DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

2017
University of Arkansas
Rice Research Verification Program

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University of Arkansas
Cooperative Extension Service
Agriculture Experiment Station
U.S. Department of Agriculture
And County Governments Cooperating

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RICE RESEARCH VERIFICATION PROGRAM, 2017

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INTRODUCTION

The 2017 growing season was the thirty-forth year for the Rice Research Verification Program (RRVP). The RRVP is an interdisciplinary effort between growers, county extension agents, extension specialists, and researchers. The RRVP is an on-farm demonstration of all the research-based recommendations developed by the University of Arkansas Division Of Agriculture for the purpose of increasing the profitability of rice production in Arkansas. The specific objectives of the program are:

1. To demonstrate and verify research-based recommendations for profitable rice production throughout the rice-producing areas of Arkansas.

2. To develop a database for economic analysis of all aspects of rice production.

3. To demonstrate the benefits of available technology and inputs for the economic production of consistently high rice yields.

4. To identify specific problems and opportunities in Arkansas rice for further investigation.

5. To promote timely implementation of management practices among rice growers.

6. To provide training and assistance to county agents and growers with limited expertise in rice production.

The RRVP fields and cooperators are selected prior to planting. Cooperators agreed to pay production expenses, provide crop expense data for economic analysis, and implement the recommended production practices in a timely manner from seedbed preparation to harvest. Fifteen fields were enrolled in the RRVP in 2017. The fields were located on commercial farms ranging in size from 9 to 113 acres. The average field size was 47 acres.

Counties participating in the program during 2017 included Arkansas, Clay, Conway, Desha, Jackson, Jefferson, Lafayette, Lincoln, Lonoke, Poinsett, Prairie, Pulaski, Randolph, White and Woodruff. In addition, county agents with rice responsibilities in eight other counties participated in the program training on a weekly basis. The Conway County field facilitated training for the majority of this group.

The fifteen rice fields totaled 710 acres enrolled in the program. Nine different cultivars were seeded: (CL151, CL153, RiceTec CLXL745, RiceTec CLXP756, Diamond, Mermentau, Roy J, RiceTec RT7311 CL, and RiceTec XP753). Cooperative Extension Service recommendations were used to manage the RRVP fields. Agronomic and pest management decisions were based on field history, soil test results, rice cultivar, and data collected from individual fields during the growing season. An integrated pest management philosophy was utilized based on CES recommendations. Data collected included components such as stand density, weed populations, disease infestation levels,

insect populations, rainfall, irrigation amounts, dates for specific growth stages, grain yield, milling yield, and grain quality.

Figure 1. County Locations (shaded) of 2017 Rice Research Verification Program Fields.

FIELD REVIEWS

Southern Coordinator – Ralph Mazzanti **Northern Coordinator** – Ron Baker

Arkansas County

The zero-grade Arkansas County field was located just north of Dewitt on a Dewitt silt loam soil. The field consisted of 36 acres and the previous crop grown on the field was soybean. The variety chosen was Diamond treated with CruiserMaxx Rice seed treatment and was drill seeded. The seeding rate was 65 lbs/acre planted on April 19th. Emergence was observed on May 2nd with a stand count of 18 plants ft^2. Conventional tillage practices were used for field preparation in the spring. According to the soil test a 0-30-90-10 (lbs/acre N-P_2O_5-K2O-Zn) was applied. Command and League herbicides were applied at planting on April 19th. Propanil and Facet were applied as pre- and post-emergence herbicides on May 26th. Using the N-STaR recommendation, nitrogen in the form of urea plus an approved NBPT was applied at 240 lbs/acre on May 27th. Midseason nitrogen was applied according to Greenseeker response index on June 22nd at a rate of 100 lbs/acre. An adequate flood was maintained throughout the growing season. Stink bugs reached threshold levels and Mustang Max insecticide was applied on August 10th. No fungicide treatment was necessary for disease control. The field was harvested on August 19th yielding 190 bu/acre and a milling yield of 55/71. The average harvest moisture was 17%. Total irrigation was 30 acre-inches with a season rainfall total of 24 inches.

Clay County

The precision-graded Clay County field was located west of McDougal on a Foley silt loam soil. This was the first rice crop following the precision-grading work. The field was 52 acres and the previous crop grown on the field was soybean. Conventional tillage practices were used for field preparation in the fall and a pre-plant fertilizer based on soil test analysis was applied in the spring at a rate of 0-45-90-25-13 (lbs/acre N-P_2O_5-K_2O-S-Zn). CL153 with Apron XL seed treatment was drill-seeded at a rate of 65 lbs/acre on April 6th. Rice emergence was observed on April 18th. The stand count was 10 plants/ft^2. Clearpath was applied pre-emergence on April 7th providing good weed control. This was followed by a post-emergence herbicide tank mix of Newpath, Sharpen, and crop oil concentrate applied on April 22nd. Urea was applied preflood on May 22nd at a rate of 288 lbs/acre. Multiple Inlet Rice Irrigation (MIRI) was utilized to achieve a more efficient permanent flood. Based on N-STaR recommendations and verified by a Trimble Greenseeker, no midseason nitrogen was applied. No insecticide or fungicide treatments were required for pest control. The rice was harvested on July 11th yielding 167 dry bu/acre. Although lower than the yield potential for this variety under more favorable conditions, it is a good yield for the first crop on a precision-graded field. The milling yield was 62/70. The average harvest moisture was 15.8%. Total irrigation for the season was 8.1 acre-inches. Rainfall was 17.25 inches.

