



2003
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Rice Research Verification Program

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And County Governments Cooperating



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Introduction

In 1983, the Cooperative Extension Service established an interdisciplinary rice educational program that stresses management intensity and integrated pest management to maximize returns. The purpose of the Rice Research Verification Program (RRVP) was to verify the profitability of University of Arkansas recommendations in fields with less than optimum yields or returns.

The goals of the RRVP are: (1) To educate producers on the benefits of utilizing University of Arkansas recommendations to improve yields and/or net returns, (2) To conduct on-farm field trials to verify research based recommendations, (3) To aid researchers in identifying areas of production that require further study, (4) To improve or refine existing recommendations which contribute to more profitable production, (5) Incorporate data from RRVP into Extension educational programs at the county and state level. Since 1983, the RRVP has been conducted on 210 commercial rice fields in 33 rice-producing counties in Arkansas. The Arkansas average rice yield over the last 20 years was 123 bushels/acre while the RRVP average was 142 bushels/acre. The program has typically averaged about 20 bushels/acre better than the state average. In 2003 the RRVP recorded the highest yields in the history of the program with an average of 172 bu/acre (Table 1). This increase in yields can mainly be attributed to higher yielding varieties, intensive management, and favorable environmental conditions.

Procedures

The RRVP fields and cooperators are selected prior to the beginning of the growing season. Cooperators agree to pay production expenses, provide expense data, and implement university recommendations in a timely manner from planting to harvest. A designated county agent from each county assists the RRVP coordinator in collecting data, scouting the field, and maintaining regular contact with the producer. Management decisions are based utilizing integrated pest management philosophy based on current University of Arkansas recommendations. An advisory committee consisting of Extension specialists and university researchers with rice responsibility assists in decision-making, development of recommendations, and program direction.

Counties participating in the program during 2003 included Arkansas, Ashley, Chicot, Clay, Craighead, Crittenden, Cross, Jackson, Poinsett, Woodruff and St. Francis for a total of 600 acres. Five varieties were seeded (Bengal, Cocodrie, Cypress, Francis, and Wells) and one hybrid (RiceTec XL8) in the eleven fields. University of Arkansas recommendations were used to manage the RRVP fields. Management decisions were based on field history, soil test results, variety, and data collected from individual fields during the growing season. Data collected included components such as stand density, weed populations, disease infestation levels, insect populations, plant dry matter accumulation, temperature, rainfall, irrigation amounts, dates for specific growth stages, grain yield, milling yield, and grain quality.

Results and Discussion

Yield

The average RRVP yield was 172 bu/A with a range of 143 to 206 bu/A (Table 1). The RRVP average yield was 27 bushels higher than the estimated state yield of 147 bu/A, which breaks the previous RRVP record of 168 bu/A, set in 2002 (Table 1). The highest yielding field was seeded with Bengal in Arkansas County and yielded 206 bu/A. Two fields, Arkansas and Clay counties, exceeded 200 bu/A, representing the first time fields enrolled in the RRVP has exceeded 200 bu/A. The lowest yielding field was seeded with Cocodrie in Jackson County. The pre-flood nitrogen in Jackson County was severely streaked across the field, which partially explains the low yield. Research has shown that as much as 40 bu/A can be lost from poor nitrogen distribution.

Milling data was also recorded on all of the RRVP fields. The average milling yield for the 11 fields was 57/70 with the highest milling yield of 67/73 in Clay County. Four fields milled below 55/70, which is considered the standard used by the rice milling industry. Arkansas, Craighead, and St. Francis Counties were harvested after the grain moisture fell below 15%, which may explain the low milling yields. Woodruff County was harvested at 18% but may reflect the expected milling yields of XL8 (Table 1).

