Chapter 17

Rice Research Verification Program

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

Since 1983, the RRVP has been conducted on 462 commercial rice fields totaling 26,827 acres. The RRVP is funded by rice grower check-off contributions administered by the Arkansas Rice Research and Promotion Board. The Arkansas RRVP represents a public exhibition of the implementation of research-based Extension recommendations in an actual field-scale farming environment. Through this program, farmers have increased yields, reduced input costs and increased net returns. The yield of fields enrolled in the RRVP has averaged 18 bushels per acre greater than the state average.

Program Goals

1. To demonstrate to producers that University of Arkansas rice management recommendations developed from small-plot research are applicable to large-scale field applications and provide optimum yields and economic returns.
2. To evaluate the current University of Arkansas rice management recommendations for completeness and determine where weaknesses in knowledge or information exist and further research is warranted.
3. To train new county extension agents in rice production and provide experiences that will benefit the agent in his overall county programming with respect to rice production.

Program Objectives

- To conduct on-farm field trials to verify the utility of research-based recommendations with the intent of optimizing the potential for profits.
- To develop an on-farm database for use in economic analyses and computer-assisted management programs.
- To aid researchers in identifying areas of production that require further study.
- To improve or refine existing recommendations which contribute to profitable production utilizing all production systems applicable to the commodity.
- To increase county extension agents' expertise in the specified commodity.
- To utilize and incorporate data and findings from the Research Verification Program into extension educational programs at the county and state level.
- To enhance the rice production skills and knowledge of program cooperators.

Program Summary

Each year, University of Arkansas rice production recommendations are evaluated on RRVP fields seeded in different cultivars, cultural practices and environmental conditions. Information is gathered through data collected from each field as a whole

as well as small replicated plots within the fields. This agronomic information is used to improve and refine recommendations to meet the needs of Arkansas rice farmers and identify areas which need additional research.

Farm cooperators agree to pay production expenses, provide crop expense data for economic analysis, scout the field with the coordinator and county agent on a weekly basis and implement recommended production practices in a timely manner from seedbed preparation to harvest. A designated county extension agent from each participating county assists the RRVP coordinator in obtaining field background information, keeping records on the field and maintaining regular contact with the grower. The agent is also responsible for scouting the field twice each week to evaluate field conditions and pest thresholds. Management decisions are made by the RRVP coordinator based on the current University of Arkansas recommendations during weekly field inspections. Technical assistance is provided by the appropriate extension specialist or researcher as needed.

Economic information is collected on the RRVP fields to estimate crop expenditures and returns. Selected yield and economic information is presented for the period 2006 through 2017 in Tables 17-1, 17-2 and 17-3. Good yields in the RRVP have enabled participants to achieve acceptable returns (Table 17-1). Average RRVP yields for the 2006-2017 period were 178 bushels per acre (Table 17-1), compared with state average yields of 158 bushels per acre for the same period (Table 17-2). In 2007 and 2013, the program achieved its highest yield since the establishment of the program at 191 bushels per acre, which was 30 bushels per acre over the reported state average.

Despite high production expenses, participants tend to receive high returns. The average return above total expenses for the RRVP was $353.42 per acre, while total expenses (operating plus ownership) averaged $635.39 per acre during 2006-2017 (Table 17-1). This compares with a state average return above total expenses of $160.01 per acre and state average total expenses of $712.15 per acre for the same period (Table 17-2). The average break-even price (total expenses divided by average grain yield) for the RRVP program during 2006-2017 was $3.57 per bushel (Table 17-1), compared with a state average break-even price of $4.53 per bushel over the same period (Table 17-2). These numbers indicate that average returns to the RRVP program were above state average returns during most years, and these higher returns were due in large part to higher yields and lower total expenses on average. Additional information on

Table 17-1. Economic information of RRVP fields, 2006-2017.

