DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

2016
University of Arkansas
Rice Research Verification Program

The Rice Research Verification Program is funded by Arkansas rice producers through check-off monies administered by the Arkansas Rice Research and Promotion Board.

University of Arkansas
Cooperative Extension Service
Agriculture Experiment Station
U.S. Department of Agriculture
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RICE RESEARCH VERIFICATION PROGRAM, 2016

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INTRODUCTION

The 2016 growing season was the thirty third 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.

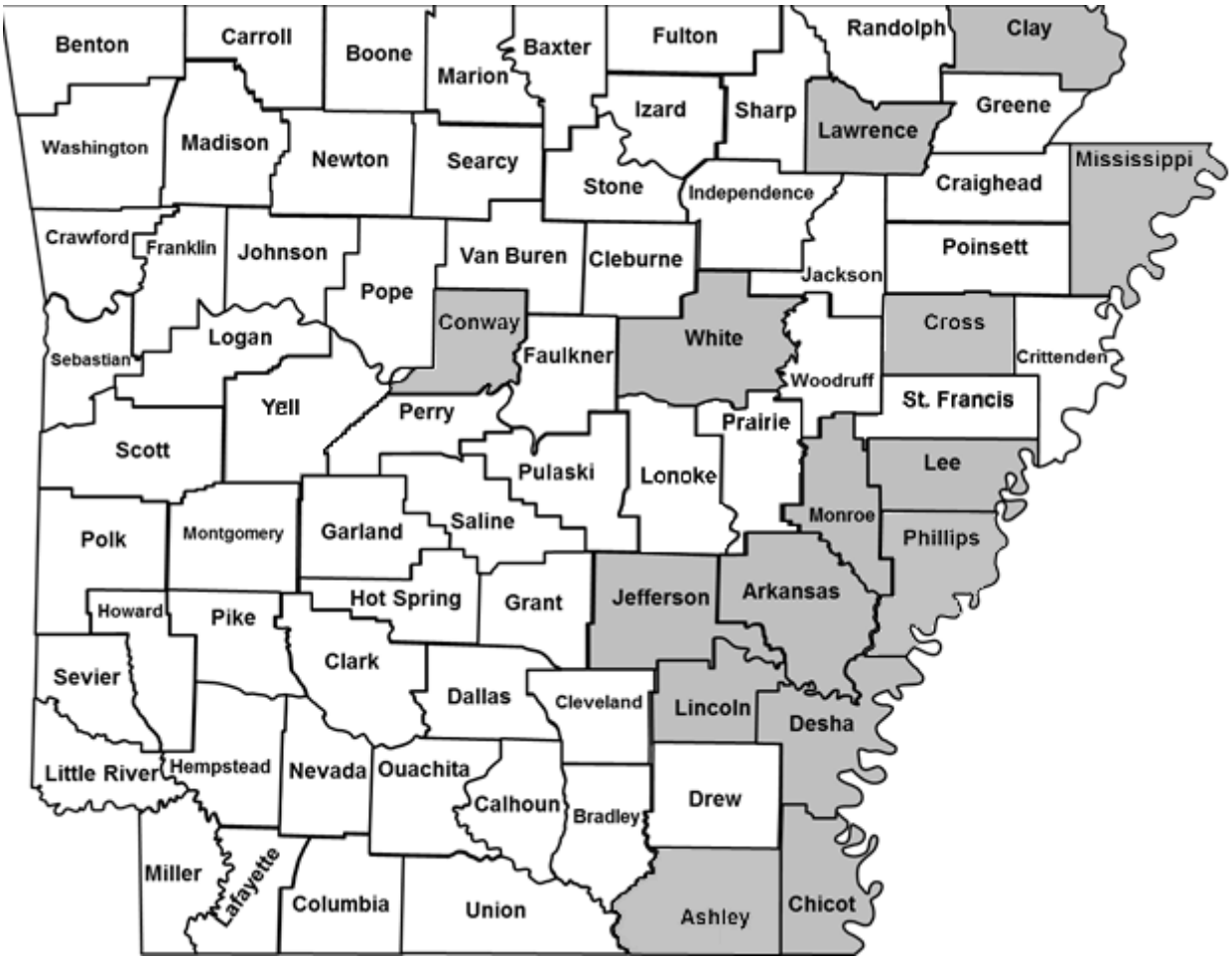
5. To promote timely implementation of management practices among rice growers.

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

Each RRVP field and cooperator was 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 2016. The fields were located on commercial farms ranging in size from 22 to 98 acres. The average field size was 54 acres.

The 2016 RRVP fields were located in Arkansas, Ashley, Chicot, Clay, Conway, Cross, Desha, Jefferson, Lawrence, Lee, Lincoln, Mississippi, Monroe, Phillips, and White Counties. Seven different cultivars (CL151, Diamond, Jupiter, Roy J, RiceTec CLXL729, RiceTec CLXL745, and RiceTec XL753) were planted. Management decisions were based on field history, soil test results, cultivar, and data collected from each individual field during the growing season.

Figure 1. County Locations (shaded) of 2016 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 between Hagler and Bayou Meto on a Dewitt silt loam soil. The field consisted of 20 acres and the previous crop grown on the field was soybean. Diamond, a new variety released from the University of Arkansas, was treated with CruiserMaxx Rice seed treatment and drill seeded. The seeding rate was 75 lbs/acre planted on April 9th. Emergence was observed on April 18th 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 (lbs/acre N-P_2O_5-K_2O) was applied. Command and League herbicides were applied at planting on April 9th. Facet was applied as a pre and post-emergence herbicide on May 11th. Using the N-STaR recommendation, nitrogen in the form of urea plus an approved NBPT product was applied at a rate of 225 lbs/acre on May 12th. Midseason nitrogen was applied as urea on June 29th at a rate of 80 lbs/acre. An adequate flood was maintained throughout the growing season. Rice stink bugs reached threshold levels and Mustang Max insecticide was applied on July 20th. No fungicide treatment was necessary for disease control. The rice was harvested on August 30th with a yield of 154 bu/acre and a milling yield of 46/65 (% Head Rice / % Total Rice). A prolonged period of high nighttime temperatures that reached or exceeded 75°F at early heading resulted in considerable blanking. Excessive rainfall at harvest caused standing rice to sprout in the heads and false smut and sooty mold to be prevalent. The average harvest moisture was 13%. Total irrigation was 30 acre-inches with a season rainfall total of 14.6 inches.