Table 1. Variety, soil series, previous crop, acreage, yield, and milling for 2003 RRVP

County	Variety	Soil Series	Previous Crop	Acres	Yield Bu/A	Milling Yield
Arkansas	Bengal	Dewitt silt loam	Soybean	75	206	52/69
Ashley	Cocodrie	Portland silty clay	Soybean	60	174	61/70
Chicot	Cypress	Sharkey clay	Soybean	45	155	66/71
Clay	Wells	Foley silt loam	Soybean	93	201	67/73
Craighead	Francis	Fountain silt loam	Soybean	18	180	48/68
Crittenden	Wells	Alligator clay	Rice	80	150	56/71
Cross	Francis	Earle silty clay loam	Rice	30	164	57/68
Jackson	Cocodrie	Dundee silt loam	Soybean	49	142	62/68
Poinsett	Wells	Alligator clay	Soybean	38	150	61/72
St. Francis	Wells	Alligator clay	Soybean	83	165	50/69
Woodruff	RiceTecXL8	Calloway silt loam	Soybean	30	173	52/68
Average				55	172	57/70

Planting and Emergence

Dry weather in March and April allowed all RRVP fields to be planted in the optimum time frame. All of the fields were planted from April 1st through April 24th (Table 2). An average of 100.2 lbs./A was seeded in the RRVP fields excluding Woodruff County (Table 2). Seeding rates were determined with the Cooperative Extension Service RICESEED program for all fields except Woodruff County. Seeding rates for XL8 were determined by company recommendations. Rainfall in late April and early May allowed all of the fields to emerge without flushing for germination or herbicide activation. An average of 16 days was required for emergence. Stand density ranged from 17 to 30 plants/ft², with an average of 21 plants/ft². This average excludes Woodruff County, which had an average of 9 plants/ft². The low seeding rate of XL8 explains the low stand density in Woodruff County.

Irrigation

Well water was used to irrigate all of the fields in the RRVP. Six of the eleven fields used multiple inlet (MI) irrigation. Flow meters were used in all of the fields (except Jackson County) to record water usage throughout the growing season, and compare MI to conventional flooding. An average of 30.4 acre-inches of water was used across both irrigation methods (Table 2). The fields with MI irrigation averaged 27.6 acre-inches of water compared to 29.8 acre-inches for fields using conventional flooding. Research suggests MI reduces water usage by approximately 25 %; however, in 2003 only a 9 % reduction was observed. Arkansas, Cross, and St. Francis Counties had higher than average water usage for MI fields, which partially explains the high MI average. The well output of 1000 gal/min in the Arkansas County field was not enough water to flood the 75 acre field in a timely manner. An extremely deep flood was held on the Cross county field to suppress leaf blast observed in the field. The Sharky Clay soil in St Francis County prevented optimum levee sealing which resulted in water loss by seepage.

Table 2. Stand density, irrigation, seeding rate, and important dates during the 2003 season.

County	Stand Density Plants/ft ²	Rainfall Inches	Irrigation Acre inches	Total Acre-in Rainfall + Irrigation	Seeding Rate Lbs/A	Planting Date	Emergence Date	Harvest Date
Arkansas	18	11.6	38.3	49.9	99	4-1	4-19	9-19
Ashley	17	12.05	23.5	35.55	100	4-3	4-26	8-20
Chicot	16	6.8	33.4	40.2	100	4-20	5-2	9-12
Clay	29	13.5	22.5	36	90	4-24	5-3	9-17
Craighead	19	12.7	27.9	40.6	78	4-14	5-3	9-26
Crittenden	30	14.45	18.75	33.2	90	4-19	5-3	9-25
Cross	26	12.25	32.4	44.65	112	4-15	5-1	9-28
Jackson	24	20.45	-----	-----	103	4-17	5-4	9-8
Poinsett	16	22.45	22.6	45.05	118	4-15	5-2	9-11
St. Francis	19	13.8	30.4	44.2	112	4-17	5-1	9-19
Woodruff	9	11.55	35.4	46.95	29	4-16	5-2	8-29
Average	21	13.8	30.4	41.6	100.2	-----	-----	-----

Fertilization

Nitrogen recommendations were based on a combination of factors including soil texture and variety requirements. Mid season nitrogen was applied at 100 lbs of urea/A across all varieties except XL8, which received 66 lbs/A (Table 3). Arkansas County received an additional 80 lbs/A due to streaking of the pre-flood nitrogen.

Nitrogen was the only fertilizer applied in 6 of the 11 fields. Heavy rain in May injured rice in Cross County. The bottom of the field was totally submerged for 14 days resulting in elongation of rice. When the water drained off the field the rice fell over and stuck to the ground. Urea was applied at a rate of 100 lbs/A and flushed in to try and stimulate growth. The Cross County field yielded 164 bu/A; however, infrared photographs indicate there may have been some significant injury where the water stood the longest (Table 3) (Figure 3).

