DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

2017
University of Arkansas
Division of Agriculture
Wheat Research Verification Program

The Wheat Research Verification Program is funded by Arkansas wheat producers through check-off funds administered by the Arkansas Wheat Promotion Board.

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

Arkansas ROW CROP VERIFICATION
DIVISION OF AGRICULTURE RESEARCH & EXTENSION University of Arkansas System

ARKANSAS WHEAT PROMOTION BOARD

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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.

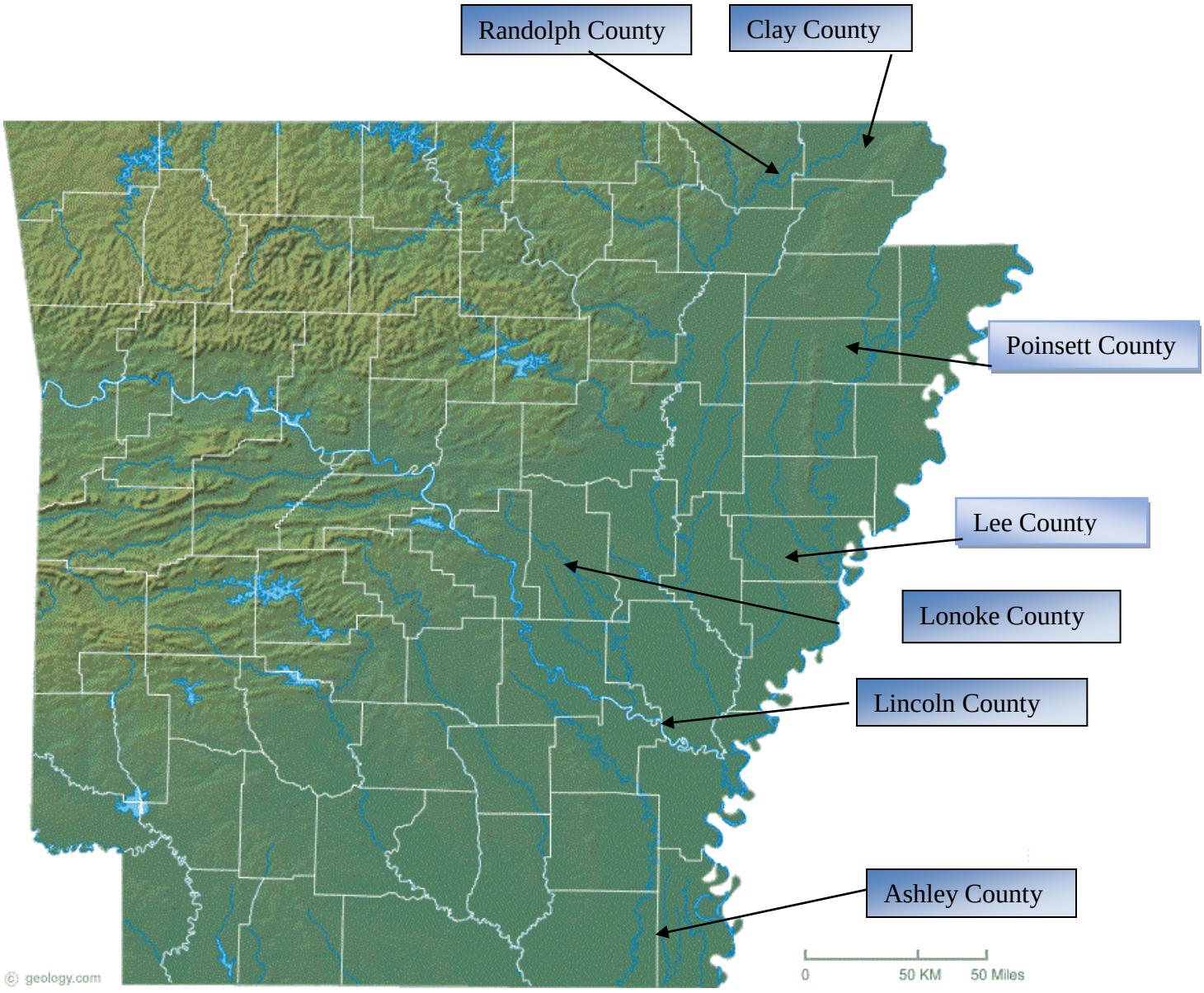
Seven producer fields were enrolled in the WRVP for the 2016-2017 growing season. Cooperators from the counties selected varieties from a short list provided by the agent and research verification coordinator. These varieties were selected based upon multi-year performance and characteristics determined 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 and corn. Fields were planted from mid-October to mid-November with seeding rates ranging from 120 drilled to 180 lbs/acre broadcast. Four fields were planted using grain drills and three fields were broadcast planted. No fields were treated for insects throughout the growing season season. The Ashley, Clay, Lee, Poinsett, and Randolph County fields were sprayed with a fungicide to control foliar diseases at heading. The Clay, Lee, Lonoke, Poinsett, and Randolph fields were treated with herbicides to control ryegrass or broadleaf winter weeds. Yields from verification fields ranged from 47.6 bu/A in Lincoln County to 87.5 bu/A in Ashely County.

