooking quality parameters for advancing in tests.

Upcoming Actions/Activities:

The above listed tests will be run on samples from the 2024 rice crop by the Riceland Foods Inc Quality laboratory.

Title: Rice Breeding and Pathology Technical Support

Lead Investigators: Dr. Christian De Guzman, Dr. Camila Nicolli, University of Arkansas System
Division of Agriculture

Co-Investigators:

Dr. Xueyan Sha, University of Arkansas System Division of Agriculture

Status: Year 3

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.

Progress/Accomplishments:

1. **Rice Leaf Blast Nursery - Evaluations in the Greenhouse - Breeding Program in 2024:**

In 2024, a comprehensive evaluation was conducted in the greenhouse involving 2,040 rice plants to determine their resistance or susceptibility to Leaf Blast. This assessment encompassed 124 rice breeding lines from the Uniform Regional Rice Nursery (URRN) and Arkansas Variety Advancement Trial (ARVAT) and 12 varieties (Nutrien). To enhance the study, an additional 2 varieties/hybrids were included to serve as benchmarks for susceptibility (M206) and resistance (Rondo). In total, 136 entries were subjected to scrutiny. Each of these 136 entries underwent evaluation against five distinct blast fungal races (IB-1, IB-17, IE-1K, IB-49 and BULK), with three replications conducted for each entry to ensure data accuracy. Meanwhile, the greenhouse remained occupied by 126 entries from the Long Grain (LG), Clearfield (CL), and Advanced Yield Trial's (AYT's), 233 entries from the Long Grain (LG), Clearfield (CL), and Preliminary Yield Trial's (PYT's).

2. **Rice Neck Blast Nursery - Evaluations in the Field - Breeding Program in 2024:**

To assess the resistance levels of the 136 entries from ARVAT, URRN and Nutrien varieties to late-season neck blast, a planting experiment was carried out at the Pine Tree Research Station (PTRS) in Colt, AR. These breeding lines were planted on April 23rd and replicated five times, resulting in a total of 680 hill plots. To induce infection, the hill plots were subjected to one inoculation using a mixture of pathogen races native to Arkansas. To create a favorable environment, susceptible rice varieties were planted as a protective border around the experimental area, and nitrogen was applied in three separate intervals. On August 28th, a meticulous evaluation was conducted on each of the 680 hill plots. This involved counting the number of panicles exhibiting symptoms of Neck Blast to determine the susceptibility of each rice breeding line.

3. **Rice Sheath Blight Nursery - Evaluations in the Field - Breeding Program in 2024:**

The identical set of 136 entries from ARVAT, URRN and Nutrien were cultivated to assess their resistance to Sheath Blight at the Rice Research & Extension Center (RREC) located in Stuttgart, AR. These breeding lines were planted on April 24th, with five replications resulting in a total of 680 hill plots. The hill plots were subjected to inoculation using a Sheath Blight isolate. The progression of the disease was visually evaluated in each of the 680 hill plots, and this evaluation was done in relation to the height of each entry. A scoring system ranging from 0 to 9 was employed, where 0 indicated no vertical disease progression and

9 signified infections reaching the flag leaf and head. The assessment of Sheath Blight disease was concluded on August 21st for the disease nursery at the RREC.

4. Rice *Cercospora* Nursery - Evaluations in the Field - Breeding Program in 2024:

The fungus *Cercospora janseana* causes **Narrow Brown Leaf Spot (leaf symptoms)**, **Cercospora Net Blotch (sheath symptoms)**, and **Cercospora Panicle Blight (panicle symptoms)**. This year marked the first time we evaluated Cercospora Net Blotch (sheath symptoms only) on 136 entries from ARVAT, URRN, and Nutrien. This evaluation took place in the same nursery planted at the Rice Research & Extension Center in Stuttgart. Additionally, we assessed the Arkansas Rice Variety Advance Trials, planted by Dr. Jarrod Hardke's group, across seven counties in Arkansas (Jefferson, Lawrence, Desha, Arkansas North, Arkansas South, St. Francis, and Crittenden). In this broader assessment, symptomology was observed on multiple plant structures, including leaves, tillers, and panicles, providing valuable insights into the resistance and susceptibility of rice breeding lines, varieties, and hybrids cultivated in Arkansas.

Upcoming Actions/Activities:

The technical support team played a pivotal role in various aspects of the research, including inoculum production, land preparation, planting, plot maintenance, field inoculation, chemical applications (utilizing adjuvants and fungicides), and harvesting across a total of 30 bays, encompassing a total of 1,314 plots. Furthermore, the tech support team collectively conducted a disease assessment for a total of 279 plots within the ARVAT, ARPT and PCT experiments in 7 different locations throughout Arkansas, contributing to the agronomy program at RREC.

Title: Crop Enterprise Budgets and Production Economics Analysis

Lead Investigators: Breana Watkins, Instructor

Status: Year 3 of 3

Objectives: The goal of this project is to provide rice enterprise budgets that are easily adaptable and allow for evaluation of costs and returns associated with production.

Progress/Accomplishments:

For the 2025 crop enterprise budgets are on track to be released November 1, 2024. There are 6 rice budgets developed based upon seed technology, Conventional, Clearfield, Hybrid, FullPage Hybrid, Provisia, and MaxAce. Tools to calculate the cost of irrigation for conservation practices, machinery costs, energy costs, as well as the cost/benefit analysis of cover crops will be available once the updated website is released. Whole-farm planning aids and summary comparisons are also in development to be released alongside the budgets.

Upcoming Actions/Activities:

Thin margins make financial planning for the upcoming season an important aspect of production agriculture. This update will move material to a new webpage, (farmplanning.uada.edu) and include a budget calculator. An irrigation cost estimator will be released soon after. Cost/benefit analysis of conservation practices in Arkansas is underway. The benefits provided by the economic analysis of alternative rice production methods provide a significant reduction in financial risk inherent in agricultural production. The current volatility faced in our input supply chains and lack of available replacements will make budgeting important in the upcoming crop seasons. Growing rice has become a preferred crop for many landowners across the state. Flexible crop enterprise budgets are beneficial for planning production methods to provide the greatest potential for financial success. The crop enterprise budgets allow economists to create impact statements useful for policy makers and shareholders when showing the importance of assistance for producers in Arkansas in times of dire need. A new layout and clarification in word usage for the budgets has been available since the 2024 crop budget release and will continue.

Title: Rice Fertilization - Developing Novel Methods to Assess Nutrient Availability to Arkansas Rice

Lead Investigators: Gerson Drescher and Trenton Roberts

Co-Investigators: Jarrod Hardke

Status: year 3

Objectives:

1. Continue long-term, fertilization trials at the Rice Research & Extension Center and the Pine Tree Research Station.
2. Evaluate nutrient uptake differences amongst pureline and hybrid cultivars during the season and explore the potential nutrient mining by hybrid cultivars.
3. Validate and refine the methods of use for in-season tissue sampling as a proactive diagnostic tool to determine hidden hunger potassium deficiency.

Soil fertility research is being developed during the 2024 growing season at the University of Arkansas System Division of Agriculture's Rice Research and Extension Center (RREC) and Pine Tree Research Station (PTRS). The research approach for each objective and major activities performed are listed below. Crop management practices (e.g., irrigation, pests, and weed control) closely followed the University of Arkansas Cooperative Extension Service recommendations.

Objective 1: Fertilizer K-rate treatments (0, 40, 80, 120, and 160 lb K₂O/ac) were applied on May 16 at the PTRS long-term study established in 2000/2001. CLL19 and RT7302 rice cultivars were planted in each plot on May 1. Pre-flood N (130 lb N/ac) was applied on June 11 to both cultivars and midseason N (30 lb N/ac) was applied to the hybrid at late boot on August 1. Fertilizer-P and -K treatments (0, 40, 80, 120, and 160 lb P₂O₅ or K₂O/ac) were applied on May 16 at the RREC long-term P and K response trials established in 2007. Ozark and RT7521 rice cultivars were planted on May 10. Pre-flood N (100 lb N/ac) was applied on June 20 to both cultivars and midseason N (30 lb N/ac) was applied to the hybrid at late boot on August 8. At booting (R2), flag leaf samples were collected from K response trials at both locations to assess tissue-K concentration. At maturity (R9), rice was harvested using a plot combine for yield measurement. Both tissue-K concentration and yield data are pending.

Objective 2: For this objective, field trials were conducted in the 2022 and 2023 growing seasons (information included in previous reports), and data analysis is currently being finalized for MS thesis and manuscript development.

Objective 3: Two fertilizer-P (0, 30, 60, 90, 120, and 150 lb P₂O₅) and two fertilizer-K rate (0, 30, 60, 90, 120, and 150 lb K₂O/ac) response trials and one P (0, 35, 70, lb P₂O₅/ac) and one K (0, 60, and 120 lb K₂O/ac) rate and time (pre-flood, 3 weeks after flooding, and R2) trials were established at PTRS on fields with sub-optimal P and K availability (six trials total). Ozark was planted on May 16, and received 135 lb N/ac before flood establishment on June 19. Rice Y-leaf samples were collected at booting (R2) and aboveground biomass samples were collected from all trials at 50% heading. Visual plant growth differences were observed among fertilizer-K treatments at early reproductive growth stages.

Additionally, furrow-irrigated rice P and K rate response trials were also established at PTRS on two fields with sub-optimal P and K availability (four trials total; two P and two K response trials; same fertilizer rates as described above)). Rice (RT 7521) was planted on April 30 and received 130 lb N/ac at V5/6 on June 12 and 45 lb N/ac at R2 (booting) on July 31. Flag leaf samples were collected at R2 to evaluate tissue-P and -K concentrations in all trials.

At rice maturity (R9) all trials were harvested using a small plot combine for yield measurement. Both tissue-P and -K concentration and yield data are pending.

Title: Rice Insect Management**Lead Investigators: Nick Bateman****Co-Investigators: Ben Thrash, Rupesh Kariyat, and Jarrod Hardke****Status: Year 3 of 3****Objectives:**

1. Evaluate the effectiveness of existing and new insecticides for control of major rice insect pests.
2. Develop defoliation thresholds for conventional and hybrid rice.
3. Determine rice stink bug resistance levels to lambda-cyhalothrin throughout the rice growing regions and new control strategies
4. Define monitoring techniques and control strategies for rice billbug in FIR
5. Communicate results with stakeholders

Progress/Accomplishments:

Multiple studies were conducted to determine the most cost-effective way to control rice water weevil. These trials ranged from insecticide seed treatment trials (22), foliar insecticide studies (4), and over treating urea with insecticides (1). We observed high rice water weevil pressure this year at Pinetree, however much lower populations were present at Rohwer and Stuttgart. Preliminary analysis suggest that greater control of rice water weevil is achieved, and higher yields are observed when combinations (neonic+diamide) of insecticide seed treatments are used. Foliar insecticides applied prior to flooding provided greater control than post flood. Insecticide treated urea did provide some control, however, it was not as consistent as insecticide seed treatments. Overall, seed treatments performed better than all other options tested.

New sampling methods for rice water weevil were evaluated as well. The goal of this objective was to understand the relationship between numbers of rice water weevil observed in a sweep net to larval counts and leaf scarring. Preliminary data suggest that there is a consistent relationship between rice water weevil adults caught with a sweep net compared to larval numbers. It was also observed that sampling in the afternoon was more consistent and much higher populations observed compared to when sampling occurred in the morning or mid-day. More sampling is need to determine if a threshold can be developed using a sweep net for rice water weevil management.

Studies were conducted to determine how best to manage pyrethroid resistant rice stink bug. These studies included application timing, threshold modifications, and reduction of rates of more expensive products. Reduced rates of Tenchu did provide adequate knockdown of rice stink bug but residual was shortened compared to a full rate. Lambda still only provided around 60% control. Studies also suggest that stink bugs are a lesser concern during the flowering and milk stage as compared to the soft/hard dough stages. This suggests that we could potentially raise our thresholds during the early stages and reduce the overall need for insecticide applications.

Large block foliar and seed treatment test were conducted to evaluate multiple products for control of rice billbug. Billbug pressure was light at study locations, however there appears to be some control with clothianidin (Belay) and chlorantraniliprole (Vantacor). Some combinations of these insecticides will be considerably more expensive than using either a Dermacor or Fortenza seed treatment. More data will be needed to determine if the foliar applications can be afforded economically compared to the seed treatments.

Upcoming Actions/Activities:

Final yield analysis will be conducted on all studies, as well as grain quality analysis on the rice stink bug studies. All results will be presented to stake holders to help aid in maintaining profitability in rice production.

CONFIDENTIAL

Title: Rice Research Verification Program

Lead Investigators: J.T. Hardke and K.B. Watkins

Co-Investigators: R. Mazzanti

Status: Year 3 of 3

Objectives:

- 1. Conduct field trials on commercial rice farms using an interdisciplinary approach of resource management to maximize net returns.**
- 2. Identify gaps in production technology that require additional research.**
- 3. Accumulate a database for developing rice budgets, computer assisted management programs, agronomic practices, resource utilization, and supports statewide educational programs.**
- 4. Provides hands-on training of Agents, consultants, and growers in rice production and crop management.**
- 5. Verify current and new research-based recommendations by establishment of grower field based replicated research.**

Progress/Accomplishments:

The 2024 RRVP fields and the associated cultivars included Chicot (CLL18, row rice), Cross (RT 7521 FP), Drew (RT 7521 FP, row rice), Jefferson (Ozark), Lonoke (RT 7521 FP), Mississippi (RT 7321 FP (row rice), Poinsett (Ozark), White (RT 7521 FP), and Woodruff (RT 7521 FP) counties.

Average yields for the 9 harvested fields in the RRVP are **185 bu/ac**, 17 bu/ac better than the current forecasted state average yield of **168 bu/ac**. Milling yields averaged 50-69 which is similar to the average reported around the state and reflective of the overall lower milling yields experienced in 2024. Three of the fields utilized furrow irrigation.

Upcoming Actions/Activities:

Complete data analysis and report summaries.

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

Lead Investigators: Griffiths G. Atungulu

Co-Investigators: Dongyi Wang, Mahfuzur Rahman

Status: Third year of a three-year project that started in 2022

Objectives:

1. Measurement of glass transition characteristics of current long- and medium-grain rice cultivars grown in Arkansas.
2. Standardization of milling yield assessment methods for contemporary long- and medium-grain rice cultivars grown in Arkansas.
3. Assessment of a new nondestructive method to measure rice chalk content based on rough rice properties.

Progress/Accomplishments:

Significant progress has been made toward the objectives in the objectives outlined for this project.

Objective 1 work was published as a BR Wells chapter¹ with chapter title "Rice Material State Diagrams: Trends of Contemporary Cultivars" and as a peer-reviewed journal article in the *Drying Technology Journal*², with article titled "Material state diagrams for informed decision-making during drying of contemporary rice cultivars". The work updated the rice drying process guidelines by generating new material state diagrams for modern pure-line and hybrid rice cultivars. Using the glass transition temperature (T_g) concept, the study revealed that newer rice varieties have higher T_g values compared to older ones, suggesting updated drying and tempering practices are necessary to prevent kernel fissuring and improve rice quality. These findings aim to help rice growers reduce economic losses during processing (Owusu et al., 2023; Owusu et al., 2024).

Objective 2, which aimed to standardize milling processes for contemporary rice cultivars. The results of this objective have been completed and published as a BR Wells chapter³ and is also under review for publication as a peer-reviewed journal article⁴ with the article titled "Optimizing Lab Methods for Consistent Rice Milling Analysis". The work evaluated the milling performance of three laboratory rice mills (McGill #2, Satake, and Zaccaria) to standardize their milling capabilities. Four rice cultivars, both medium- and long-grain, were tested at two moisture levels (13% and 15%) and three sample sizes. Key findings reveal that moisture content, cultivar type, and mill type significantly affected head rice yield (HRY) and milled rice yield (MRY), with the Satake mill generally producing the highest yields (Olaoni et al., 2024a; Olaoni et al., 2024b). The standardization of these milling settings is expected to benefit the rice industry by providing more reliable control over milling outcomes across diverse rice cultivars.

Objective 3 Progress: Using a lab assembled hyperspectral image analyzer and a 3D printed sample holder for rice kernel positioning, we employed hyperspectral imaging (HSI) technology combined with machine learning algorithms to assess chalkiness levels in 100 kernels. The preliminary findings showed that the Neural Network Architecture Search Enabled Wide-Deep Learning Model (NAS-WD) achieved superior classification accuracy, with rates exceeding 90% for both rough and brown rice samples. Ultimately, we want to assess chalk in rice kernels without removing the husk, in rough rice form. These results so far are promising and demonstrate the potential of HSI for non-invasive and efficient application for rice chalk classification.

Upcoming/On-going Actions/Activities:

Building on the promising preliminary findings from the hyperspectral imaging study, we have extended the analysis by testing 400 additional kernels to improve the robustness of the model and further refine our chalkiness detection methodology. This expanded dataset will allow for more comprehensive validation of the NAS-WD model's accuracy and ensure the results are scalable for large-scale industrial applications. Once this is successful, the goal is to translate this information into a hardware system built for in-line continuous chalk detection. This system will be developed and tested on a lab scale and if successful, patented and scaled up for industrial application.

In addition, during the 2024 crop season, 16 rice cultivars were harvested from RiceTec show plots in Harrisburg, AR, and six cultivars were collected from the University of Arkansas Rice Research and Extension Center in Stuttgart, AR. These samples included long-grain pure-line and hybrid rice varieties, as well as medium-grain cultivars. The samples were cleaned, sealed, and stored in a walk-in cooler for physicochemical quality analyses. These samples are to be run through our annual cultivar attribute analysis workflow. Part of these samples are to be shared with specific industry partners to test functionality for various end-uses and link that information with processing.

References:

1. Owusu, E. A., Luthra, K., January, R., & Atungulu, G. G. (2023). Rice material state diagrams: trends of contemporary cultivars. *B.R. Wells Arkansas Rice Research Studies 2023*. University of Arkansas Division of Agriculture.
2. Owusu, E. A., Luthra, K., & Atungulu, G. (2024). Material state diagrams for informed decision-making during drying of contemporary rice cultivars. *Drying Technology*, 42(5), 917-925.
3. Olaoni, S. O., Regonda, B., Luthra, K., & Atungulu, G. G. (2024a). Optimizing Lab Methods for Consistent Rice Milling Analysis. *B.R. Wells Arkansas Rice Research Studies 2024*. University of Arkansas Division of Agriculture.
4. Olaoni, S. O., Regonda, B., Luthra, K., & Atungulu, G. G. (2024b). Optimizing lab methods for consistent rice milling analyses. *Journal of Cereal Chemistry*. (Under review).

MEMORANDUM OF UNDERSTANDING
BETWEEN
THE ARKANSAS RICE RESEARCH AND PROMOTION BOARD
AND

THE BOARD OF TRUSTEES OF THE UNIVERSITY OF ARKANSAS, ACTING BY AND FOR THE UNIVERSITY OF
ARKANSAS DIVISION OF AGRICULTURE

THIS MEMORANDUM OF UNDERSTANDING ("the MOU") is made and entered into between the Arkansas Rice Research and Promotion Board ("the Board"), located at 1 Natural Resources Drive, Little Rock, AR 72205, and the the Board of Trustees of the University of Arkansas, acting by and for the University of Arkansas Division of Agriculture (UADA), located at 1371 W. Altheimer Dr., Fayetteville, AR 72704.

