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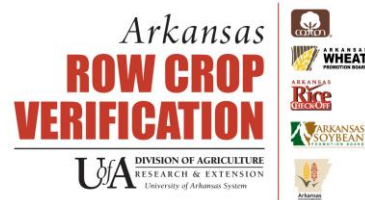
2017

University of Arkansas

**Corn and Grain Sorghum Research
Verification Program**

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University of Arkansas
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CORN & GRAIN SORGHUM RESEARCH VERIFICATION PROGRAM, 2017

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INTRODUCTION

The 2017 growing season was the eighteenth year for the Corn and Grain Sorghum Research Verification Program (CGSRVP). The CGSRVP is an interdisciplinary effort between growers, county Extension agents, Extension specialists, and researchers. The CGSRVP is an on-farm demonstration of all the research-based recommendations required to grow corn and grain sorghum profitably in Arkansas. The specific objectives of the program are:

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

Each CGSRVP 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. Five growers enrolled in the CGSRVP in the spring of 2017, four corn and one grain sorghum fields. The fields were located on commercial farms and ranged in size from 40.0 to 71.1 acres for the corn fields with an average field size of 52.5 acres. The grain sorghum field was 22 acres.

The 2017 CGSRVP corn fields were in Jackson, Prairie, and St Francis Counties; and the grain sorghum field was in White County. There was another corn field in the River Valley that was a collaboration between six County Agents. Four corn hybrids and one grain sorghum hybrid were planted. Management decisions were based on field history, soil test results, hybrids, and data collected from each individual field during the growing season.

An electronic copy of this publication can be found at the following web addresses:

www.uaex.edu/verification
www.uaex.edu/cgsrvp

www.uaex.edu/corn
www.uaex.edu/grain-sorghum

Figure 1. Location of 2017 Corn and Grain Sorghum Research Verification Fields



CORN FIELD REVIEWS

Jackson County

The Jackson/Poinsett County corn research verification field was located in the eastern part of Jackson County East of Amagon and was a collaborative effort between the Jackson and Poinsett County extension agents. The field was just over 40 acres and the previous crop was soybeans. The soil type was Calhoun Silt Loam. The field was disked and field cultivated in the early spring. A mixed preplant fertilizer of 46-90-90-0-10 was custom applied on March 31, followed by Kelly Tool and hipper roller on 30 inch beds. The field was planted the same day with Pioneer P2089VYHR at 37,000 seeds per acre on 30 inch row spacing. The field emerged on April 8 and the final plant stand was 34,000 plants per acre. The producer applied 1 pint of Dual II Magnum, 1 quart of atrazine, and 1 quart of glyphosate per acre on March 31. The same herbicides were applied at same the rates on April 26 along with 325 pounds per acre of Urea. A pre-tassel application of 100 pounds of Urea (46 units N) was aerially applied on June 10. Total fertilizer for the field was 242-90-90-0-10. The field was furrow irrigated 4 times. The field was harvested on September 12 at 16.7% moisture and yielded 223.9 bushels per acre adjusted to 15.5% moisture.

Prairie County

The Prairie County corn research verification field was located in the northern part of the county north of Hazen. The field was 40 acres and the previous crop was soybeans. The soil type was Immanuel Silt Loam. The field was disked and floated in the fall followed field cultivation in the spring. A mixed preplant fertilizer of 60-60-90-0-0 was custom applied on March 28 then bedded and rolled into a 60 inch bed. The field was planted on March 29 with Armor 1500PRO2 at 36,000 seeds per acre on 30 inch row spacing. The field emerged on April 12 and the final plant population was 32,500 plants per acre. The producer applied 1 pint of Dual II Magnum, 1 quart of glyphosate, and 2 quarts of atrazine on April 26 followed by 200 pounds of Urea and 100 pounds of Ammonium Sulfate per acre aerially applied. A pre-tassel application of 100 pounds of Urea (46 units N) was aerially applied on May 31. Total fertilizer for the field was 219-60-90-24-0. The field was furrow irrigated 2 times. The field was harvested on 9-15-17 at 16% moisture and yielded 201 bushels per acre adjusted to 15.5% moisture.