Ashley County

The 38-acre contoured field was located just south of Portland on Grubbs silt loam and Jackport silty clay loam soils. Conventional tillage practices were utilized and the previous crop was soybean. The variety was RiceTec hybrid CLXL729 treated with the company's standard seed treatment. The field was drill seeded on April 26th at a rate of 26 lbs/acre. Emergence was observed on May 10th with a stand count of 6 plants/ft^2. Glyphosate, Command, and League herbicides were applied for burndown and pre-emergence weed control on April 26th. There was a long delay establishing the contour levees yet pre-emergence herbicides coupled with rainfall gave extended control. Facet and Permit Plus were applied as post-emergence herbicides on May 26th. Nitrogen in the form of urea with an approved NBPT product was applied on June 2nd at a rate of 260 lbs/acre according to the N-STaR recommendation. An adequate flood was maintained throughout the growing season. The late boot application of urea was applied on July 2nd at 70 lbs/acre. No fungicides were necessary for disease control. Rice stink bug reached threshold levels and Lambda-Cy insecticide was applied on July 28th. The field was harvested on September 28th yielding 173 bu/acre. The average harvest moisture was 18%. The milling yield was 58/68. The irrigation water use totaled 30 acre-inches and the rainfall for the growing season was 11 inches.

Chicot County

The 69-acre zero-grade field was located north of Lake Village on a Perry clay soil. On April 26th, RiceTec hybrid CLXL745, treated with the company's standard seed treatment was drill-seeded at 24 lbs/acre. Glyphosate, Command, and Sharpen herbicides were applied on April 4th for burndown and pre-emergence weed control. Field emergence was recorded on May 15th with a stand density of 2 plants/ft^2 which eventually increased to 2.5 plants/ft^2. On June 7th Ricestar HT and Command were applied as pre- and post-emergence herbicides and were followed by an application of RiceBeaux. Based on N-STaR recommendations, nitrogen in the form of urea with an approved NBPT product was applied at 200 lbs/acre on June 12th. An adequate flood was maintained throughout the growing season. Urea fertilizer was applied at late boot on July 21st at 70 lbs/acre. No fungicides or insecticides were necessary for the growing season. The field was harvested September 9th with a yield of 236 bu/acre and a milling yield of 58/70. This was the highest yield in the 2016 Rice Research Verification program. The harvest moisture averaged 14%. The grower was very pleased with the yield considering the low stand count and excessive rainfall at harvest time. The irrigation amount was 30.0 acre-inches. Rainfall amounts were 18.6 inches for the growing season.

Clay County

The precision-graded Clay County field was located northeast of Piggott on a Fountain silt loam soil. The field was 90 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 pre-plant in the spring at a rate of 0-20-80-10 (lbs/acre N-P_2O_5-K_2O-Zn). A burndown herbicide tank mix of Roundup plus Sharpen was applied pre-plant. RiceTec hybrid XL753 with the company's standard seed treatment plus NipsIt INSIDE insecticide seed treatment was drill-seeded at a rate of 24 lbs/acre on April 15th. Rice emergence was observed on April 28th. The stand count was 6 plants/ft^2. Command and Facet L herbicides were applied pre-emergence providing excellent weed control. No post-emergence herbicide application was needed. Off-target herbicide drift combined with unfavorably cool weather reduced the seedling stand to 4 plants/ft^2. Ammonium sulfate was applied at 100 lbs/acre to stimulate growth and recovery. Using the N-STaR recommendation, urea plus an approved NBPT product was applied preflood on June 2nd at a rate of 220 lbs/acre. Multiple inlet irrigation was utilized to achieve a more efficient permanent flood. Even so, the permeable nature of the soil made flood levels somewhat difficult to maintain during the season. A late boot application of urea was made at a rate of 65 lbs./acre. No insecticide or fungicide treatments were required for pest control. The rice was harvested on August 30th, yielding 154 dry bu/acre. The milling yield was 58/70. The average harvest moisture was 16.3%. Total irrigation for the season was 39.7 acre-inches. Rainfall was 15.4 inches.

Conway County

The zero-grade Conway County field was southeast of Blackwell on a Dardanelle silt loam. The field was 51.5 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, no pre-plant fertilizer was applied. A burndown/pre-

emergence herbicide tank mix of generic glyphosate plus Command was applied at planting. Rice Tec hybrid XL753 with the company's standard seed treatment plus NipsIt INSIDE insecticide seed treatment was drill-seeded at a rate of 23 lbs/acre on April 15th. Rice emergence was observed on April 24th. The stand count was 5 plants/ft^2. Ammonium sulfate was applied at 100 lbs/acre due to the somewhat thin stand and to stimulate recovery from cool weather. A post-emergence application of RiceBeaux herbicide was made on May 12th providing good control of weeds except for some small, scattered patches of red rice that required manual control. Using the N-STaR recommendation, urea plus an approved NBPT product was applied preflood on May 18th at a rate of 155 lbs/acre. A permanent flood was established with a cascade system primarily using an electric well but river water from the local Irrigation District was also utilized. Flood levels were maintained well throughout the season. A late boot application of urea was made at a rate of 65 lbs/acre. Rice stink bug moved into the field at extremely high numbers and were treated with Lamda-cyhalothrin on July 12th followed by a second treatment a week later. No fungicide treatments were required. The rice was harvested on August 31st yielding 176 bu/acre. The milling yield was 56/70. The average harvest moisture was 11.7%. Total irrigation for the season was 16.8 acre-inches. Rainfall was 12.4 inches.