WHEREAS, the Board is organized as a state government entity under Ark. Code Ann. §§ 2-20-501 *et seq.* to promote the growth and development of the rice industry in Arkansas by research, extension, promotion, and market development; and

WHEREAS, the University of Arkansas is a public institution of higher education organized and existing under the laws and Constitution of the State of Arkansas, and the Division of Agriculture is a part of the University of Arkansas, which serves as the research and education program for the benefit of the citizens of Arkansas; and

WHEREAS, the Board has historically voted to advance research funding to the UADA at its summer meeting; and

WHEREAS, the parties now desire to set forth their agreement for the management and use of these funds in writing;

NOW, THEREFORE, the Board and the UADA hereby enter into this MOU and agree as follows:

SECTION 1. Funding

Funds shall only be advanced upon a duly passed motion by the Board that includes the total amount of funding to be advanced to the UADA.

To receive research funding advances, the UADA agrees to:

- a. Deposit the advanced payments into a segregated interest-bearing account in accordance with the Board's approved motion(s).
- b. Manage the deposited funds in accordance with the standards outlined in Arkansas State Board of Finance Rule 2012-A.
- c. Present an annual detailed report on the invested funds to the Board.
- d. Submit research proposals to the Board no less than one month prior to the Board's annual funding meeting, provided UADA is given adequate advance notice of the date of said annual meeting.

- e. Withhold from allocating or disbursing any portion of the advanced funding until the Board has approved research projects and allocations at its annual funding meeting.
- f. Disburse interest earned on advanced funding only for rice research- and education related needs previously approved by the Board
- g. Return, upon the Board's request, any advanced funding that exceeds the amount awarded by the Board at its annual funding allocation meeting.

SECTION 2. Acknowledgments

- a. This is the entire agreement between the parties. It supersedes any and all oral and written agreements between the parties.
- b. Modifications and amendments to this agreement, including any exhibit or appendix, shall be enforceable only if they are in writing and are signed by authorized representatives of both parties.

This agreement is effective upon agreement and proper execution thereof by the Chairman of the Arkansas Rice Research and Promotion Board and the University of Arkansas Division of Agriculture.

Agreed to by the Arkansas Rice Research and Promotion Board:

	<u>11/6/24</u>
Chairman of the Board	Date

Agreed to by the University of Arkansas Division of Agriculture:

_____ University of Arkansas Division of Agriculture	_____ Date
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Arkansas Freedom of Information Act

FOIA's Purposes: Ark. Code Ann. § 25-19-102

- To ensure that electors (citizens) are fully advised of the activities and decisions of their public officials
 - Liberally construed in favor of openness
 - Exceptions are narrowly construed



Agenda

- Purposes
- The 3 Steps
 - Meetings
 - Records

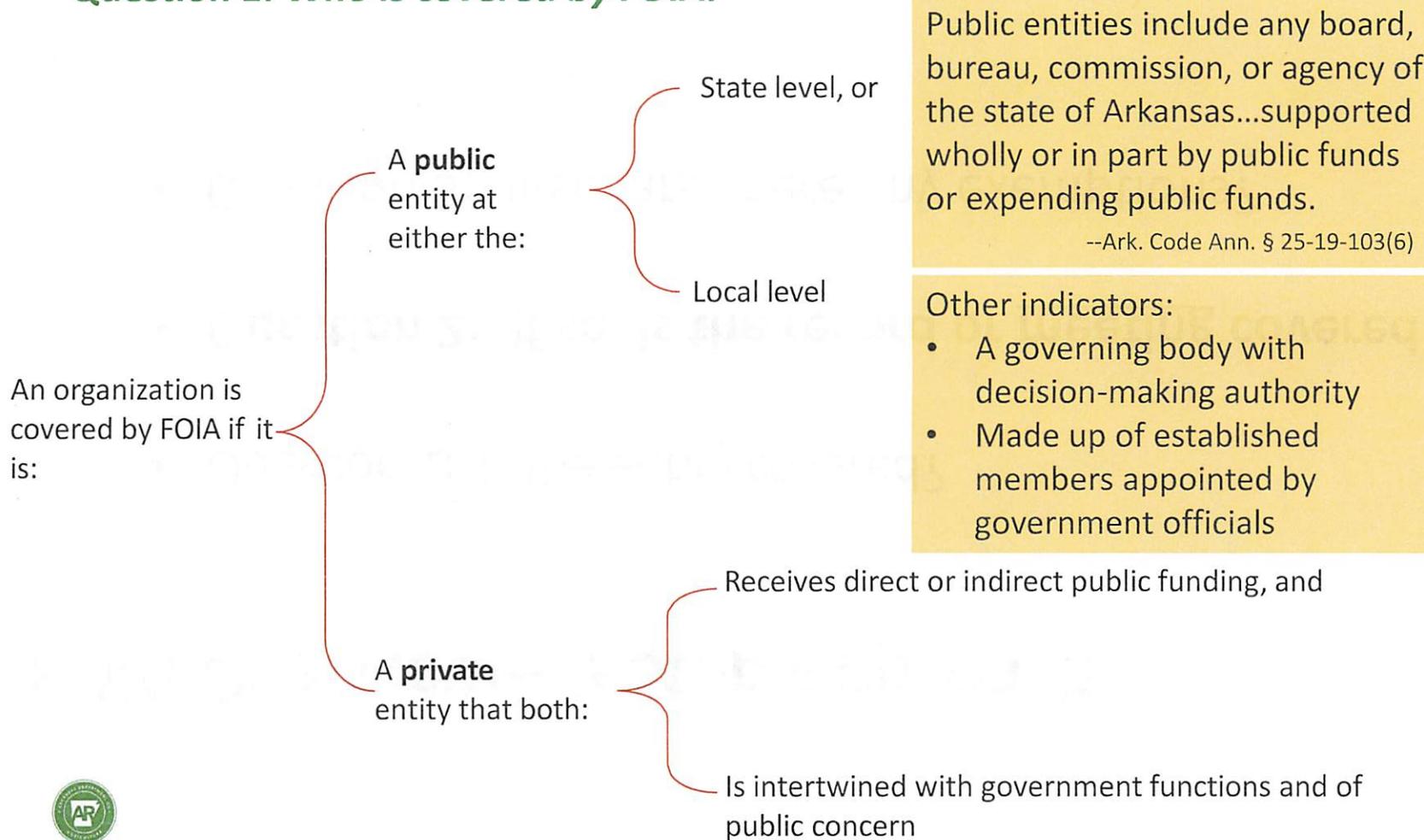


FOIA Overview—3 Step Approach

- **Question 1: Is the entity covered?**
- Question 2: If so, is the record or meeting covered?
- Question 3: If so, are there any exemptions?



Question 1: Who is covered by FOIA?



FOIA Overview—3 Step Approach

- Question 1: Is the entity covered?
- Question 2: If so, is the record or meeting covered?
- Question 3: If so, are there any exemptions?



What is a “meeting”?

- Statutory definition: “All meetings are public meetings.”
- Guidance from the Arkansas Supreme Court:
“The FOIA applies to a meeting called for the purpose of **DISCUSSING** or **TAKING ACTION** on a matter on which foreseeable action will be taken by the governing body.”
- A gathering may be considered “a meeting” for AFOIA purposes even though a quorum is not present.
- Conducting an email or telephone poll violates AFOIA.
- Determination of “a meeting” is a fact-specific inquiry that may ultimately be resolved by the court.



Are these items considered meetings?

- Social gatherings
- Chance encounter at the coffee shop
- Email or telephone poll
- Voting by secret ballot



Question 2: Is the meeting covered?

An event or gathering
is a "public meeting"

De facto, if two or more members of the governing body "meet"

AND DISCUSS BOARD BUSINESS

Constructively, if the governing body effectively communicated
even though no two members gathered or directly spoke



When the meeting is covered—Part 1

Notice Requirements

- Regular Meetings:
 1. Time, place and date – generally aim for at least 5 days notice
 2. to anyone who asks to be notified
 3. To news media
 - a. In the county where the meeting's held, and
 - b. located elsewhere that cover the regular meetings
 4. And to those that have asked to be notified

- Special/Emergency Meetings:
 1. Time, place and date – at least 2 hours in advance...
 2. to news media that have requested notice



When the meeting is covered—Part 2

- **Attendance**, not participation, at meetings
- Recording—at least audio
- Public must be able to “see” how each individual voted



FOIA Overview—3 Step Approach

- Question 1: Is the entity covered?
- **Question 2: If so, is the record or meeting covered?**
- Question 3: If so, are there any exemptions?



Question 2: Is the record covered?

A writing, recording
or other electronic
info is:

defined as a
public record only
if it is both:

kept, and

constitutes a record of the performance
or lack of performance of official functions

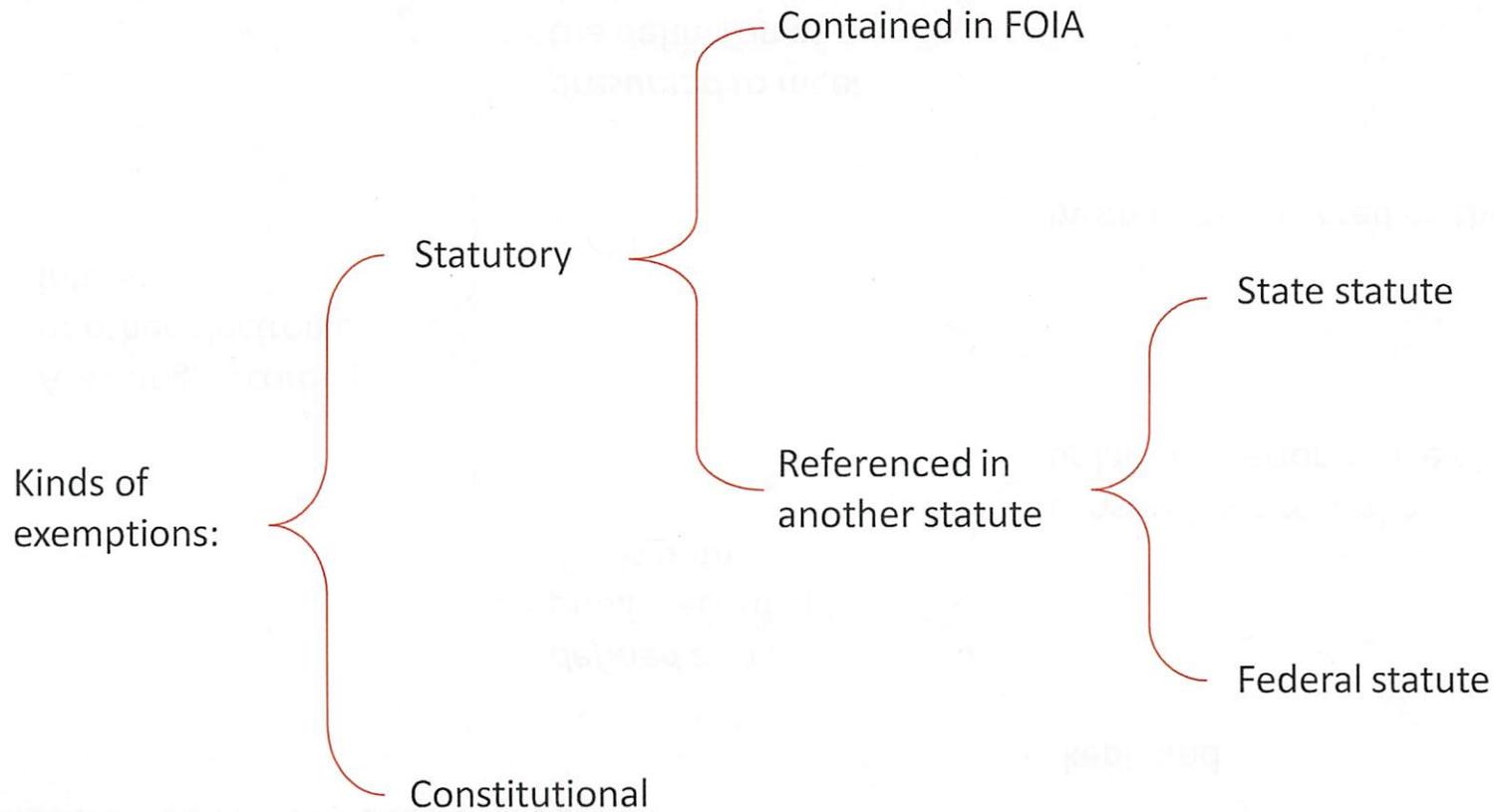
presumed to meet
the definition of a
“public record”
if it is held either:

by an entity covered by the FOIA, or

by a public employee within the scope of
the employee’s employment



Is the record exempt?



Is the public meeting exempt?

Kinds of
Exceptions
(in FOIA itself)

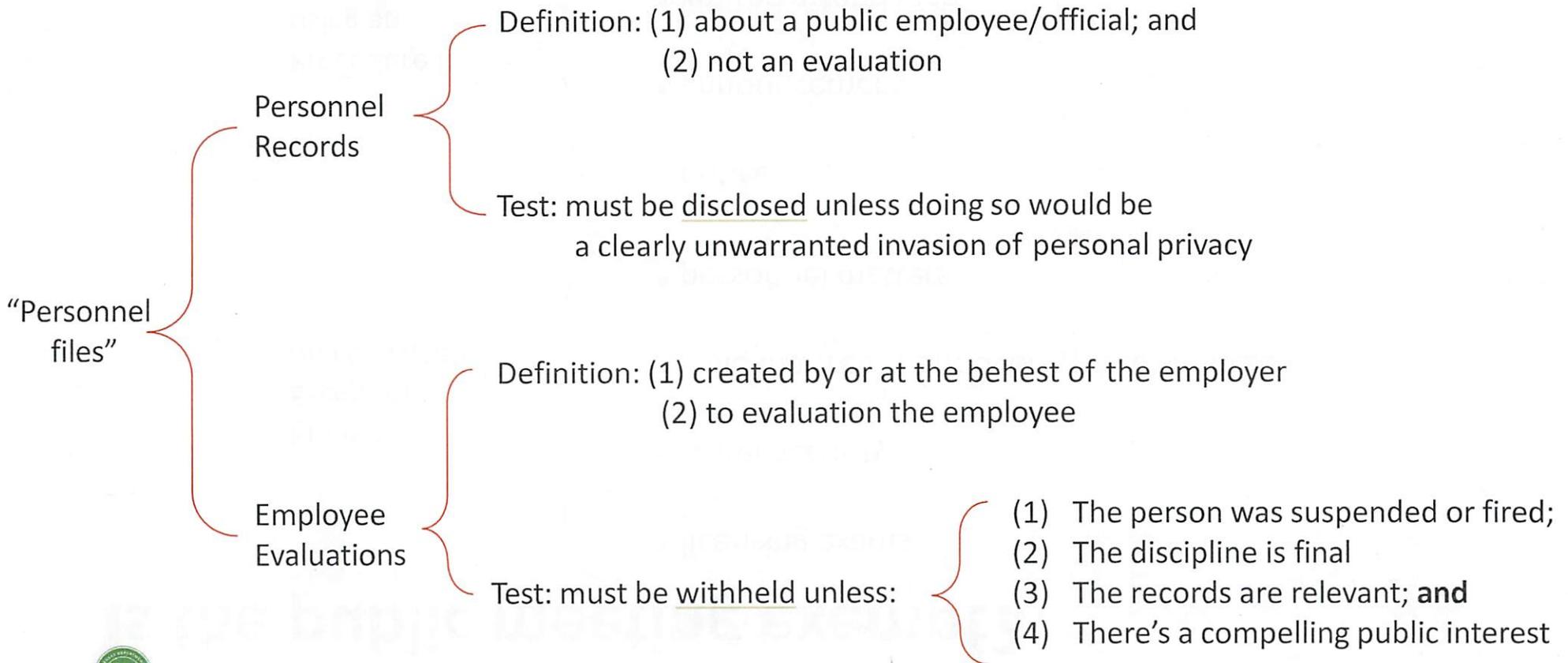
- licensing exams
- water security
- child maltreatment oversight committee
- personnel matters

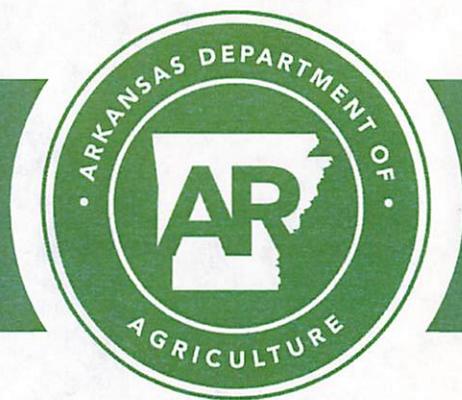
Procedure for
using an
exception

- notice
- announcement
- limited attendance
- public vote



Is the record exempt?





Questions?



Arkansas



Arkansas Rice Introduction Letter

Dear Fellow Arkansan, Friend of Rice, Rice Stakeholder:

Arkansas is the largest rice producing state in the U.S. The Arkansas rice industry is valued at over \$6 billion annually and supports 25,000 jobs. Over half of that value is in the postharvest processing of rice. Arkansas is predominately a long grain producer with approximately 10 percent of the acreage planted in medium grain.

Our state is the largest supplier of rice to the U.S. domestic market. Arkansas being centrally located makes it ideal for U.S. industrial, food service, and retail users of rice.

Nearly half of the U.S. crop is exported each year and Arkansas rice makes up a significant portion of those exports. Over the last 30 years, Arkansas has benefited from several trade agreements such as NAFTA/USMCA, CAFTA-DR, U.S. Panama Trade Promotion Agreement, and the U.S.-Colombian Trade Promotion Agreement which have lowered and will eventually eliminate tariffs for U.S. rice and set up quotas for U.S. rice. These markets are primarily long grain paddy markets from the Mid-South and the Gulf, and they're milled, packaged, and sold in their destination countries.

The Arkansas rice industry is very active in the export market. Arkansas' key long grain milled/parboiled markets are Haiti, Iraq, Mexico, Canada, Saudi Arabia, Colombia, Central America, and the United Kingdom.

Through the industry contribution that comes from our check-off dollars, the USA Rice Federation can request and receive millions of dollars from USDA to promote U.S. rice overseas. In 2024, more than \$6.5 million in USDA funds were used to regain lost market share in Latin America, open new markets for U.S. rice in the Middle East and find new importers in Cuba. Additionally, the USA Rice Federation has a robust domestic promotion program that includes commercial and noncommercial foodservice chain engagement which has, in-store retail partnerships, influencer activations, K-12 nutrition programming, resource creation, and federal nutrition advocacy.

Thank you for your service to the Arkansas rice industry. We look forward to working with you to benefit all segments of the U.S. rice industry and strengthening this great industry that is vital to our state.

Sincerely,

Arkansas Rice Federation Board of Directors

About the Arkansas Rice Federation

What is the Arkansas Rice Federation?

The Arkansas Rice Federation is the umbrella organization representing the state's entire rice industry. It is comprised of:

- Arkansas Rice Farmers
- Arkansas Rice Council
- Arkansas Rice Millers
- Arkansas Rice Merchants

The organization serves as the full-time voice for the industry, providing proactive outreach to the state government and elected officials as well as Arkansas's congressional delegation in Washington, D.C., coordinating on key issues with state and national commodity groups, and serving as the primary media contact for the Arkansas rice community.

Arkansas Rice Federation is a member of the USA Rice Federation, the global advocate for all segments of the U.S. rice industry with a mission to promote and protect the interests of farmers, millers, merchants and allied businesses.

The Arkansas Rice Federation represents the Arkansas rice industry, including farmers, millers, merchants, and others. It was formed in 2008 as a coalition of the Arkansas Rice Council, Arkansas Rice Farmers Group, state rice mills, and merchants.

The work of the Arkansas Rice Federation is guided by its Arkansas members. Operations are managed by the Arkansas Rice Federation's executive director.

Arkansas Rice

The state's largest rice industry trade association, serving as the umbrella organization for all sectors including the Arkansas Rice Farmers, Arkansas Rice Council, Arkansas Rice Millers and Arkansas Rice Merchants.