Phosphorus (P) was applied in Arkansas, Clay, Poinsett, St Francis, and Woodruff counties based on soil test results (Table 3). DAP (18-46-0) was blended with pre-flood nitrogen in Arkansas, Poinsett, and St. Francis counties. DAP was blended with pre-flood nitrogen to allow for as much P uptake as possible. Potassium and P were blended and applied in Clay and Woodruff counties as a pre-plant application.

Zinc (Zn) was applied in Arkansas and Woodruff Counties. The soil test in Arkansas County did not call for a Zn treatment; however, the field did have a history of Zn problems. A seed treatment was applied and no Zn deficiency was observed during the growing season. Woodruff County had a high pH and low zinc. A granular Zn was applied at 10 lbs/A and no Zn deficiency was observed (Table 3).

Table 3. Soil test results from RRVP fields and fertility recommendations

County	Soil pH	P LB/A	K LB/A	Zn LB/A	Nitrogen Rate Urea (45%) ¹	Total N Rate/A	Fertility P-K- Zn ²
Arkansas	5.9	30	225	7.3	27-230-100-80	197	69-0-0.5
Ashley	6.9	90	448	5.6	23-250-100	168	0-0-0
Chicot	6.3	80	522	6.9	0-266-100	165	0-0-0
Clay	6.5	28	141	8.8	0-250-100	158	40-60-0
Craighead	7.0	41	270	6.1	0-230-100	149	0-0-0
Crittenden	5.3	51	489	10.3	0-300-100	180	0-0-0
Cross	5.5	42	390	4.4	100-240-100	198	0-0-0
Jackson	8.0	52	339	8.9	0-230-100	149	0-0-0
Poinsett	7.4	44	525	8.3	0-300-100	180	40-0-0
St. Francis	7.3	31	712	10.2	0-300-100	180	46-0-0
Woodruff	8.1	36	148	4.8	0-200-66	120	40-105-10

¹ Flushed in 2 leaf-pre-flood-midseason

² P₂O₅-K₂O-Zn includes seed treatments

Weed Control

In 2003, the average herbicide cost was \$39.47 (Table 6). All fields utilized Command for early season grass control (Table 4). Only one field (Crittenden County) did not require a postemergence herbicide application for grass or broadleaf weed control. Command plus Facet was applied and frequent rain in May resulted in excellent residual control from Facet.

Clay County had the most inexpensive weed control program at \$17.45 an acre (Table 6). Command was applied preemergence and provided excellent control of grass species. The main broadleaf weeds were cocklebur and morningglory. Aim was applied at 1.6 oz/A and provided excellent control of both species.

Arkansas and St. Francis Counties had the most expensive weed control programs at \$64.99 and \$62.16, respectively. Command plus Facet was applied in Arkansas County, but failed to provide season long control of grass. Duet, Permit, and Aim were applied for control of the weed spectrum pre-flood. In most cases, the Duet plus Permit tank mix would provide sufficient broadleaf weed control; however, pigweed pressure was high, so Aim was applied due to the low herbicide activity of Duet and Permit on pigweed. In St. Francis County, frequent rain delayed the pre-flood nitrogen application due to wet soil. This delay gave grass species a chance to break through the preemergence herbicide. The decision was made to control the grass post-flood based on survival after flooding, subsequently, Facet was applied at 0.5 lbs/A to 20 acres of the field.

Clincher was applied in one (Ashley County) RRVP field. In this field, Command and Facet were applied preemergence with the hope that no additional herbicide applications would be needed because cotton fields would be emerged across the road by the time a second herbicide application would be required. Since the field had been precision-leveled 2 years prior to the 2003 growing season, a reduced rate of Command and Facet was used to limit the potential for rice injury. Broadleaf weeds were controlled by Facet, but the reduced rate did not provide season long grass control. Clincher applied 1 week post-flood at 15 oz/A provided excellent control of the grass species remaining.

Table 4. Herbicide rate and timings for 2003 RRVP fields.