Cross County

The traditionally contoured Cross County field was located southwest of Hickory Ridge on Crowley and Hillemann silt loam soils. The field was 98 acres and the previous crop grown was soybean. Conventional tillage practices were used for spring field preparation and a pre-plant fertilizer based on soil test analysis was applied at the rate of 0-50-90-5 (lbs/acre N-P_2O_5-K_2O-Zn). On April 7th, the variety Roy J with CruiserMaxx Rice seed treatment was broadcast seeded at a rate of 90 lbs/acre. Rice emergence was observed on April 20th and consisted of 20 plants/ft^2. Command herbicide was applied pre-emergence followed by a post-emergence tank mix application of Obey and Permit Plus. Excellent pre- and post-emergence control of weeds was achieved. Using the N-STaR recommendation, urea plus an approved NBPT product was applied preflood on May 26th at the rate 220 lbs/acre. Application streaking of the N occurred in part of the field and had to be corrected with an additional 75 lbs/A of urea on 25 acres. Multiple risers were utilized to achieve a more efficient permanent flood. Once the permanent flood was established, flood levels were maintained adequately throughout the season. A midseason application of urea was made at a rate of 100 lbs/acre. No fungicide or insecticide applications were required. The rice was harvested on September 15th yielding 158 bu/acre. This lower than expected yield was attributed primarily to considerable blanking due to adverse weather during the pollination period. The milling yield was 52/70. The average harvest moisture was 12%. Total irrigation was 20.5 acre-inches and total rainfall for the season was 14.6 inches.

Desha County

The 50-acre contour levee field was located just south of Dumas on Herbert silt loam and Perry clay soils. Traditional tillage practices were performed and the previous crop was soybean. According to the soil test the pre-plant fertilizer 0-46-0-4 (lbs/acre N-P_2O_5-K_2O-Zn) was applied in the spring. Roy J treated with NipsIt Suite Rice insecticide

seed treatment was drill-seeded at 70 lbs/ acre on April 6th. Command and League herbicides were applied on April 6th for pre-emergence weed control. Emergence was observed on April 21st with 19 plants/ft^2. Facet was applied as a post-emergence herbicide on May 12th. Nitrogen in the form of urea plus an approved NBPT product was applied at 260 lbs/acre on May 18th according to the N-STaR recommendation. Midseason urea was applied at 100 lbs/acre on June 8th according to GreenSeeker recommendation. The field had a history of kernel smut and rice stink bugs reached threshold levels. Stratego fungicide and Lambda Cy insecticide were applied on July 19th. The field was harvested on August 31st yielding 151 bu/acre with a milling yield of 51/69. Considerable blanking was observed and rice sprouting was prevalent from excessive rainfall and high humidity at harvest. The average harvest moisture was 17%. The irrigation amount was 30 acre-inches and the total rainfall amount was 22.3 inches.

Jefferson County

The 67-acre row water field was located 10 miles south of Pine Bluff on the Arkansas River on Rilla silty clay loam soil. The previous crop grown was soybean. The RiceTec hybrid XL753 treated with the company's standard seed treatment was drill seeded at 24 lbs/acre on March 29th. A pre-plant fertilizer based on soil test analysis was applied on March 30th at a recommended rate of 0-50-0 (lbs/acre of N-P_2O_5-K_2O). Touchdown, Command, and League herbicides were applied on April 8th for burndown and pre-emergence grass, broadleaf, and aquatic weed control. Rice emergence was observed on April 15th with a stand density of 6 plants ft^2. Prowl and Facet pre-emergence herbicides were applied on May 2nd. Using the N-STaR recommendation, nitrogen in the form of urea with an approved NBPT product was applied at 325 lbs/acre on May 9th. Intermittent flushing was utilized every 2-3 days as row water irrigation. A second urea application was made on May 19th at 100 lbs/acre to compensate for nitrogen loss due to the row water irrigation. Midseason urea was applied on May 31th at 70 lbs/acre. No fungicides or insecticides were warranted during the growing season. Sodium chlorate was applied on August 27th as a desiccant on vegetative growth to the lower one-third of the field. The field was harvested on August 29th yielding 165 bu/acre and a milling yield of 63/69. The average harvest moisture was 14% and the irrigation amount was 30 acre-inches. The rainfall amount totaled 18.5 inches.

Lawrence County

The precision-grade 50-acre Lawrence County field was located north of Alicia on a Jackport silty clay loam soil. The previous crop grown on the field was soybean. Conventional tillage practices were used for field preparation in the spring. A pre-plant fertilizer based on soil test analysis was applied on April 13th at the recommended rate of 0-68-0-2 (lbs of N-P_2O_5-K_2O-Zn/acre). On April 14th, the variety CL151 treated with CruiserMaxx Rice was drill-seeded at a rate of 74 lbs/acre. Emergence was observed on April 29th. The stand count was 13 plants/ft^2. RoundUp tank-mixed with Command was applied as a burndown/pre-emergence herbicide treatment on April 18th. This was followed on May 7th by a post-emergence herbicide tank mix of Newpath plus Strada. A second post-emergence application on June 11th included Clearpath and Permit Plus. Very good pre- and post-emergence control of weeds was achieved. Using the N-STaR

recommendation, urea plus an approved NBPT product at 175 lbs/A was applied as a single preflood treatment. Multiple inlet irrigation was utilized to achieve a more efficient permanent flood. Once the permanent flood was established, flood levels were maintained sufficiently throughout the season. A corrective urea application at the rate of 75 lbs/A was required late midseason. No fungicide applications were required. No insecticide treatments were required. On September 2nd, sodium chlorate was applied as a harvest aid treatment. The field was harvested on September 7th with a grain yield of 176 bu/acre. The milling yield was 56/68. The average harvest moisture was 16.8%. Total irrigation for the season was 15.9 acre-inches. Rainfall was 15.9 inches.