The 2016-2017 growing season produced its own obstacles for Arkansas wheat producers. Dry conditions in October and November hampered germination and pre-emerge herbicide activation. Consistent rains in mid to late November and above average temperatures allowed for adequate tillering. Late winter and early spring was warmer than normal resulting in early wheat growth. Initial spring fertilizer application went out as early as February 1. The second application timing was delayed in several fields due to wet conditions. Despite the warm spring a late spring freeze caused slight to moderate damage to several fields. Foliar diseases, particularly stripe rust, developed late in the season and warranted treatment. Weather conditions allowed for good harvest conditions in late May through Mid-June. Planted acres were down slightly due to price and planting conditions. Arkansas producers planted an estimated 195,000 acres of wheat in the fall of 2016. The verification program average yield for the 2017 season was 66 bu/ac and the state average was 55 bu/ac.

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 2016-2017 Wheat Research Verification Program Fields



Field Reviews

Southern Fields – Chad Norton

Ashley County

The 40 acre field with soil types McGehee and Arkabutla silt loam, was located east of Hamburg and followed corn. Following land preparation and a fertilizer application of 0-70-90, the field was drill seeded on October 18, 2016 with Pioneer 26R41 at 120 pounds/acre and seed was treated with Cruiser 5FS seed treatment. Wheat emerged on October 25, 2016 at a density of 25 plants/ft². No herbicide applications were warranted for weed control. Initial early spring fertilizer application of 100 pounds DAP plus 50 pounds ammonium sulfate plus 100 pounds urea per acre was applied February 1, 2017. The second spring fertilizer application of 100# urea/acre was applied February 16, 2017, for a total spring N rate of 120 pounds/acre. On April 7, 2017 a fungicide application of 8.2 ounces/acre Prosaro was applied as a preventative for fusarium head scab. The field was harvested on May 30, 2017 yielding 87.5 bushels/acre adjusted to 13.5% moisture.

Lee County

The 55 acre field with Memphis silt loam and Zachary soils was located south of Marianna and followed soybeans. Following a fertilizer application of 0-0-80 the field was broadcast seeded on October 5, 2016 with Armor Havoc at 120 pounds/acre and seed was treated with CruiserMax Vibrance Cereals. Emergence occurred October 16, 2016 with a plant stand of 30 plants/ft². On January 31, 2017, Harmony Extra at .9 ounces/acre was applied as a post-emergence herbicide for henbit and garlic control. Initial early spring fertilizer application of 100 pounds ammonium sulfate plus 117 pounds urea was applied February 10, 2017. The second fertilizer application of 100 pounds urea was applied February 24, 2017, for a total spring N rate of 120 pounds/acre. After freezing temperatures on the weekend of March 11 there was damage noticed in the field. On April 12, 2017, 4 ounces/acre Tebustar was applied for control of leaf rust. The field was harvested on May 30, 2017 yielding 49.1 bushels/acre adjusted to 13.5% moisture.

Lincoln County

The 60 acre field with a McGehee silt loam and Desha clay, was located at Varner and followed corn. Following land preparation and a fertilizer application of 0-60-90, the field was broadcast planted October 27, 2016 with AgriMAXX 413 at 120 pounds/acre and seed was treated with CruiserMax Vibrance Cereals. Emergence occured November 4, 2016 with a plant stand of 24 plants/ft². No herbicide applications were warranted for weed control. After intense grazing by geese, initial early spring fertilizer application of 50# ammonium sulfate plus 50# urea per acre was applied January 20, 2017 that resulted in significant fertilizer streaking. Following that, geese again intensely grazed the field so it was determined that an additional 20 units N should be applied to compensate for the loss. Second and third spring fertilizer applications of 150 pounds/acre urea each were applied April 10 and April 21, 2017, respectively, for a total spring N rate of 140 pounds/acre. Both the second and third fertilizer applications were extremely late. No fungicide applications were made. The field was harvested June 12, 2017 yielding 47.6 bushels/acre adjusted to 13.5% moisture.