Conway County

The zero-grade Conway County field was southeast of Blackwell. The original soil classification was Dardanelle silt loam but since zero grading a silty clay loam to clay loam is a more accurate soil type for most of the field. The field was 48 acres and the previous

crop grown on the field was rice. Conventional tillage practices were used for field preparation in the spring and based on soil test analysis, a pre-plant fertilizer at the rate of 18-46-0 (lbs/acre N-P_2O_5-K_2O) was applied. A burndown/pre-emergence herbicide tank mix of glyphosate plus Prowl H_2O and Bolero was applied at planting. RiceTec hybrid XP753 with the company's standard seed treatment plus NipsIt INSIDE insecticide was drill-seeded at a rate of 24 lbs/acre on April 15th. Rice emergence was observed on April 26th. The stand count was 5.8 plants/ft^2. A post-emergence application of propanil was made on May 25th providing good control of weeds except for patches of weedy rice (allotment of Clearfield hybrid seed was insufficient to include this field in 2017). Using the N-STaR recommendation, urea plus an approved NBPT product was applied pre-flood on May 26th at a rate of 155 lbs/acre. A permanent flood was established within 2 days. Flood levels were maintained well throughout the season. Greenseeker technology was utilized weekly during midseason growth stages to monitor nitrogen needs and a nitrogen deficiency was revealed. Urea was applied on June 22nd at a rate of 100 lbs/acre to correct this problem. This was followed by the normal late boot application of urea for hybrid cultivars at a rate of 65 lbs/acre on July 14th. Rice stink bugs moved into the field at extremely high numbers but were controlled with a single lambda-cyhalothrin application on July 19th. No fungicide treatments were required. The rice was harvested on September 11th yielding 179 dry bu/acre. The milling yield was low at 46/71 and reflected the impact of red rice in the field. It is also probable that wetting and drying of mature grain before the field could be harvested had an impact as well. The average harvest moisture was 15%. Total irrigation for the season was 29 acre-inches. Rainfall was 17 inches.

Desha County

The 85-acre contour levee field was located just south of Dumas on a Herbert silt loam and Perry clay soil. Traditional tillage practices were performed and the previous crop was soybean. According to the soil test the pre-plant fertilizer 0-40-0-0 (lbs/acre N-P_2O_5-K_2O-Zn) was applied in the spring with a terra gator. Roy J treated with CruiserMaxx Rice seed treatment was drill-seeded at 67 lbs/acre on April 10th. Command and League were applied on April 11th as pre-emergence herbicides. Emergence was observed on April 20th with 14 plants/ft^2. Duet was applied as a post-emergence herbicide on May 12th. Nitrogen in the form of urea plus an approved NBPT product was applied at 170 lbs/acre on May 26th in accordance with the N-STaR recommendation. Mid-season urea was applied at 100 lbs/acre on June 26th according to Greenseeker response index. The field had a history of kernel smut and propiconazole fungicide was applied on July 13th. Rice blast preventative azoxystrobin was applied on July 22nd. Stink bugs reached threshold levels and lambda-cyhalothrin insecticide was applied on July 22nd. The field was harvested on September 7th yielding 152 bu/acre with a milling yield of 46/69. The average harvest moisture was 17%. The irrigation amount was 28 acre-inches and the total rainfall amount was 28 inches.

Jackson County

The precision-graded Jackson County field was southeast of Newport on a Crowley silt loam and Jackport silty clay loam. The field was 113 acres and the previous crop grown on the field was soybean. Conventional tillage practices were used for field preparation in the spring and based on soil test analysis, a pre-plant fertilizer at the rate

of 0-46-60 (lbs/acre N-P_2O_5-K_2O) was applied. A pre-emergence application of Command herbicide was made at planting. RiceTec hybrid CLXL745 with the company's standard seed treatment plus NipsIt INSIDE insecticide was drill-seeded at a rate of 26 lbs/acre on April 11th. Rice emergence was observed on April 26th. The stand count was 6 plants/ft^2. A post-emergence application of Newpath herbicide plus a nonionic surfactant was made on May 22nd followed by Clearpath plus crop oil concentrate on June 3rd. Excellent weed control was achieved. Ammonium sulfate was applied on May 31st at a rate of 100 lbs/acre to speed recovery from weather related stresses and shorten the period to flood-up. Using the N-STaR recommendation, urea plus an approved NBPT product was applied preflood on June 9th at a rate of 185 lbs/acre. A permanent flood was subsequently established within 4 days and flood levels were maintained well throughout the season. Greenseeker technology was utilized weekly during midseason growth stages verifying that nitrogen levels were normal. The late boot application of urea for hybrid cultivars was made at a rate of 70 lbs/acre on July 11th. A smut disease preventative treatment was applied on July 21st with a fungicide tank mix of Quilt Xcel and Tilt 3.6EC. Rice stinkbugs did not reach treatment thresholds. No insecticides were required. The rice was harvested on September 12th yielding 206 dry bu/acre. The milling yield was 59/70. The average harvest moisture was 17%. Total irrigation for the season was 13.6 acre-inches. Rainfall was 17.5 inches.

Jefferson County

The 38-acre row-water field was located 10 miles south of Pine Bluff on the Arkansas River. The soil class consisted of Portland Clay and Herbert silt loam soil. The previous crop grown was soybean. The RiceTec hybrid XP753 treated with CruiserMaxx Rice and the company's standard seed treatment was drill seeded at 24 lbs/acre on April 7th. No pre-plant fertilizer was necessary according to soil testing. Emergence was observed on April 20th at 8 plants ft^2. Roundup, Command and League herbicides were applied April 7th. Residual herbicides were extended for 38 days with continual rains. Facet L herbicide and crop oil concentrate were applied on May 15th. Nitrogen in the form of urea was applied with an approved NBPT product according to row-water rice recommendations. The first application was applied at 150 lbs/acre on May 22nd followed by 150 lbs/acre on May 30th followed by 75 lbs/acre on June 6th. Intermittent flushing was utilized every 2-3 days as row-water irrigation. No fungicides or insecticides were warranted during the growing season. The field was harvested on August 23rd yielding a remarkable 238 bu/acre and milling yield 46/69. The average harvest moisture was 17% and the irrigation amount was 30 acre-inches. The rainfall amount totaled 24 inches.

Lafayette County

The 39-acre contour field was located south of Lewisville on Billyhaw and Bossier clay soil. Spring conventional tillage practices were used and no pre-plant fertilizer was required according to the soil test. Mermentau treated with CruiserMaxx Rice was drill-seeded at 95 lbs/acre on April 1st. Command and glyphosate herbicides were applied at planting. Emergence was observed on April 16th with 20 plants/ft^2. Regiment, Facet L, and Permit were applied as post-emergence herbicides on May 5th. Using the N-STaR recommendation, nitrogen in the form of urea was applied at 340 lbs/acre on May 11th. Field flooding took only two days so NBPT was not necessary. Midseason nitrogen was applied at 100 lbs/acre on June 12th according to Greenseeker response index. The field

looked good from the start and throughout the growing season. Stink bugs reached threshold levels and Karate Z was applied on July 13th. The field was harvested September 4th yielding 195 bu/acre. The milling yield was 55/67 and the average harvest moisture was 12%.