Lee County

The 37-acre field was located just east of Moro on a Calloway and Henry silt loam soil. Soybean was the previous crop grown on the field. Conventional tillage practices were performed on the contour levee field. A pre-plant fertilizer blend of 0-30-60-11 (lbs/acre N-P_2O_5-K_2O-Zn) was applied according to the soil sample analysis. On April 26th the variety Roy J, treated with CruiserMaxx Rice seed treatment plus zinc, was drill-seeded at a rate of 75 lbs/acre. Sharpen and Command were applied on April 26th as burndown and pre-emergence herbicides. Emergence was observed on May 10th with 17 plants/ft^2. Facet L was applied on May 24th as a post-emergence herbicide. Based on N-STaR recommendations, nitrogen in the form of urea plus an approved NBPT product was applied at 250 lbs/acre on June 2nd. A minimal flood was maintained throughout the growing season with multiple-inlet irrigation. Using GreenSeeker recommendation, no midseason urea fertilizer was necessary. Numerous hybrid off-types were observed late season. The field was harvested on September 8th with a yield of 140 bu/acre and a milling yield of 59/68. The average harvest moisture was 15%. The irrigation water use totaled 55.5 acre-inches and the season-long rainfall total was 12.0 inches.

Lincoln County

The 31-acre row water field was located just south of Grady on a Perry clay soil. The previous crop was corn and there were no spring tillage practices performed. Afforia, 2,4-D, and Select herbicides were applied in early spring for burndown and winter annual grass and weed control. RiceTec hybrid XL753 treated with CruiserMaxx Rice in addition to the company's standard seed treatment was drill-seeded on April 9th at a rate of 24 lbs/acre. The rice emerged on April 20th at 5 plants/ft^2. Command, League, Firstshot and glyphosate herbicides were applied on April 9th for burndown and pre-emergence weed control. Prowl herbicide was applied on April 28th to aid in grass residual control. Facet and Permit were applied as post-emergence herbicides on May 9th. Using the N-STaR recommendation, nitrogen in the form of urea plus an approved NBPT product was applied at 300 lbs/acre on May 10th. A second application of urea was made on June 7th at 100 lbs/acre to compensate for nitrogen loss due to row water irrigation. The late boot urea application was applied on July 10th at 70 lbs/acre. Rice stink bug reached threshold levels prompting Mustang Maxx to be applied on July 12th. The field was harvested on August 23rd yielding 173 bu/acre. The milling yield was 52/70 and the average harvest moisture was 15%. The irrigation water use was 48 acre-inches and the rainfall totaled 15.1 inches.

Mississippi County

The precision-grade Mississippi County field was located west of Wilson on a Sharkey and Tunica silty clay soil. Previous crop was soybean. The field was 68 acres and conventional tillage practices were used for field preparation in the spring. A tank mix of glyphosate plus 2,4-D was applied as an early spring burndown herbicide. Based on soil test analysis no pre-plant fertilizer was needed. RiceTec hybrid XL753 with the company's standard seed treatment was drill-seeded at a rate of 24 lbs/acre on April 9th. Rice emergence was observed on April 22nd with a stand count of 10 plants/ft². However, herbicide injury reduced the stand to 7 plants/ft². Ammonium sulfate at 75 lbs/acre plus urea at 75 lbs/acre* was applied to stimulate growth and recovery. Command plus Facet L herbicides were applied at planting and provided excellent weed control. No post-emergence herbicide application was needed. Urea plus an approved NBPT product at a rate of 240 lbs/acre was applied preflood on May 24th. Multiple inlet irrigation was utilized to achieve a more efficient permanent flood. Once the permanent flood was established, flood levels were maintained well throughout the season. Harvest began on September 1st. The field yield average was 187 bu/acre. Moisture at harvest was 14%. The milling yield was 63/69. Total irrigation was 20.7 acre-inches. Total rainfall for the season was 13.8 inches.

***Though recommended in certain situations, the addition of urea to ammonium sulfate was a miscommunication in this case. Either product would have likely sufficed without adding the other to meet the need here.

Monroe County

The straight-levee 70-acre field was located east of Clarendon on a Grubbs silt loam and Jackport silty clay loam soil. Conventional tillage practices were used for field preparation in the spring and soybean was the previous crop. Based on soil test analysis, mixed fertilizer at the rate of 0-60-60 (lbs/acre N-P_2O_5-K_2O) was applied in the spring. The medium-grain variety Jupiter, treated with CruiserMaxx Rice seed treatment and Release, was drill-seeded at 65 lbs/acre on April 9th. Emergence was observed on April 26th at 16 plants ft^2. Glyphosate, Command, and League herbicides were applied on April 10th. Prowl ws applied as a pre-emergence herbicide on May 9th. Facet and Permit Plus were applied May 17th as post-emergence herbicides. Nitrogen fertilizer in the form of urea plus an approved NBPT product was applied June 12th at 180 lbs/acre according to the N-STaR recommendation. An adequate permanent flood was maintained throughout the growing season using multiple inlet irrigation. Areas of ALS resistant annual sedge were observed throughout the growing season. No fungicide or insecticide applications were necessary due to careful scouting. Midseason nitrogen was applied at 100 lbs/acre on July 2nd according to GreenSeeker recommendation. Sodium Chlorate was applied on August 28th as a desiccant. The field was harvested August 31st with a yield of 142 bu/acre. The milling yield was 55/68. Irrigation totaled 20.0 acre-inches. Rainfall amounts totaled 16.4 inches.