Arkansas	PRE: Command (1 pt) Facet (.38 LB) POST: Aim (1.6 oz) Duet (3 qts) Permit .25 oz
Ashley	PRE: Command (1 pt) Facet (0.38 LB) LP: Clincher (15 oz)
Chicot	PRE: Roundup Ultra 1(1 qt)Command (1 pt) POST: Facet (0.5 LB) Stam (4 qts)
Clay	PRE: Command (0.8 pt) POST: Aim (1.6 oz)
Craighead	PRE: Command (0.8 pt) POST: Aim (1.6 oz) Permit (0.75 oz)
Crittenden	PRE: Command (1 pt) Facet (0.38 LB)
Cross	PRE: Command (1 pt) POST: Facet (0.5 LB) Duet (3 qts) Permit (0.25 oz)
Jackson	PRE: Command (1 pt) POST: Aim (1.6 oz) Blazer (0.5 pts)
Poinsett	PRE: Command (1.5 pt) POST: Stam (3 qts) Facet (0.25 LB)
St. Francis	PRE: Command (1.5 pt) POST: Stam (3 qts) Aim (1.6 oz) LP: Facet (0.5 LB)
Woodruff	PRE: Command (0.8 pt) POST: Aim (1.6 oz) Stam (3 qts)

Disease Control

Summers in Arkansas can usually be defined by hot and dry weather. This was not the case in many of the RRVP fields in 2003. A prolonged wet and cool June in many areas resulted in 9 of the 11 fields being treated for sheath blight and increased fungicide cost. In many cases sheath blight was a problem late when the rice was starting to head. Quadris was used in most of the fields and due to the problem occurring so late in the season a reduced rate of 6.4 oz/A was used and provided excellent control of the disease. Stratego was used in one field (Ashley County) due to sheath blight and a field history of kernel smut. The field was seeded in Cocodrie, which is susceptible to kernel smut. Stratego at 1 pt/A was applied and provided excellent control of both diseases. Disease monitoring studies were established in 7 of the RRVP fields to evaluate various varieties across the state (Table 7).

Insect control

Two of the RRVP fields were treated for rice water weevil in 2003 (Woodruff and St. Francis Counties). Weevil traps were placed in the RRVP in cooperation with Dr. John Bernhardt and Tony Richards. The traps and thresholds are being developed as a more accurate way of scouting for weevils as compared to the leaf scaring method. Most of the varieties being grown in Arkansas today would require an average of 40 weevils a trap to require treatment. Woodruff County was seeded in XL8 and due to the low seeding rate and plant population a threshold of 10 or more weevils require treatment. Both fields were treated with Karate at 1.8 oz/A. Rice stinkbugs were a problem in a few parts of the state in 2003. Ashley, Chicot, Crittenden, Cross, Poinsett, and St Francis Counties were treated with 1.8 oz/A of Karate. The treatment worked well and none of the fields reached threshold levels after treatment.

Table 5. Fungicide and insecticides applications in 2003 RRVP fields.

<u>County</u>	<u>Fungicide</u>	<u>Rice Water Weevil</u>	<u>Rice Stink Bug</u>
Arkansas	-----	-----	-----
Ashley	1 pt/A Stratego	Icon seed Treatment	1.85 oz/A Karate
Chicot	12.8 oz/A Quadris	-----	1.85 oz/A Karate
Clay	6.4 oz/A Quadris	-----	-----
Craighead	6.4 oz/A Quadris	-----	-----
Crittenden	6.4 oz/A Quadris	-----	1.85 oz/A Karate
Cross	-----	-----	1.85 oz/A Karate
Jackson	12.8 oz/A Quadris	-----	-----
Poinsett	6.4 oz/A Quadris	-----	1.85 oz/A Karate
St. Francis	6.4 oz/A Quadris	1.85 oz/A Karate	1.85 oz/A Karate
Woodruff	6.4 oz/A Quadris	1.85 oz/A Karate	-----

Economic Analysis

This section provides information on the development of estimated production costs for the 2003 RRVP. Records of operations on each field provided the basis for estimating these costs. The field records were compiled by participating county Extension faculty, the coordinator of the RRVP, and the producers for each field.

Presented in this analysis are specified operating costs, specified ownership costs and total specified costs for each field. Break-even prices for the various cost components and returns above specified expenses at the average 2003 price are also presented.