Lincoln County

The 39-acre zero-grade field was located just east of Star City on a Perry clay soil. The previous crop has been continuous rice. There were no spring tillage practices performed on the field. Based on soil test analysis, no pre-plant fertilizer was applied. RiceTec CLXP756 treated with CruiserMaxx Rice in addition to the company's standard seed treatment was drill-seeded on April 31st. The seeding rate was 25 lbs/acre. Newpath and Command herbicides were applied at planting. The rice emerged on April 13th at 9 plants/ft^2. Weedy rice also emerged between the drills from the continuous rice cropping system. Super Wham, Prowl, and Command herbicides were applied as post and pre-emergence herbicides on April 17th. Clearpath and Permit Plus were applied May 11th. Using the N-STaR recommendation, nitrogen in the form of urea with an approved NBPT product was applied at 200 lbs/acre on May 13th. The late boot urea application was made on July 10th at 70 lbs/acre. Stink bugs reached threshold levels twice and were treated with Mustang Max on July 13th and again on August 8th. The field was harvested on August 26th yielding 196 bu/acre. The milling yield was 39/68 and the average harvest moisture was 18%. The irrigation water use was 3.6 acre-inches and the rainfall totaled 32 inches. The continuous weekly rains during the growing season accounted for cost savings on irrigation. The weedy rice (along with rain and high humidity at harvest) likely contributed to the milling yield.

Lonoke County

The 40-acre contour field was located north of Lonoke on a Callaway silt loam soil. Spring conventional tillage practices were used and pre-plant fertilizer was applied at 0-60-90-10 (lbs/acre N-P_2O_5-K_2O-Zn) according to the soil test. RiceTec XP753 treated with CruiserMaxx Rice in addition to the company's standard seed treatment was drill-seeded at 19 lbs/acre on April 14th. Roundup, Command, and League were applied April 18th as burndown and pre-emergence herbicides. Stand emergence was observed on April 26th with 6 plants/ft^2. Facet L, Permit Plus, and Sharpen were applied as post-emergence herbicides on May 16th. Excessive rains throughout May, June, and July damaged levees requiring continual repair yet on the positive side gave extended herbicide residual control. Nitrogen in the form of urea with an approved NBPT product was applied May 24th according to the N-STaR recommendation. The late-boot urea application was made on July 13th at 75 lbs/acre. No fungicides or insecticides were necessary due to disease or stink bugs not reaching threshold levels. The field was harvested on August 4th yielding 176 bu/acre. The milling yield was 54/71. The rainfall for the growing season totaled 22.6 inches. Irrigation amounts totaled 30 acre-inches.

Poinsett County

The precision-graded Poinsett County field was located northwest of Harrisburg on a Henry silt loam soil. The field was 46.4 acres and the previous crop grown was soybean. Conventional tillage practices were used for field preparation in the fall and a pre-plant fertilizer was applied in the spring at a rate of 0-90-112 (lbs/acre N-P_2O_5-K_2O).

The variety Roy J with CruiserMaxx Rice seed treatment was drill-seeded at a rate of 66 lbs/acre on April 14th. Rice emergence was observed on April 25th. The stand count was 14 plants/ft^2. Command pre-emergence herbicide was applied on April 15th. At the 2-3 leaf stage the rice was covered by flood waters from heavy rains and remained under water for more than a week. The rice survived with a stand count of 11.8 plants/ft^2 and appeared to recover over a period of two weeks. Ammonium sulfate at a rate of 100 lbs/acre was applied on May 15th to help stimulate this recovery. On May 30th recovery was sufficient to apply a post-emergence herbicide tank mix of Facet L plus Prowl H_2O and crop oil concentrate. Excellent weed control was achieved. Based on N-STaR recommendations, urea plus an approved NBPT product was applied in a single preflood application at a rate of 260 lbs/acre on June 3rd. Flood-up using multiple risers was achieved within 72 hours. Greenseeker technology was utilized weekly to monitor nitrogen needs during midseason growth stages until the onset of panicle emergence. No midseason nitrogen was required based on the Greenseeker response index. A generic propiconazole fungicide was applied on July 18th as a preventive treatment for smut disease. Rice stink bugs did not reach treatment thresholds. No insecticides were required. Harvest was on September 26th yielding 155 dry bu/acre: a low yield for this variety yet an improvement over recent field history despite weather related challenges during the season. The milling yield was very low at 42/70 and likely reflects the impact of intermittent wetting and drying of mature grain before the field could be harvested. The average harvest moisture was 15%. Total irrigation for the season was 12.8 acre-inches. Rainfall was 22.2 inches.

Prairie County

The 39-acre contour field was located south of Hazen on a Stuttgart silt loam soil. Spring conventional tillage practices were used for field preparation and pre-plant fertilizer of 0-30-60 (lbs/acre N-$P_2 0_5$-$K_2 0$) was applied based on soil testing. The RiceTec hybrid RT7311 CL was drill-seeded on March 30th at 24 lbs/acre. Command and League were applied as pre-emergence herbicides on April 2nd. Stand emergence was observed on April 12th with 8 plants/ft^2. Newpath herbicide was flown on 4 acres of the north end of the field for grass escapes. Clearpath herbicide was applied on May 9th. Using the N-STaR recommendation, urea plus an approved NBPT product was applied pre-flood at a rate of 260 lbs/acre on May 10th. Multiple Inlet Rice Irrigation (MIRI) was utilized to achieve a more efficient permanent flood. Late-boot urea at a rate of 70 lbs/acre was applied May 23rd. Stink bugs reached threshold levels twice. Lambda-cyhalothrin was applied July 7th and again on July 28th. The field was harvested with a near verification record of 248 bu/acre. The milling yield was a disappointing 42/66. The average harvest moisture was 18%. Rainfall total was 22 inches. Irrigation amounts were measured at 32 acre-inches.