Arkansas Rice Council

Promoting Rice at Home and Around the World

Arkansas Rice Farmers

The Rice Farmers' Advocate

Arkansas Rice Millers

Representing Arkansas Rice Milling Industry and Allied Business

Arkansas Rice Merchants

Representing Rough and Seed Rice Merchandisers

Arkansas Rice Staff Responsibilities

- Address media inquiries
- Media monitoring
- Manage Federation, Council and Farmers budgets
- Compile and produce annual report
- Create quarterly activity reports
- Maintain regular social media activities
- Manage and update multiple websites
- Coordinate with media via releases, advisories, etc.
- Provide timely rice industry updates to membership
- Attend relevant industry events and meetings
- Manage Arkansas Rice booth and seek opportunities for new visibility
- Develop, monitor inventory and sell promotional items
- Create Arkansas Rice digital and design materials while protecting the Rice brand
- Coordinate and facilitate Rice Month activities
- Field all trade association management including member inquiries, meeting agendas and details
- Develop relations with Arkansas and National policymakers and leadership

Arkansas Rice Council

The Arkansas Rice Council is affiliated with the USA Rice Council, which steers the course for domestic and international promotion of U.S.-grown rice. The Arkansas Rice Council's board annually elects producer representatives to the USA Rice Council Board of Directors

The Arkansas Rice Council is the promotional arm of the Arkansas rice industry, with a focus on increasing rice awareness and use. The Council is an active and visible standard-bearer for Arkansas rice, spearheading activities like the annual Governor's proclamation of Arkansas Rice Month each September and providing rice information at public and industry events

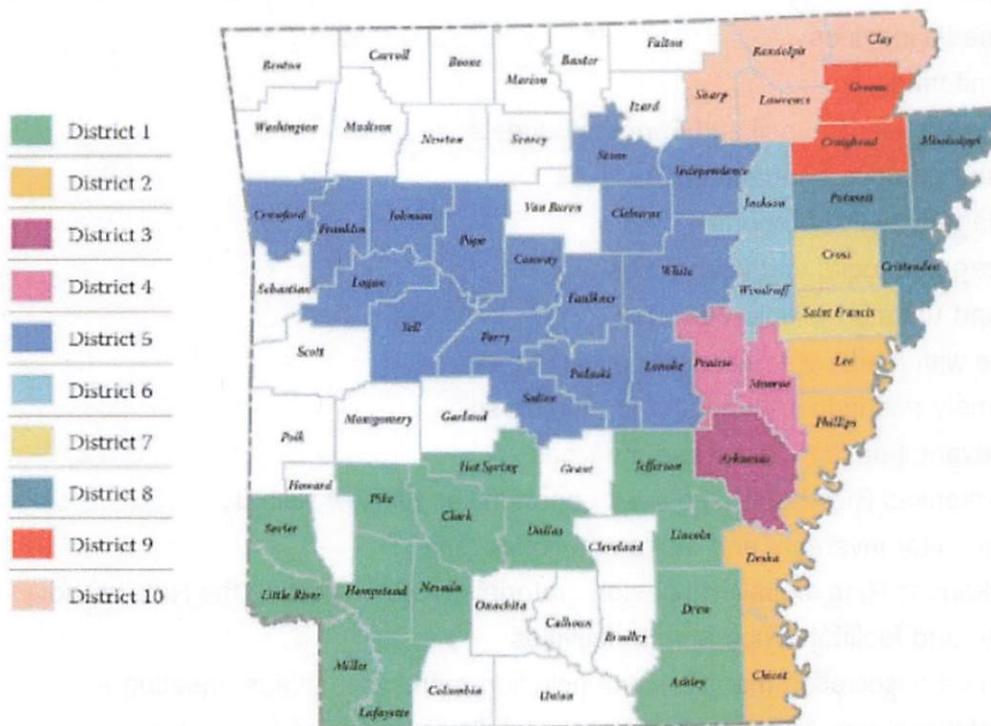
Through representation in the USA Rice Council as well as USA Rice domestic and international promotion committees, Arkansas rice farmers have a strong voice in the development and guidance of programs to promote U.S.-grown rice in the United States and around the world.

Membership

Thirty farmer directors are elected to serve on the Arkansas Rice Council Board of Directors, three from each of ten districts. Each farmer director serves for a three-year term.

What is expected of a Board member?

A director is expected to represent the interests of the rice farmers in his/her district and to take an active role in communicating the mission and work of the Arkansas Rice Council.



Arkansas Rice Council Special Projects



License Plate

The Arkansas Rice Council worked with the Department of Finance and Administration beginning in 2014 to develop a specialty license plate to promote Arkansas rice. The license plate can be purchased at Department of Finance and Administration revenue offices across the state. Specialty fees from the plates help fund scholarships for high school seniors and students pursuing a career in agriculture. Any motor vehicle owner may obtain the Arkansas Rice license plate for the specialty registration fee of \$35. To learn more, please call 501.682.4692 or visit www.dfa.arkansas.gov.



Rice Reps

Since 2019, the goal of the Arkansas Rice Reps program is to encourage interest in rice promotion and to publicize the importance of the Arkansas rice industry to the state's economy. Contestants are judged on their promotional activities, creativity, involvement and stewardship. The five-month program includes social media competitions with over \$17,000 in scholarship dollars being awarded.

A collegiate scholarship program has been established for Arkansas students majoring in agriculture, who are a Junior or Senior with at least a 2.5 GPA and have a financial need. The scholarship amount awarded to each of the following universities is \$2,500 per academic year: Arkansas State University, Arkansas Tech University, Southern Arkansas University, University of Arkansas at Fayetteville, University of Arkansas at Monticello, and the University of Arkansas at Pine Bluff.

Arkansas Rice Council Board of Directors

For election purposes, the rice producing area of Arkansas is divided into ten districts. Each district has three rice farmers, elected by their peers, representing that district on the board for a term of three years. Terms are staggered so one third of the board is up for election each year. There are two non-voting Ex Officio positions on the board.

Structure

- 10 election districts
- Each district elects 3 directors (30 directors on the Arkansas Rice Council Board)
- 1/3 of the board, one position per district, is elected each year

Annual Election Process

- Arkansas Rice Council President appoints a Nominating Committee
- Committee nominates one person for each expiring position
- Mailing goes out to all Arkansas rice farmers on mailing list, which includes:
 - Postcard outlining election process,
 - Names of nominees from Nominating Committee,
 - Instruction how to obtain a petition form for any rice producer who wishes to add his/her name to the ballot.
- Any Arkansas rice producer who wants to run for a seat in his/her district can do so by:
 - Obtaining signatures of 15 FSA registered rice farmers in his/her district on the petition,
 - Submitting completed petition to independent accounting firm that oversees election by designated deadline.
- In districts where no petitions are submitted, the nominee is considered elected unopposed.
- In districts where petitions are submitted:
 - Ballot with the names of all candidates is prepared,
 - Ballot and bio information on each candidate is sent to all farmers in that district,
 - Farmers return ballots to the independent accounting firm, which tabulates results (farmers vote only in the district where their FSA Control Office is located, even if they farm in more than one county).
- Election results are announced at the Arkansas Rice Council Annual Meeting.

Arkansas Rice Farmers Board of Directors

The Arkansas Rice Farmers are affiliated with the USA Rice Farmers Group. Composed entirely of rice farmers, this representative body ensures a forum for policy development on legislative and regulatory issues that affect rice farmers and provides rice farmers with a national voice to address those issues.

Membership

Thirty farmer directors are elected to serve on the Arkansas Rice Farmers Board of Directors, three from each of district. Each farmer director serves for a six-year term.

A member is eligible for board service in the district where his/her FSA county control office is located, or in the district of their residence.

Legislative Monitoring and Political Action Committee Management

The Arkansas Rice Farmers group works collectively on policy development for legislative and regulatory issues impacting the industry. In order to enhance these efforts, staff and contractors engage in political activities and relationships to help maintain a strong presence in Little Rock as well as Washington, D.C. These activities are also enhanced by political action committee fund- raising efforts coupled with strategic contribution planning on both state and federal levels.

The USA Rice Farmers Group is the national legislative and regulatory advocacy association for rice farmers. It provides a forum for policy development on issues that affect rice farmers and equips them with a strong voice to advance and implement activities to address those issues.

The Arkansas Rice Farmers Board of Directors names a state delegation to the USA Rice Farmers Group Board of Directors. Each member state determines the size of its delegation (minimum of 8 directors per state delegation). Voting is by state; each state has one vote.

Member states include: Arkansas, California, Louisiana, Mississippi, Missouri, and Texas.

Arkansas Rice Millers

Representing Arkansas Rice Milling Industry and Allied Business

The Arkansas Rice Millers are the state affiliate of the USA Rice Millers' Association (RMA).

Arkansas Rice Miller membership includes farmer-owned cooperatives and privately owned mills. Their emphasis is on value added products and exports.

Arkansas Rice Merchants

Representing Rough and Seed Rice Merchandisers

Arkansas members of the USA Rice Merchant's Association members are an important component of the U.S. rice industry, providing a market outlet for thousands of farmers in all six rice-producing states.

Through the USA Rice Merchants' Association, members are affiliated with the USA Rice Federation, the national advocate for all segments of the U.S. rice industry.

Through the Federation, merchandisers are working with farmers, millers and allied businesses to increase profitability for the entire U.S. rice industry.

Arkansas Rice Board of Directors

11 Members

5 Farmers

Selected jointly by Arkansas Rice Council and
Arkansas Rice Farmers members

2 Merchants

Selected by the Arkansas members of the
USA Rice Merchants' Association

2 Millers

Selected by the Arkansas members of the
USA Rice Millers' Association

2 Ex-Officio

USA Rice President
Arkansas Rice Executive Director

*Each director shall hold office for 2 years or until his or her
earlier resignation or removal as provided for herein.*

About the USA Rice Federation

Mission

To ensure the health and vitality of a unified U.S. rice industry by advocating on behalf of farmers, millers, merchants, and allied businesses.

USA RICE FEDERATION: A UNIFIED VOICE FOR THE U.S. RICE INDUSTRY FEDERATION MEMBER ORGANIZATIONS

USA Rice Council: Promoting U.S.-grown Rice at Home and Around the World

USA Rice Farmers Group: The Rice Farmers' Advocate

USA Rice Millers' Association: Representing the U.S. Rice Milling Industry since 1899

USA Rice Merchants' Association: Representing Rough and Seed Rice Merchandisers

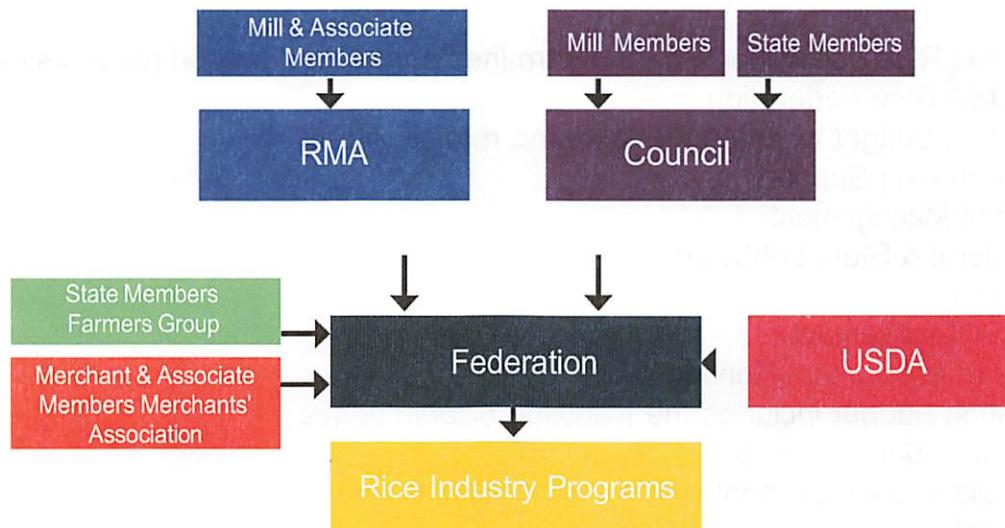
The USA Rice Federation is an umbrella organization representing all segments of the U.S. rice industry. Through the USA Rice Federation, the U.S. rice industry has a unifying forum that facilitates policy and program development and equips the industry with a strong voice.

The USA Rice Council, USA Rice Farmers Group, USA Rice Millers' Association and USA Rice Merchants' Association are members of the USA Rice Federation. Each member organization has its own bylaws and board of directors. Staffing is provided by the USA Rice Federation.

The Rice Foundation is a separate organization dedicated to research and education. It has its own governance and board of directors. Farmers, millers, suppliers, and users of rice are represented in the Foundation, fostering communication on research and education priorities to enhance the industry's response to the needs of the marketplace. The USA Rice Federation provides management services for The Rice Foundation.



USA Rice Funding Flow



USA Rice Federation Funding

This chart shows the flow of financial support into the USA Rice Federation, which puts these resources to work conducting programs on behalf of the U.S. rice industry.

The two main sources of industry funding are the USA Rice Council and the USA Rice Millers' Association. USA Rice also receives substantial funding from USDA through their market development cooperator program.

Most USA Rice Council funding from member states is restricted for promotion and market development work only. Unrestricted dues from the Millers, Merchants, Farmers Groups and Enterprise Partners make it possible to conduct non-promotion work on farm policy and other legislative efforts that are major priorities for rice farmers and the U.S. rice industry.

Arkansas Rice Funding Sources

Arkansas Rice Federation

- Arkansas Rice Federation Board determines annual budget and requests funds back from USA Rice Federation.
- Operating budget includes the following retainer items:
 - Accounting Support
 - Event Management
 - Federal & State Lobbying
 - Media
 - PAC Management
 - Trade Association Management
- Operating budget includes the following billable items:
 - Dues & Subscriptions
 - Meals & Entertainment
 - Website
 - Travel
 - Legal & Consulting Fees
 - Audit Fees
 - Directors & Officers Insurance

Arkansas Rice Council

- Arkansas Rice Council Board determines annual budget and requests funds back from USA Rice Council.
- Budget is restricted for promotional activities, which are determined and approved by the Arkansas Rice Council Board.

Arkansas Rice Farmers

No operating budget exists



STAFF CONTACTS

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501-912-7560

Tisha Gribble, Director of Promotions
arkansasricefarmers@gmail.com
501-590-3739

RICE SOCIAL MEDIA

 /ARKANSASRICE

 /RICEARKANSAS

 /ARKANSASRICE

#ARRICE

Attachment 7



DIVISION OF AGRICULTURE
RESEARCH & EXTENSION

University of Arkansas System

Crop Improvement Update

FALL 2024

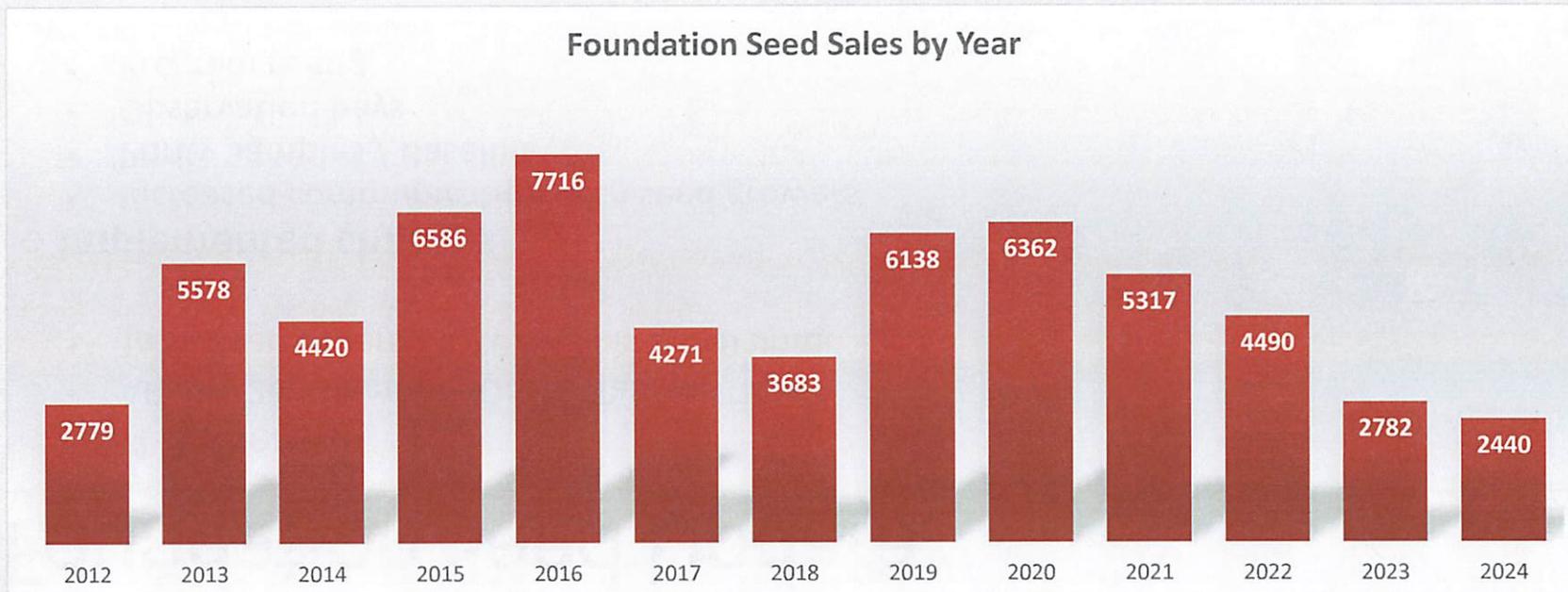
Foundation Seed Update

- **2024-25 Season**
 - ARoma 22, Diamond, Ozark, Taurus, Titan
 - Total Seed orders for 2023-24 is 2,440 units

- **Implemented changes**
 - Increased communication with seed growers
 - Purity Samples / Baseline
 - Observation bays
 - Program re-org

- **Upcoming changes**
 - Implement Q-sorter into program
 - Increased marketing

Foundation Seed Update



* Seed orders

Commercialization Update

Licensed lines

- ProGold 1 , 3M, 4L
- RU961099 – Short Grain
- 1st year of production

Contracted FS Production

- ProGold 1 , 3M, 4L

Questions?