River Valley

The River Valley corn research verification field was located in the southwest part of Conway County near Blackwell. This field was a collaborative effort between agents in Conway, Faulkner, Logan, Perry, Pope and Yell counties. The field was 47 acres and the previous crop was soybean. The soil type was Dardanelle Silt Loam. The field was disked and field cultivated in the spring. On April 10, 100 pounds of Urea (46 units N) plus 100 pounds of Ammonium Sulfate (21 units N, 24 units S) was applied by the producer and bedded in the row. The field was planted on April 10 with Terral REV 23BHR55 at 32,000 seeds per acre on 30 inch row spacing. The field emerged on April 17 and the final plant population was 32,000 plants per acre. The producer applied 260 pounds of Urea (120 units N) on April 27 followed by 3 oz per acre Capreno, 1 quart per acre of glyphosate plus 1.5 quarts of atrazine for weed control. A pre-tassel application of 100 pounds of Urea (46 units N) was aerially applied on May 31. Total

fertilizer for the field was 233-0-60-24-0. The field was pivot irrigated 4 times. The field was harvested on August 29 at 18% moisture and yielded 214.3 bushels per acre adjusted to 15.5% moisture.

St Francis County

The St Francis County corn research verification field was located in the western part of the county south of Widener. The field was 53 acres and the previous crop was soybeans. The soil type was Bowdre Silty Clay Loam. The field was field cultivated in February. On March 24, 100 pounds of Urea (46 units N), 50 pounds of Zinc Sulfate (20 units Z and 10 units of S), 80 units of potassium, 110 units of phosphorus plus 100 pounds of Ammonium Sulfate (21 units N, 24 units S) was custom applied and field cultivated in. The field was planted on March 24 with Armor 1717PRO at 36,000 seeds per acre on 38 inch twin row spacing. The field emerged on April 3 and the final plant population was 35,000 plants per acre. 250 pounds of Urea (115 units N) was custom applied on April 19. On April 19, 3.6 pints of Halex GT plus 1.5 quarts of atrazine was applied by the producer for weed control. A pre-tassel application of 100 pounds of Urea (46 units) was applied on June 7. Total fertilizer for this field was 228-110-80-34-20. The field was irrigated two times. The field was harvested on August 23 at 15.5% moisture and yielded 239.0 bushels per acre adjusted to 15.5% moisture.

GRAIN SORGHUM FIELD REVIEW

White County

The White County grain sorghum research verification field was located in the northern part of the county near Russell. The field was 21 acres and previous crop was soybeans. The soil type was Calhoun Silt Loam. The field was subsoiled in the fall. A burndown application of 32 ounces of Roundup plus 24 ounces of 2,4-D was applied on March 31. The field was field cultivated on April 21 and again on April 25 followed by a mixed preplant fertilizer of 50-0-60-0-0. The field was planted on April 25 to Sorghum Partners 7715 (sugarcane aphid tolerant hybrid) at 150,000 seeds/acre on 30 inch row spacing. The seeding rate was higher than desired due to a planter malfunction. 1.5 pints of s-metolachlor was applied by the producer on April 26. The field emerged on May 1 to a final plant population of 123,000 plants per acre. 1 quart of atrazine was applied by the producer on May 19 and June 6 for pigweeds. On May 19, 130 pounds of Urea (60 units N) was custom applied. Total fertilizer for the field was 110-0-60-0-0. The field was sprayed with 14 ounces of Prevathon on July 26 for headworm control. The field was harvested on September 10 at 13.7% moisture and yielded 72.3 bushels per acre adjusted to 14% moisture.

Table 1. Agronomic information for the 2017 Corn Research Verification Fields.