Pulaski County

The 60-acre contoured field was located just south of Bredlow Corner on a Desha clay soil. Diamond variety treated with CruiserMaxx Rice was drill-seeded at 65 lbs/acre on April 15th. No pre-plant fertilizer was necessary according to the soil test. Command was applied as a pre-plant herbicide at planting. Facet L and Permit were applied as post-emergence herbicides on April 28th. Command, League, and propanil were applied June 16th followed by Facet L and Regiment on June 20th. Several herbicide applications

were warranted due to levees delayed by excessive rain and power unit issues. Nitrogen in the form of urea was applied with an approved NBPT product at 220 lbs/acre according to the N-STaR recommendation. Midseason urea was applied at 100 lbs/acre on July 8th according to the Greenseeker response index. Stink bugs reached threshold level and Karate Z was applied on July 27th. The field was harvested on October 2nd yielding 175 bu/acre. The milling yield was 43/67 and the average harvest moisture was 17%. Rainfall total was 16 inches and irrigation amounts totaled 30 acre-inches.

Randolph County

The traditionally contoured Randolph County field was located east of Pocahontas on Amagon and Dundee silt loam soils. The field was 9 acres and the previous crop grown was soybean. Spring conventional tillage practices were used for field preparation and a pre-plant fertilizer based on soil test analysis was applied at a rate of 0-46-60 (lbs/acre N-$P_2 0_5$-$K_2 0$). On May 19th, CL151 with CruiserMaxx Rice seed treatment was drill-seeded at a rate of 65 lbs/acre. Rice emergence was observed on May 27th and consisted of 22 plants/ft². Weather conditions did not allow for a pre-emergence herbicide application. The herbicide tank mix of Clearpath, Sharpen, and crop oil concentrate was applied post-emergence on June 7th providing good control of weeds. Using the N-STaR recommendation, urea was applied in a single preflood application at a rate of 270 lbs/acre on June 22nd. Flood-up with surface water was achieved within 24 hours. Once the permanent flood was established, flood levels were maintained well throughout the season. Greenseeker technology was utilized weekly to monitor nitrogen needs during midseason growth stages until the onset of panicle emergence. No midseason nitrogen was needed based on the Greenseeker response index. Based on weather conditions and field evaluations, a fungicide application was applied as a blast disease preventative on July 27th followed by a second blast preventative fungicide application the next week. Rice stink bugs did not reach treatment thresholds and no insecticides were required. The field was harvested on October 14th yielding 164 dry bu/acre. Moisture at harvest was 16.9%. The milling yield was 59/69. Total irrigation was 33 acre-inches and total rainfall for the season was 15 inches.

White County

The traditionally contoured White County field was located southeast of Kensett on Calhoun and Immanuel silt loam soils. The field was 24 acres and the previous crop grown was soybean. Spring conventional tillage practices were used for field preparation and a pre-plant fertilizer based on soil test analysis was applied at a rate of 0-0-60 (lbs/acre N-$P_2 0_5$-$K_2 0$). On April 20th, RiceTec hybrid XP753 with the company's standard seed treatment plus NipsIt INSIDE insecticide was drill-seeded at a rate of 26 lbs/acre. Rice emergence was observed on May 3rd and consisted of 8 plants/ft². Weather conditions precluded a pre-emergence herbicide application. A post-emergence herbicide tank mix of Facet L, Prowl H_2O, and crop oil concentrate was applied on May 17th providing excellent control of weeds. Using the N-STaR recommendation, urea plus an approved NBPT product was applied preflood at a rate of 261 lbs/acre on May 28th. Multiple Inlet Rice Irrigation (MIRI) was utilized to achieve a more efficient permanent flood. After the permanent flood was established, flood levels were maintained sufficiently until the irrigation pump's power unit failed. This resulted in flood loss and dry soil on the upper 12 acres before irrigation could resume. Nitrogen depletion in that area was

confirmed by Greenseeker technology. A nitrogen correction using urea was applied to the affected acres at a rate of 100 lbs/acre on June 23rd. The entire field received the normal hybrid late boot application of urea at the rate of 65 lbs/acre on July 14th. Greenseeker utilization continued weekly until the onset of panicle emergence. No further nitrogen deficiency was detected. Based on field evaluations, no fungicide application was required. Rice stink bugs exceeded the threshold for treatment and were controlled with a single lambda-cyhalothrin application on July 21st. The field was harvested on September 7th yielding 205 bu/acre. Moisture at harvest was 18%. The milling yield was 63/73. Total irrigation was 12.1 acre-inches and total rainfall for the season was 25.18 inches.

Woodruff County

The traditionally contoured Woodruff County field was located just north of Hunter on Overcup silt loam soil. The field was 42 acres and the previous crop grown was soybean. Spring conventional tillage practices were used for field preparation and a pre-plant fertilizer based on soil test analysis was applied at a rate of 0-45-90 (lbs/acre N-$P_2 0_5$-$K_2 0$). On March 25th, a pre-plant herbicide tank mix of RoundUp and FirstShot was applied to control early spring weeds. The variety Diamond with CruiserMaxx Rice seed treatment was drill-seeded at a rate of 66 lbs/acre on April 9th. Rice emergence was observed on April 16th and consisted of 20 plants/ft². A pre-emergence herbicide tank mix of Command and League was applied on April 13th. This was eventually followed by a post-emergence herbicide application of Facet L and crop oil concentrate on May 27th. A delay in the post-emergence herbicide application was necessary due to the south end of the field sustaining significant injury two weeks earlier from off-target herbicide drift and recovery was prolonged. The remaining stand count appeared sufficient for high yield potential. However, subsequent observations revealed that tillering in the injured rice was significantly below the uninjured area of the field. Using the N-STaR recommendation, urea plus an approved NBPT product was applied in a single preflood application rate of 270 lbs/acre on May 30th. A timely flood-up was achieved but an irrigation problem was encountered leading to flood loss and drying of the field two weeks later ultimately resulting in symptoms of nitrogen deficiency. The deficiency was confirmed utilizing Greenseeker technology. Flooding resumed and on June 23rd a nitrogen correction of 100 lbs urea/acre was applied. Greenseeker utilization continued weekly until the onset of panicle emergence. No further nitrogen deficiency was detected. Based on field evaluations, no fungicides were required. Rice stinkbugs did not reach treatment thresholds and no insecticides were required. The field was harvested on September 7th averaging 157 dry bu/acre. This is a low yield for this variety reflecting losses from the injured area of the field and possibly other stresses on the crop at critical growth stages. Moisture at harvest was 15%. The milling yield was 60/70. Total irrigation was 18.7 acre-inches and total rainfall for the season was 18.64 inches.

Table 1. Agronomic information for fields enrolled in the 2017 Rice Research Verification Program.