Phillips County

The contoured 38-acre field was located north of Wabash on Tunica silty clay soil. Conventional tillage was used after the previous soybean crop. Based on soil test analysis no pre-plant fertilizer was needed. The variety Roy J was treated with NipsIt

Suite Rice seed treatment and drill-seeded at 75 lbs/acre on April 11th. Emergence was observed on April 28th at 22 plants/ft^2. Facet L and Command were applied as pre-emergence herbicides on May 12th. Facet L was applied on June 7th as a post-emergence herbicide. Nitrogen in the form of urea plus an approved NBPT product was applied on June 8th at 175 lbs/acre. Multiple-inlet irrigation was utilized to achieve a more efficient permanent flood. Midseason nitrogen was applied at 100 lbs/acre on July 13th according to GreenSeeker recommendation. Rice stink bugs reached threshold levels and Lambda Cy insecticide was applied July 13th. The field was harvested on September 28th yielding 148 bu/acre. The milling yield was 51/65. The irrigation amount was 30 acre-inches and the rainfall amount was 10.0 inches.

White County

The precision-grade White County field was located south of Kensett on Calhoun and Calloway silt loam soils. The field was 34.7 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 0-50-50-10 (lbs/acre N-P_20_5-K_20-Zn) on the north 18 acres. This portion of the field has not performed as well as the remainder of the field ever since it had a leveling correction a few years ago. No pre-plant fertilizer was required on the remainder of the field. On May 8th, RiceTec hybrid XL753 with the company's standard seed treatment plus NipsIt INSIDE insecticide was drill-seeded at a rate of 22 lbs/acre. Rice emergence was observed on May 15th and consisted of 7 plants/ft^2. Command herbicide was applied pre-emergence followed by a post-emergence application of propanil providing excellent control of weeds. Using the N-STaR recommendation, urea plus an approved NBPT product was applied preflood at a rate of 200 lbs/acre on June 17th. Once the permanent flood was established, flood levels were maintained well throughout the season. However, nitrogen depletion symptoms began to appear on the north 18 acres making it necessary to apply additional N to correct the problem and urea at a rate of 85 lbs/acre was applied. The entire field received the normal 65 lbs of urea at late boot. Based on field evaluations, no fungicide application was required. Rice stink bugs exceeded the threshold for treatment on the north 18 acres which was about a week behind the rest of the field. Control was achieved with a single application of Lamda-Cy on September 7th. The field was harvested on September 20th yielding 156 bu/acre due in part to excessive rains during flowering. Moisture at harvest was 15.9%. The milling yield was 61/72. Total irrigation was 12.1 acre-inches and total rainfall for the season was 20.2 inches.

Table 1. Agronomic information for fields enrolled in the 2016 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	20	Soybean	75	18	09-Apr	18-Apr	30-Aug	154	46/65	13
Ashley	CLXL729	38	Soybean	26	6	26-Apr	10-May	7-Sep	173	58/68	14
Chicot	CLXL745	69	Rice	24	2	26-Apr	15-May	8-Sep	236	58/70	14
Clay	XL753	90	Soybean	24	6	15-Apr	28-Apr	30-Aug	154	58/70	16.3
Conway	XL753	51.5	Rice	23	5	13-Apr	24-Apr	31-Aug	176	56/70	11.7
Cross	Roy J	98	Soybean	90	20	07-Apr	20-Apr	15-Sep	158	52/70	12
Desha	Roy J	50	Soybean	70	19	06-Apr	21-Apr	31-Aug	151	51/69	17
Jefferson	XL753	67	Soybean	24	6	29-Mar	15-Apr	21-Aug	165	63/69	14
Lawrence	CL151	50	Soybean	74	13	14-Apr	29-Apr	07-Sep	176	56/68	16.8
Lee	Roy J	37	Soybean	75	17	26-Apr	10-May	08-Sep	140	59/68	14.5
Lincoln	XL753	31	Corn	24	5	09-Apr	20-Apr	23-Aug	173	53/70	15
Mississippi	XL753	68	Soybean	24	7	09-Apr	22-Apr	01-Sep	187	63/69	14
Monroe	Jupiter	70	Soybean	65	16	16-Apr	26-Apr	26-Sep	142	55/68	15
Phillips	Roy J	38	Rice	75	22	11-May	28-May	28-Sep	148	51/65	16.3
White	XL753	34.7	Soybean	22	7	8-May	15-May	22-Sep	156	61/72	15.9
Average		**54.1**		[y]	[x]	**17-Apr**	**30-Apr**	**6-Sep**	**166**	**56/69**	**14.63**

[z] Head rice milling yield / Total rice milling yield.
[y] Seeding rates averaged 74.9 lbs/acre for conventional cultivars and 24.9 lbs/acre for hybrid cultivars.
[x] Stand density averaged 17.9 plants/ft^2 for conventional cultivars and 5.5 plants/ft^2 for hybrid cultivars.

Table 2. Soil test results, fertilization program, and soil classification for fields enrolled in the 2016 Rice Research Verification Program.