County	Hybrid	Field Size (ac)	Row Spacing (in)	Previous Crop	Planting Population (seeds/ac)	Plant Stand (plants/ac)	Planting Date	Emergence Date	Harvest Date	Yield (bu/ac)
Jackson	Pioneer P2089VYHR	40.0	30"	Soybeans	37,000	34,000	3/31/17	4/8/17	9/12/17	223.9
Prairie	Armor 1500PRO ²	40.0	30"	Soybeans	36,000	32,500	4/1/17	4/9/17	9/15/17	201.0
River Valley	Terral REV 23BHR55 ¹	47.0	30"	Soybeans	32,000	31,000	4/10/17	4/17/17	8/29/17	214.3
St Francis	Armor 1717PRO ²	53	38" twin	Soybeans	36,000	35,000	3/24/17	4/3/17	8/23/17	239.0
Average		45			34,375	31,750				219.5

Traits – ¹ YieldGard, Herculex I, Roundup Ready Corn 2, Liberty Link

² Genuity VT Double Pro

³ Herculex I, Roundup Ready Corn 2, Liberty Link

Table 2. Agronomic information for the 2017 Grain Sorghum Research Verification Fields.

County	Hybrid	Field Size (ac)	Row Spacing (in)	Previous Crop	Planting Population (lbs/ac)	Plant Stand (plants/ac)	Planting Date	Emergence Date	Harvest Date	Yield (bu/ac)
White	Sorghum Partners 7715	21	30"	Soybeans	150,000	123,000	4/25/17	5/1/17	9/10/17	72.3

Table 3. Soil test results, applied fertilizer, total fertilizer and soil classification for the 2017 Corn Research Verification Fields.

County	Soil Test (lb/ac)					Applied Fertilizer N-P-K-S-Zn ¹ (lb/ac)			Total Applied Fertilizer N-P-K-S-Zn	Soil Classification
	pH	P	K	S	Zn	Preplant	Sidedress	Pre Tassel		
Jackson	6.8	70	226	12	4.6	46-90-90-0-10	150-0-0-0-0	46-0-0-0-0	242-90-90-0-10	
Prairie	7.1	18	120	28	5.8	60-60-90-0-0	113-0-0-24-0	46-0-0-0-0	219-60-90-24-0	Immanuel Silt Loam
River Valley	6.6	180	330	24	21.4	67-0-60-24-0	120-0-0-0-0	46-0-0-0-0	233-0-60-24-0	Dardanelle Silt Loam
St Francis	6.8	46	224	12	8.2	67-110-80-34-20	115-0-0-0-0	46-0-0-0-0	228-110-80-34-20	Bowdre Silty Clay Loam

Table 4. Soil test results, applied fertilizer, total fertilizer and soil classification for the 2017 Grain Sorghum Research Verification Fields.

County	Soil Test (lb/ac)					Applied Fertilizer N-P-K-S-Zn ¹ (lb/ac)		Total Applied Fertilizer N-P-K-S-Zn	Soil Classification
	pH	P	K	S	Zn	Preplant	Sidedress		
White	6.5	86	264	26	3.6	50-0-60-0-0	60-0-0-0-0	110-0-60-0-0	Calhoun Silt Loam

¹ N=nitrogen, P= phosphorus, K=potassium, S=sulfur and Zn=zinc.

Table 5. Pesticide information for the 2017 Corn Research Verification fields.

County	Herbicide	Insecticide	Fungicide
Jackson	1 qt glyphosate + 1 pt Dual II Magnum + 1 qt atrazine – March 31 1 qt glyphosate + 1 pt Dual II Magnum + 1 qt atrazine – April 26	None	Trivapro 13.7 oz/acre
Prairie	1 qt glyphosate + 1 pt Dual II Magnum + 2 qts atrazine – May 12	None	None
River Valley	3 oz Capreno + 1 qt glyphosate + 1.5 qts atrazine April 10	None	None
St Francis	3.6 pts Halex GT + 1.5 qts atrazine – April 19	None	None

Table 6. . Pesticide information for the 2017 Grain Sorghum Research Verification field.

