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## Authors and Acknowledgements

### Conducted by:

Chris Grimes, Program Associate (Now Craighead County Extension Agent)  
Chad Norton, Program Associate  
Dr. Jason Kelley, Extension Agronomist - Wheat and Feed Grains  
Dr. Archie Flanders, Extension Economist

### Acknowledgments:

#### Cooperating Wheat Producers:

Kyle Harriman - Ashley County	Kevin Hicks - Lonoke County
Eric Guenther - Jefferson County	Don and Bryan Thielemier - Randolph County
Bobby Mike Watson - Lawrence County	

#### Cooperating County Extension Agents:

Kevin Norton - Ashley County	Keith Perkins & Jenny Ross- Lonoke County
Anthony Whittington - Jefferson County	Mike Andrews - Randolph County
Herb Ginn - Lawrence County	

#### Cooperative Extension Service:

Dr. Trent Roberts, Soil Fertility  
Dr. Leo Espinoza, Extension Soils Specialist  
Dr. Glenn Studebaker, Extension Entomologist  
Dr. Terry Spurlock, Extension Plant Pathologist  
Dr. Gus Lorenz, Extension Entomologist  
Dr. Bob Scott, Extension Weed Scientist  
Mr. Chris Meux, Extension Design Specialist  
Dr. Robert Bacon, Department Head, Department of Crop, Soil, and Environmental Sciences

#### Agricultural Experiment Station:

Dr. Esten Mason, Assistant Professor, Wheat Breeding and Genetics

#### Arkansas Wheat Promotion Board Members:

Kenny Clark	Tim Smith	David Wallace
Terry Dabbs	Blake Swears	Barry Walls
Jackie Prince	George Toll	Charles Williams III

## Introduction

The Wheat Research Verification Program (WRVP) represents an interdisciplinary effort of farmers, county Extension agents, Extension specialists, and researchers committed to improving the profitability of wheat production in Arkansas. The WRVP program began in 1986 under the direction of the University of Arkansas Cooperative Extension Service. The Arkansas Wheat Promotion Board has allocated the funding necessary for the WRVP program each year since its inception.

The WRVP program is designed as on-farm demonstrations of all the research-based recommendations required to grow wheat profitably in Arkansas. The WRVP program is part of the University of Arkansas Extension Service's goal of helping wheat producers make economical, agronomical, and environmentally sound decisions on their farms. The specific objectives of the program are:

1. To verify research-based recommendations for profitable wheat production in all wheat producing areas of Arkansas.
2. To develop a database for economic analysis of all aspects of wheat production to demonstrate that consistently high yields of wheat can be produced economically.
3. To identify specific problems and opportunities in Arkansas wheat production for further investigation.
4. To promote timely cultural and management practices among all wheat farmers.
5. To provide training and assistance to county agents with limited expertise in wheat production.

Five producer fields were enrolled in the WRVP for the 2015-2016 growing season. Cooperators from the counties selected varieties from a short list provided by the agent and research verification coordinator. These varieties were selected based upon multi-year performance and characteristics determined by the University of Arkansas wheat variety testing program.