2024 Rice Crop Overview

Jarrold Hardke
Rice Extension Agronomist

UofA

DIVISION OF AGRICULTURE
RESEARCH & EXTENSION

University of Arkansas System

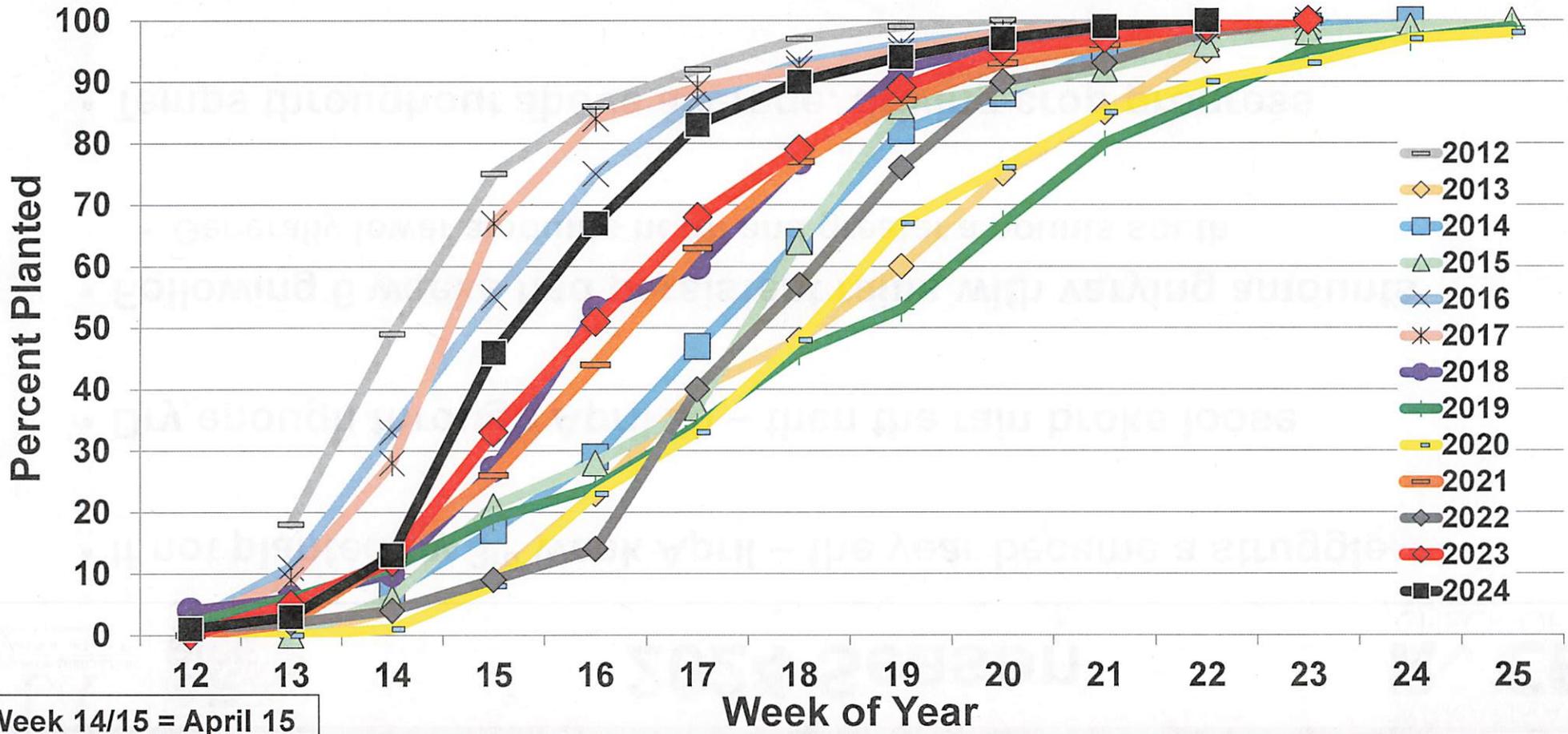


ARKANSAS
R✓CE
CHECK-OFF

2024 Season

- **Dang the torpedoes, full speed ahead!**
 - Northeast – lightning fast and stayed dry early
 - Central – early opportunity but broken up more
 - South – couldn't miss a rain
- **Economics going the other direction (down)**

2012-2024 AR Rice Planting Progress



2024 Season

- If not planted by 3rd week April – the year became a struggle
- Dry enough through April 20 – then the rain broke loose
- Following 6 weeks had persistent rains with varying amounts
 - Generally lower amounts north and greater amounts south
- Temps throughout above average, driving crop progress
- Rice progress 10+ days ahead of 30-year predicted average progress

2024 Season



2024 Season



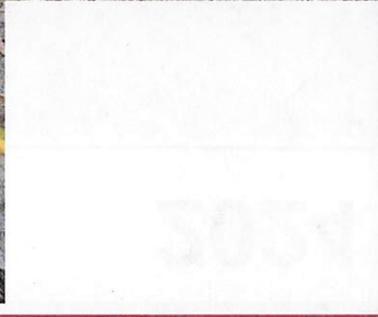
2024 Season



2024 Season



2024 Season



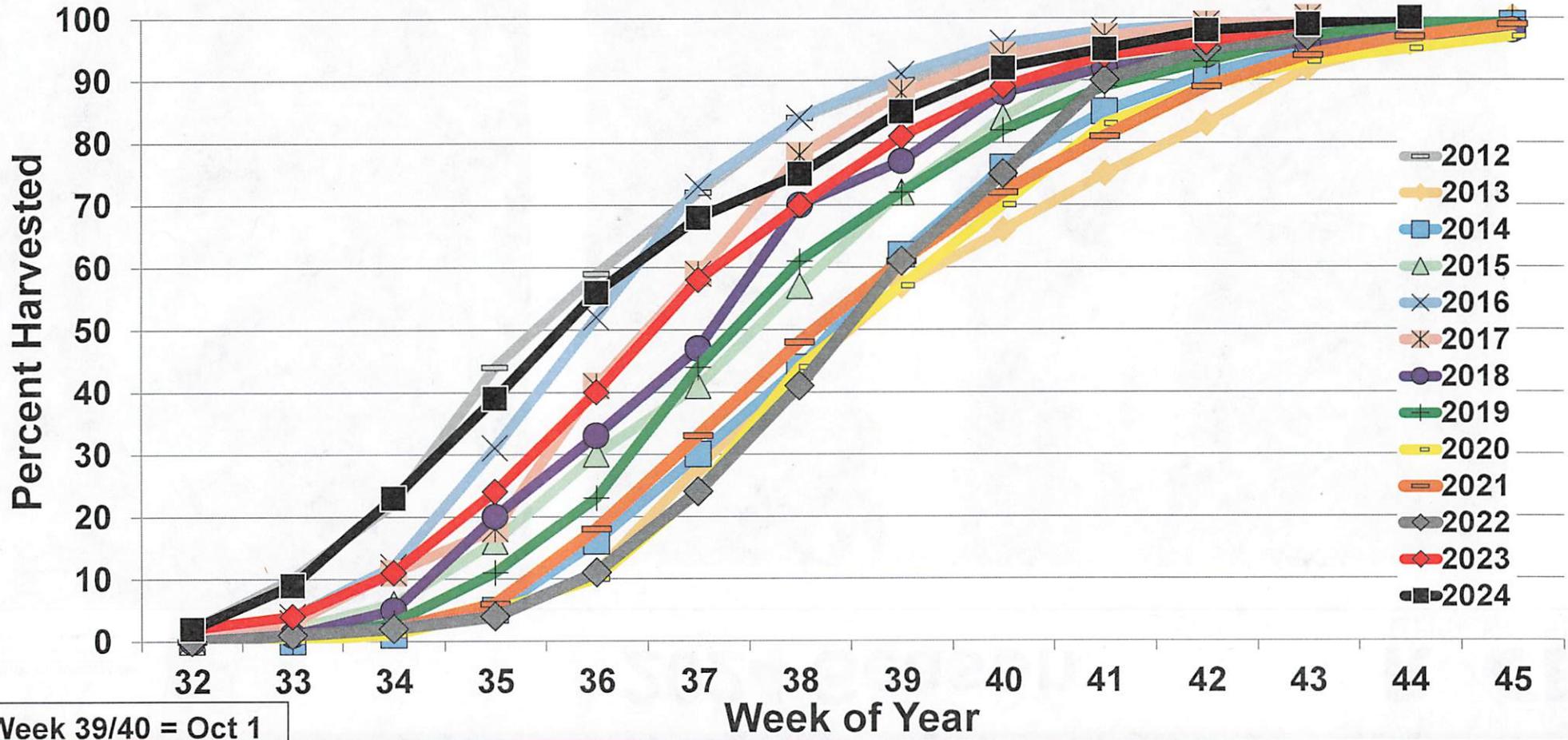
2024 Season



2024 Season

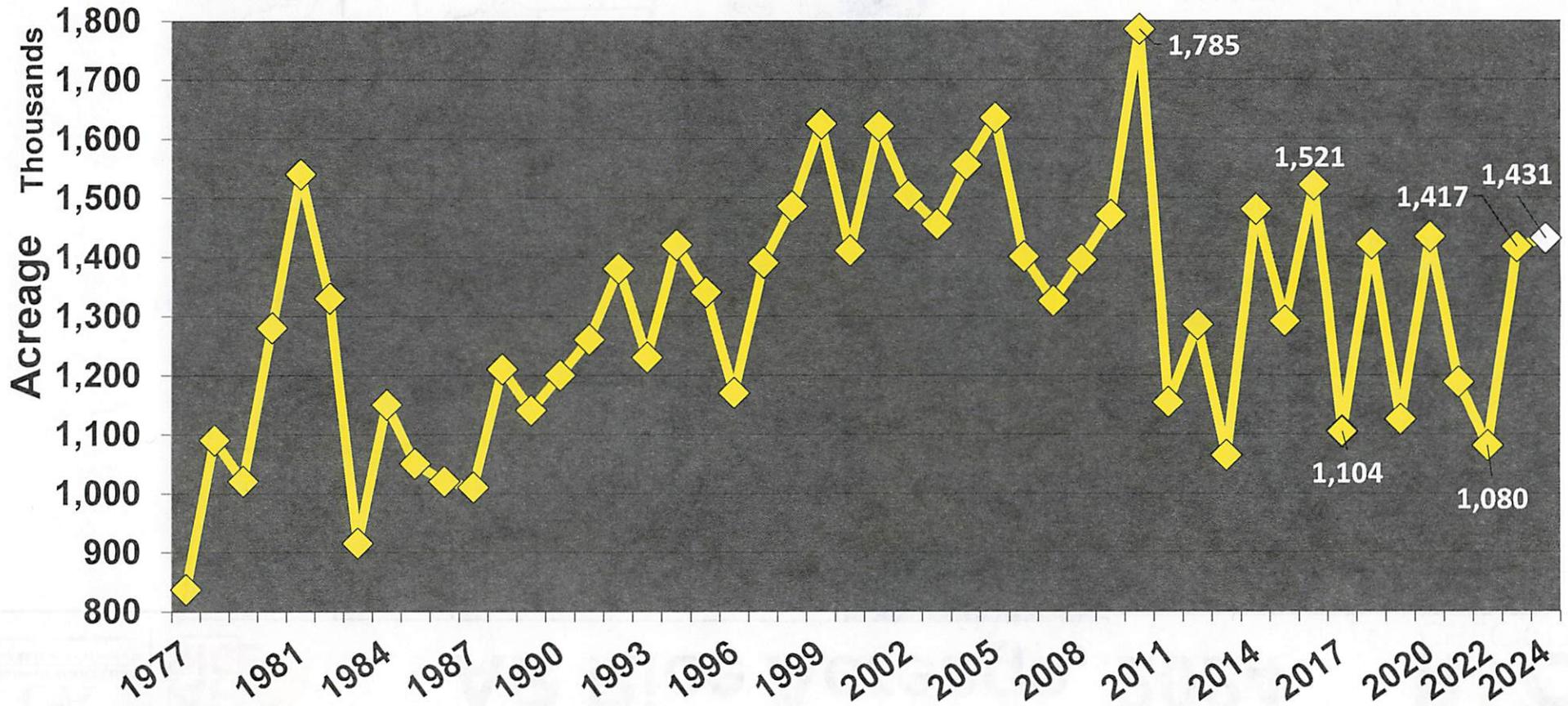


2012-2024 AR Rice Harvest Progress

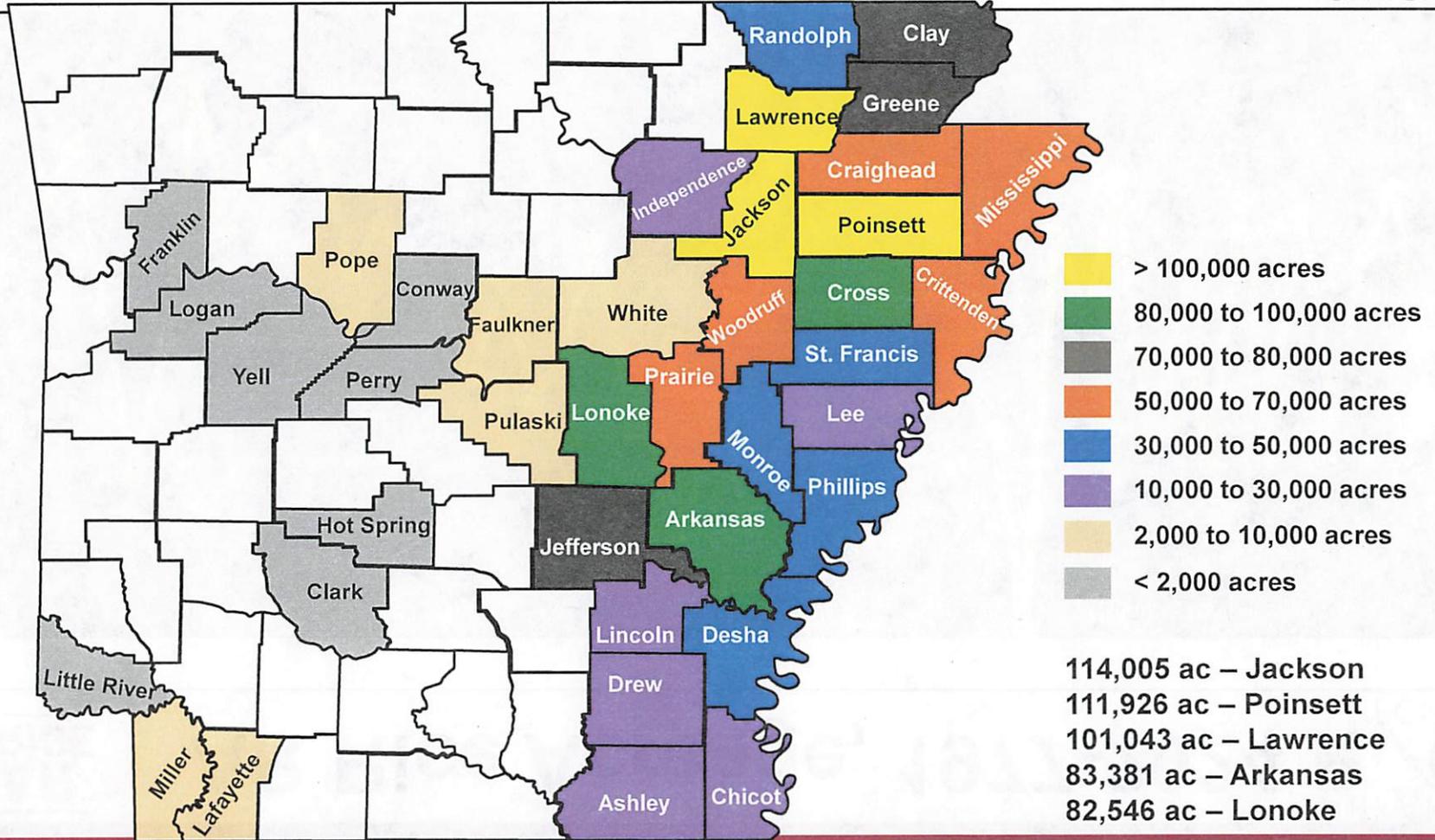


Week 39/40 = Oct 1

AR Rice Acreage, 1977-2024

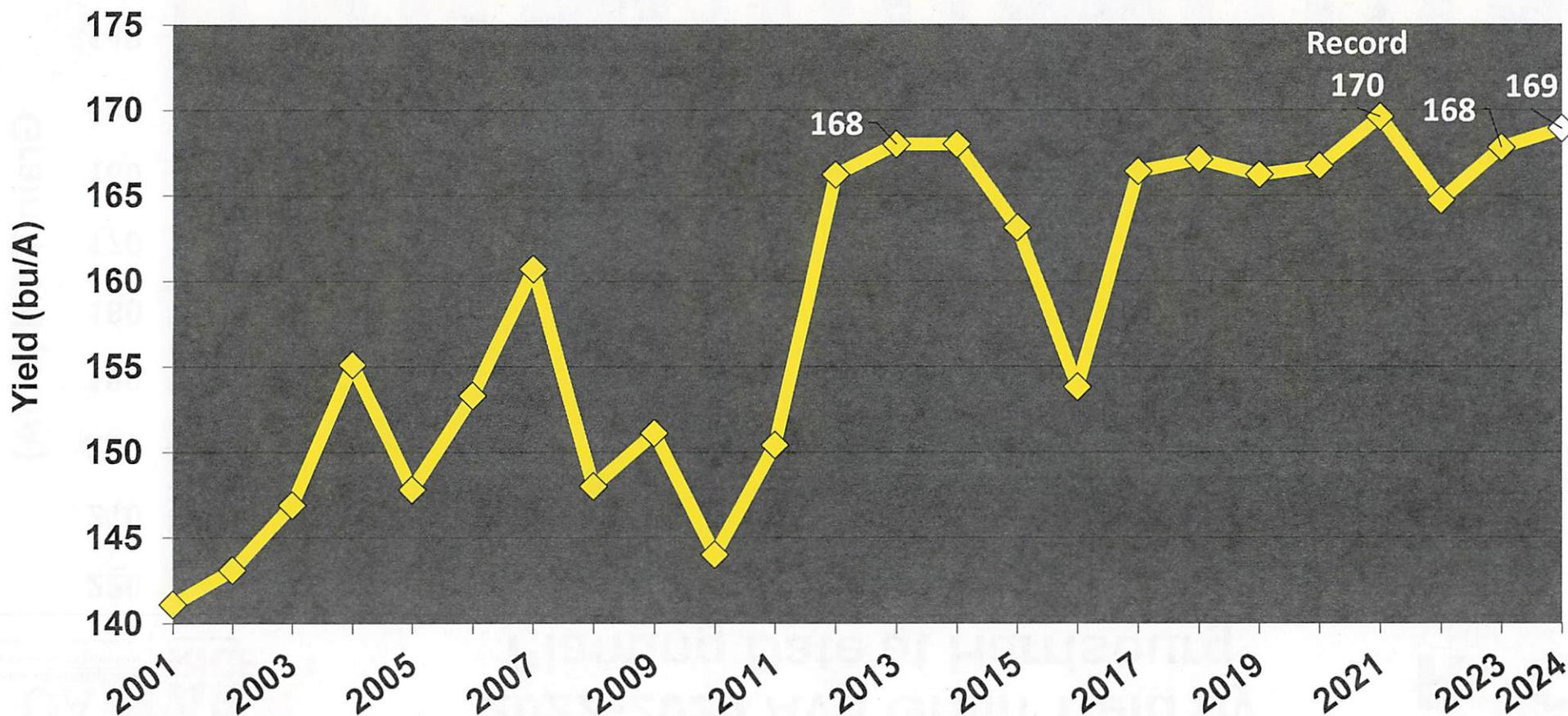


AR Rice Acreage, 2024

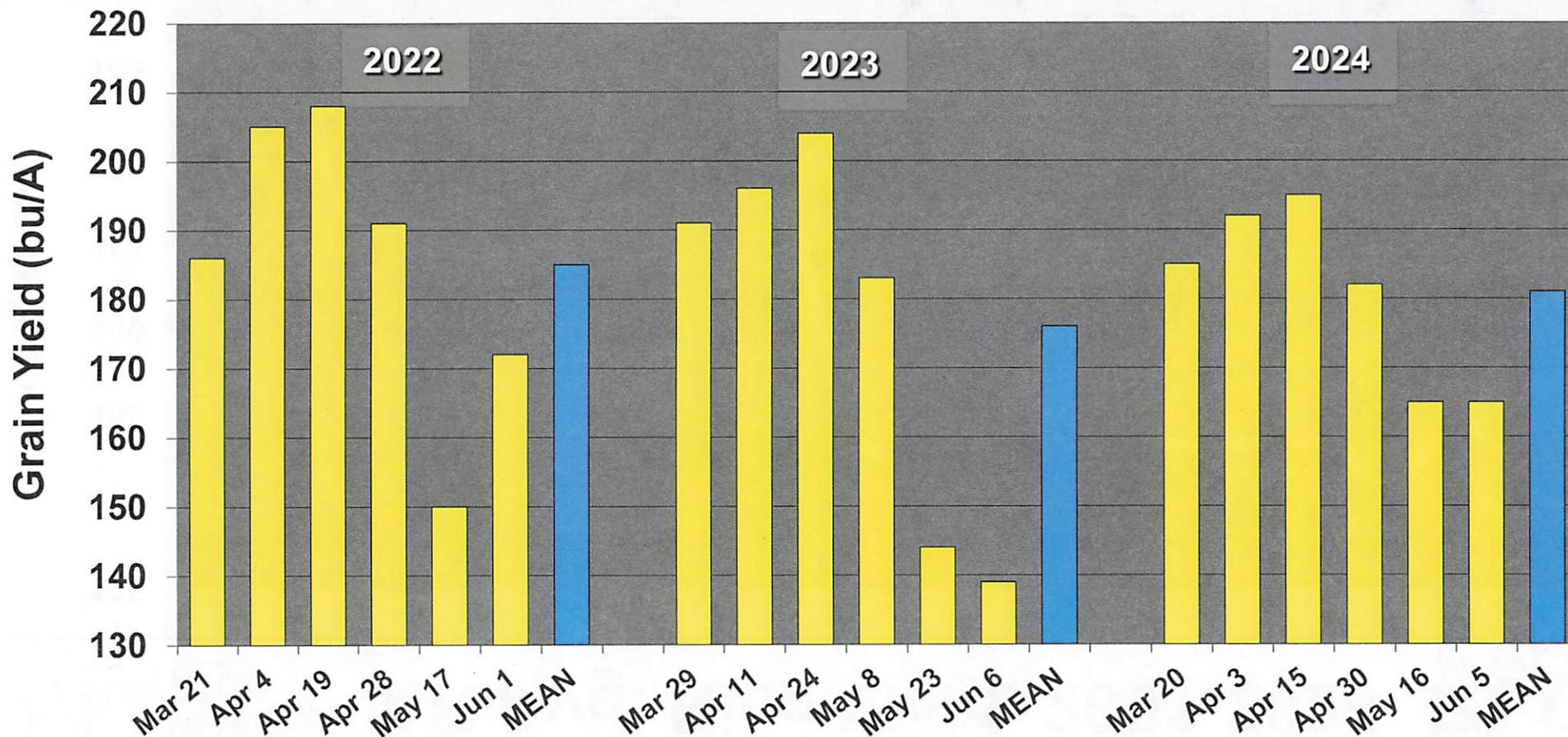


114,005 ac – Jackson
 111,926 ac – Poinsett
 101,043 ac – Lawrence
 83,381 ac – Arkansas
 82,546 ac – Lonoke