Year	Average Arkansas Rice Price†	RRVP Average Grain Yield‡	Total Operating Expenses††	Ownership Expenses††	Total Expenses	Returns Above Total Expenses	Breakeven Price
	$/bu	Bu/A	$/A	$/A	$/A	$/A	$/bu
2006	4.11	164	396.40	44.45	440.85	233.19	2.69
2007	4.65	191	438.92	51.25	490.17	397.14	2.57
2008	7.43	174	668.00	45.82	713.82	579.00	4.10
2009	6.09	182	580.82	54.36	635.18	469.49	3.50
2010	4.55	164	588.18	74.40	662.59	83.39	4.04
2011	6.50	168	616.56	69.76	686.31	404.15	4.09
2012	6.32	188	637.61	92.35	729.96	456.60	3.89
2013	6.51	191	627.65	86.25	713.90	526.30	3.75
2014	5.53	189	554.11	98.37	652.48	390.85	3.46
2015	5.25	176	571.43	100.98	672.41	248.53	3.83
2016	4.52	166	513.75	90.42	604.17	145.14	3.64
2017	4.95	188	521.88	100.98	622.85	307.26	3.31
Average	**5.53**	**178**	**559.61**	**75.78**	**635.39**	**353.42**	**3.57**

† Average rice harvest price obtained from RRVP economic analysis, 2006-2017.
‡ Average annual yield for fields enrolled in the RRVP, 2006-2017.
†† Annual average total operating and ownership expenses from fields enrolled in the RRVP, 2006-2017.

Table 17-2. State average economic information, 2006-2017.

Year	Average Ark. Rice Price†	State Average Grain Yield‡	Total Operating Expenses††	Ownership Expenses††	Total Expenses	Returns Above Total Expenses	Breakeven Price
	$/bu	Bu/A	$/A	$/A	$/A	$/A	$/bu
2006	4.11	153	461.29	80.23	541.52	88.68	3.53
2007	4.65	161	465.63	87.21	552.84	194.53	3.44
2008	7.43	148	637.73	87.03	724.76	374.88	4.90
2009	6.09	151	713.51	89.83	803.34	116.37	5.32
2010	4.55	144	635.90	79.44	715.34	-60.34	4.97
2011	6.50	150	615.54	104.03	719.57	257.96	4.78
2012	6.32	166	706.41	102.16	808.57	240.47	4.87
2013	6.51	168	714.30	104.23	818.53	274.93	4.30
2014	5.53	168	644.86	110.15	755.01	174.56	4.49
2015	5.25	163	626.27	123.31	749.58	106.35	4.60
2016	4.52	154	579.19	114.46	693.65	0.77	4.51
2017	4.95	164	547.83	115.21	663.04	150.96	4.03
Average	**5.53**	**158**	**612.37**	**99.77**	**712.15**	**160.01**	**4.53**

† Average rice harvest price obtained from RRVP economic analysis, 2006-2017.
‡ USDA, National Agricultural Statistics Service, "Rice: Acreage, Yield, Production, Price and Value," http://www.nass.usda.gov/Statistics_by_State/Arkansas/Publications/Statistical_Bulletin/Historical_Data/histrice.pdf.
†† Annual average total operating and ownership expenses calculated from University of Arkansas System Division of Agriculture rice crop production budgets for farm planning, 2006-2017.

Table 17-3. Average cost of six crop input items† in the RRVP, 2006-2017.

Year	Seed	Herbicide	Fertilizer	Fungicide	Insecticide	Irrigation
	$/A					
2006	35.34	58.23	88.61	5.29	5.66	75.95
2007	55.46	57.80	82.55	5.47	0.83	65.99
2008	65.83	83.14	203.48	10.23	6.22	108.78
2009	100.58	80.51	164.89	7.00	2.19	58.67
2010	98.12	63.06	127.91	11.49	4.81	82.65
2011	87.29	70.60	144.63	6.33	5.34	75.74
2012	77.94	70.33	167.82	10.63	1.15	65.54
2013	78.00	84.65	149.28	8.39	4.38	60.85
2014	85.52	61.10	98.48	10.19	1.15	48.82
2015	85.92	69.91	120.46	14.20	4.56	45.48
2016	100.42	67.86	86.00	8.70	4.79	39.95
2017	94.30	74.54	87.38	24.37	7.47	47.25
Average	**62.12**	**62.51**	**105.91**	**11.02**	**3.60**	**61.30**

† Average annual input cost for fields enrolled in the RRVP, 2006-2017.

economic performance of RRVP fields can be obtained in the annual RRVP summary found in the B.R. Wells Rice Research Series published by the University of Arkansas Agricultural Experiment Station and online at http://arkansas-ag-news.uark.edu/research-series.aspx. Rice production budgets and the Rice Research Series publication are available at your local county Extension office or online at http://www.uaex.edu.