Field Location by County	Soil Test				Applied Fertilizer (lbs/acre)			Soil Classification
	pH	lbs/acre			Mixed Fertilizer [v] N-P-K-Zn[w]	N-Star Urea (46%N) rates and timing [x, y]	Total N rate (lbs N/acre) [z]	
		P	K	Zn				
Arkansas	6.1	54	151	9.1	0-30-90-0	225-80-0	140	Dewitt silt loam
Ashley	6.2	57	340	4.0	0-0-0-0	260-0-70	152	Grubbs silt loam and Jackport silty clay loam
Chicot	7.0	32	788	5.0	18-46-0-0	200-0-70	124	Perry Clay
Clay	6.9	61	175	14.3	21-20-80-10	220-0-65	131	Fountain silt loam
Conway	6.2	96	430	9.6	21-0-0-0	155-0-65	101	Dardanelle silt loam
Cross	7.1	37	169	4.8	0-50-90-5	220-100-0	156†	Crowley & Hillemann silt loams
Desha	7.6	50	359	4.9	0-46-0-4	260-0-0	167†	Perry Clay and Herbert silt loam
Jefferson	7.1	47	506	7.2	0-50-0-0	325-0-70	228†	Rilla silty clay loam
Lawrence	7.3	14	383	3.9	0-68-0-2	175-0-0	115†	Jackport silty clay loam-clay
Lee	7.5	50	197	6.4	0-30-60-11	250-0-0	115	Calloway and Henry silt loam
Lincoln	7.0	89	707	6.9	0-0-0-0	300-0-70	216†	Perry clay
Mississippi	7.1	58	389	5.6	51-0-0-0	240-0-65	140	Sharkey & Tunica silty clays
Monroe	7.0	30	235	4.6	0-60-60-0	180-100-0	129	Grubbs silt loam and Jackport silty clay loam
Phillips	6.3	86	459	5.0	0-0-0-0	175-100-0	127	Tunica silty clay
White North*	5.4	46	392	3	0-50-50-10	200-0-65	161†	Calhoun & Calloway silt loams
White South*	5.7	61	296	3.9	0-0-0-0	200-0-65	122	Calhoun & Calloway silt loams

[v] Column includes seed treatments, regular pre-plant applications and applications for problems other than nitrogen depletion (details in field reviews).
[w] N=nitrogen, P=phosphorus, K=potassium, Zn=zinc.
[x] Timing: preflood – midseason – boot. All fields were fertilized according to its N-star recommendation listed in this column.
[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 more seasonal N than N-Star recommended 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 problems is recorded in the Mixed Fertilizer column.
*North and South are different areas of the same field requiring significantly different fertilizer applications.

Table 3. Herbicide rates and timings for fields enrolled in the 2016 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 (4 oz)	Facet L (25 oz)
Ashley	Command (16 oz) + League (3.2 oz) + glyphosate (32 oz)	Facet L (32 oz) + Permit Plus (0.75 oz) + COC (1 qt)
Chicot	Command (16 oz) + glyphosate (32 oz) + Sharpen (2 oz)	Ricestar (24 oz) + Command (11 oz) FB RiceBeaux (3 qt)
Clay	Spring Burndown: RoundUp (28 oz) + Sharpen (2 oz) + MSO (12 oz) Command (12.8 oz) + Facet L (22 oz)	None
Conway	Command (16 oz) + glyphosate (32 oz)	RiceBeaux (4 qt)
Cross	Command (12.8 oz)	Obey (22 oz) + Permit Plus (0.75 oz)
Desha	Command (16 oz) + League (3.2 oz)	Facet (0.5 lb) + COC (12.8 oz)
Jefferson	Command (16 oz) + League (4 oz) + glyphosate (32 oz)	Prowl H_2O (2.1 pt) +Facet (32 oz) + COC (1 qt)
Lawrence	Command (12.8 oz) + glyphosate (42 oz)	Newpath (4 oz) + Strada (2 oz) FB Clearpath (0.5 lb) + Permit (0.75 oz)
Lee	Command (12.8 oz) + Sharpen (2 oz)	Facet L (26 oz)
Lincoln	Spring Burndown: Afforia (2.5 oz) + 2,4-D (16 oz) + Select (12 oz)) FB glyphosate (26 oz) + Firstshot (0.6 oz) + Command (21 oz) + League (4 oz)	Prowl H_2O (2.1 pt) FB Facet L (32 oz) + Permit (1 oz) +COC (1 qt)
Mississippi	Spring Burndown: glyphosate (32 oz) + 2,4-D (16 oz) Command (17.6 oz) + Facet L (30 oz)	None
Monroe	Command (12.8 oz) + League (6.4 oz) + glyphosate (32 oz)	Prowl H_2O (2.1 pt) FB Facet L (25 oz) + Permit Plus (0.75 oz) + COC (1 qt)
Phillips	Command (16 oz) + Facet L (16 oz)	Facet L (25 oz)
White	Command (17.6 oz)	Propanil (3 qt)

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

Table 4. Seed treatments used and foliar fungicide and insecticide applications made on fields enrolled in the 2016 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 (3.6 oz)
Ashley	RTST	------	------	------	Lambda-Cy (2.5 oz)
Chicot	RTST	------	------	------	------
Clay	RTST + NipsIt INSIDE	------	------	------	------
Conway	RTST + NipsIt INSIDE	------	------	------	Lambda-Cy (3.6 oz) fb Lambda-Cy (3.2 oz)
Cross	CruiserMaxx Rice (7 fl oz)	------	------	------	------
Desha	NipsIt Suite Rice (2.9 fl oz)	Stratego (19 oz)	------	------	Lambda-Cy (4.2 oz)
Jefferson	RTST	------	------	------	------
Lawrence	CruiserMaxx Rice (7 fl oz)		------	------	------
Lee	CruiserMaxx Rice (7 fl oz)	------	------	------	------
Lincoln	CruiserMaxx Rice (7 fl oz)	------	------	------	Mustang Max (4 oz)
Mississippi	RTST	------	------	------	------
Monroe	CruiserMaxx Rice (7 fl oz) + Release (0.3 oz)	------	------	------	------
Phillips	NipsIt Suite Rice (2.9 fl oz)	------	------	------	Lambda-Cy (3.2 oz)
White North	RTST + NipsIt INSIDE	------	------	------	Lambda-Cy (3.2 oz)
White South	RTST + NipsIt INSIDE	------	------	------	------

[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 2016 Rice Research Verification Program.