Table 6. Selected variable input expense from 2003 RRVP fields¹

County	Variety/Hybrid	Fertilizer ²	Herbicides	Fungicides	Insecticides	Irrigation
-----Input cost \$/acre-----						
Arkansas	Bengal	49.10	64.99	2.86	0.00	59.23
Ashley	Cocodrie	37.95	50.75	17.43	4.86	42.86
Chicot	Cypress	31.11	45.27	24.57	4.86	54.03
Clay	Wells	37.75	17.45	12.28	0.00	41.73
Craighead	Francis	38.94	25.82	12.28	0.00	47.82
Crittenden	Wells	34.00	26.15	12.28	4.86	37.49
Cross	Francis	37.40	40.94	0.00	4.86	52.90
Jackson	Cocodrie	23.80	28.02	24.57	0.00	-----
Poinsett	Wells	31.60	46.94	12.28	4.86	43.42
St. Francis	Wells	40.10	62.16	12.28	9.72	50.65
Woodruff	XL8	41.16	25.82	12.28	4.86	56.29
Average		36.63	39.47	13.01	3.53	48.6

¹Does not include all variable costs, such as drying, hauling equipment repair, ect.

²Includes cost for material and application costs for each variable.

Specified Operating Costs

Specified operating costs are those expenditures that would generally require annual cash outlays and would be included on an annual operating loan application (Table 6). Actual quantities of all operating inputs were used in this analysis. The average of the actual prices paid by cooperating producers was used to calculate costs.

Fuel and repair costs for both machinery and irrigation equipment were calculated by Extension models based on averages. Therefore, the producers' actual machinery costs may vary from the machinery cost estimates that are presented in this report (Table 6). However, the producers' actual field operations were used as a basis for calculations and his equipment size and type were matched as closely as possible. Specified operating costs for the 11 RRVP fields ranged from \$301.60/A for Craighead County to \$418.59/A for Woodruff County with an overall average of \$354.86/A (Table 6).

Land Costs

Land costs incurred by producers participating in the RRVP would likely vary from land ownership, cash rent, or some form of crop share arrangement. Therefore, a comparison of these divergent cost structures would contribute little to this analysis. For this reason, a 25% crop share rent was assumed to provide a consistent standard for comparison. This is not meant to imply that this arrangement is normal or that it should be used in place of existing arrangements. It is simply a consistent measure to be used across all RRVP fields. The average break-even price needed to cover total specified costs including an assumed 25% crop share was \$2.08/bu (Table 7).

Returns

Table 6 includes estimated returns per acre above Total Specified Operating Costs and Total Specified Costs. Costs for risk, overhead and management are not included. Since land agreements are so variable, it is difficult to figure land costs. However, a break-even price which takes land in consideration is included and ranged from \$210.77/A in St. Francis County to \$388.05/A in Clay County with an average of \$271.06/A.

Table 7. Selected economic information from 2002 RRVP.

County	Specified Operating Costs ¹	Specified Ownership Costs	Land Costs ³	Total specified Costs	Return Above Specified Operating Cost ²	Returns Above Total Specified Cost	Break-even price w/land ⁴
-----\$/Acre-----							-\$/Bu--
Arkansas	353.65	59.50	216.30	413.55	451.65	338.59	2.00
Ashley	309.04	54.20	182.70	345.16	358.64	289.23	1.98
Chicot	306.16	54.10	162.75	360.27	290.73	218.05	2.32
Clay	269.09	57.70	211.05	326.80	517.40	388.05	1.62
Craighead	272.88	57.67	189.00	301.60	454.40	340.80	1.67
Crittenden	267.35	62.05	157.50	329.40	363.60	272.70	1.99
Cross	301.48	68.70	172.20	370.18	318.62	238.97	2.25
Jackson	252.06	59.37	149.10	311.44	289.16	216.87	2.17
Poinsett	268.45	51.03	157.50	319.49	310.51	232.89	2.12
St. Francis	350.31	61.67	173.25	411.98	281.02	210.77	2.49
Woodruff	358.08	60.07	181.65	418.59	317.21	234.76	2.37
Average	300.78	58.77	177.54	354.86	359.35	271.06	2.08

¹ Specified variable costs of production

² \$4.20/bu settlement price for rough rice

³ 25% crop share rent was assumed

⁴ Price/bu required by producer to equal total costs

On Farm Research

Research was conducted in many of the verification fields in 2003. Disease monitoring tests were planted in seven fields across the state (Table 8). This provides researchers with information on how varieties perform under various environmental conditions and different soil types. Hybrid yields ranged from 199 to 266 bushels/acre. Wells and Francis also performed well with yields ranging from 189 to 199 bushels/acre. Icon seed treatments were also evaluated in seven verification fields (Table 9). No differences in yield were observed across rates of Icon in these studies. Seeding rate studies were also planted in two of the verification fields (Table 10). These studies are established to determine the optimum seeding rate for various varieties.