County	Herbicide	Insecticide	Fungicide
White	1.5 pts metolachlor – April 26 1.0 qt atrazine – May 19 1.0 qt atrazine – June 6	14 oz Prevathon – July 26	None

Table 7. Irrigation information and rainfall for the 2017 Corn Research Verification Fields.

County	Irrigation Type	Number of Irrigations	Rainfall (in) Planting to Black Layer (R6)	Rainfall (in) Planting to Harvest
Jackson	Furrow	4		
Prairie	Furrow	3		
River Valley	Pivot	4		
St Francis	Furrow	2		

*Field was harvested for silage and didn't reach R6.

Table 8. Irrigation information and rainfall for the 2017 Grain Sorghum Research Verification Fields.

County	Irrigation Type	Number of Irrigations	Rainfall (in) Planting to Maturity	Rainfall (in) Planting to Harvest
White	Non Irrigated	***		

*Rainfall amount measured in verification field by weather stations.

*Each furrow irrigation provided approximately 2 acre/inches of water.

Economic Analysis – Breana Watkins

This section provides information on production costs for the 2017 CGSRVP. Records of field operations on each field provide the basis for estimating these costs. The field records were compiled by the CGSRVP coordinator, county Extension agents, and cooperators. Production data from the 5 fields (4 corn and 1 grain sorghum) 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 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 2017 Crop Enterprise Budgets published by the Cooperative Extension Service and information provided by the producer cooperators. 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 utilize employee labor or provide unpaid labor for equipment maintenance.

Operating expenses include production expenses, as well as interest paid on operating capital and all post-harvest expenses. Post-harvest expenses include, as applicable for each crop, hauling, drying, check-off fees, and other expenses typically incurred after harvest. Post-harvest expenses increase or decrease with yield.

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 represent prices of new equipment. This measure differs from typical depreciation methods, as well as actual annual cash expenses for machinery, but establishes a benchmark that estimates farm profitability.

Operating costs, total costs, costs per bushel, and returns are presented in Table 9 for corn and grain sorghum. Costs in this report do not include land costs, management or other expenses and fees not associated with production. Budget summaries for corn are presented in Table 10. A summary for grain sorghum is shown in Table 11. Price received for corn of \$3.75/bu is the 2017 average for the most active weeks of the harvest period. The corresponding average prices for grain sorghum is \$3.35/bu as determined by the most active weeks of the grain sorghum harvest period. Average corn yield from the verification fields harvested for grain is 219.55 bu/acre and the grain sorghum yield is 72.3 bu/acre.

Average production expenses for the corn fields harvested for grain in Table 10 are \$372.62 per acre. Table 10 indicates that fertilizers and nutrients are the largest expense category at \$141.04 per acre, or 38% of production expenses. Seed costs average \$122.50 per acre which is 33% of production expenses.

With average corn yield of 219.55 bu/acre, average operating costs are \$2.20/bu in Table 9. Operating costs range from a low of \$419.10 in the River Valley field to a high of \$541.36 in St.

Francis County. Returns to operating costs average \$341.35 per acre. Returns to operating costs have a low of \$309.49 in Jackson County and a high of \$384.53 in the River Valley field. Average fixed costs are \$81.91 which leads to an average total costs of \$563.87 per acre. Returns to total costs average \$259.44 per acre with a low of \$227.64 in Prairie County and a high of \$291.22 in the River Valley field. Total specified costs average \$2.57/bu.

The grain sorghum field has an average production expense of \$206.91 per acre in Table 11. Fertilizers and nutrients are 24% of production expenses with an average expense of \$50.03 per acre in Table 11. Operating expenses average \$208.89 which is \$2.89/bu as determined by the yield in the White County field. Returns to operating costs average \$33.31 per acre. Fixed costs average \$76.60 per acre. This leads to average total costs of \$285.49 per acre, or \$3.95/bu. Returns to total specified costs average -\$43.39 per acre.

