ECONOMIC OVERVIEW AND SUSTAINABILITY OF ARKANSAS COTTON RESEARCH AND SUSTAINABILITY PROGRAM

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Abstract

Producers continuously focus on adjustments that can be made to increase efficiency in an effort to improve profitability. As changes in production are made and producers improve efficiency, a positive impact is often observed in regards to sustainability. Practices that lead to becoming more sustainable often lead to increased yield, a decrease in operating expenses dollar per pound lint harvested. A modified production system no-till cover is a strategy that has direct impact on improving soil health and becoming more sustainable. However, producers are often hesitant to adopt a new technology. The objective of this study is to evaluate the impact no-till with cover crop has on yield, cost of production and improved sustainability. The University of Arkansas Cotton Research Verification Sustainability Program (CRVSP) conducted research along with Discovery farms on several fields in 2017. All but two fields allowed for comparisons to be made between Farmer Standard no-cover to that of a modified production system no-till with cover crop. Throughout this study all of the producers' inputs were recorded providing the information needed to calculate both fixed and variable costs. Budget summaries for cotton are presented in Table 2. Price received for cotton of $0.74 is the estimated Arkansas annual average for the 2016 production year, and includes a $0.05 premium for cotton seed value after deducting post-harvest expenses. Average cotton yield for all verification fields is 1159 lint pounds per acre.

Introduction

The University of Arkansas, Division of Agriculture has been conducting the CRVP since 1980. This is an interdisciplinary effort in which best management practices and production technologies are applied in a timely manner to a specific farm field. Since the inception of the CRVP in 1980, there have been 283 fields entered into the program. The success of the cotton program spawned verification programs in rice, soybeans, wheat and corn in Arkansas and other states in the Mid-South. In 2014, the CRVP became known as the CRVSP. The CRVSP expands beyond that of the traditional verification program by measuring the producers' environmental footprint for each field and evaluating the connection between profitability and sustainability.

Methods

The CRVSP was comprised of 14 fields at three locations in 2016, with 8 fields being in Desha County, 2 fields in Mississippi County, and 4 fields in St. Francis County. Each field was entered into the Field to Market Fieldprint Calculator. Two fields entered second year of research regarding Farmer Standard with stale seedbed compared to that of a modified production system no-till with cover. Increasing both efficiency and profitability will continue to be a major part of the program in 2017.

The CRVSP has worked along with Discovery farms in Southeast Arkansas on 6 of the 14 fields in the program. Discovery farms main focus is to monitor edge of field water quality. Fields are watered in two sets. The split field arrangement provides the opportunity to compare two production strategies. The farmer standard tillage and cover crop usage was compared to a no-till system with a cereal rye cover crop. At the Mississippi and St. Francis County locations the fields were not accompanied with the unique opportunity of having the fields watered in two sets. In fall 2015, all no-till with cover fields had cereal rye broadcasted, with a targeted seeding rate of 56 lbs/A. The remaining two fields had no established cover crops in 2016. Irrigation methods was composed of either furrow or pivot irrigation at all locations. This program was conducted under various farmers' standard tillage treatments, irrigation regimes, soil types and environmental conditions. The diversity of the fields in the program reflect cotton production in Arkansas. Field records were maintained and economic analysis were conducted at seasons end to determine net return per acre for each field in the program.

Results

The majority of the cotton in Arkansas was planted from late April to mid- May. Plant Bug numbers decreased this year compared to 2015, fields in the CRVSP were treated an average of 2.3 times for plant bugs. A slightly higher plant bug pressure was seen in St. Francis County in 2016 compared to other fields in the study. Each field had an average of 1.3 burndowns, and 1.9 herbicide applications for the 2016 season. All fields except for Manila had an average of 1.7 treatments for moths/worms. Average costs for herbicides and insecticides were $82.56 and $38.60 respectively. Pest control represents a significant expense and can impact yield greatly.

Records of field operations on each field provide the basis for estimating expenses. Production data from the 14 fields were applied to determine costs and returns above operating costs, as well as total specified costs. Operating costs and total costs per pound indicate the commodity price needed to meet each costs type. Operating costs, total costs, costs per pound, and returns are presented in Table 1. Costs in this report do not include land costs, management, or other expenses and fees associated with production. Budget summaries for cotton are presented in Table 2. Price received for cotton of $0.74/lb. is the estimated Arkansas annual average for the 2016 production year and includes a $0.05 premium for cottonseed value after deducting all post-harvest expenses. Average cotton yield for all verification fields is 1,159 lb. per acre. Value of cottonseed is set equal to total post-harvest expenses for each field with a $0.05/lb. net premium.

Average operating costs for cotton in Table 1 and Table 2 are $512.31 per acre. Table 2 indicates that chemicals average $151.16/acre and are 30% of the operating expenses. Seed and associated technology fees average $127.00/acre, or 25% of operating expenses and include six fields planted with a cover crop. Fertilizer and nutrient costs average 17% of operating expenses and are $86.08/acre.