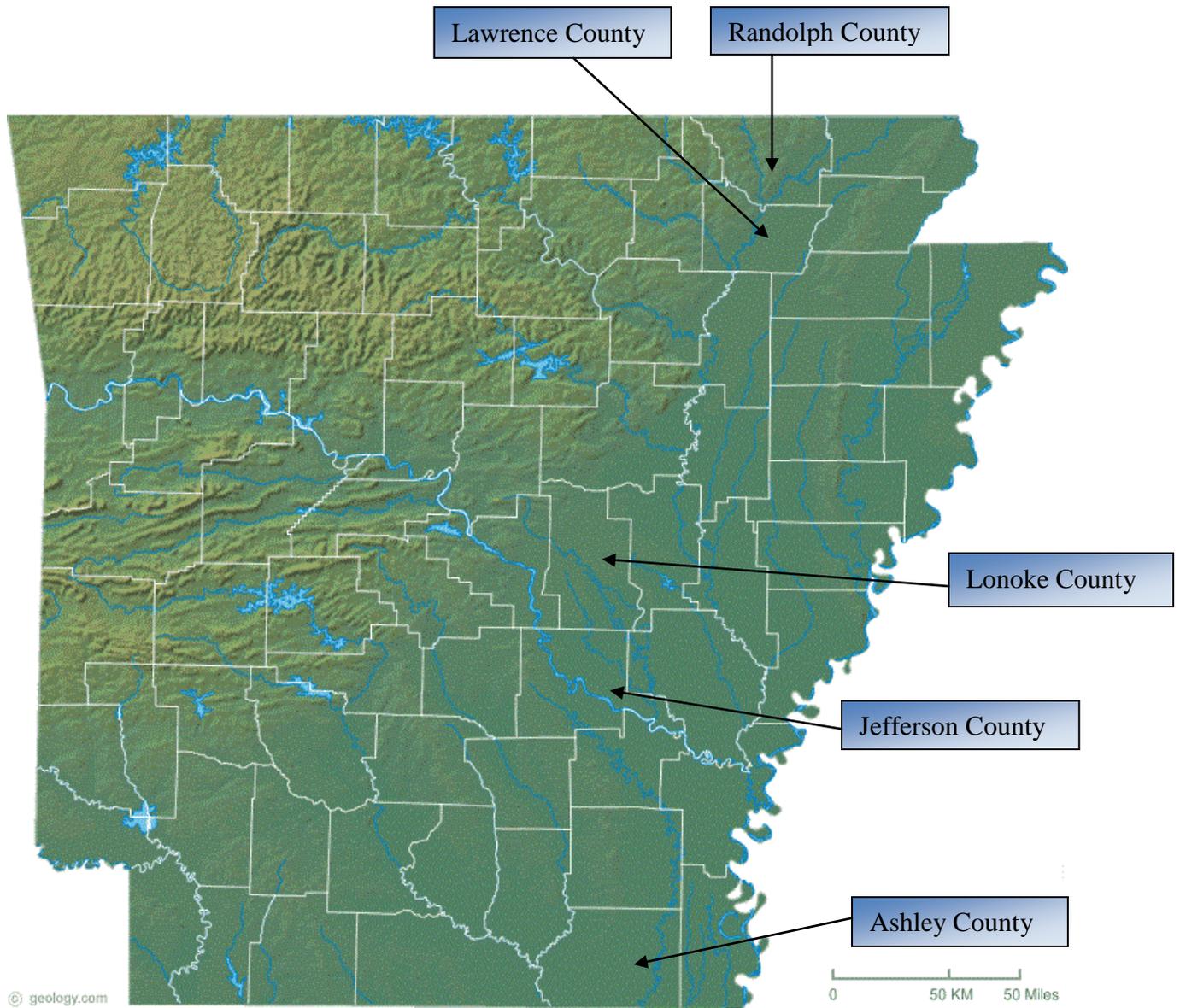
Soil types for fields enrolled in the program ranged from sandy loam to clay, with previous crops of soybean, corn, or fallow. Fields were planted in from mid-October to mid-November with seeding rates ranging from 115 to 180 lbs/acre. Four fields were planted using grain drills and one field was broadcast planted. No fields were treated for insects throughout the season. The Lonoke County field was sprayed with a fungicide to control foliar diseases at heading. The Ashley, Jefferson, and Lawrence County fields were treated with herbicides to control ryegrass or broadleaf winter weeds. The average yield for WRVP fields was 63 bu/A, compared to the estimated state average yield of 56 bu/A. Yields from verification fields ranged from 53 bu/A in Randolph County to 78 bu/A in Jefferson County.

Overall the 2015-2016 growing season was a challenging year for Arkansas wheat producers. Very dry conditions in August through most of October hampered seedbed preparation after summer crop harvest. Many wheat growers needed a rain to help prepare a better seedbed for planting. Once rains started in late October, many areas of the state did not have an opportunity to plant because of wet soil conditions. Much of the state's wheat acres

were planted into dry soils in Mid-late October or planted in Mid-November under less than ideal conditions. Overall planted wheat acreage was down due to planting difficulties and relatively low grain prices. Arkansas producers planted an estimated 200,000 acres of wheat in the fall of 2015, nearly the lowest acreage in recent history. February was relatively dry and provided an opportunity to apply the first application of topdress nitrogen timely. A wet March delayed application of the second topdress nitrogen application and most likely a yield limiting factor in some fields, along with the wet conditions that also likely limited yields. March 2016 was one of the wettest months statewide on record. Foliar diseases, particularly stripe rust, were a problem for producers who did not plant varieties that had stripe rust resistance. Warm and dry weather in early June allowed for a quick harvest. Grain quality was good overall with test weights averaging near 58 lb/bu. The estimated state average wheat yield in 2016 was 56 bu/A.