Figures 17-1 through 17-4 represent a graphical comparison of average data collected from fields enrolled in the program. Yields in the RRVP, as well as the state average, have significantly increased since the program started in 1983 (Figure 17-1). There are several reasons for this yield increase: higher yielding cultivars, nitrogen adjustments, new fungicides and management practices.

Although yields have increased in both the RRVP and the state average, the RRVP cost of production (total operating expenses) has typically been less than the state average (Figure 17-2; Tables 17-1 and 17-2). This is likely due to improvements in management efficiency on the RRVP fields resulting from applying inputs based on University of Arkansas recommendations.

The average herbicide cost of RRVP fields has been cyclical. Peaks in herbicide costs were observed in 1988 and 1995, but in recent years herbicide costs have remained elevated (Figure 17-3). The costs are typically less than the state average due to timely applications, flushing when necessary and spraying only when conditions dictate the need. Herbicides like Command and Facet require moisture for activation. During most years, adequate rainfall is received during planting season for seed germination and herbicide activation. However, in some years rainfall is not received and fields must be flushed to provide the moisture for germination and herbicide activation. Also, cool temperatures during the seedling stage can result in slower rice growth, delayed flooding and, subsequently, increased herbicide costs. Flushing does add cost, but if herbicides are not activated in a timely manner, they begin to degrade and lose activity. Flushing adds cost but is cheaper than another herbicide application later.

One trend that has been observed during the program is the reduction in the amount of pounds of active ingredients applied per acre in weed control. In the RRVP, total amount of active ingredients applied as herbicides

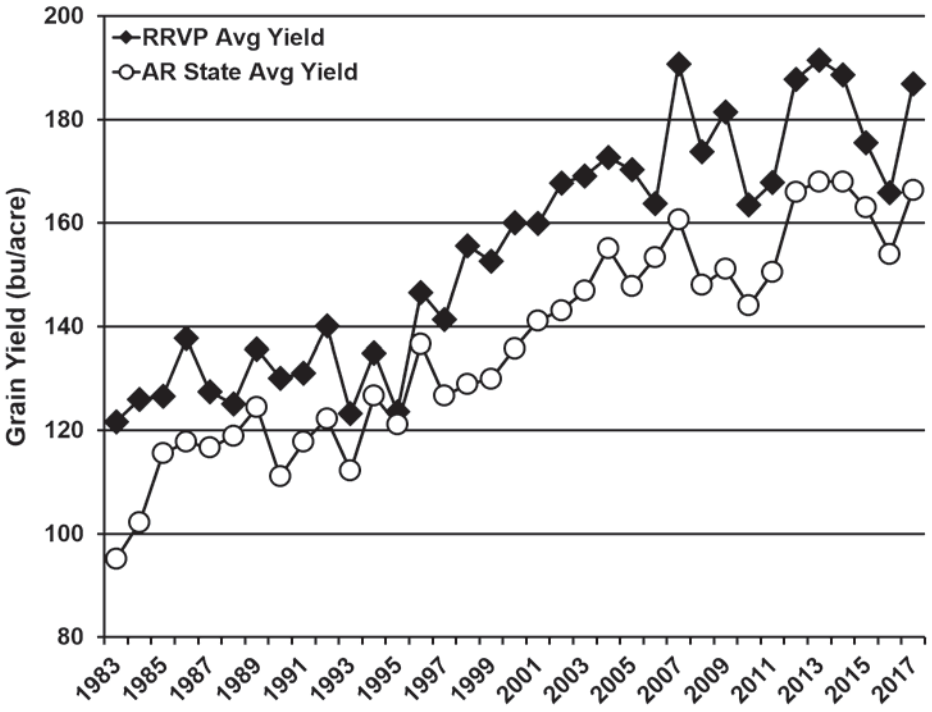

Figure 17-1. Annual average grain yields (bu/acre) for the RRVP and the Arkansas state average, 1983-2017.