With average yield of 1,159 lb. per acre, average operating costs are $0.45/lb. in Table 1. Operating costs range from a low of $450.96 in the Manila North field to a high of $551.01 in the Grain Bin West Field. Returns to operating costs average $345.51. The range is from a low of $200.90 in the Wellcot field to a high of $456.64 in the Conder's South field. Average fixed costs are $150.12 which leads to average total costs of $662.43 per acre. The average returns to total specified costs are $195.39 per acre. The low is $42.11 in the Shop North field, and the high is $307.56 in the Conder's South field. Total specified costs average $0.58/lb.

Table 1. Operating Costs, Total Costs, and Returns for 2016 CRVSP fields

Field	Operating Costs	Operating Costs per Pound	Returns to Operating Costs	Total Fixed Costs	Total Costs	Returns to Total Costs	Total Costs per Pound
Shop North	523.95	0.53	201.99	159.88	683.83	42.11	0.70
Shop South	538.26	0.50	257.98	141.70	679.96	116.28	0.63
Weaver North	506.57	0.40	431.75	158.70	665.27	273.05	0.52
Weaver South	524.67	0.41	417.35	136.49	661.17	280.85	0.52
Homeplace	531.53	0.49	278.77	160.63	692.17	118.13	0.63
Grain Bin East	527.58	0.43	372.26	136.51	664.10	235.74	0.55
Grain Bin West	551.01	0.42	409.51	154.05	705.06	255.46	0.54
Wellcot	459.92	0.52	200.90	147.65	607.57	53.25	0.68
Manila South	466.40	0.42	349.82	154.96	621.36	194.86	0.56
Manila North	450.96	0.40	392.64	170.29	621.25	222.35	0.54
Conders North	529.64	0.44	370.94	138.02	667.66	232.92	0.55
Conders South	512.76	0.39	456.64	149.07	661.83	307.56	0.51
Causey West	538.23	0.45	340.89	151.66	689.89	189.23	0.58
Causey East	510.80	0.44	355.74	142.11	652.91	213.63	0.56
Average	**512.31**	**0.45**	**345.51**	**150.12**	**662.43**	**195.39**	**0.58**

[1]Returns include cottonseed value equal to post-harvest expenses with a $0.05/lb. premium added to lint price.

Table 2. Summary of Revenue and Expenses per Acre for 2016 CRVSP fields

	Field							
Revenue	Shop North	Shop South	Weaver North	Weaver South	Homeplace	Grain Bin East	Grain Bin West	Wellcot
Yield (lb.)	981	1,076	1,268	1,273	1,095	1,216	1,298	893
Price[1] ($/lb.)	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Total Crop Revenue	**725.94**	**796.24**	**938.32**	**942.02**	**810.30**	**899.84**	**960.52**	**660.82**
Cottonseed Value[1]	128.17	140.58	165.66	166.32	143.06	158.87	169.58	116.67
Expenses								
Seed	116.22	137.22	115.21	127.78	118.02	130.59	109.59	109.59
Fertilizers & Nutrients	82.84	82.84	74.29	82.84	82.84	82.84	82.84	82.84
Herbicides	112.29	112.29	106.29	106.29	92.82	106.28	118.66	58.73
Insecticides	38.06	38.06	38.06	38.06	52.71	38.06	61.84	32.30
Other Chemicals	27.34	27.34	27.34	27.34	29.60	27.34	27.34	28.08
Custom Applications	35.00	35.00	35.00	42.00	42.00	42.00	42.00	42.00
Other Inputs	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
Diesel Fuel	14.38	12.08	14.58	11.52	14.90	11.52	14.25	13.61
Irrigation Energy Costs	8.76	8.05	7.28	5.43	8.84	5.46	6.57	7.34
Input Costs	**438.37**	**456.37**	**421.54**	**444.75**	**445.23**	**447.58**	**466.58**	**377.99**
Fees	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00
Repairs & Maintenance[2]	29.03	26.95	28.76	26.06	29.28	26.06	27.80	27.69
Labor, Field Activities	22.40	20.44	22.52	19.69	22.70	19.70	21.84	21.58
Production Expenses	**511.80**	**525.77**	**494.82**	**512.50**	**519.20**	**515.34**	**538.22**	**449.25**
Interest	12.16	12.49	11.75	12.17	12.33	12.24	12.78	10.67
Post-harvest Expenses	128.17	140.58	165.66	166.32	143.06	158.87	169.58	116.67
Operating Expenses	**523.95**	**538.26**	**506.57**	**524.67**	**531.53**	**527.58**	**551.01**	**459.92**
Returns to Operating Expenses	**201.99**	**257.98**	**431.75**	**417.35**	**278.77**	**372.26**	**409.51**	**200.90**
Capital Recovery & Fixed Costs	159.88	141.70	158.70	136.49	160.63	136.51	154.05	147.65
Total Specified Expenses[3]	**683.83**	**679.96**	**665.27**	**661.17**	**692.17**	**664.10**	**705.06**	**607.57**
Returns to Specified Expenses	**42.11**	**116.28**	**273.05**	**280.85**	**118.13**	**235.74**	**255.46**	**53.25**
Operating Expenses/lb.	0.53	0.50	0.40	0.41	0.49	0.43	0.42	0.52
Total Expenses/lb.	0.70	0.63	0.52	0.52	0.63	0.55	0.54	0.68

[1]Price includes cottonseed value equal to post-harvest expenses with a $0.05/lb. premium added to lint price.