Lonoke County

The 21 acre field with Calhoun and Immanuel silt loam soils, was located north of Carlisle and followed soybeans. Following land preparation and a fertilizer application of 20-69-77, the field was broadcast planted on raised beds on November 16, 2016 with AGS 2055 at 180 pounds/acre. The seed was treated with, CruiserMax Vibrance Cereals. Following heavy rains, it emerged November 27, 2016 to a plant stand of 10 plants/ft² on top of rows and 35 plants/ft² in the middles. On February 8, 2017, Axial XL at 16.4 ounces/acre plus Harmony Extra at .9 ounces/acre were applied as a post-emergence herbicide for ryegrass and henbit control, respectively. The initial early spring fertilizer application of 50 pounds ammonium sulfate plus 100 pounds urea per acre was applied February 13, 2017. The second fertilizer application of 141 pounds urea/acre was applied February 24, 2017, for a total spring N rate of 120 pounds/acre. No fungicide applications were warranted. The field was harvested June 12, 2017 yielding 61.1 bushels/acre adjusted to 13.5% moisture.

Northern Fields – Chris Elkins

Clay County

The 43 acre field with Dexter and Foley Silt Loam soils, was located west of McDougal and followed corn. Following land preparation and a fertilizer application of 0-0-60, the field was drill seeded on October 16, 2016 with Armor Havoc at 120 pounds/acre. The seed was treated with Vibrance Extreme seed treatment. Emergence occurred on October 23, 2016 and had a plant stand of 22 plants/ft². On February 23, 2017, Harmony Extra at .9 ounces/acre was applied as a post-emergence herbicide for henbit control. The initial early spring fertilizer application of 50 pounds ammonium sulfate plus 115 pounds urea/acre was applied February 13, 2017. The second fertilizer application of 160 pounds urea/acre was applied March 20, 2017, for a total spring N rate of 137 pounds/acre. The second application of N was increase due to excess geese feeding and was applied later than optimum due to excess rains. On April 18, 2017, 6.5oz Prosaro was applied for stripe rust control and suppression of Fusarium head blight. The field was harvested on June 9, 2017 yielding 70.1 bushels/acre adjusted to 13.5% moisture.

Poinsett County

The 50 acre field with Falaya and Collins Silt Loam soil types, was located 5 miles east of Harrisburg and followed soybeans. Following land preparation and a fertilizer application of 0-60-60, the field was drill seeded on October 20, 2017 with Armor Ambush at 120 pounds/acre. The seed was treated with, Vibrance Extreme seed treatment. On October 22, 2016 an application of 32 ounce generic glyphosate and 1 ounce Zidua was applied as a delayed pre-emerge for ryegrass control. Wheat emerged on October 28, 2017 to a plant stand of 27 plants/ft². On November 11, 2016, 16.4 ounces Axail XL plus 2 pints Prowl H20 was applied as a 100 feet field border treatment for post ryegrass. The initial early spring fertilizer application of 50 pounds ammonium sulfate and 50 pounds of urea/acre was applied February 11, 2017. Second and third spring fertilizer applications of 100 pounds/acre urea each were applied February 24, 2017 and March 4, 2017 respectively, for a total spring N rate of 126 pounds/acre. On April 7, 2017 4oz Stratego YLD was applied for the control of stripe rust. The field was harvested on June 8, 2017 yielding 76.4 bushels/acre adjusted to 13.5% moisture.

Randolph County.

The 63 acre field with a Bosket Fine Sandy Loam soil type, was located east of Pocahontas and followed soybeans. Following land preparation and a fertilizer application of 10.5-0-60-12s, the field was drill seeded on October 20, 2017 with Armor Vandal at 120 pounds/acre. The seed was treated with Vibrance Extreme seed treatment. Wheat emerged on October 28, 2017 to a plant stand of 28 plants/ft². On February 16, 2017, 2 ounces of Powerflex was applied as a 100 feet border treatment post ryegrass control. The initial early spring fertilizer application of 50 pounds ammonium sulfate and 115 pounds urea/acre was applied on February 20, 2017. The second fertilizer application of 125 pounds urea/acre was applied on March 16, 2017, for a total spring N rate of 121 pounds/acre. On April 14, 2017, 10.5 ounces Quilt Excel was applied for the control of stripe rust. The field was harvested on June 17, 2017 yielding 70.9 bushels/acre adjusted to 13.5% moisture.