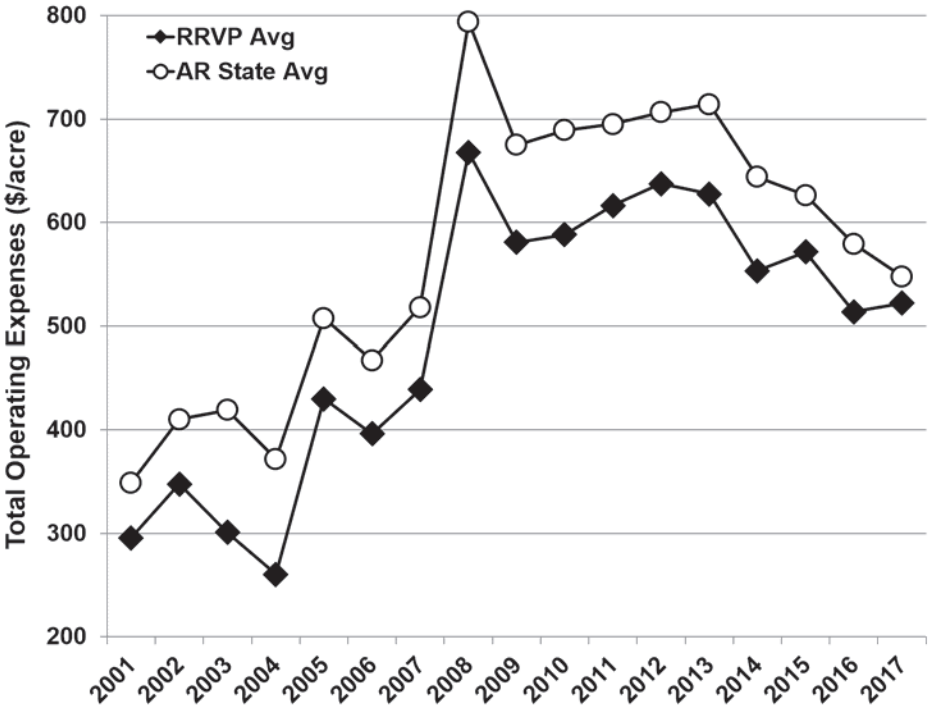

Figure 17-2. Average annual total operating expenses of rice production for RRVP and the state average, 2001-2017.

per field has reduced from more than 9 pounds ai/A to just over 3 pounds ai/A. This reduction is a result of new herbicide chemistry that has greater activity at significantly lower use rates. This is important because it relates to less environmental risk as fewer pesticides are available to be found in streams and lakes as the result of runoff from adjacent rice fields.

Fungicide applications are based on the level of diseases in each of the RRVP fields (Figure 17-3). Sheath blight is a disease that occurs every year. The climate in Arkansas is very conducive to the growth of the disease due to the hot and humid conditions. However, in the last several years new fungicides have provided an excellent tool for fighting this disease. There has been a significant increase in fungicide use in both the state and the RRVP.

Insecticide use in rice production often depends on the year (Figure 17-3). There are two major insects that have the potential to cause problems in a rice crop. They are the rice water weevil and the rice stink bug. Rice water weevils can be a significant pest in all seeding methods but are usually more of a problem in water-seeded rice. Treating for rice water weevils in water-seeded rice can be expensive and usually costs more than in drill-seeded rice. Rice stink bug numbers were high statewide in 2006, 2008, 2010 and 2011, and multiple insecticide applications were needed for adequate control.

Irrigation costs have varied greatly depending on the year (Figure 17-4). Changes in irriga-