Field Location by County	Cultivar	Field size (acres)	Previous crop	Seeding rate (lbs/acre)	Stand density (plants/ft^2)	Planting date	Emergence date	Harvest date	Yield (bu/A)	Milling yield[z]	Harvest Moisture (%)
Arkansas	Diamond	36.8	Soybean	65	18	19-Apr	02-May	19-Sep	190	55/71	17
Clay	CL153	52	Soybean	65	10	04-Apr	18-Apr	11-Sep	167	62/70	16
Conway	XP753	48	Rice	24	5.8	15-Apr	26-Apr	11-Sep	179	46/71	15
Desha	Roy J	85	Soybean	67	14	10-Apr	20-Apr	07-Sep	152	46/69	17
Jackson	CLXL745	113	Soybean	26	6	11-Apr	26-Apr	12-Sep	206	59/70	17
Jefferson	XP753	38	Corn	22	8	07-Apr	20-Apr	23-Aug	238	46/69	17
Lafayette	Mermentau	39	Soybean	95	20	01-Apr	16-Apr	04-Sep	195	55/67	12
Lincoln	CLXP756	38	Rice	25	9	31-Mar	13-Apr	26-Aug	196	39/58	18
Lonoke	XP753	40	Soybean	19	6	14-Apr	26-Apr	04-Sep	176	54/71	16
Poinsett	Roy J	46.4	Soybean	66	11.8	14-Apr	25-Apr	26-Sep	155	42/70	15
Prairie	RT 7311 CL	39	Soybean	24	8	30-Mar	12-Apr	26-Aug	248	42/66	18
Pulaski	Diamond	60	Soybean	65	22	15-Apr	28-Apr	02-Oct	175	43/67	17
Randolph	CL151	9	Soybean	66	22	19-May	27-May	14-Oct	164	59/69	17
White	XP753	24	Soybean	26	8	20-Apr	03-May	07-Sep	205	63/73	18
Woodruff	Diamond	42	Soybean	66	20	10-Apr	16-Apr	07-Sep	157	60/70	15
Average		**47**		[y]	[x]	**12-Apr**	**25-Apr**	**11-Sep**	**187**	**51/69**	**16.33**

[z] Head rice milling yield / Total rice milling yield.

[y] Seeding rates averaged 69 lbs/acre for conventional cultivars and 24 lbs/acre for hybrid cultivars.

[x] Stand density averaged 17 plants/ft^2 for conventional cultivars and 6 plants/ft^2 for hybrid cultivars.

Table 2. Soil test results, fertilization program, and soil classification for fields enrolled in the 2017 Rice Research Verification Program.

Field Location by County	Soil Test				Applied Fertilizer (lbs/acre)			Soil Classification
		lbs/acre			Mixed Fertilizer [v]	N-Star Urea (46%N) rates and timing [x, y]	Total N rate (lbs N/acre) [z]	
	pH	P	K	Zn	N-P-K-Zn[w]			
Arkansas	6.4	34	166	10.8	0-30-90-10	240-100-0	156	Dewitt Silt Loam
Clay	6.7	27	151	6.5	0-45-90-13	315-0-0	133	Foley silt loam
Conway	6.1	49	344	9.2	18-46-0-0	155-0-65	147†	Dardanelle silt loam
Desha	7.4	70	682	6.6	0-40-0-0	170-100-0	124	Hebert silt loam/Perry clay
Jackson	5.9	24	355	4.2	0-46-60	207-0-65	138[N]	Crowley silt loam/Jackport silty clay loam
Jefferson	6.5	86	292	18.6	0-0-0-0	150-150-75*	172	Portland clay/Hebert silt loam
Lafayette	7.2	38	686	4.2	0-0-0-0	340-100-0	202	Billyhaw clay/Bossier clay
Lincoln	6.5	68	742	10.4	0-0-0-0	200-0-70	124	Perry clay
Lonoke	6.0	36	92	4.0	0-60-90-10	225-0-75	138	Calloway silt loam
Poinsett	7.0	28	154	12.9	0-90-112-0	260-0-0	121	Henry silt loam
Prairie	6.3	64	318	18.0	0-30-60-0	260-0-70	152	Stuttgart silt loam
Pulaski	6.0	99	333	4.0	0-0-0-0	220-100-0	147	Desha clay
Randolph	6.0	32	357	9.4	0-46-60-0	270-0-0	270	Amagon/Dundee silt loams
White	7.1	96	224	13.1	0-0-60-0	260-0-65	173†	Calhoun/Immanuel silt loams
Woodruff	6.9	46	208	8.2	0-45-90-0	207-0-0	140†	Overcup silt loam

[v] Column includes seed treatments and regular pre-plant applications.

[w] N=nitrogen, P=phosphorus, K=potassium, Zn=zinc.

[x] Timing: preflood – midseason – boot. Each field was fertilized according to its N-STaR recommendation. The asterisk (*) denotes an adjusted N-STaR rate and timing for furrow irrigated rice. The N-STaR base without the furrow irrigated adjustments was 135-0-30 (294-0-65 lbs of urea).

[y] The N-Star preflood N recommendation in all fields was treated with an approved NBPT product to minimize nitrogen loss due to ammonia volatilization.

[z] Some fields required additional seasonal N exceeding the N-Star recommendation in order to counteract nitrogen depletion (details in field reviews). This additional N is included in the totals marked (†). Extra N applied 2 weeks or more before flood-up to address other issues is recorded in the Mixed Fertilizer column. The total marked ([N]) includes 21 lbs of N from Ammonium Sulfate applied 10 days before the pre-flood urea (details in field review).

Table 3. Herbicide rates and timings for fields enrolled in the 2017 Rice Research Verification Program.