Table 9. Operating Costs, Total Costs, and Returns, 2017 Corn & Grain Sorghum RVP in dollars.

Corn							
Field	Operating Costs	Operating Costs per Bu.	Returns to Operating Costs	Total Fixed Costs	Total Costs	Returns to Total Costs	Total Costs per Bu.
Jackson	530.13	2.37	309.49	73.81	603.94	235.68	2.70
Prairie	437.25	2.18	316.50	88.86	526.11	227.64	2.62
River Valley	419.1	1.96	384.53	93.31	512.4	291.22	2.39
St. Francis	541.36	2.27	354.89	71.67	613.03	283.22	2.56
Average	481.96	2.20	341.35	81.91	563.87	259.44	2.57
Grain Sorghum							
White	208.89	2.89	33.31	76.60	285.49	-43.29	3.95
Average	208.89	2.89	33.31	76.60	285.49	-43.29	3.95

Table 10. 2017 Corn RVP, Summary of Revenue and Expenses per Acre

Revenue	Jackson	Prairie	St. Francis	River Valley	Average
Yield: Grain (bu.)	223.9	201	239	214.3	219.55
Price: Grain (\$/bu.)	3.75	3.75	3.75	3.75	3.75
Total Crop Revenue	839.63	753.75	896.25	803.63	823.32
Expenses					
Seed	126.00	126.00	126.00	112.00	122.50
Fertilizers & Nutrients	152.03	125.28	187.96	98.88	141.04
Herbicides	38.85	15.00	27.48	29.10	27.61
Insecticides	0.00	0.00	0.00	0.00	0.00
Custom Applications	28.00	7.00	21.00	7.00	15.75
Other Inputs	3.50	3.50	3.50	3.50	3.50
Diesel Fuel	8.66	12.36	9.77	9.72	10.13
Irrigation Energy Costs	5.83	2.92	6.56	13.28	7.15
Input Costs	373.39	292.06	382.27	273.48	330.30
Fees	13.00	13.00	13.00	13.00	13.00
Repairs & Maintenance ¹	22.61	28.55	16.00	19.13	21.57
Labor, Field Activities	6.16	9.68	7.24	7.91	7.75
Production Expenses	415.16	343.29	418.51	313.52	372.62
Interest	8.83	7.13	8.92	6.64	7.88
Post-harvest Expenses	100.76	90.45	107.55	96.44	98.80
Total Operating Expenses	530.13	437.25	541.36	419.10	481.96
Returns to Operating Expenses	309.49	316.50	354.89	384.53	341.35
Capital Recovery & Fixed Costs	73.81	88.86	71.67	93.31	81.91
Total Specified Expenses²	603.94	526.11	613.03	512.40	563.87
Returns to Specified Expenses	235.68	227.64	283.22	291.22	259.44
Operating Expenses/bu.	2.37	2.18	2.27	1.96	2.20
Total Specified Expenses/bu.	2.70	2.62	2.56	2.39	2.57

¹Includes employee labor allocated to repairs and maintenance.

Table 11. Summary of Revenue and Expenses per Acre, 2017 Grain Sorghum RVP

Revenue	White
Yield (bu.)	72.3
Price (\$/bu.)	3.35
Total Crop Revenue	242.21
Expenses	
Seed	25.20
Fertilizers & Nutrients	50.03
Herbicides	14.75
Insecticides	16.30
Other Chemicals	0.00
Custom Applications	21.00
Other Inputs	0.00
Diesel Fuel	12.77
Irrigation Energy Costs	0.00
Input Costs	167.05
Fees	13.00
Repairs & Maintenance ¹	17.44
Labor, Field Activities	9.42
Production Expenses	206.91
Interest	3.91
Post-harvest Expenses	18.80
Total Operating Expenses	208.89
Returns to Operating Expenses	33.31
Capital Recovery & Fixed Costs	76.60
Total Specified Expenses²	285.49
Returns to Specified Expenses	-43.29
Operating Expenses/bu.	2.89
Total Specified Expenses/bu.	3.95