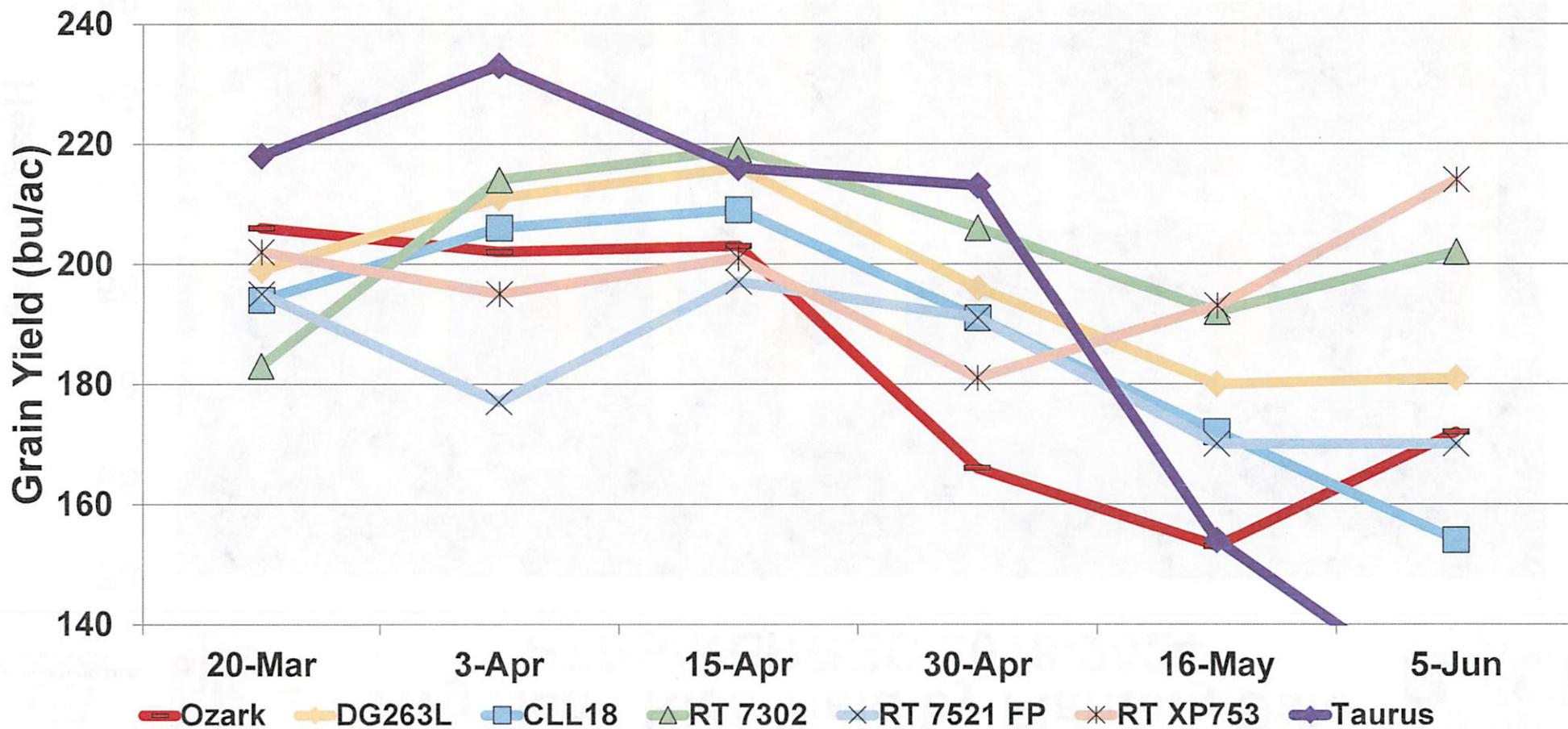
AR Avg. Rice Yield, 2001-2024



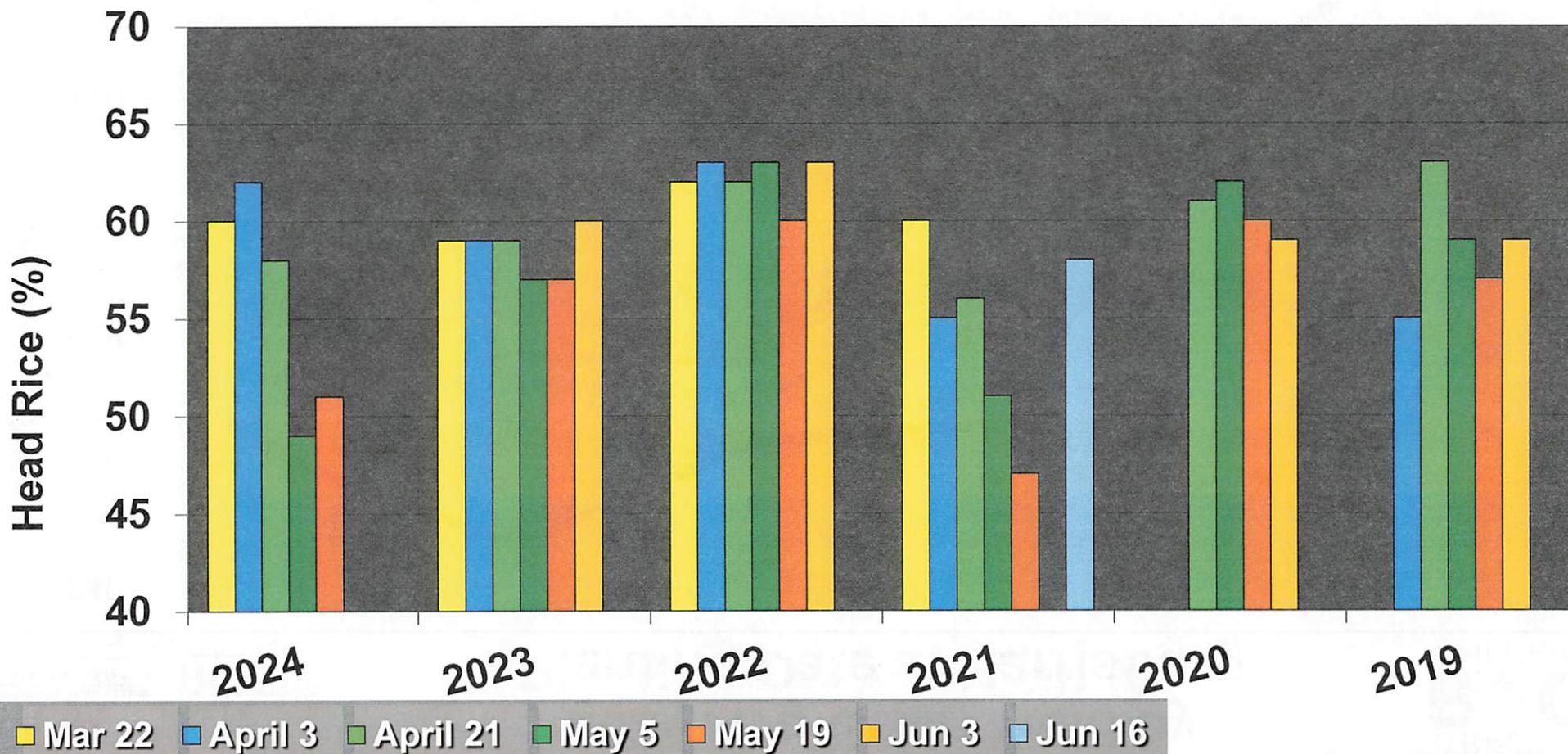
2022-2024 Avg Grain Yield by Planting Date at Harrisburg



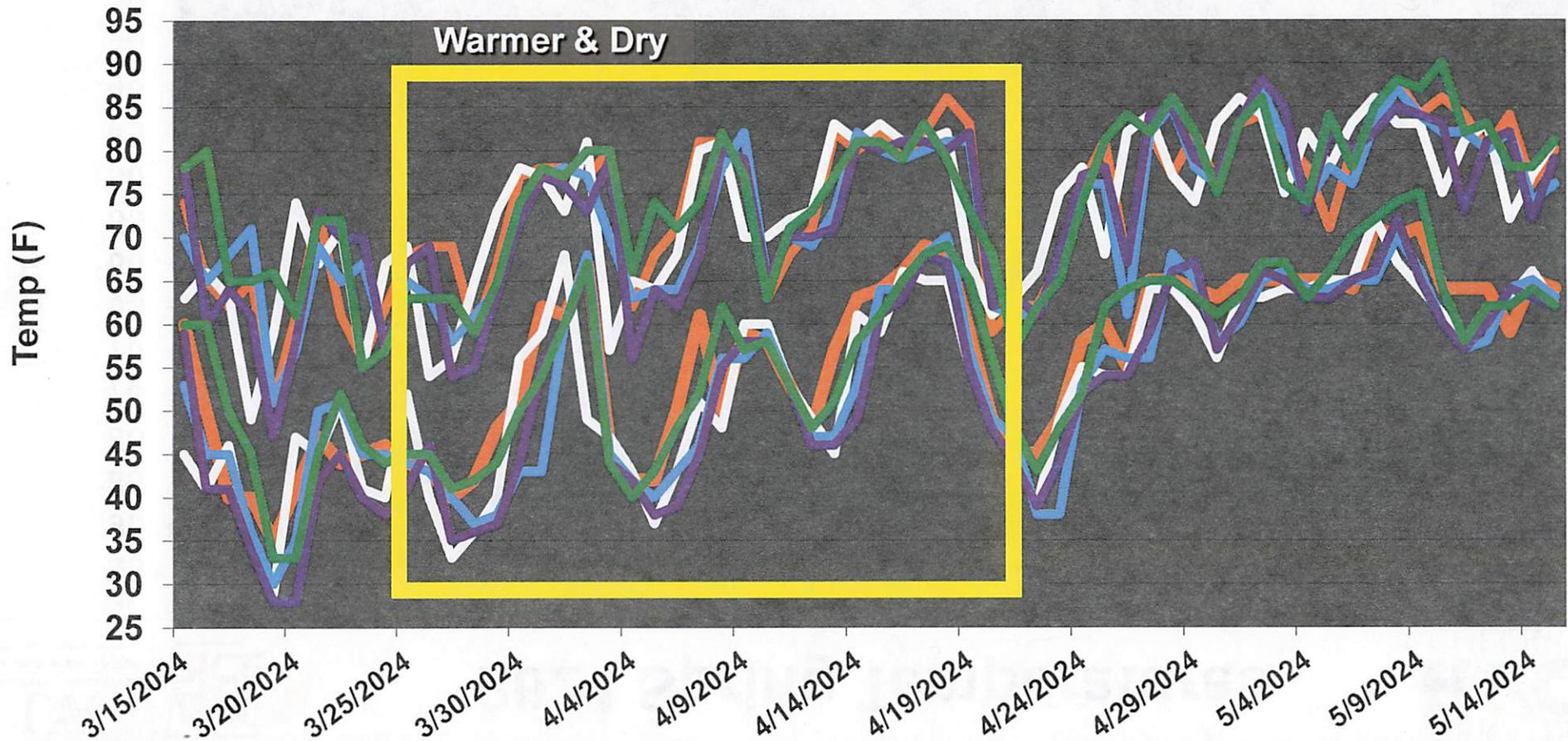
2024 Avg Grain Yield by Planting Date at Harrisburg



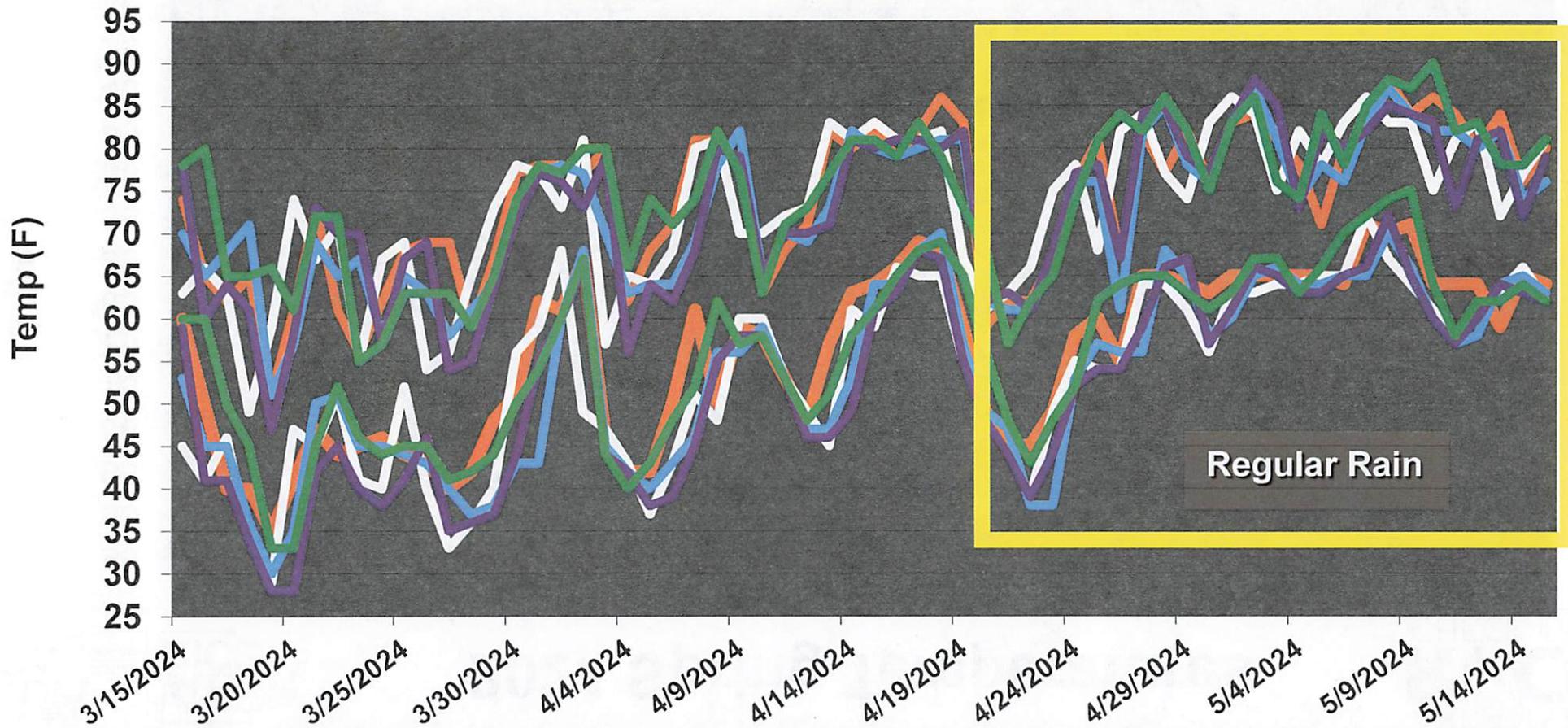
Avg Head Rice Yield by Planting Date PTRS/NERREC 2018-2024