Table 1. General Agronomic Information of Verification Fields in 2016-2017.

County	Variety	Acres	Planting Method & Rate	2016 Planting Date	Previous Crop	Yield Bu/A
Ashley	Pioneer 26R41	40	Drill 120 lbs/A	Oct. 18	Corn	87.5
Clay	Armor Havoc	43	Drill 120lbs/A	Oct. 16	Corn	70.1
Lee	Armor Havoc	55	Broadcast 120 lbs/A	Oct. 5	Soybean	49.1
Lincoln	AgriMAXX 413	60	Broadcast 120 lbs/A	Oct. 27	Corn	47.6
Lonoke	AGS 2055	19	Broadcast 180 lbs/A	Nov. 16	Soybean	61.1
Poinsett	Armor Ambush	50	Drill 120lbs/A	Oct. 20	Soybean	76.4
Randolph	Armor Vandal	63	Drill 120lbs/A	Oct. 20	Soybean	70.9
Average						**66.1 bu/A**

Table 2. Soil Type and Fertilizer Inputs for 2016-2017 Wheat Verification Fields.				
County	**Soil Type**	**Fall Fertilizer**	**Spring Fertilizer**	**Total Spring Nitrogen**
Ashley	Calhoun & Arkabutla silt loam	0-70-90	Feb. 1 - 100 lbs/A urea + 50 lbs/A ammonium sulfate, + 100 lbs/A DAP Feb. 16 - 100 lbs/A urea	120
Clay	Dexter & Foley silt loam	0-0-60	Feb 13 – 115lbs/A urea + 50lbs/A ammonium sulfate Mar 20 – 160lbs/A urea	137
Lee	Memphis silt loam & Zachary soils	0-0-80	Feb. 10 – 117 lbs/A urea + 100 lbs/A ammonium sulfate Feb. 24 – 100 lbs/A urea	121
Lincoln	McGehee silt loam & Desha clay	0-60-90	Jan. 20 – 50 lbs/A DAP + 75 lbs/A ammonium sulfate Apr. 10 – 150 lbs/A urea Apr. 21 – 150 lbs/A urea	152
Lonoke	Calhoun & Immanuel silt loam	20-69-77	Feb 13 – 100 lbs/A urea + 50 lbs/A ammonium sulfate Feb. 24 – 141 lbs/A urea	121
Poinsett	Falaya & Collins silt loam	0-60-60	Feb 11- 50lbs/A urea + 50lbs/A Ammonium sulfate Feb. 24 – 100lbs/A urea Mar. 4 – 100lbs/A urea	126
Randolph	Bosket Fine Sandy Loam	10.5-0-60-12s	Feb. 20 – 115lbs/A urea + 50lbs/A ammonium sulfate Mar. 16 – 125lbs/A urea	121
Average				**128 lbs N**

Table 3. Pesticide Information for the 2016-2017 Wheat Verification Fields			
County	**Herbicide**	**Insecticide**	**Fungicide**
Ashley	-	-	Apr. 7 – 8.2 oz/A Prosaro
Clay	Feb. 23- .9oz Harmony Extra	-	Apr.18 – 6.5oz Prosaro
Lee	Jan. 31 - .9 oz/A Harmony Extra	-	Apr. 12 – 4 oz/A Tebustar
Lincoln	-	-	-
Lonoke	Feb. 8 – 16.4 oz/A Axial XL + .9 oz/A Harmony Extra	-	-
Poinsett	Oct. 22 -32oz Generic Glyphosate, 1oz Zidua Nov 11(Edge only)-16.4 oz Axial Xl, 2pts Prowl H20	-	Apr. 7- 4oz Stratego YLD
Randolph	Feb 16(Edge only)- 2oz Powerflex	-	Apr. 14 10.5oz Quilt Excel

Economic Analysis of the 2017 Wheat Research Verification Program

This section reports information on costs and returns for the 2017 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 7 fields were applied to determine costs and returns above operating costs, as well as total specified costs. Operating costs per bushel 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 2016 Crop Enterprise Budgets 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 1. 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 2. Price received for wheat of $4.70/bu. is determined by the Arkansas average cash price during the reported harvest period of the WRVP fields. Average wheat yield is 66.1 bu. per acre.

Average operating costs for wheat in Table 1 are $237.17 per acre. Table 2 indicates that fertilizers and nutrients are the largest expense category at $82.20 per acre, or 38% of total production expenses. Seed costs average $46.93 per acre, and fungicides average $12.11 per acre. Two fields had no fungicides applied.