The Wheat Research Verification Program continues to demonstrate that Extension's research-based recommendations can produce profitable, high yielding wheat across a wide range of conditions and soil types. Over a 30 year period, the WRVP has averaged approximately 13 bushels above the average state yield. The program is funded by wheat check-off dollars and is administered through the Arkansas Wheat Promotion Board.

**Figure 1. Locations of 2015-2016 Wheat Research Verification Program Fields**



## Field Reviews

### Ashley County

The 40 acre field with a Calhoun silt loam soil was located east of Hamburg and the previous crop was corn. Following land preparation, a pre-plant fertilizer of 0-46-60 was applied according to soil test recommendations. The field was broadcast seeded on October 20, 2015 with the variety Dixie McAllister, Warden Cereals 2 seed treatment, at 180 pounds per acre and the seed was incorporated with a field cultivator. Final plant population was 26 plants per square foot. A post-emergence application of 1.5 pints 2,4-D was applied on January 15, 2016 for winter annual broadleaf weed control. A total spring nitrogen rate of 120 pounds per acre was applied in 2 applications, with the first February 12 (80 lbs. urea + 50 lbs. DAP + 50 lbs. ammonium sulfate/acre) and the second on March 8 (140 lbs. urea/acre). No fungicide or insecticide applications were warranted. During the growing season the field received over 35 inches of rain, with 18 inches falling over a 3 day period in early March. Excessive rainfall during the growing season combined with areas of poor drainage in the field was a yield limiting factor. The field was harvested on June 7 yielding 67.4 bushels per acre.

### Jefferson County

The 22 acre field with a Rilla silt loam and Portland clay soil was located south of Sherrill and the previous crop was soybean. Following land preparation the field was drill seeded on October 21, 2015 with the variety Delta Grow 7500 at 120 pounds of seed per acre. Final plant population was 27 plants per square foot. A post-emergence herbicide application of 1.5 pints 2,4-D was applied on February 1, 2016 for winter annual broadleaf weed control. A total spring nitrogen rate of 121 pounds per acre was applied in 2 application, with the first February 22 (100 lbs. urea + 100 lbs. DAP + 100 lbs. 0-0-60/acre) and the second on March 14 (100 lbs. urea + 50 lbs. ammonium sulfate/acre). No fungicide or insecticide applications were warranted. Although the field received over 25 inches of rain during the growing season, it drained well so yield reduction was minimized. The field was harvested June 8 yielding 78 bushels per acre.

### Lawrence County

The 75 acre field with a Beulah sandy loam soil was located west of Hoxie and had previously been fallow in 2015. Following land preparation for planting, a pre-plant application of 1 ton chicken litter per acre was applied. The field was drill seeded on October 12, 2015 with the variety Armor Havoc at 129 pounds of seed per acre. A post-emergence herbicide application of 3 ounces Anthem Flex per acre was applied on November 5 for winter annual grass weed control. A total spring nitrogen rate of 114 pounds per acre was applied in 2 applications, with the first February 12, 2016 (175 lbs. 39-0-0-8) and the second on February 28 (100 lbs. urea). No fungicide or insecticide applications were warranted. The field was harvested June 11 yielding 60 bushels per acre.

### Lonoke County

The 19 acre field with a Calloway silt loam was located northeast of Woodlawn and had previously been fallow in 2015. Following land preparation for planting, the field was drill seeded on November 11, 2015 with the variety Coker 9553 at 120 pounds per acre. Final plant population was 22 plants per square foot. Two sprayer swaths of Axial XL at 16.4 ounces per

acre was recommended on northern and eastern edges for ryegrass control but was never applied due to poor weather conditions. A total spring nitrogen rate of 124 pounds per acre was applied in 2 applications, with the first February 22, 2016 (100 lbs. urea + 50 lbs. DAP + 100 lbs. 0-0-60) and the second on March 15 (150 lbs. urea). A fungicide application of Bumper at 4 ounces per acre was applied on April 16 for Septoria Leaf Blotch control. No insecticide application was warranted. Wheat yield around northern and eastern edges was reduced due to competition from ryegrass. The field was harvested June 18 yielding 57 bushels per acre.

### **Randolph County**

The 45 acre field with a Bosket fine sandy loam was located east of Pocahontas and the previous crop was soybean. Following land preparation for planting, pre-plant fertilizer of 29-34-30 was applied to the field. Wheat was drill seeded on November 4, 2015 with the variety Syngenta Harrison at 115 pounds per acre. A total spring nitrogen rate of 105 pounds per acre was applied in 2 applications, with the first February 19, 2016 (100 lbs. urea + 60 lbs. ammonium sulfate) and the second on March 17 (100 lbs. urea with Agrotain). No fungicide or insecticide applications were warranted. The field was harvested June 13 yielding 53 bushels per acre.