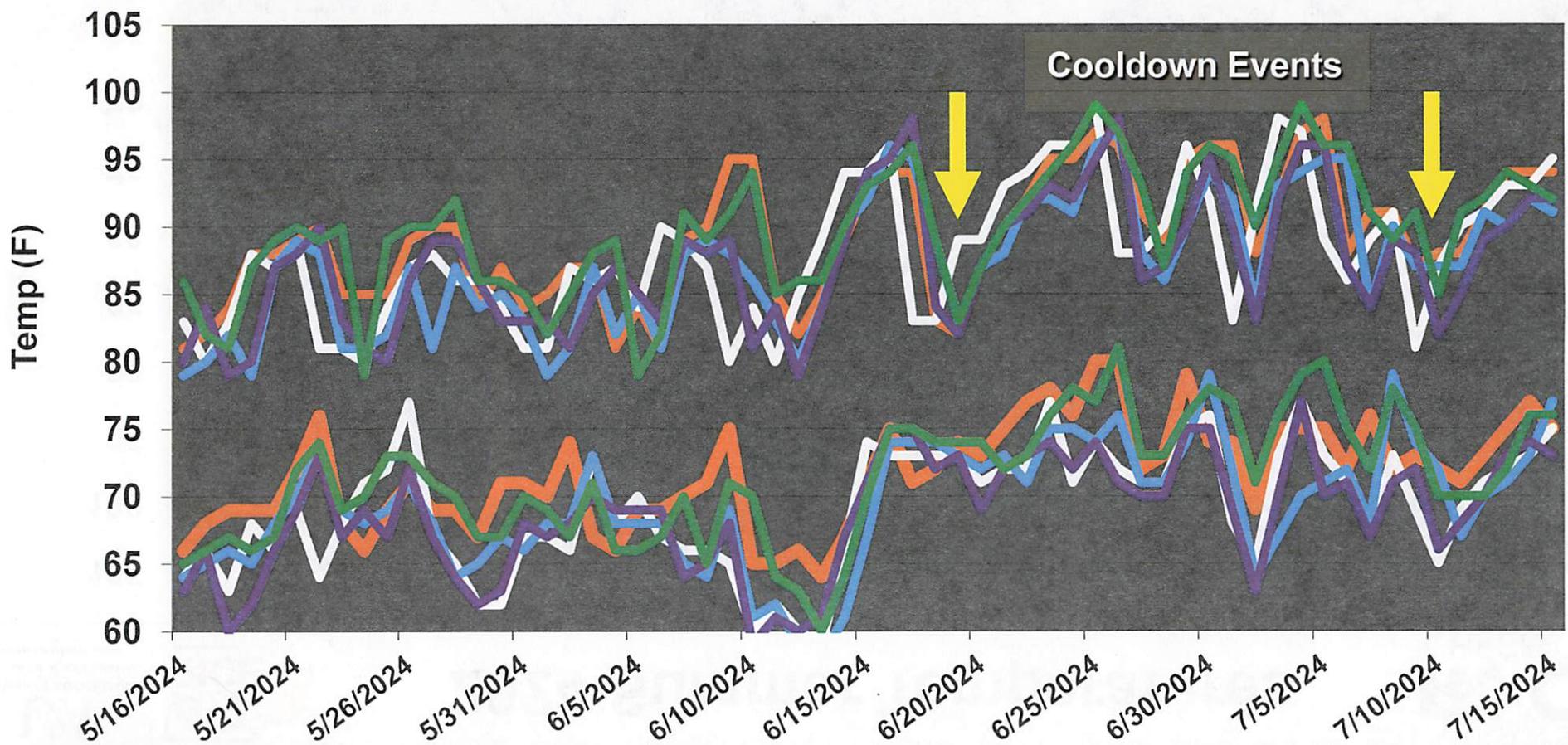
2024 Spring Temperatures



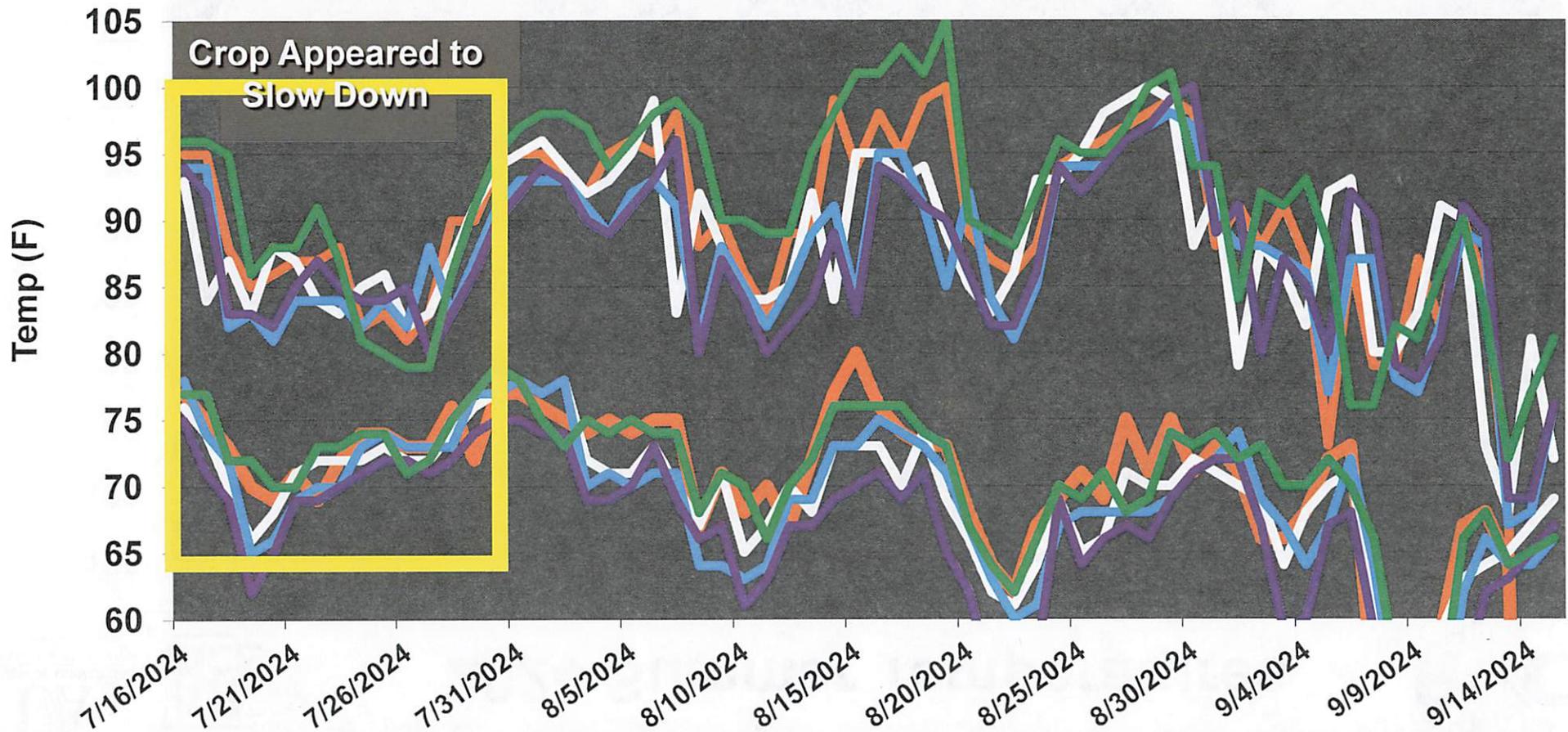
2024 Spring Temperatures



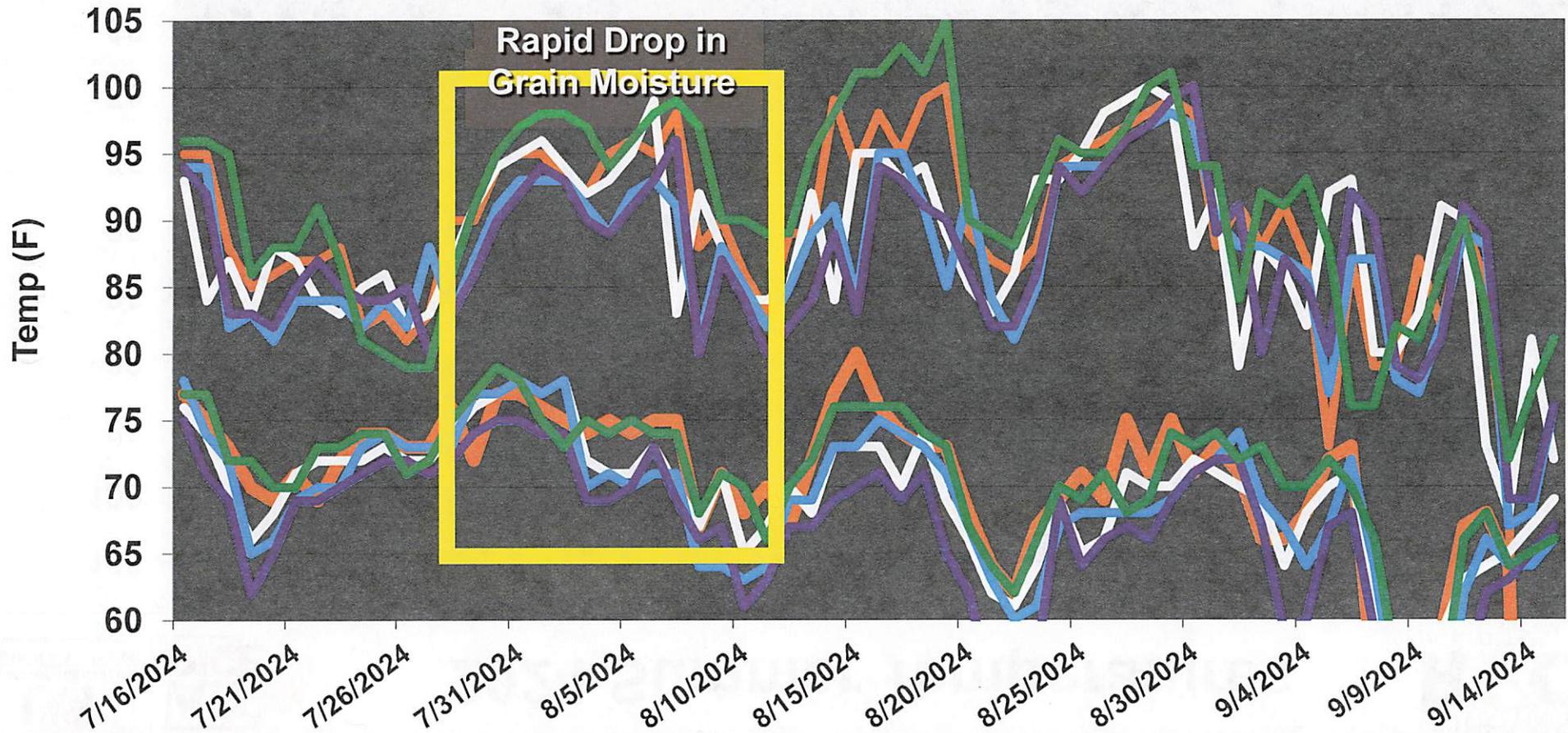
2024 Summer Temperatures



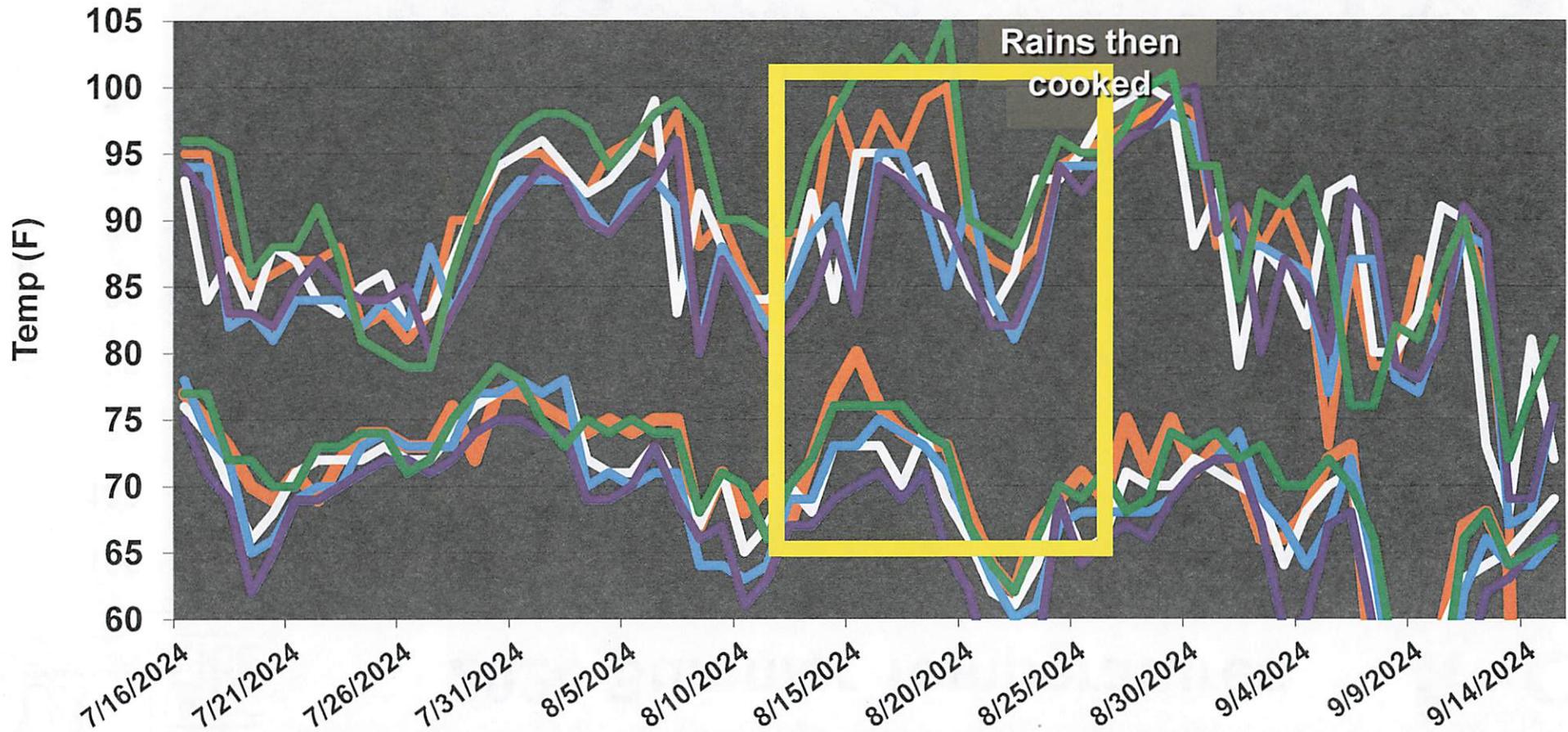
2024 Summer Temperatures



2024 Summer Temperatures

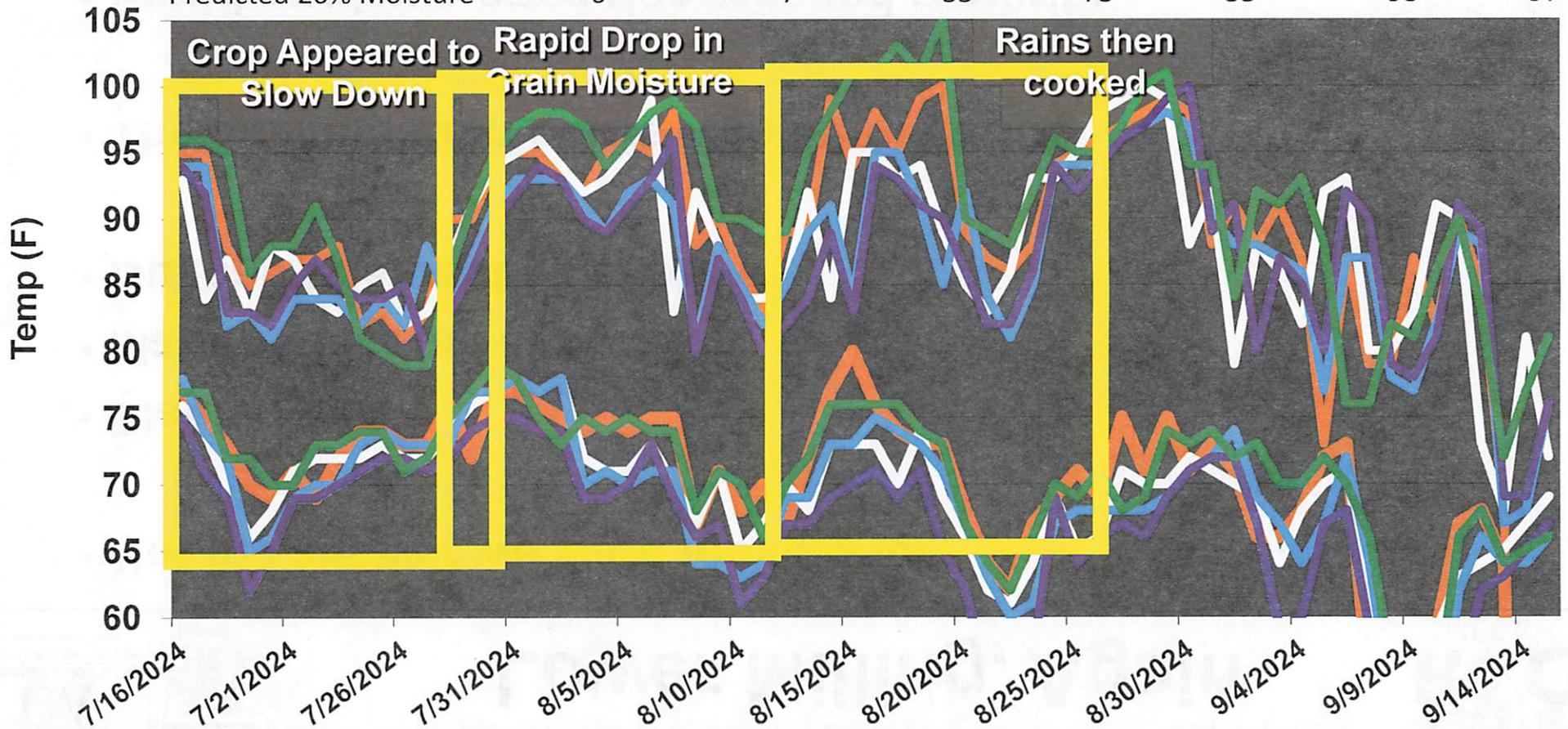


2024 Summer Temperatures



2024 Summer Temperatures

Harvest Progress	0	2	9	23	39	56	68	FF
Predicted 20% Moisture	0	7	35	75	88	93	97	



Lower Milling, Again

- **Not the answer we were looking for**
- **Planted fast**
- **Matured fast (all at once)**
- **But can't harvest all at once**

- **The conversation starts with temperature**

- **Rapid drydown once rice reached maturity**
 - **Frequent comment – “started at 19%, was at 14% by end of week”**

Lower Milling, Again

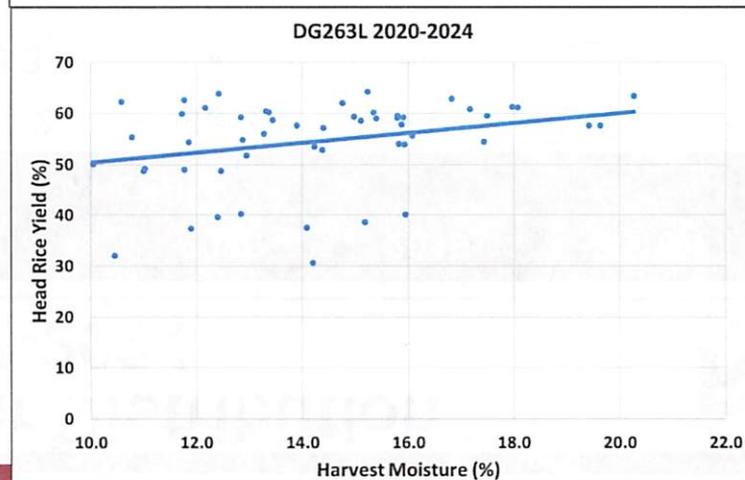
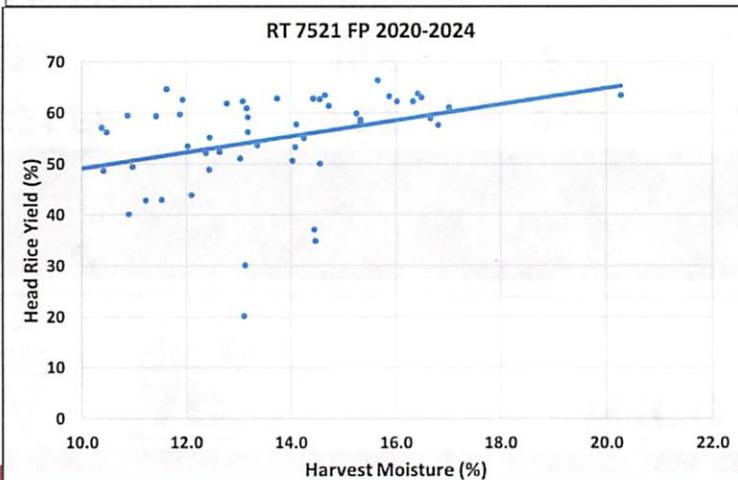
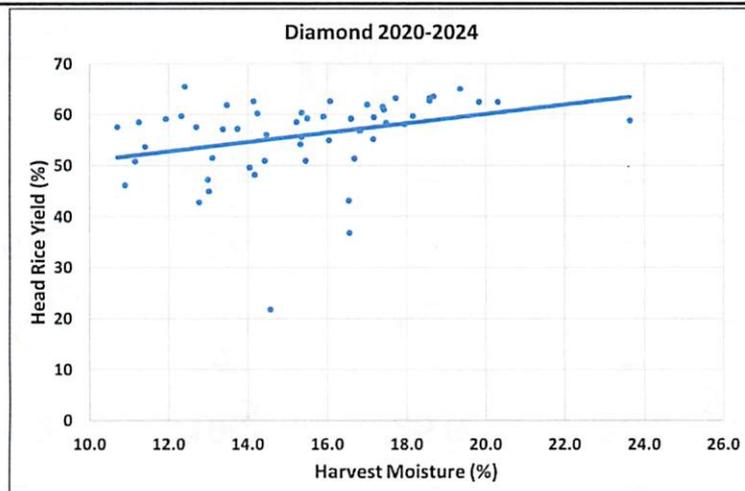
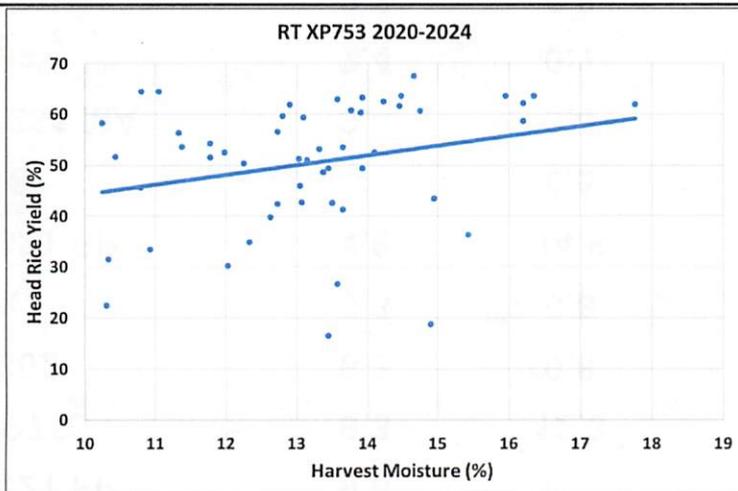
- **Rapid drying making rice overly brittle**
 - Trends to lower milling
- **Add in rains over Labor Day**
 - Start downhill
- **Hurricane Francine**
 - Remaining 30% of rice that was mature “nuked”
 - Milling went over the edge of the cliff