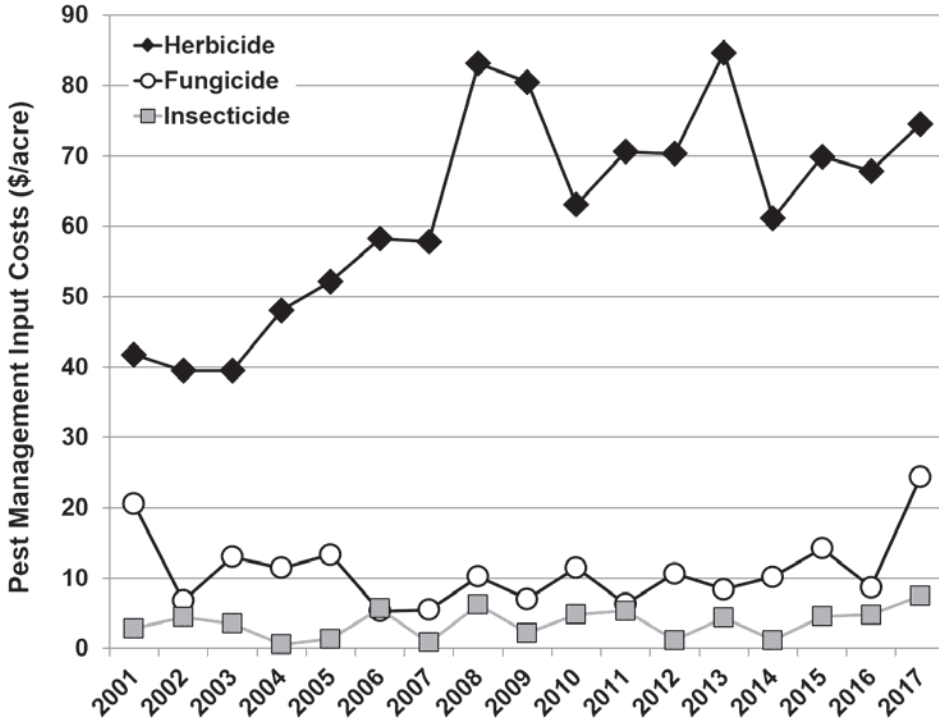

Figure 17-3. Average annual pest management costs in the RRVP, 2001-2017.

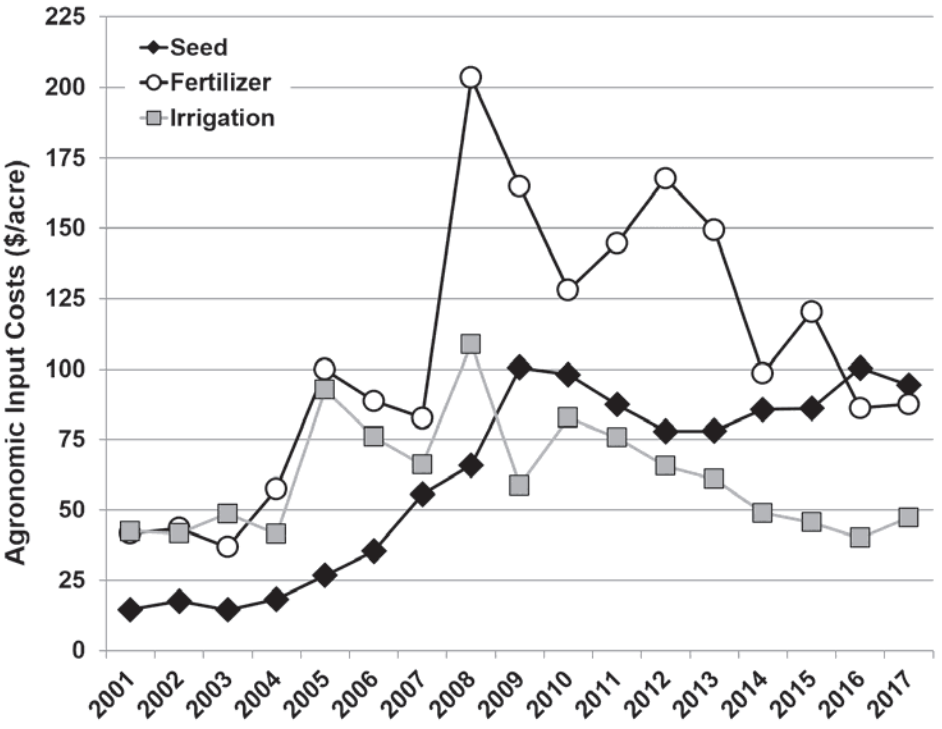

Figure 17-4. Average annual agronomic costs in the RRVP, 2001-2017.

the irrigation source utilized for the field enrolled in the RRVP. However, annual variation in fuel cost plays a significant role in irrigation costs as well.

Another goal of the program is to look for areas in rice production that require additional research. Over the last 30 years, the program has resulted in highlighting research needs in several areas.

Examples include:

- First K deficiency in rice observed
- Sulfur deficiency
- Fungicides for sheath blight/blast control
- Rice water weevil thresholds for specific cultivars
- Improvements in N management
- False smut
- Bacterial panicle blight
- Replacement for Icon

The verification program usually works with producers for two years. Cooperators and fields for the program are chosen through a joint effort involving the coordinator, county extension agents and extension district directors. Cooperators who seek to enhance their rice production skills and knowledge through personal participation in the weekly field inspections with the coordinator and county extension agent are sought for the program.

The RRVP has been successful for more than 30 years. This program has provided positive benefits to farmers, landowners, county extension agents and researchers. The RRVP continues to be the epitome of taking research to the field and educating growers on methods to increase productivity and efficiency. If you are interested in participating in the Rice Research Verification Program, contact your local county extension agent for more information.