Field Location by County	Pre-emergence Herbicide Applications (Trade name & product rate/acre)[x]	Post-emergence Herbicide Applications (Trade name & product rate/acre)[x]
Arkansas	Command (12.8 oz) + League (6.4 oz)	Propanil (4 qt) + Facet L (32 oz) + COC (1 pt)
Clay	Clearpath (0.5 lb)	Newpath (4 oz) + Sharpen (1 oz) + COC (6.4 oz)
Conway	Prowl H_2O (2 pt) + Bolero (3 pt) + Glyphosate (1 qt)	Propanil (3 qt)
Desha	Command (20 oz) + League (6.4 oz)	Duet (3 qt) + COC (1 qt)
Jackson	Command (12.8 oz)	Newpath (4 oz) + Nonionic Surfactant (2.6 oz) FB Clearpath (0.5 lb) + COC (8 oz)
Jefferson	Command (16 oz) + League (6.4 oz) + RoundUp (27 oz)	Facet L (22 oz)
Lafayette	Command (24 oz) + Glyphosate (1 qt)	Regiment (0.5 oz) + Facet L (32 oz) + COC (1 pt)
Lincoln	Newpath (5 oz) + Command (19 oz)	Super Wham (3 qt) + Prowl H_2O (2.1 pt) + Command (16 oz) FB Clearpath (0.5 lb) + Permit Plus (0.75 oz) + COC (1 pt)
Lonoke	Command (12.8 oz) + RoundUp (1 qt) + League (6.4 oz)	Facet L (32 oz) + Permit Plus (0.75 oz) + Sharpen (1 oz)
Poinsett	Command (12.8 oz)	Facet L (32 oz) + Prowl H_2O (2.1 pt) + COC (1 qt)
Prairie	Command (12.8 oz) + League (6.4 oz)	Newpath (4 oz) on 4 acres only FB Clearpath (0.5 lb) + COC (1 pt) on entire field
Pulaski	Facet L (22 oz) + Permit (1 oz) + COC (1 pt)	Command (16 oz) + League (6.4 oz) + Propanil (1 qt) + COC (1 pt) FB Facet L (21 oz) + Regiment (0.5 oz) + DynaPac (1 pt)
Randolph	None	Clearpath (0.5 lb) + Sharpen (1 oz) + COC (8 oz)
White	None	Facet L (22 oz) + Prowl H_2O (2.1 pt) + COC (1 qt)
Woodruff	Command (12.8 oz) + League (6.4 oz)	Facet L (22 oz) + COC (1 qt)

[x] 'FB' = 'followed by' and is used to separate herbicide application events; COC = Crop Oil Concentrate.

Table 4. Seed treatments used and foliar fungicide and insecticide applications made on fields enrolled in the 2017 Rice Research Verification Program.

Field Location by County	Seed treatments (trade name and product rate/cwt seed)	Foliar fungicide and insecticide applications (trade name and product rate/acre)			
	Fungicide and/or Insecticide Seed Treatment for Control of Diseases and Insects of Seedling Rice[z]	Fungicide Applications for Control of Sheath Blight/Kernel Smut/False Smut	Fungicide Applications for Control of Rice Blast	Insecticide Applications for Control of Rice Water Weevil	Insecticide Applications for Control of Rice Stink Bug/Chinch Bug
Arkansas	CruiserMaxx Rice (7 fl oz)	------	------	------	Mustang Max (4 oz)
Clay	Apron XL	------	------	------	------
Conway	RTST + NipsIt INSIDE	------	------	------	Lambda-Cyhalothrin (3.6 oz)
Desha	CruiserMaxx Rice (7 fl oz)	Propiconazole (6 oz)	Azoxystrobin (12.5 oz)	------	Lambda-Cyhalothrin (1.8 oz)
Jackson	RTST + NipsIt INSIDE	Quilt Xcel (16 oz) + Tilt (1.5 oz)	------	------	
Jefferson	RTST + NipsIt INSIDE	------	------	------	------
Lafayette	CruiserMaxx Rice (7 fl oz)	------	------	------	Karate (1.8 oz)
Lincoln	RTST + NipsIt INSIDE	------	------	------	Mustang Max (4 oz)
Lonoke	RTST + NipsIt INSIDE	------	------	------	------
Poinsett	CruiserMaxx Rice (7 fl oz)	Propiconazole (6 oz)	------	------	------
Prairie	RTST + NipsIt INSIDE	------	------	------	Lambda-Cyhalothrin (1.8 oz) FB Lambda-Cyhalothrin (1.8 oz)
Pulaski	CruiserMaxx Rice (7 fl oz)	------	------	------	Karate (1.8 oz)
Randolph	CruiserMaxx Rice (7 fl oz)	------	Quadris (12.8 oz) FB Quadris (12.8 oz)	------	------
White	RTST + NipsIt INSIDE	------	------	------	Lambda-Cyhalothrin (1.8 oz)
Woodruff	CruiserMaxx Rice (7 fl oz)	------	------	------	------

[z] RTST refers to 'RiceTec Seed Treatment'. This abbreviation defines those fields whose seed was treated by RiceTec, Inc. prior to seed purchase. RTST seed is treated with compounds intended to enhance germination and early-season plant growth while 'RTST + NipsIt INSIDE' includes all the components of 'RTST' plus an insecticide to further protect seedlings.

Table 5. Rainfall and irrigation information for fields enrolled in the 2017 Rice Research Verification Program.

Field Location by County	Rainfall (inches)	Irrigation[z] (acre inches)	Rainfall + Irrigation (inches)
Arkansas	24.0	30.0*	54.0
Clay	17.3	8.1	25.4
Conway	17.0	29.0	46.0
Desha	28.0	28.0	56.0
Jackson	17.5	13.6	31.1
Jefferson	23.9	30.0*	53.9
Lafayette	18.0	28.3	46.3
Lincoln	32.0	3.6	35.6
Lonoke	22.6	30.0*	52.6
Poinsett	22.2	12.8	35.0
Prairie	21.5	32.0	53.5
Pulaski	16.4	30.0*	46.4
Randolph	15.0	30.0*	48.0
White	25.6	12.1	37.7
Woodruff	18.6	18.7	37.3
Average	**21.3**	**18.6†**	**40.4†**

[z] Not all fields were equipped with flow meters to monitor water use for irrigation. Therefore, the average irrigation amount in fields with flow meters over a period of years was calculated and this average was used for fields with no irrigation data. Irrigation amounts using this calculated average are followed by an asterisk (*).

† Average values for Irrigation and Rainfall + Irrigation are only for those fields with measured irrigation amounts and does not include fields where the state average irrigation value of 30.0 acre-inches was used.

ECONOMIC ANALYSIS

This section provides information on production costs and returns for the 2017 Rice Research Verification Program (RRVP). Records of field operations on each field provided the basis for estimating production costs. The field records were compiled by the RRVP coordinators, county Extension agents, and cooperators. Production data from the 15 fields were applied to determine costs and returns above operating costs, as well as total specified costs. Operating costs and total costs per bushel indicate the commodity price needed to meet each cost type.