Lower Milling, Again

- **Four(?) consecutive seasons with “less-than-ideal” milling**



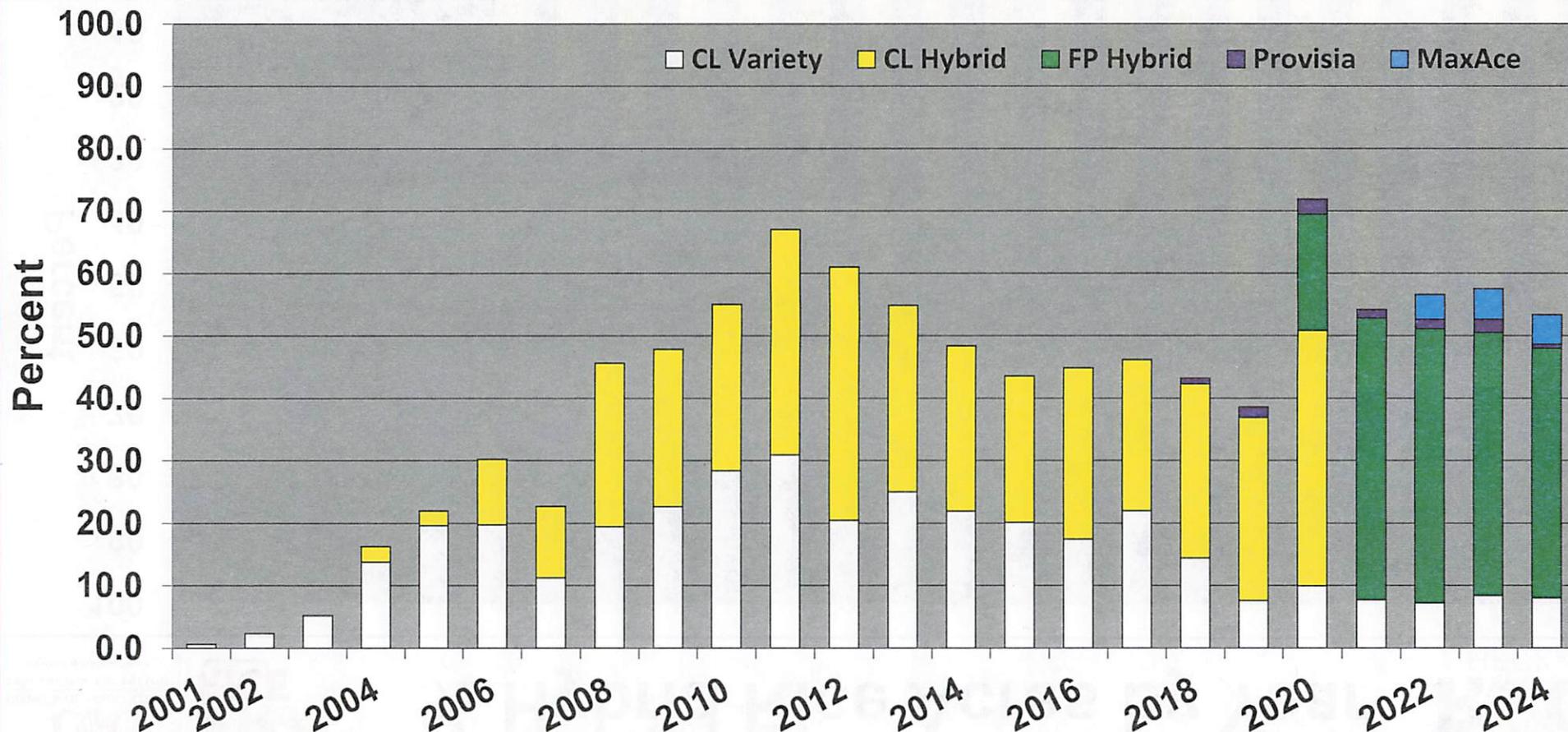
Milling Yields by Harvest Moisture



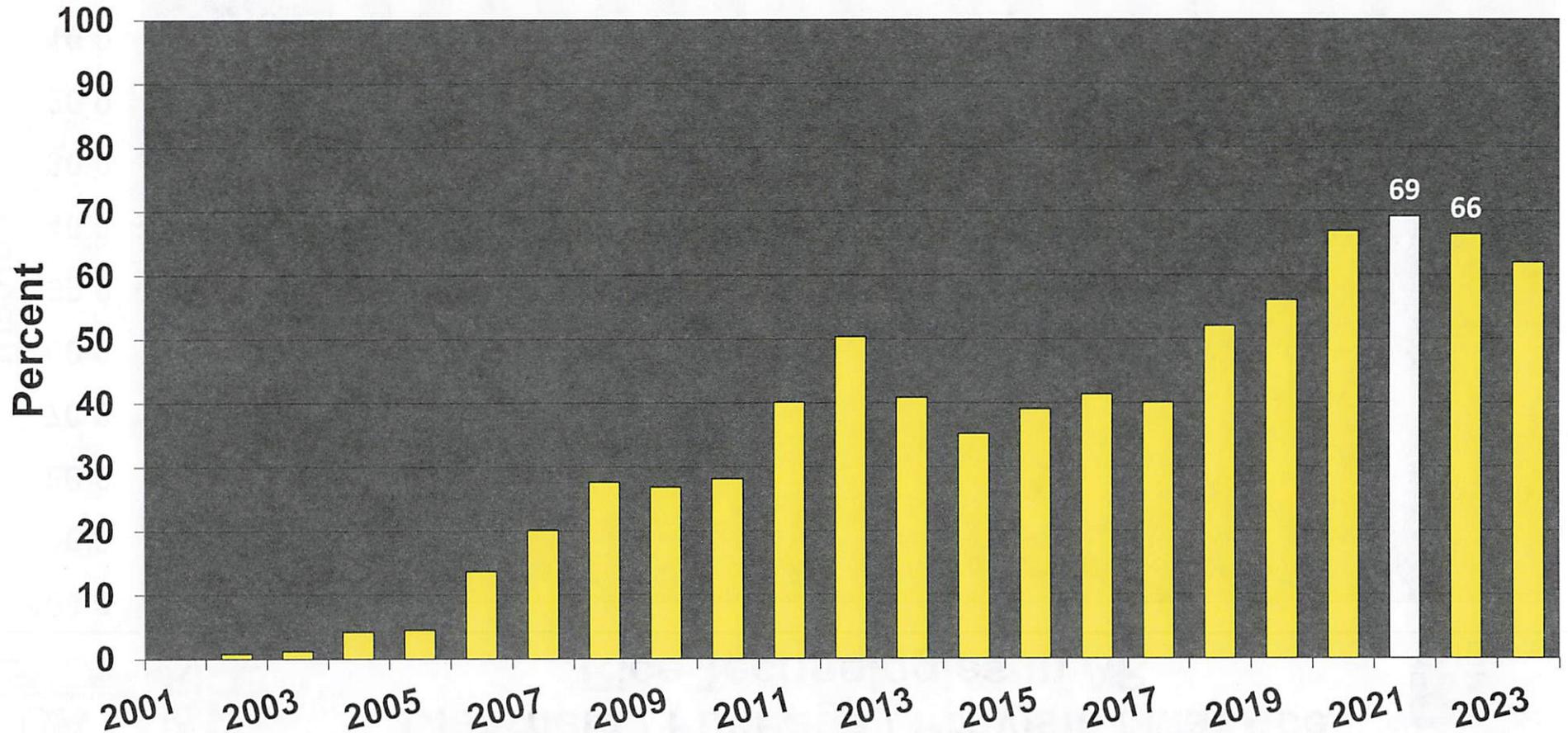
Rice Cultivar Distribution 2017-2024

Cultivar	2024*	2023	2022	2021	2020	2019	2018	2017
	% of Acres							
RT 7521 FP	25.7	21.3	29.8	21.2	13.3	--	--	--
DG263L	10.6	8.1	10.9	3.3	--	--	--	--
RT 7421 FP	9.5	6.0	--	--	--	--	--	--
RT XP753	9.3	12.3	17.8	21.2	19.2	25.6	22.2	16.5
RT 7302	6.3	0.8	--	--	--	--	--	--
Ozark	5.8	0.8	--	--	--	--	--	--
RT 7321 FP	4.8	14.6	14.6	25.2	5.4	--	--	--
CLL18	4.4	0.5	--	--	--	--	--	--
RTv7231 MA	3.4	3.4	**	--	--	--	--	--
Taurus	2.4	0.1	--	--	--	--	--	--
Titan	2.3	5.8	2.7	2.7	2.5	6.5	4.7	3.0
Diamond	2.0	3.8	5.5	6.0	10.1	10.9	20.0	8.6
CLL16	1.9	4.3	4.9	2.5	0.1	--	--	--

Clearfield / FullPage / Provisia / MaxAce Rice Technologies in AR



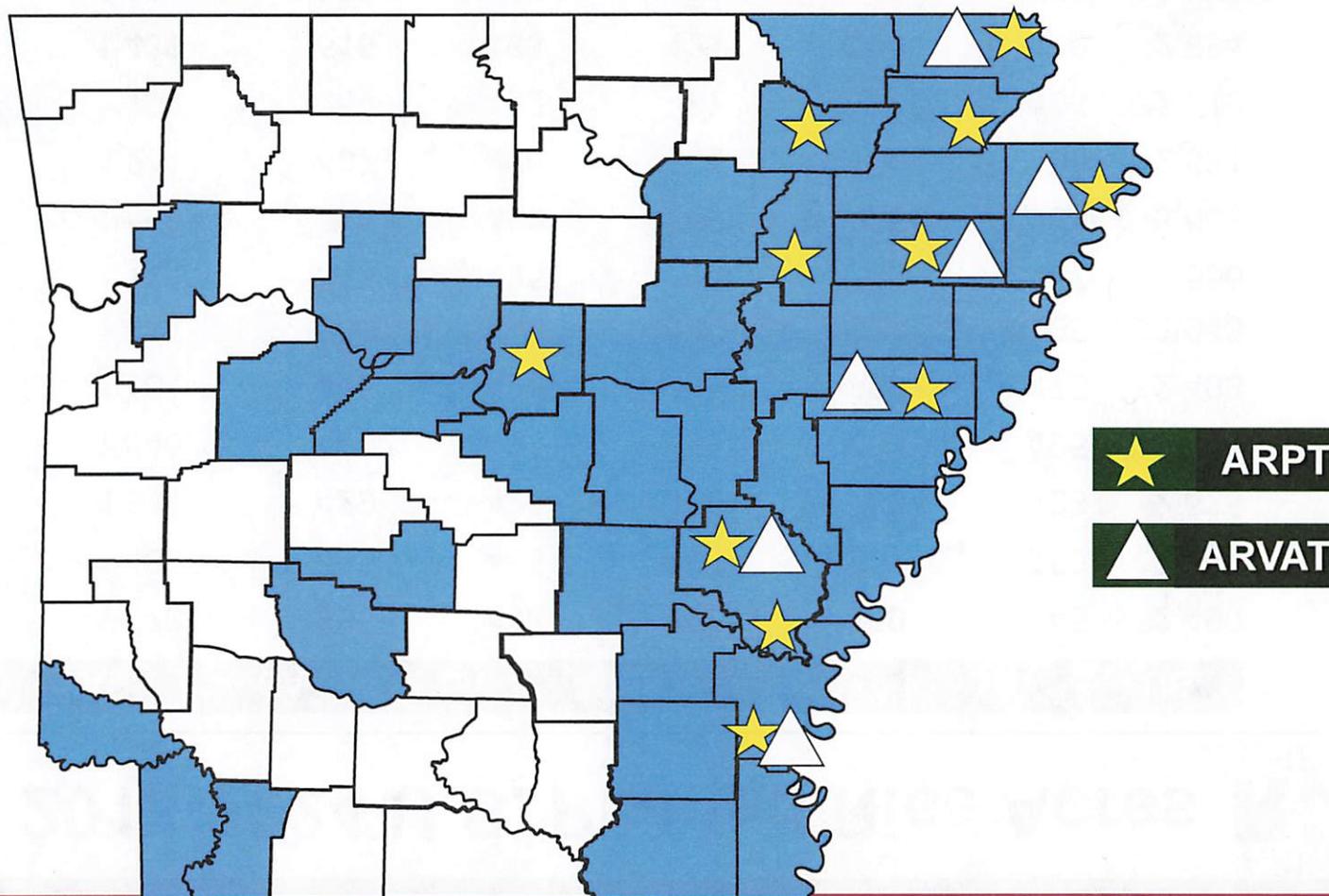
% Hybrid Rice Acres by Year



2013-2024 U.S. Planted Rice Acres

Year	AR	CA	LA	MS	MO	TX	US
2013	1,076	567	418	125	159	145	2,490
2014	1,486	445	466	191	216	150	2,954
2015	1,311	429	420	150	182	133	2,625
2016	1,546	541	437	195	236	195	3,150
2017	1,161	445	400	115	169	173	2,463
2018	1,441	506	440	140	224	195	2,946
2019	1,161	503	425	117	187	157	2,550
2020	1,459	517	480	168	225	184	3,033
2021	1,211	407	420	104	199	190	2,531
2022	1,104	254	422	87	157	195	2,219
2023	1,436	515	468	121	205	149	2,894
21-23 AVG	1,250	392	437	104	187	178	2,548
2024 NASS	1,451	488	475	157	220	149	2,940
Harvested	1,431	485	466	156	214	144	2,896

2024 ARPT Locations



2024 ARPT Locations (LG)

Cultivar	RREC	PTRS	NEREC	NERREC	CLAY	DES	GRE	JAC	LAW	FAU	ARK	AVG
Diamond	204	184	160	176	197	171	153	198	181	171	193	183
Ozark	200	187	131	172	205	165	184	191	194	168	204	187
ProGold LG4	201	170	126	153	199	171	186	190	179	161	189	180
DG263L	210	198	171	182	191	197	192	222	173	195	186	195
RTv7303	210	188	199	157	204	185	175	221	168	188	187	188
CLHA03	179	167	106	155	182	161	177	182	164	163	193	172
CLL16	217	176	122	196	181	161	169	187	169	176	183	181
CLL18	220	198	142	155	217	175	175	205	186	178	191	190
CLL19	184	181	146	152	205	165	166	182	179	156	203	177
PVL03	170	144	104	131	162	156	144	161	142	152	163	152
PVL04	179	177	136	163	178	171	161	195	156	180	187	175
DG563PVL	212	198	150	209	176	180	165	197	177	174	196	188
RTv7231MA	183	178	128	182	212	168	185	208	199	154	217	188
RT 7331 MA	224	194	151	191	230	194	194	227	195	196	219	206
RT 7421 FP	238	222	139	216	210	198	179	236	182	187	227	210
RT 7521 FP	238	200	139	200	243	200	200	223	144	170	195	201
RT 7302	243	197	141	234	232	213	201	240	173	182	198	211
RT 7401	247	216	144	213	218	206	191	239	188	197	197	211
RT XP753	211	201	171	205	238	196	190	234	182	193	214	206
DG3H2004	256	200	142	216	226	218	186	235	155	163	204	206
DG3H2007	234	198	139	169	232	210	214	246	119	200	211	203

2024 ARPT Locations (LG)

Cultivar	RREC	PTRS	NEREC	NERREC	CLAY	DES	GRE	JAC	LAW	FAU	ARK	AVG
Diamond	55-74	37-71	60-73	47-70	57-72	55-72	54-74	51-74	51-75	22-71	43-76	48-73
Ozark	55-74	43-71	64-73	48-70	60-73	53-71	55-74	56-73	51-75	25-71	49-76	50-73
ProGold LG4	57-75	40-71	62-72	51-69	58-73	56-71	58-73	58-74	49-75	24-70	48-75	50-72
DG263L	59-72	40-69	54-69	40-68	54-71	59-70	57-72	57-72	40-72	31-69	39-74	47-71
RTv7303	62-71	41-68	61-70	45-66	53-71	59-70	59-71	56-71	46-72	28-68	47-74	51-70
CLHA03	56-74	44-70	59-72	50-70	59-72	62-72	63-73	56-73	56-75	34-71	51-75	53-72
CLL16	51-72	27-70	55-69	43-70	57-72	55-70	53-73	56-73	50-74	24-72	45-75	46-72
CLL18	56-73	42-70	58-71	41-68	56-71	53-70	55-72	54-73	51-74	27-69	46-75	48-71
CLL19	59-73	39-70	54-71	44-68	61-72	57-72	56-74	60-74	46-75	22-71	43-76	48-72
PVL03	61-75	33-70	57-71	46-70	55-74	58-73	57-75	57-74	45-76	25-72	46-73	49-73
PVL04	55-74	44-69	55-70	44-66	59-72	53-70	56-73	58-72	49-74	42-71	39-76	49-71
DG563PVL	63-73	44-69	56-68	50-68	56-71	62-70	59-70	59-73	46-72	36-70	50-74	52-71
RTv7231MA	53-72	15-70	42-68	27-67	54-74	51-70	54-72	48-73	36-74	13-68	46-75	38-71
RT 7331 MA	57-74	20-71	48-71	37-71	55-74	46-73	52-74	50-74	36-75	15-71	41-76	40-73
RT 7421 FP	50-74	32-70	55-70	41-70	51-72	50-69	52-73	46-73	26-74	14-70	50-75	42-72
RT 7521 FP	54-73	35-71	51-70	44-70	53-72	58-71	55-73	50-74	30-75	20-70	37-76	43-72
RT 7302	59-75	21-70	50-70	43-70	55-73	51-73	54-74	50-74	24-75	18-71	39-76	41-73
RT 7401	54-74	23-70	55-71	35-70	55-72	51-72	54-72	50-73	27-74	17-70	50-75	41-72
RT XP753	49-74	19-71	46-71	35-72	53-74	43-73	49-74	44-74	27-75	17-70	36-76	36-73
DG3H2004	58-74	27-70	42-68	43-70	52-72	50-71	51-71	49-74	30-74	20-66	37-75	41-71
DG3H2007	54-75	26-70	37-69	39-69	48-72	50-72	50-71	43-73	25-73	20-70	43-75	39-72