Summary

The 2003 Rice Research Verification Program was conducted on 11 commercial rice fields across the state. Counties participating in the program during 2003 included Arkansas, Ashley, Chicot, Clay, Craighead, Crittenden, Cross, Jackson, Poinsett, Woodruff and St. Francis for a total of 600 acres. Grain yield in the 2003 RRVP averaged 172 bu/acre with a range of 143 to 206 bu/acre. All fields were planted in April and emerged without flushing. The 2003 RRVP average yield was 25 bushels/acre greater than the estimated Arkansas state average of 147 bu/acre. The highest yielding field was in Arkansas County with a grain yield of 206 bu/acre. The lowest yielding field was in Jackson County and produced 143 bu/acre. Milling quality in the RRVP was comparable with milling from the Arkansas Rice Performance Trials and averaged 57/70.

Table 8. Rice Disease Monitoring Program 2003
R.L. Cartwright, C.E. Wilson, Jr., and J. Gibbons

Entry	Variety	Ashley	Chic ot	Crittenden	Cross	Poinsett	St. Francis	Woodruff	Mean
24	XP710	231	248	218	243	224	193	224	226
25	XP712	237	209	209	224	194	189	210	210
23	XL8	204	221	172	225	198	176	194	199
13	PIROGUE	205	209	210	228	200	200	201	208
12	FRANCIS	177	211	195	218	204	201	186	199
10	CLXL8	216	219	168	215	196	189	190	199
15	RU0001151	152	215	181	217	206	212	180	195
21	WELLS	182	196	185	207	201	189	166	189
16	RU0001188	136	220	179	205	209	177	174	186
4	AHRENT	184	192	190	217	188	179	167	188
3	AB8684	153	187	172	221	199	187	169	184
5	BENGAL	161	201	171	220	187	185	187	187
2	AB8649	157	203	182	202	196	169	173	183
7	CHENIERE	148	205	164	208	192	182	161	180
18	RU0204114	136	182	167	208	189	171	147	172
22	XL7	192	145	119	204	202	170	184	174
11	COCODRIE	139	181	177	195	173	174	158	171
8	CL121	138	172	153	183	169	175	159	164
20	TX9092	155	173	163	199	192	161	149	170
17	RU0101093	167	131	107	187	185	154	155	155
9	CL161	159	182	149	172	119	163	154	157
1	AB8198	130	188	90	193	164	152	173	156
19	TX8181	97	157	158	189	182	172	143	157
14	RU0001124	127	169	157	181	172	158	156	160
6	BOLIVAR	131	111	147	162	164	140	147	143
LSD		53.1	30.9	36.3	17.8	25.4	35.8	23.5	

Table 9. 2003 Rice Icon Study
R.L. Cartwright, C.E. Wilson, Jr., and J. Gibbons

Treatment	Ashley	Chicot	Crittenden	Cross	Poinsett	St. Francis	Woodruff	Mean
Untreated	181.1	170.8	168.7	183.0	166.9	173.2	165.5	172.8
ICON 0.0125	149.3	194.7	174.0	183.3	173.6	175.8	155.9	172.4
ICON 0.01875	141.7	202.4	173.3	180.2	177.1	175.2	154.1	172.0
ICON 0.025	138.6	181.5	174.2	183.5	176.9	175.4	168.0	171.1
LSD	32.4	ns	ns	ns	ns	ns	ns	
C.V.%	10.6	8.8	5.2	6.3	4.0	6.1	11.6	

Table 10. 2003 Rice Seeding Rate Study
R.L. Cartwright, C.E. Wilson, Jr., and J. Gibbons

Variety Seeding Rate	Cross	Woodruff	Mean
CL161 22.5	162.0	154.6	158.3
CL161 45	166.0	165.8	165.9
CL161 67.5	155.6	157.2	156.4
CL161 90	168.0	148.7	158.4
CL161 112.5	161.1	164.0	162.5
CL161 135	145.0	145.8	145.4
Francis 22.5	194.4	160.9	177.7
Francis 45	200.6	195.6	198.1
Francis 67.5	192.3	197.5	194.9
Francis 90	186.3	185.5	185.9
Francis 112.5	194.8	197.1	195.9
Francis 135	181.3	188.0	184.6
LSD	9.2	14.6	
C.V.%	7.4	7.1	

Figure 1. Counties that have been enrolled in the program and the number of years they participated.