Field Location by County	Rainfall (inches)	Irrigation[z] (acre-inches)	Rainfall + Irrigation (inches)
Arkansas	14.6	30.0*	44.6
Ashley	11.0	30.0*	41.0
Chicot	18.6	30.0*	48.6
Clay	15.4	39.7	55.1
Conway	12.4	16.8	29.2
Cross	14.6	20.5	35.1
Desha	22.3	30.0*	52.3
Jefferson	18.5	30.0*	48.5
Lawrence	15.9	15.9	31.8
Lee	12.0	55.5	67.5
Lincoln	15.1	48.0	63.1
Mississippi	13.8	20.7	34.5
Monroe	16.4	20.0	36.4
Phillips	10.0	30.0*	40.0
White	20.2	12.1	32.3
Average	**15.4**	**27.7†**	**42.8†**

[z] An average established from flow meter data over a period of years was used for several fields not equipped with flow meters to monitor irrigation water use. 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 2016 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 2016 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 $384.87/acre for Phillips County to $635.31 for Chicot County, while operating costs per bushel ranged from $2.60/bu for Phillips County to $3.81/bu for Jefferson County. Total costs per acre (operating plus fixed) ranged from $487.65/acre for Phillips County to $721.94/acre for Chicot County, and total costs per bushel ranged from $3.06/bu for Chicot County to $4.32/bu for Jefferson County. Returns above operating costs ranged from $142.58/acre for Clay County to $456.96/acre for Chicot County, and returns above total costs ranged from $50.14/acre for Clay County to $370.33/acre for Chicot 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 2016 RRVP was 166 bushels/acre but ranged from 140 bushels/acre for Lee County to 236 bushels/acre for Chicot County. An Arkansas average long-grain cash price of $4.56/bu and an Arkansas average medium grain cash price of $4.49/bu were estimated using USDA, National Agricultural Statistics Service (NASS) US long and medium grain price data for the months of August through October. The RRVP had one field planted to a medium-grain cultivar (Monroe County). A premium or discount was given to each field based on the milling yield observed for each field and standard milling yields of 55/70 for long-grain rice and 58/69 for medium-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 $4.11/bu in Arkansas County to $4.79/bu in White County. The medium-grain price adjusted for milling yield for the Monroe County field was $4.38/bu (Table 7).

The average operating expense for the 15 RRVP fields was $513.75/acre (Table 7). Post-harvest expenses accounted for the largest share of operating expenses on average (21.4%) followed

by seed (19.6%), fertilizers & nutrients (16.7%), and chemicals (14.0%). Although seed's share of operating expenses was 19.6% across the 15 fields, it's average cost and share of operating expenses varied depending on whether a Clearfield hybrid was used ($152.24/acre; 25.5% of operating expenses), a non-Clearfield hybrid was used ($132.97/acre; 23.7% of operating expenses), a Clearfield non-hybrid (pureline) variety was used ($88.50/acre; 18.5% of operating expenses) or a non-Clearfield non-hybrid (pureline) variety was used ($52.59/acre; 11.8% of operating expenses).

The average return above operating expenses for the 15 fields was $237.02/acre and ranged from $142.58/acre for Clay County to $456.96/acre for Chicot County. The average return above total specified expenses for the 15 fields was $146.61/acre and ranged from $50.14/acre for Clay County to $370.33/acre for Chicot 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 2016 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	433.79	2.82	198.71	70.08	503.87	128.63	3.27
Ashley	558.82	3.23	225.95	94.52	653.33	131.43	3.78
Chicot	635.31	2.69	456.96	86.63	721.94	370.33	3.06
Clay	570.17	3.70	142.58	92.44	662.61	50.14	4.30
Conway	511.28	2.91	294.75	81.07	592.35	213.69	3.37
Cross	465.97	2.95	242.30	100.74	566.71	141.56	3.59
Desha	456.82	3.03	209.46	91.90	548.73	117.56	3.63
Jefferson	628.96	3.81	147.12	84.10	713.06	63.02	4.32
Lawrence	478.59	2.72	311.25	90.31	568.90	220.94	3.23
Lee	451.55	3.23	186.92	110.97	562.52	75.95	4.02
Lincoln	623.20	3.60	156.51	92.11	715.30	64.41	4.13
Mississippi	514.51	2.75	365.05	88.68	603.18	276.37	3.23
Monroe	477.70	3.36	143.91	85.73	563.43	58.17	3.97
Phillips	384.87	2.60	240.93	102.79	487.65	138.15	3.29
White	514.77	3.30	232.94	84.19	598.96	148.75	3.84
Average	**513.75**	**3.11**	**237.02**	**90.42**	**604.17**	**146.61**	**3.67**

Table 7. Summary of Revenue and Expenses per Acre for fields enrolled in the 2016 Rice Research Verification Program.