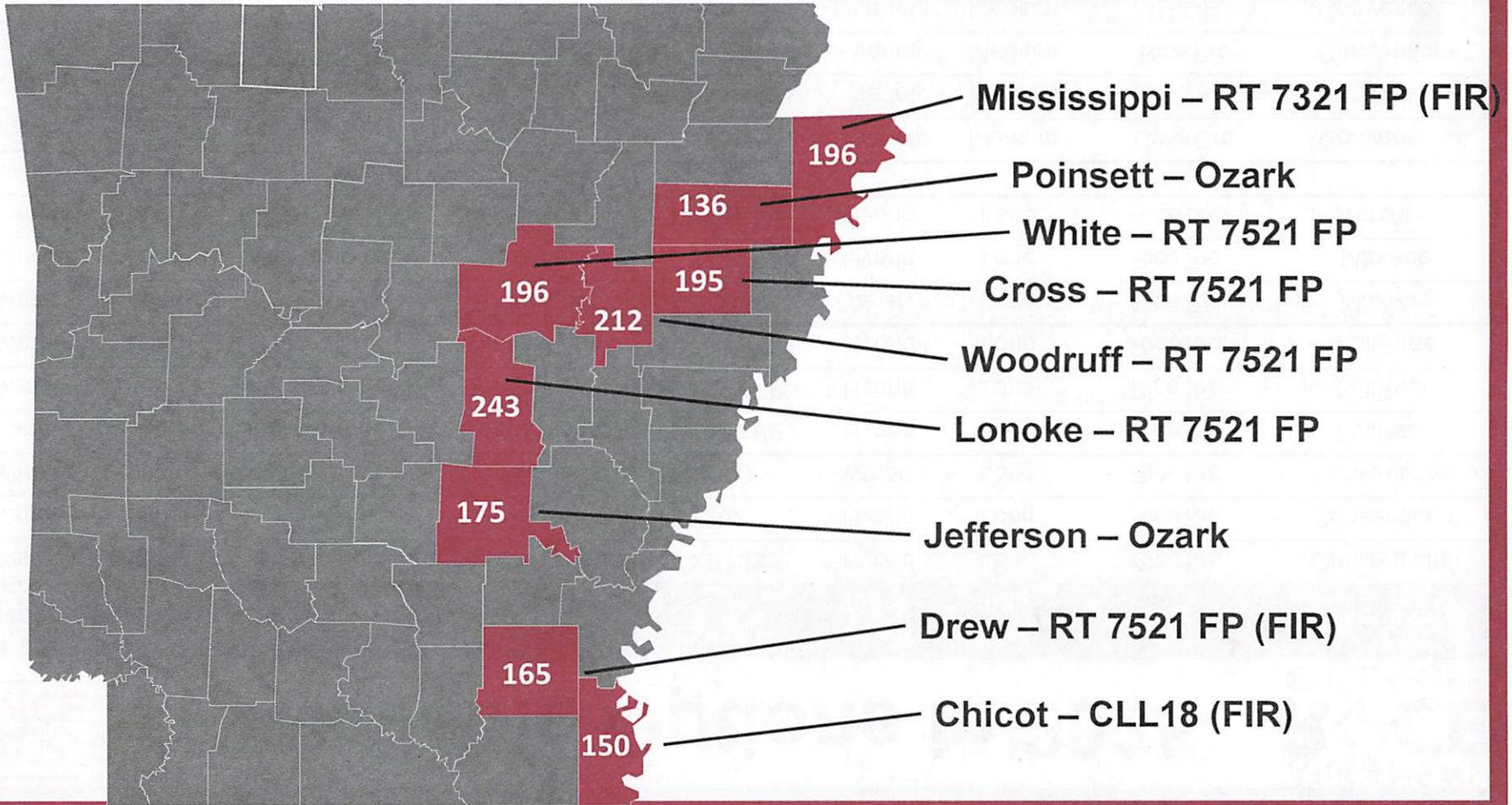
2024 ARPT Locations (MG)

Cultivar	RREC	PTRS	NEREC	NERREC	CLAY	DES	GRE	JAC	LAW	FAU	ARK	AVG
DG353M	218	182	132	168	185	161	175	179	181	178	186	181
ProGoldM3	201	187	170	189	208	176	192	191	185	159	191	188
RT 3202	247	196	127	199	225	202	210	221	174	181	214	207
Taurus	194	188	126	102	222	179	189	204	181	160	191	181
Titan	188	206	170	170	219	152	183	212	198	173	194	189
CLM04	210	183	128	140	184	176	182	178	156	167	186	176
CLM05	209	192	113	198	195	174	190	190	190	182	189	191

2024 ARPT Locations (MG)

Cultivar	RREC	PTRS	NEREC	NERREC	CLAY	DES	GRE	JAC	LAW	FAU	ARK	AVG
DG353M	64-74	31-71	59-71	48-69	59-72	62-70	67-73	56-73	53-75	17-70	54-75	51-72
ProGoldM3	67-74	41-70	62-70	56-68	63-71	63-68	68-72	60-73	54-73	31-70	57-74	56-71
RT 3202	57-73	19-68	46-68	38-68	46-72	51-72	57-73	46-72	51-74	20-69	48-75	42-71
Taurus	62-74	21-70	57-71	36-69	62-72	57-72	67-73	54-73	41-75	22-69	47-76	47-72
Titan	60-73	17-70	53-71	34-69	57-71	55-71	59-72	58-72	41-73	16-70	48-75	44-72
CLM04	64-74	29-70	62-70	47-69	59-72	64-69	69-72	56-73	42-73	22-69	66-74	52-71
CLM05	61-72	26-67	53-69	44-68	58-70	57-67	66-70	53-72	51-72	24-69	57-74	49-70

RRVP 2024 Enrolled Counties





Available Options in 2025



Cultivar	Hybrid / Variety	Grain Type	Released By	Technology	Cultivar	Hybrid / Variety	Grain Type	Released By	Technology
Diamond	Variety	Long	UADA	Conventional	RT XP753	Hybrid	Long	RiceTec	Conventional
Ozark	Variety	Long	UADA	Conventional	RT 7302	Hybrid	Long	RiceTec	Conventional
ProGold1	Variety	Long	UADA; Progeny	Conventional	RTv7303	Variety	Long	RiceTec	Conventional
ProGold2	Variety	Long	UADA; Progeny	Conventional	RT 7321 FP	Hybrid	Long	RiceTec	FullPage
ProGold L4	Variety	Long	UADA; Progeny	Conventional	RT 7421 FP	Hybrid	Long	RiceTec	FullPage
DG263L	Variety	Long	DynaGro	Conventional	RT 7521 FP	Hybrid	Long	RiceTec	FullPage
CLHA03	Variety	Long	MSU; Horizon	Clearfield	RTv7231 MA	Variety	Long	RiceTec	MaxAce
CLL16	Variety	Long	UADA; Horizon	Clearfield	RT 7331 MA	Hybrid	Long	RiceTec	MaxAce
CLL18	Variety	Long	UADA; Horizon	Clearfield	RT 7431 MA	Hybrid	Long	RiceTec	MaxAce
CLL19	Variety	Long	LSU; Horizon	Clearfield					
DG563PVL	Variety	Long	DynaGro	Provisia	DG353M	Variety	Medium	DynaGro	Conventional
PVL03	Variety	Long	LSU; Horizon	Provisia	ProGold M3	Variety	Medium	UADA; Progeny	Conventional
PVL04	Variety	Long	UADA; Horizon	Provisia	RT 3202	Variety	Medium	RiceTec	Conventional
					Taurus	Variety	Medium	UADA	Conventional
					Titan	Variety	Medium	UADA	Conventional
					CLM04	Variety	Medium	UADA; Horizon	Clearfield
					CLM05	Variety	Medium	UADA; Horizon	Clearfield

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Long Grain and Aromatic Rice Breeding Updates

Christian De Guzman PhD

Assistant Professor – Rice Breeder

University of Arkansas Division of Agriculture

Rice Research and Extension Center

November 6, 2024

Potential Conventional Long Grain Release

22LG136



- Conventional Long Grain
- **Characteristics**
 - High yield potential
 - Has PITA gene for blast resistance
 - High amylose (L202, Cheniere cook type)
 - Milling yield (head/total) is 54/68 comparable to Ozark 55/69 (2023 ARVAT)
 - Days to heading is 1-2 days later than Ozark
 - Height is similar to Ozark - 36 inches
 - Lower chalk: 8.8% vs Ozark 11.8% (2023 Riceland evaluation, ARVAT - 6 locations)

Yield (bu/ac) of 22LG136 in 16 environments from 2023-2024

Variety	2023 Arkansas Variety Advancement 6 locations in AR	2023 Advanced Yield Trial 3 locations in AR	2023 URRN 4 locations (AR, LA, MS, TX)	2024 Advanced Yield trial 3 locations in AR	Ave yield
22LG136	179	194	223	208	196.0 (194)
Ozark	176	183	244	189	193.5 (183)
Diamond	163	-	-	178	(170.0)
23LG115	-	200	229	188	205

Potential Clearfield Long Grain Release



RU2301024

- Clearfield Long Grain
- **Characteristics**
 - High yield potential
 - Has PITA gene for blast resistance
 - Typical U.S. southern long grain cook type
 - Milling yield (head/total) is 53/70 lower than CLL18 - 56/69 (2023 ARVAT)
 - Days to heading is 4-5 days earlier than CLL18
 - Height is 1 inch taller than CLL18
 - Lower chalk: 6.1% vs CLL18 10.6% (2023 Riceland evaluation, ARVAT - 6 locations)

Yield (bu/ac) of RU2301024 in 15 environments from 2023-2024

Variety	2023 Arkansas Variety Advancement 5 locations in AR	2023 Advanced Yield Trial 3 locations in AR	2023 URRN 4 locations (AR, LA, MS, TX)	2024 Advanced Yield trial 3 locations in AR	Ave yield
RU2301024	177	182	225	181	191 (180)
CLL18	173	182	-	186	(180)
CLL16	173	178	228	182	190 (178)

Potential Aromatic Release

RU2101109



- Conventional Aromatic “Jasmine type” Long Grain
- **Characteristics**
 - Very high yield potential for aromatic rice segment
 - Maturity is 1-2 days later than ARoma22.
 - Standard height approximately 39 inches similar to ARoma22.
 - Higher head rice yield (61/69) than ARoma22 (56/68).
 - Grain dimensions: Similar to ARoma 22 in length but 0.1-0.2 mm wider
 - Chalk: 1 to 2% higher chalk than ARoma22. (4.5% vs 6.5% in 2023 Riceland evaluation, ARVAT - 4 locations
 - Aromatic: Positive for 2-ap and carries the fgr allele for Aroma.



Yield (bu/ac) of RU2101109 in 18 environments from 2021-2024

Variety	2021 Advance Yield Trial 1 Location	2021 URRN 4 locations AR, LA, TX, MS	2021	2022	2023	2024 Preliminary Yield Trial 1 location	Ave yield
			Arkansas Performance test 4 locations in AR	Arkansas Variety Advancement 4 locations in AR	Arkansas Variety Advancement 4 locations in AR		
RU2101109	216	207	206	174	157	184	191
ARoma22	179	170	173	-	133	178	167
Diamond	-	209	208	173	160	-	188

Aromatic lines in the pipeline

Yield (bu/ac) of top 4 Aromatic lines in 1 location -2024

Year	Trial	Variety	Yield (bu/ac)	days to heading	Height (cm)	L:W ratio
2023	Advanced Yield trial	23Ar3736	196	91	110	3.8
		23Ar3703	188	89	112	3.1
		23Ar3709	178	87	111	3.2
		23Ar3724	184	89	114	3.8
		ARoma22	170	88	116	3.4
2024	Preliminary Yield trial	ARO2300345	207	93	104	-
		L2303533	204	96	96	-
		ARO2300249	204	94	90	-
		ARO2300409	203	95	95	-
		RU2101109	185	98	117	-
		ARoma22	178	94	114	-

Thank You

Arkansas Rice Research and Promotion Board
University of Arkansas Division of Agriculture
Rice Research and Extension Center

Long Grain and Aromatic Rice Breeding Team

Danny McCarty – Program Associate

Carl Hunter Northcutt – Program Technician

Helen Marie Ellenburg – Lab Technician

Brittany McCollum – Temporary Lab Tech

Arkansas Rice Research and Promotion Board Fall Meeting, Nov 6, 2024

Rice Breeding Program Updates

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Yield and agronomics of selected conventional long- and medium-grain lines and checks at RREC, Stuttgart; NEREC, Keiser; NERREC, Harrisburg; and PTRS, Pine Tree, 2024

Variety	Grain type	Days to 50% heading	Height	Yield (Bu/A)						Pita
				RREC1	RREC2	NEREC	NERREC	PTRS	Mean	
23AR124	LG	82	40	232	211	157	221	203	205	
23AR148	LG	80	41	218	205	153	213	212	200	Pi-ta
23AR143	LG	81	41	229	197	157	202	207	199	Pi-ta
RTXP753	LG	77	42	274	254	184	232	273	243	
DG263L	LG	76	39	210	218	162	201	212	201	
Ozark	LG	82	41	222	209	152	209	225	203	
24AR254	MG	92	36	216	215	155	229	223	208	
23AR219	MG	89	35	210	201	162	212	228	203	
Taurus	MG	78	35	227	196	162	215	226	205	

New and improved Provisia lines for potential release in 2025

Variety	Grain type	Yield (Bu/A)	Days to 50% heading	Height	v.s. PVL03		v.s. PVL04		%Milling		Pita
					%Yield	%Win	%Yield	%Win	Head rice	Total rice	
23AR2114	PVLG	204	86	44	116	97	108	92	51	68	Pi-ta
23AR2133	PVLG	207	87	41	115	80	111	100	55	68	
23AR2134	PVLG	205	87	40	118	89	114	100	53	68	
PVL03	PVLG	173	86	40					55	69	Pi-ta
PVL04	PVLG	181	89	40					57	68	Pi-ta
					v.s. Taurus						
					%Yield	%Win					
23AR2205	PVMG	210	90	41	104	65			59	67	

Yield and agronomics of selected experimental hybrid and checks at RREC, Stuttgart; NEREC, Keiser; NERREC, Harrisburg; and PTRS, Pine Tree, 2024

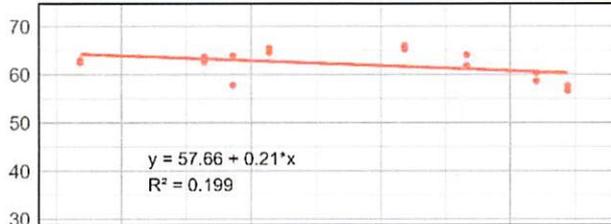
Variety	Grain type	Days to 50% heading	Height	Yield (Bu/A)						Pita
				RREC1	RREC2	RREC3	NERREC	PTRS	Mean	
24AR1111	CLG	83	40	207	212	218	202	207	209	Pi-ta
24AR1129	CLG	84	42	214	206	225	189	210	209	Pi-ta
24AR1133	CLG	84	43	212	200	230	188	213	208	Pi-ta
CLL16	CLG	87	41	199	194	200	197	213	201	Pi-ta
CLL18	CLG	85	41	213	222	220	186	221	212	
24AR1205	CLMG	82	36	204	194	215	183	216	202	
CLM05	CLMG	87	37	200	198	201	203	204	201	

Performance of selected experimental hybrid and checks at RREC, Stuttgart; NEREC, Keiser; NERREC, Harrisburg; and PTRS, Pine Tree, 2024

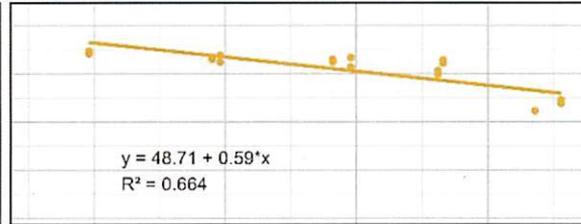
Variety	Grain type	Days to 50% heading	Height	Yield (Bu/A)						Notes
				RREC1	RREC2	NEREC	NERREC	PTRS	Mean	
22HX105CL	CLH	80	47	224	207	148	203	224	201	Pi-ta, glabrous
23HX106	LGH	75	50	237	217	149	190	209	200	Pi-ta, glabrous
23HX108	LGH	80	50	226	203	137	189	219	195	Pi-ta
23HX101CL	CLH	78	48	205	200	124	210	222	192	Pi-ta
Ozark	LG	82	41	222	209	152	209	225	203	
DG263L	LG	76	39	210	218	162	201	212	201	
RTXP753	LGH	77	42	274	254	184	232	273	243	
RT7521FP	FPH	80	48	263	241	169	230	276	236	

Impact of Moisture Content on Head Rice Yield by Variety

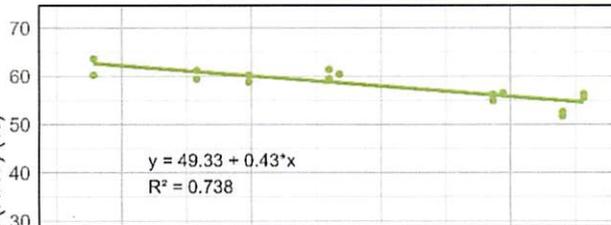
23AR2205



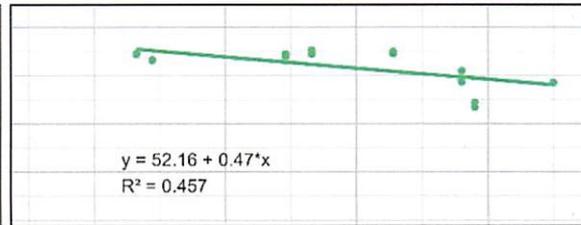
CLM04



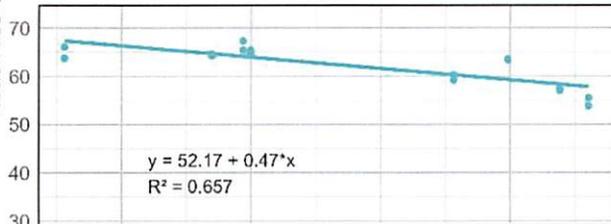
CLM05



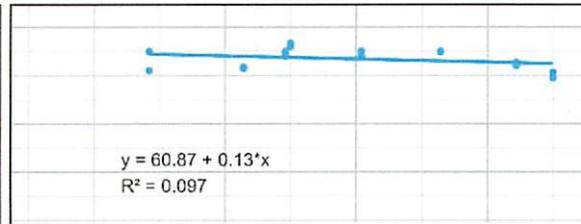
JUPITER



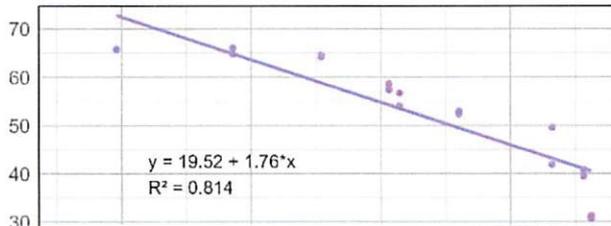
LYNX



ProGold3M



TAURUS



TITAN



Harvest Moisture Content (HMC) (%)

Variety

- 23AR2205
- CLM04
- CLM05
- JUPITER
- LYNX
- ProGold3M
- TAURUS
- TITAN