[2]Includes employee labor allocated to repairs and maintenance.

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

Table 2 Continued. Summary of Revenue and Expenses per Acre for 2016 CRVSP fields comparing farmer standard (FS) with or without cover crop (CC) to no-till (NT) with or without cover crop (CC)

	Field						
Revenue	Manila South	Manila North	Conders North	Conders South	Causey West	Causey East	**Average**
Yield (lb.)	1,103	1,140	1,217	1,310	1,188	1,171	1,159
Price[1] ($/lb.)	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Total Crop Revenue	**816.22**	**843.60**	**900.58**	**969.40**	**879.12**	**866.54**	**857.82**
Cottonseed Value[1]	144.11	148.94	159.00	171.15	155.21	152.99	151.45
Expenses							
Seed	123.33	108.98	155.88	134.88	155.88	134.88	127.00
Fertilizers & Nutrients	103.74	103.74	85.86	85.86	85.86	85.86	86.08
Herbicides	41.74	41.74	64.68	64.68	64.68	64.68	82.56
Insecticides	26.14	26.14	37.73	37.73	37.73	37.73	38.60
Other Chemicals	30.70	30.70	34.24	34.24	34.24	34.24	30.00
Custom Applications	25.00	18.00	41.00	34.00	34.00	34.00	35.79
Other Inputs	3.50	3.50	24.53	32.16	29.49	29.12	10.74
Diesel Fuel	10.98	13.43	8.79	10.53	11.89	10.79	12.38
Irrigation Energy Costs	20.01	20.01	7.22	7.22	7.18	7.38	9.05
Input Costs	**385.15**	**366.24**	**459.93**	**441.30**	**460.95**	**438.69**	**432.19**
Fees	22.00	22.00	22.00	22.00	22.00	22.00	22.00
Repairs & Maintenance[2]	28.89	30.68	26.70	27.77	29.69	27.74	28.08
Labor, Field Activities	19.54	21.58	8.72	9.79	13.10	10.52	18.15
Production Expenses	**455.58**	**440.50**	**517.35**	**500.87**	**525.74**	**498.95**	**500.42**
Interest	10.82	10.46	12.29	11.90	12.49	11.85	11.89
Post-harvest Expenses	144.11	148.94	159.00	171.15	155.21	152.99	151.45
Operating Expenses	**466.40**	**450.96**	**529.64**	**512.76**	**538.23**	**510.80**	**512.31**
Returns to Operating Expenses	**349.82**	**392.64**	**370.94**	**456.64**	**340.89**	**355.74**	**345.51**
Capital Recovery & Fixed Costs	154.96	170.29	138.02	149.07	151.66	142.11	150.12
Total Specified Expenses[3]	**621.36**	**621.25**	**667.66**	**661.83**	**689.89**	**652.91**	**662.43**
Returns to Specified Expenses	**194.86**	**222.35**	**232.92**	**307.56**	**189.23**	**213.63**	**195.39**
Operating Expenses/lb.	0.42	0.40	0.44	0.39	0.45	0.44	0.45
Total Expenses/lb.	0.56	0.54	0.55	0.51	0.58	0.56	0.58

[1]Price includes cottonseed value equal to post-harvest expenses with a $0.05/lb. premium added to lint price.
[2]Includes employee labor allocated to repairs and maintenance.
[3]Does not include land costs, management, or other expenses and fees not associated with production.

Summary

Various different production methods exist, as no one practice will work for all producers as there are differences among locations. The program was conducted under various farmers' standard tillage treatments, irrigation regimes, soil types and environmental conditions. To give an idea of the field locations: (8) fields were located in Southeast Arkansas, (4) fields were located in Eastern Arkansas, and (2) field were located in Northeast Arkansas. All but two fields allowed for comparison of farmer standard tillage to that of a modified production system no-till cover. Converting to no-till with cover crops is one strategy that often improves soil health, sustainability and often increases yield. The no-till cover fields had 56 lbs/A of cereal rye cover crop seed broadcasted on the field in the fall of 2015 after stalks were shredded. The cover crop seed expense is the reason why the seed prices vary between farmer standard and no-till fields. One significant expense that can impact yield greatly is pest control. As yield increases, operating expenses per pound and total expenses per pound decrease. The information presented above does not include land costs, management, or other expenses and fees not associated with production. This program has become a vital tool in the educational efforts of the University of Arkansas. It continues to serve as a broad clientele including cotton growers, consultants, researchers, and county extension agents. The program strives to obtain its goals and provide timely information to the Arkansas cotton commodity.