Operating costs are those expenditures that would generally require annual cash outlays and would be included on an annual operating loan application. Actual quantities of all operating inputs as reported by the cooperators are used in this analysis. Input prices are determined by data from the 2017 Crop Enterprise Budgets published by the Cooperative Extension Service and information provided by the cooperating producers. Fuel and repair costs for machinery are calculated using a budget calculator based on parameters and standards established by the American Society of Agricultural and Biological Engineers. Machinery repair costs should be regarded as estimated values for full-service repairs, and actual cash outlays could differ as producers provide unpaid labor for equipment maintenance.

Fixed costs of machinery are determined by a capital recovery method which determines the amount of money that should be set aside each year to replace the value of equipment used in production. Machinery costs are estimated by applying engineering formulas to representative prices of new equipment. This measure differs from typical depreciation methods, as well as actual annual cash expenses for machinery.

Operating costs, fixed costs, costs per bushel, and returns above operating and total specified costs are presented in Table 6. Costs in this report do not include land costs, management, or other expenses and fees not associated with production. Operating costs ranged from $414.27/acre for Woodruff County to $636.45 for Prairie County, while operating costs per bushel ranged from $2.27/bu for Jefferson County to $3.24/bu for Desha County. Total costs per acre (operating plus fixed) ranged from $523.58/acre for Woodruff County to $748.64/acre for Prairie County, and total costs per bushel ranged from $2.59/bu for Jefferson County to $3.84/bu for Desha County. Returns above operating costs ranged from $216.02/acre for Desha County to $568.91/acre for Jefferson County, and returns above total costs ranged from $121.64/acre for Pulaski County to $494.43/acre for Jefferson County.

A summary of yield, rice price, revenues, and expenses by expense type for each RRVP field is presented in Table 7. The average rice yield for the 2017 RRVP was 187 bushels/acre but ranged from 152 bushels/acre for Desha County to 248 bushels/acre for Prairie County. An Arkansas average long-grain cash price of $4.95/bu was estimated using USDA, National Agricultural Statistics Service (NASS) US long price data for the months of August through October. The RRVP had all fields planted to long grain rice. A premium or discount was given to each field based on the milling yield observed for each field and a standard milling yield of 55/70 for long-grain rice. Broken rice was assumed to have 65% of whole grain price value. If milling yield was higher than the standard, a premium was made while a discount was given for

milling less than the standard. Estimated long-grain prices adjusted for milling yield varied from $4.41/bu in Prairie County to $5.31/bu in White County (Table 7).

The average operating expense for the 15 RRVP fields was $521.88/acre (Table 7). Post-harvest expenses accounted for the largest share of operating expenses on average (21.6%) followed by seed (17.4%), fertilizers & nutrients (16.8%), and chemicals (16.2%). Although seed's share of operating expenses was 17.4% across the 15 fields, its average cost and share of operating expenses varied depending on whether a Clearfield hybrid was used ($149.85/acre; 26.0% of operating expenses), a non-Clearfield hybrid was used ($134.39/acre; 24.2% of operating expenses), a Clearfield non-hybrid (pureline) variety was used ($71.31/acre; 15.7% of operating expenses) or a non-Clearfield non-hybrid (pureline) variety was used ($36.91/acre; 7.6% of operating expenses).

The average return above operating expenses for the 15 fields was $387.02/acre and ranged from $216.02/acre for Desha County to $568.91/acre for Jefferson County. The average return above total specified expenses for the 15 fields was $277.05/acre and ranged from $121.64/acre for Pulaski County to $494.43/acre for Jefferson County. Table 8 provides select variable input costs for each field and includes a further breakdown of chemical costs into herbicides, insecticides, and fungicides. Table 8 also lists the specific rice cultivars grown on each RRVP field.

Table 6. Operating Costs, Total Costs, and Returns for fields enrolled in the 2017 Rice Research Verification Program.

County	Operating Costs ($/acre)	Operating Costs ($/bushel)	Returns to Operating Costs ($/acre)	Fixed Costs ($/acre)	Total Costs ($/acre)	Returns to Total Costs ($/acre)	Total Costs ($/bushel)
Arkansas	595.02	3.13	354.99	75.18	670.19	279.81	3.53
Clay	453.01	2.71	404.44	99.64	552.65	304.80	3.31
Conway	573.46	3.20	279.09	76.45	649.91	202.64	3.63
Desha	492.73	3.24	216.02	90.38	583.10	125.64	3.84
Jackson	584.39	2.84	457.03	100.30	684.68	356.73	3.32
Jefferson	540.84	2.27	568.91	74.48	615.32	494.43	2.59
Lafayette	481.97	2.47	454.02	105.72	587.69	348.31	3.01
Lincoln	509.17	2.60	358.79	61.98	571.15	296.81	2.91
Lonoke	552.78	3.14	322.59	108.08	660.85	214.51	3.75
Poinsett	449.79	2.90	264.36	97.71	547.49	166.66	3.53
Prairie	636.45	2.57	456.59	112.20	748.64	344.39	3.02
Pulaski	538.13	3.08	246.53	124.89	663.02	121.64	3.79
Randolph	455.40	2.78	365.49	151.97	607.37	213.52	3.70
White	550.76	2.69	537.96	126.35	677.11	411.61	3.30
Woodruff	414.27	2.64	383.57	109.31	523.58	274.25	3.33
Average	**521.88**	**2.82**	**378.02**	**100.97**	**622.85**	**277.05**	**3.37**

Table 7. Summary of Revenue and Expenses per Acre for fields enrolled in the 2017 Rice Research Verification Program.