With average yield of 66.1 bu. per acre, average operating costs are $3.71/bu. Operating costs range from a low of $197.72 per acre in Randolph County to a high of $285.46 per acre in the Lonoke County field. Returns to operating costs average $73.50 per acre. The low is $1.71 in Lonoke County, and the high is $145.24 in Poinsett County. Average fixed costs are $49.96 per acre which leads to average total costs of $287.13 per acre. Returns to total costs average $23.54 per acre with a low of -$45.69 in Lonoke County and a high of $101.21 in Poinsett County. Total specified costs average $4.48/bu.

Table 1. 2017 Operating Costs, Total Costs, and Returns

Field	Operating Costs	Operating Costs per Bushel	Returns to Operating Costs	Total Fixed Costs	Total Costs[1]	Returns to Total Costs	Total Costs per Bushel
Ashley	278.40	3.18	132.85	65.40	343.80	67.45	3.93
Clay	257.88	3.68	71.59	55.47	313.34	16.13	4.47
Lee	223.55	4.55	7.22	47.92	271.47	-40.70	5.53
Lincoln	203.35	4.27	20.37	43.76	247.10	-23.38	5.19
Lonoke	285.46	4.67	1.71	47.40	332.86	-45.69	5.45
Poinsett	213.84	2.80	145.24	44.03	257.87	101.21	3.38
Randolph	197.72	2.79	135.51	45.76	243.49	89.74	3.43
Average	**237.17**	**3.71**	**73.50**	**49.96**	**287.13**	**23.54**	**4.48**

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

Table 2. 2017 Revenue and Expenses per Acre

	Field							
Revenue	Ashley	Clay	Lee	Lincoln	Lonoke	Poinsett	Randolph	**Average**
Yield (bu.)	87.5	70.1	49.1	47.6	61.1	76.4	70.9	66.1
Price ($/bu.)	4.70	4.70	4.70	4.70	4.70	4.70	4.70	4.70
Total Crop Revenue	**411.25**	**329.47**	**230.77**	**223.72**	**287.17**	**359.08**	**333.23**	**310.67**
Expenses								
Seed	43.80	43.80	43.80	43.80	65.70	43.80	43.80	46.93
Fertilizers & Nutrients	122.81	76.59	73.73	80.68	106.28	50.50	64.80	82.20
Herbicides	0.00	12.15	12.50	0.00	20.61	13.13	1.45	8.55
Insecticides	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fungicides	22.71	18.01	9.96	0.00	0.00	20.16	13.97	12.11
Custom Applications	14.00	43.75	31.00	28.00	33.73	27.20	15.75	27.63
Diesel Fuel	11.32	9.72	7.71	6.90	7.31	6.35	6.88	8.03
Irrigation Energy Costs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Input Costs	**214.65**	**204.02**	**178.70**	**159.38**	**233.63**	**161.14**	**146.65**	**185.45**
Crop Insurance	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00
Repairs & Maintenance[1]	13.24	12.06	9.49	9.23	9.51	10.59	10.11	10.60
Labor, Field Activities	8.84	5.01	4.71	4.93	7.19	4.75	5.38	5.83
Production Expenses	**249.72**	**234.09**	**205.90**	**186.54**	**263.32**	**189.48**	**175.13**	**214.88**
Interest	5.93	5.56	4.89	4.43	6.25	4.50	4.16	5.10
Post-harvest Expenses	22.75	18.23	12.77	12.38	15.89	19.86	18.43	17.19
Total Operating Expenses	**278.40**	**257.88**	**223.55**	**203.35**	**285.46**	**213.84**	**197.72**	**237.17**
Returns to Operating Expenses	**132.85**	**71.59**	**7.22**	**20.37**	**1.71**	**145.24**	**135.51**	**73.50**
Capital Recovery & Fixed Costs	65.40	55.47	47.92	43.76	47.40	44.03	45.76	49.96
Total Specified Expenses[2]	**343.80**	**313.34**	**271.47**	**247.10**	**332.86**	**257.87**	**243.49**	**287.13**
Returns to Specified Expenses	**67.45**	**16.13**	**-40.70**	**-23.38**	**-45.69**	**101.21**	**89.74**	**23.54**
Operating Expenses/bu.	3.18	3.68	4.55	4.27	4.67	2.80	2.79	3.71
Total Specified Expenses/bu.	3.93	4.47	5.53	5.19	5.45	3.38	3.43	4.48

[1]Includes employee labor allocated to repairs and maintenance.
[2]Does not include land costs, management, or other expenses and fees not associated with production.