County	Variety	Acres	Planting Method & Rate	2015 Planting Date	Previous Crop	Yield Bu/A
Ashley	Dixie McAlister	40	Broadcast 180 lbs/A	Oct. 22	Corn	67
Jefferson	Delta Grow 7500	22	Drill 120 lbs/A	Oct. 21	Soybean	78
Lawrence	Armor Havoc	75	Drill 129 lbs/A	Oct 12	Fallow	60
Lonoke	Coker 9553	19	Drill 120 lbs/A	Nov. 11	Fallow	57
Randolph	Syngenta Harrison	45	Drill 115 lbs/A	Nov. 4	Soybean	53
<b>Average</b>						<b>63 bu/A</b>

County	Soil Type	Fall Fertilizer	Spring Fertilizer	Total Spring Nitrogen
Ashley	Calhoun silt loam	0-46-60	Feb. 12 - 80 lbs/A urea + 50 lbs/A ammonium sulfate, + 50 lbs/A DAP March 8 - 140 lbs/A urea	120
Jefferson	Rilla silt loam, Portland clay	None	Feb. 22 - 100 lbs/A urea + 100 lbs/A DAP + 100 lbs/A 0-0-60 March 14 - 100 lbs/A urea + 50 lbs/A ammonium sulfate	121
Lawrence	Beulah sandy loam	1 Ton Chicken Litter	Feb. 12 - 175 lbs/A of a 39-0-0-8 blend Feb. 28 - 100 lbs/A urea	114
Lonoke	Calloway silt loam	None	Feb 22 - 100 lbs/A urea + 50 lbs/A DAP + 100 lbs/A 0-0-60 March 15 - 150 lbs/A urea	124
Randolph	Bosket fine sandy loam	29-34-30	Feb. 19 - 100 lbs/A urea + 60 lbs/A ammonium sulfate March 17 - 100 lbs/A urea	105
<b>Average</b>				<b>117 lbs N</b>

**Table 3. Pesticide Information**

<b>County</b>	<b>Herbicide</b>	<b>Insecticide</b>	<b>Fungicide</b>
Ashley	January 15, 1.5 pt/A 2,4-D	-	-
Jefferson	February 1, 1.5 pt/A 2,4-D	-	-
Lawrence	November 5, 3 oz/A Anthem Flex	-	-
Lonoke	-	-	April 16, 4 oz/A Bumper
Randolph	-	-	-

## Economic Analysis

This section reports information on production costs and returns for the 2016 Wheat Research Verification Program (WRVP). Records of field operations on each field are the basis for estimating these costs. The field records were compiled by the WRVP coordinators, county Extension agents, and cooperators. Production data from the 5 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 costs type.

Production expenses are those expenditures that would generally require annual cash outlays and would be included on an annual operating loan application. Actual quantities of all production inputs as reported by the cooperators are used in this analysis. Input prices are determined by data from the 2015 Crop Enterprise Budgets (wheat revised September 2015) published by the Cooperative Extension Service. 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 and maintenance costs should be regarded as estimated values, and actual cash outlays could differ as producers utilize employee labor for equipment maintenance.

Ownership 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, total costs, costs per bushel, and returns are presented in Table 4. Costs in this report do not include land costs, management, or other expenses and fees not associated with production. Budget summaries for wheat are presented in Table 5. Price received for wheat of \$4.65/bu. is determined by the Memphis average cash price during June of 2016. Average wheat yield is 63.1 bu. per acre.

Average operating costs for wheat in Table 4 are \$209.78 per acre. Table 5 indicates that fertilizers and nutrients are the largest expense category at \$92.51 per acre, or 44% of total operating costs. Seed costs average \$43.40 per acre, and herbicides average \$4.24 per acre. Two fields had no herbicides applied.

With average yield of 63.1 bu. per acre, average operating costs are \$3.34/bu. Operating costs range from a low of \$168.10 per acre in Randolph County to a high of \$252.37 per acre in the Ashley County field. Returns to operating costs average \$83.54 per acre. The low is \$53.97 in Lawrence County and the high is \$137.10 in Jefferson County. Average fixed costs are \$43.31 per acre which leads to average total costs of \$253.09 per acre. Returns to total costs average \$40.23 per acre with a low of \$4.90 in Ashley County and a high of \$99.19 in Jefferson County. Total specified costs average \$4.03/bu.