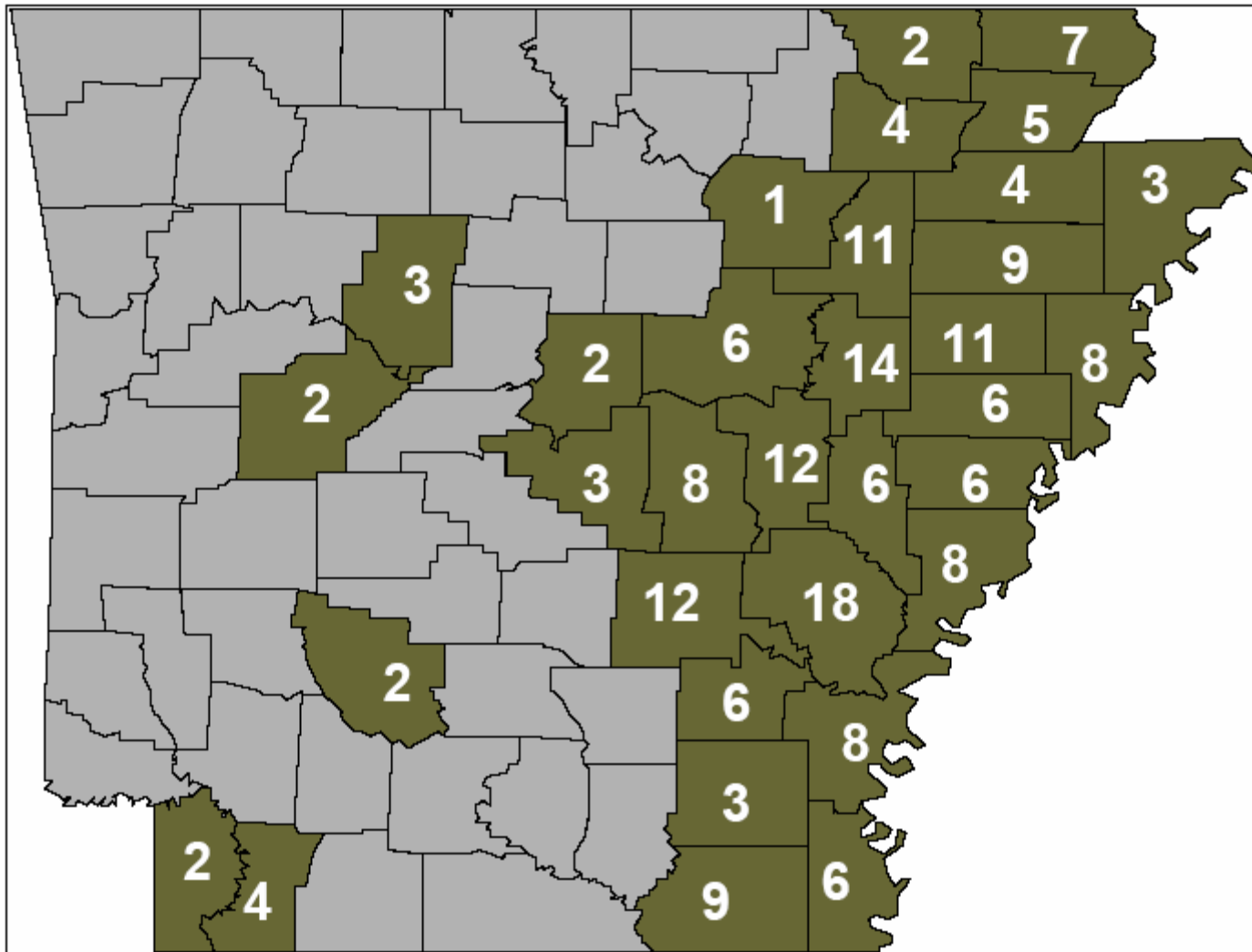


Figure 2. Infrared picture of Cross County field.