Receipts	**Arkansas**	**Ashley**	**Chicot**	**Clay**	**Conway**	**Cross**	**Desha**	**Jefferson**
Yield (bu.)	154	173	236	154	176	158	151	165
Price Received	4.11	4.54	4.63	4.63	4.58	4.48	4.41	4.70
Total Crop Revenue	**632.50**	**784.76**	**1092.27**	**712.75**	**806.04**	**708.27**	**666.28**	**776.08**
Operating Expenses								
Seed	60.56	154.97	149.52	133.68	128.11	42.30	49.00	140.16
Fertilizers & Nutrients	94.11	63.92	77.79	106.58	49.48	116.85	94.45	118.35
Chemicals	49.15	82.13	107.11	47.36	72.58	61.35	70.96	95.10
Custom Applications	29.75	39.20	49.00	56.40	52.85	48.40	39.20	71.75
Diesel Fuel	8.39	7.13	5.56	7.75	10.75	11.59	9.40	5.12
Repairs & Maintenance	16.31	22.05	21.50	21.28	18.02	20.28	20.69	20.58
Irrigation Energy Costs	0.00	44.29	44.29	57.12	17.28	30.27	43.20	44.29
Labor, Field Activities	9.64	8.90	6.85	10.32	8.29	10.58	10.31	6.08
Other Inputs & Fees, Pre-harvest	63.69	21.45	17.11	27.51	37.15	19.53	19.42	18.05
Post-harvest Expenses	102.18	114.79	156.59	102.18	116.78	104.83	100.19	109.48
Total Operating Expenses	**433.79**	**558.82**	**635.31**	**570.17**	**511.28**	**465.97**	**456.82**	**628.96**
Returns to Operating Expenses	**198.71**	**225.95**	**456.96**	**142.58**	**294.75**	**242.30**	**209.46**	**147.12**
Capital Recovery & Fixed Costs	70.08	94.52	86.63	92.44	81.07	100.74	91.90	84.10
Total Specified Expenses [z]	**503.87**	**653.33**	**721.94**	**662.61**	**592.35**	**566.71**	**548.73**	**713.06**
Returns to Specified Expenses	**128.63**	**131.43**	**370.33**	**50.14**	**213.69**	**141.56**	**117.56**	**63.02**
Operating Expenses/Yield Unit	2.82	3.23	2.69	3.70	2.91	2.95	3.03	3.81
Total Expenses/Yield Unit	3.27	3.78	3.06	4.30	3.37	3.59	3.63	4.32

[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 2016 Rice Research Verification Program (Continued).

Receipts	Lawrence	Lee	Lincoln	Mississippi	Monroe	Phillips	White	Average
Yield (bu.)	176	140	173	187	142	148	156	166
Price Received	4.49	4.56	4.51	4.70	4.38	4.23	4.79	4.52
Total Crop Revenue	**789.84**	**638.46**	**779.71**	**879.55**	**621.61**	**625.80**	**747.72**	**750.78**
Operating Expenses								
Seed	88.50	60.38	133.68	133.68	51.55	51.75	128.48	100.42
Fertilizers & Nutrients	61.00	84.66	88.48	68.35	93.44	51.75	120.74	86.00
Chemicals	90.09	43.98	107.16	50.49	106.79	60.07	37.05	72.09
Custom Applications	40.25	24.50	56.00	44.80	44.60	19.25	57.80	44.92
Diesel Fuel	7.85	8.84	6.98	7.34	8.74	9.45	7.98	8.19
Repairs & Maintenance	21.24	24.37	21.60	20.29	19.12	22.35	20.06	20.65
Irrigation Energy Costs	23.50	79.93	69.13	30.49	28.80	43.20	3.54	37.29
Labor, Field Activities	9.84	12.54	7.60	9.30	10.40	11.04	9.42	9.41
Other Inputs & Fees, Pre-harvest	19.54	19.47	17.79	25.71	20.05	17.80	26.19	24.70
Post-harvest Expenses	116.78	92.89	114.79	124.07	94.22	98.20	103.51	110.10
Total Operating Expenses	**478.59**	**451.55**	**623.20**	**514.51**	**477.70**	**384.87**	**514.77**	**513.75**
Returns to Operating Expenses	**311.25**	**186.92**	**156.51**	**365.05**	**143.91**	**240.93**	**232.94**	**237.02**
Capital Recovery & Fixed Costs	90.31	110.97	92.11	88.68	85.73	102.79	84.19	90.42
Total Specified Expenses [z]	**568.90**	**562.52**	**715.30**	**603.18**	**563.43**	**487.65**	**598.96**	**604.17**
Returns to Specified Expenses	**220.94**	**75.95**	**64.41**	**276.37**	**58.17**	**138.15**	**148.75**	**146.61**
Operating Expenses/Yield Unit	2.72	3.23	3.60	2.75	3.36	2.60	3.30	3.11
Total Expenses/Yield Unit	3.23	4.02	4.13	3.23	3.97	3.29	3.84	3.67

Table 8. Selected Variable Input Costs per Acre for fields enrolled in the 2016 Rice Research Verification Program.

County	Rice Type	Seed	Fertilizers & Nutrients	Herbicides	Insecticides	Fungicides and Other Inputs	Diesel Fuel	Irrigation Energy Costs
Arkansas	Diamond	60.56	94.11	43.93	5.22	---	8.39	--- [a]
Ashley	CLXL729	154.97	63.92	79.30	2.83	---	7.13	44.29
Chicot	CLXL745	149.52	77.79	107.11	---	---	5.56	44.29
Clay	XL753	133.68	106.58	47.36	---	---	7.75	57.12
Conway	XL753	128.11	49.48	64.90	7.68	---	10.75	17.28
Cross	Roy J	42.30	116.85	61.35	---	---	11.59	30.27
Desha	Roy J	49.00	94.45	35.84	4.75	30.38	9.40	43.20
Jefferson	XL753	140.16	118.35	93.35	---	1.75	5.12	44.29
Lawrence	CL151	88.50	61.00	86.59	---	3.50	7.85	23.50
Lee	Roy J	60.38	84.66	43.98	---	---	8.84	79.93
Lincoln	XL753	133.68	88.48	101.36	5.80	---	6.98	69.13
Mississippi	XL753	133.68	68.35	46.99	---	3.50	7.34	30.49
Monroe	Jupiter	51.55	93.44	102.41	---	4.38	8.74	28.80
Phillips	Roy J	51.75	51.75	69.93	3.62	---	9.45	43.20
White	XL753	128.48	120.74	33.44	3.62	---	7.98	3.54
Average	**---**	**100.42**	**86.00**	**67.86**	**4.79**	**8.70**	**8.19**	**39.95**

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