Table 4. Operating Costs, Total Costs, and Returns

Field	Operating Costs	Operating Costs per Bushel	Returns to Operating Costs	Total Fixed Costs	Total Costs	Returns to Total Costs	Total Costs per Bushel
Ashley	252.37	3.74	61.04	56.15	308.51	4.90	4.58
Jefferson	225.60	2.89	137.10	37.91	263.51	99.19	3.38
Lawrence	225.03	3.75	53.97	40.89	265.91	13.09	4.43
Lonoke	177.82	3.12	87.23	40.13	217.95	47.10	3.82
Randolph	168.10	3.17	78.35	41.46	209.56	36.89	3.95
<b>Average</b>	<b>209.78</b>	<b>3.34</b>	<b>83.54</b>	<b>43.31</b>	<b>253.09</b>	<b>40.23</b>	<b>4.03</b>

<sup>1</sup>Does not include land costs, management, or other expenses and fees not associated with production.

Table 5. Summary of Revenue and Expenses per Acre

Revenue	Field					Average
	Ashley	Jefferson	Lawrence	Lonoke	Randolph	
Yield (bu.)	67.4	78.0	60.0	57.0	53.0	63.1
Price (\$/bu.)	4.65	4.65	4.65	4.65	4.65	4.65
<b>Total Crop Revenue</b>	<b>313.41</b>	<b>362.70</b>	<b>279.00</b>	<b>265.05</b>	<b>246.45</b>	<b>293.32</b>
<b>Expenses</b>						
Seed	62.13	38.40	41.28	38.40	36.80	43.40
Fertilizers & Nutrients	107.90	94.25	93.88	82.75	83.79	92.51
Herbicides	3.42	3.42	14.35	0.00	0.00	4.24
Insecticides	0.00	0.00	0.00	0.00	0.00	0.00
Other Chemicals	0.00	0.00	0.00	2.03	0.00	0.41
Custom Applications	16.80	38.50	26.25	7.00	0.00	17.71
Other Inputs	0.00	0.00	0.00	0.00	0.00	0.00
Diesel Fuel	14.32	9.36	8.21	8.04	9.97	9.98
Irrigation Energy Costs	0.00	0.00	0.00	0.00	0.00	0.00
<b>Input Costs</b>	<b>204.57</b>	<b>183.93</b>	<b>183.97</b>	<b>138.22</b>	<b>130.56</b>	<b>168.25</b>
Fees	0.00	0.00	0.00	0.00	0.00	0.00
Repairs & Maintenance <sup>1</sup>	16.45	12.33	13.80	13.71	13.39	13.94
Labor, Field Activities	8.37	4.30	6.79	7.29	6.79	6.71
<b>Production Expenses</b>	<b>229.39</b>	<b>200.56</b>	<b>204.57</b>	<b>159.22</b>	<b>150.74</b>	<b>188.90</b>
Interest	5.45	4.76	4.86	3.78	3.58	4.49
Post-harvest Expenses	17.52	20.28	15.60	14.82	13.78	16.40
Custom Harvest	0.00	0.00	0.00	0.00	0.00	0.00
<b>Total Operating Expenses</b>	<b>252.37</b>	<b>225.60</b>	<b>225.03</b>	<b>177.82</b>	<b>168.10</b>	<b>209.78</b>
<b>Returns to Operating Expenses</b>	<b>61.04</b>	<b>137.10</b>	<b>53.97</b>	<b>87.23</b>	<b>78.35</b>	<b>83.54</b>
Capital Recovery & Fixed Costs	56.15	37.91	40.89	40.13	41.46	43.31
<b>Total Specified Expenses<sup>2</sup></b>	<b>308.51</b>	<b>263.51</b>	<b>265.91</b>	<b>217.95</b>	<b>209.56</b>	<b>253.09</b>
<b>Returns to Specified Expenses</b>	<b>4.90</b>	<b>99.19</b>	<b>13.09</b>	<b>47.10</b>	<b>36.89</b>	<b>40.23</b>
Operating Expenses/bu.	3.74	2.89	3.75	3.12	3.17	3.34
Total Specified Expenses/bu.	4.58	3.38	4.43	3.82	3.95	4.03

<sup>1</sup>Includes employee labor allocated to repairs and maintenance.

<sup>2</sup>Does not include land costs, management, or other expenses and fees not associated with production.