Receipts	Arkansas	Clay	Conway	Desha	Jackson	Jefferson	Lafayette	Lincoln
Yield (bu.)	190	167	179	152	206	238	195	196
Price Received	5.00	5.13	4.76	4.66	5.06	4.66	4.80	4.43
Total Crop Revenue	**950.00**	**857.46**	**852.55**	**708.75**	**1041.41**	**1109.75**	**935.99**	**867.96**
Operating Expenses								
Seed	36.93	64.16	138.72	41.88	149.25	138.72	54.82	121.75
Fertilizers & Nutrients	113.81	119.14	76.27	59.81	95.44	73.69	70.40	50.50
Chemicals	101.01	42.39	65.56	149.33	65.30	61.40	94.17	136.71
Custom Applications	37.80	41.16	52.85	51.10	54.95	35.00	37.80	35.00
Diesel Fuel	15.04	18.48	16.04	15.52	18.11	9.18	18.85	10.86
Repairs & Maintenance	18.27	21.94	18.70	20.58	21.43	18.77	23.77	15.89
Irrigation Energy Costs	0.00	21.05	0.00	42.78	35.34	45.84	43.24	5.50
Labor, Field Activities	9.88	10.31	9.58	10.86	9.87	6.25	12.88	6.45
Other Inputs & Fees, Pre-harvest	147.61	13.61	87.71	9.14	10.38	8.36	8.37	8.23
Post-harvest Expenses	114.67	100.78	108.03	91.73	124.32	143.63	117.68	118.29
Total Operating Expenses	**595.02**	**453.01**	**573.46**	**492.73**	**584.39**	**540.84**	**481.97**	**509.17**
Returns to Operating Expenses	**354.99**	**404.44**	**279.09**	**216.02**	**457.03**	**568.91**	**454.02**	**358.79**
Capital Recovery & Fixed Costs	75.18	99.64	76.45	90.38	100.30	74.48	105.72	61.98
Total Specified Expenses [z]	**670.19**	**552.65**	**649.91**	**583.10**	**684.68**	**615.32**	**587.69**	**571.15**
Returns to Specified Expenses	**279.81**	**304.80**	**202.64**	**125.64**	**356.73**	**494.43**	**348.31**	**296.81**
Operating Expenses/Yield Unit	3.13	2.71	3.20	3.24	2.84	2.27	2.47	2.60
Total Expenses/Yield Unit	3.53	3.31	3.63	3.84	3.32	2.59	3.01	2.91

[z] Does not include land costs, management, or other expenses and fees not associated with production.

Table 7. Summary of Revenue and Expenses per Acre for fields enrolled in the 2017 Rice Research Verification Program (Continued).

Receipts	Lonoke	Poinsett	Prairie	Pulaski	Randolph	White	Woodruff	Average
Yield (bu.)	176	155	248	175	164	205	157	187
Price Received	4.97	4.61	4.41	4.48	5.01	5.31	5.08	4.83
Total Crop Revenue	**875.36**	**714.15**	**1093.03**	**784.66**	**820.89**	**1088.72**	**797.84**	**899.90**
Operating Expenses								
Seed	109.82	38.08	178.56	18.85	78.46	150.28	38.08	90.56
Fertilizers & Nutrients	119.09	133.13	91.07	59.23	77.70	83.98	91.14	87.63
Chemicals	84.66	54.84	82.24	157.46	59.73	45.91	65.56	84.42
Custom Applications	21.00	60.20	60.20	50.40	46.90	60.27	49.49	46.27
Diesel Fuel	18.69	20.01	17.73	19.50	22.18	21.29	20.05	17.44
Repairs & Maintenance	24.55	22.27	24.55	26.22	32.94	27.46	24.00	22.76
Irrigation Energy Costs	45.84	6.57	9.66	77.95	16.94	9.29	5.64	24.38
Labor, Field Activities	12.80	7.45	11.83	13.09	13.37	13.38	12.62	10.71
Other Inputs & Fees, Pre-harvest	10.10	13.70	10.95	9.80	8.20	15.19	12.93	24.95
Post-harvest Expenses	106.22	93.54	149.67	105.61	98.97	123.72	94.75	112.77
Total Operating Expenses	**552.78**	**449.79**	**636.45**	**538.13**	**455.40**	**550.76**	**414.27**	**521.88**
Returns to Operating Expenses	**322.59**	**264.36**	**456.59**	**246.53**	**365.49**	**537.96**	**383.57**	**378.02**
Capital Recovery & Fixed Costs	108.08	97.71	112.20	124.89	151.97	126.35	109.31	100.97
Total Specified Expenses [z]	**660.85**	**547.49**	**748.64**	**663.02**	**607.37**	**677.11**	**523.58**	**622.85**
Returns to Specified Expenses	**214.51**	**166.66**	**344.39**	**121.64**	**213.52**	**411.61**	**274.25**	**277.05**
Operating Expenses/Yield Unit	3.14	2.90	2.57	3.08	2.78	2.69	2.64	2.82
Total Expenses/Yield Unit	3.75	3.53	3.02	3.79	3.70	3.30	3.33	3.37

[z] Does not include land costs, management, or other expenses and fees not associated with production.

Table 8. Selected Variable Input Costs per Acre for fields enrolled in the 2017 Rice Research Verification Program.

County	Rice Type	Seed	Fertilizers & Nutrients	Herbicides	Insecticides	Fungicides and Other Inputs	Diesel Fuel	Irrigation Energy Costs
Arkansas	Diamond	36.93	113.81	95.25	5.76	---	15.04	--- [a]
Clay	CL153	64.16	119.14	42.39	---	---	18.48	21.05
Conway	XP753	138.72	76.27	57.43	8.13	---	16.04	--- [a]
Desha	Roy J	41.88	59.81	116.63	4.07	28.63	15.52	42.78
Jackson	CLXL745	149.25	95.44	48.24	---	17.06	18.11	35.34
Jefferson	XP753	138.72	73.69	61.40	---	---	9.18	45.84
Lafayette	Mermentau	54.82	70.40	90.11	4.07	---	18.85	43.24
Lincoln	CLXP756	121.75	50.50	125.19	11.52	---	10.86	5.50
Lonoke	XP753	109.82	119.09	84.66	---	---	18.69	45.84
Poinsett	Roy J	38.08	133.13	50.13	---	4.71	20.01	6.57
Prairie	RT 7311 CL	178.56	91.07	64.17	18.07	---	17.73	9.66
Pulaski	Diamond	18.85	59.23	153.40	4.07	---	19.50	77.95
Randolph	CL151	78.46	77.70	12.67	---	47.06	22.18	16.94
White	XP753	150.28	83.98	41.85	4.07	---	21.29	9.29
Woodruff	Diamond	38.08	91.14	65.56	---	---	20.05	5.64
Average	**---**	**94.30**	**87.38**	**74.54**	**7.47**	**24.37**	**17.25**	**30.00**

[a] Water was applied by gravity flow to RRVP fields in Arkansas and Conway counties. Thus, irrigation energy costs were equal to zero for this county.