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SUMMARY OF PRECISION FARMING PRACTICES AND PERCEPTIONS OF MISSISSIPPI COTTON PRODUCERS: RESULTS FROM THE 2001 SOUTHERN PRECISION FARMING SURVEY

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Abstract

Precision farming is being hailed as a set of new technologies promising private economic gains and societal environmental benefits. These new technologies are used to identify and measure within-field variability and its causes, prescribe site-specific input applications that match varying crop and soil needs, and apply the inputs as prescribed. Reduction of input levels, increased efficiency of inputs as well as proper timing of the inputs can reduce costs as well increase yields/returns.

Extensive research has been conducted in low value grain crops for which yield monitors have been commercialized. The use of precision technology for cotton (a higher valued crop) is more limited because accurate yield monitors have only recently become commercially available. Because cotton is an important high-value crop in Mississippi, an assessment of the use of precision farming practices, an investigation into the factors that influence adoption of precision farming technologies, and an evaluation of the likelihood that cotton producers will adopt newly developed yield monitoring systems would provide important information for Mississippi cotton producers and agri-businesses alike.

The adoption of precision farming technologies depends on the characteristics of the decision-maker, the farm, and the cotton market. The 1997 Census of Agriculture revealed 1700 cotton producers in Mississippi. Overall characteristics of Mississippi farms as reported in the 1997 Census were 65 percent full ownership of farm land, 96% family/partner ownership of the farming operation, 3% corporate ownership, 6.8% of the farms contained 1000 acres or more. Planted acres of cotton in Mississippi have ranged from .95 million acres to 1.3 million acres over the last five years. Statewide cotton yields have averaged 753 pounds for the period 1996-2000. The future of precision farming in cotton production depends on how producers view this set of new technologies and how willing they are to improve current management practices.

The objectives of this study were 1) to determine attitudes toward and current use of precision farming technologies by Mississippi cotton producers and 2) to examine Mississippi cotton producers' willingness to pay for a cotton yield monitoring system. A mail survey of cotton producers located in Alabama, Florida, Georgia, Mississippi, North Carolina, and Tennessee was conducted in January and February of 2001 to establish the current use of precision farming technologies in these Southeastern states. This report provides information dealing with the Mississippi portion of the survey.

Results indicate cotton producers are listening to crop consultants, extension and research personnel at universities, and farm dealers in making decisions about precision farming. Most responding cotton producers use computers for farm management decisions, believe precision farming will be profitable in the future, and those producers who adopt these technologies do so to increase profit. The top four precision farming technologies being used by adopters were soil survey maps, soil grid sampling, soil sampling by management zones and variable rate fertilizer application. Responding producers indicated less willingness to purchase precision farming equipment (yield monitors) as price increased.

Objectives

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Survey Methods

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A questionnaire was developed to query producers about their attitudes toward and use of precision farming technologies (Appendix 1). The questionnaire was previously pre-tested on two producers in Tennessee by the University of Tennessee researchers involved in this study and their suggestions were incorporated into the final version. Following Dillman's general mail survey procedures, the questionnaire, a postage paid return envelope, and a cover letter explaining the purpose

of the survey were sent to each producer. The initial mailing of the questionnaire was on January 16, 2001, and a reminder post card was sent one week later on January 23, 2001. A follow-up mailing to producers not responding to previous inquiries was conducted three weeks later on February 15, 2001. The second mailing included a letter indicating the importance of the survey, the questionnaire, and a postage paid return envelope. Producers were instructed to return their questionnaire without filling it out if they were not a cotton producer.

A mailing list of 1334 potential Mississippi cotton producers for the 1999-2000 season was furnished by the Cotton Board in Memphis, Tennessee (Skourpa, 2000). Of the 1334 questionnaires mailed, 24 were returned undeliverable and 28 indicated they were not cotton farmers or had retired, giving a total of 1282 cotton producers in Mississippi. Of those who responded, 262 individuals provided data. Assuming the remaining non-respondents to the survey were active cotton producers, the usable response rate was 20 percent.

Acknowledgements

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Conclusions

The objectives of this study were 1) to determine attitudes toward and current use of precision farming technologies by Mississippi cotton producers and 2) to examine Mississippi cotton producers' willingness to pay for a cotton yield monitoring system. Cotton producers are confronted everyday with information concerning the rapidly growing precision farming industry. Most responding cotton producers use computers for farm management decisions, believe precision farming will be profitable in the future, and those producers who adopt these technologies do so to increase profit. Cotton producers are listening to crop consultants, extension and research personnel at universities, and farm dealers in making decisions about precision farming. Responding adopters of precision farming practices planted more cotton acreage and reported higher yields per acre than non-adopters. The top four precision farming technologies being used by adopters were soil survey maps, soil grid sampling, soil sampling by management zones and variable rate fertilizer application. Responding producers indicated less willingness to purchase precision farming equipment (yield monitors) as price increased. As more information becomes available, cotton producers will have greater opportunities to make more informed decisions about the use of these technologies on their farms. Findings from this and other studies that investigate the current use and future prospects of precision farming technologies are important to cotton producers because they provide the needed information for making better decisions.

Table 1. Primary county of cotton farm business reported by primary decision maker for Mississippi cotton farms - 2001 Southern Precision Farming Survey[a]

County	1997 Census of Agriculture[b]	Number of Usable Surveys	Precision Farming Adopters	Precision Farming Non-adopters
Benton	9 (.6%)[C]	1 (.4%)	0	1 (.6%)
Bolivar	97 (6%)	18 (7%)	5 (8%)	13 (7%)
Calhoun	67 (4%)	2 (.8%)	1	2 (1%)
Carroll	31 (2%)	4 (2%)	2 (3%)	2 (1%)
Chickasaw	11 (.7%)	3 (1%)	0	3 (2%)
Claiborne	3 (.2%)	2 (.8%)	2 (3%)	1 (.6%)
Coahoma	92 (6%)	16 (7%)	5 (8%)	11 (4%)
Copiah	4 (.2%)	1 (.4%)	0	1 (.6%)
Desoto	18 (1%)	2 (.8%)	0	2 (1%)
Forrest	1 (0%)	1 (.4%)	0	1 (.6%)
George	5 (.2%)	3 (1%)	0	3 (2%)
Greene	4 (.2%)	1 (.4%)	0	1 (.6%)
Hinds	28 (2%)	3 (1%)	0	3 (2%)
Holmes	57 (4%)	10 (4%)	3 (5%)	7 (4%)
Humphreys	93 (6%)	17 (7%)	6 (10%)	11 (4%)
Issaquena	29 (2%)	4 (2%)	0	4 (2%)
Itawamba	7 (.4%)	2 (.8%)	0	2 (1%)
Lafayette	16 (1%)	1 (.4%)	0	1 (.6%)
Leake	9 (.6%)	1 (.4%)	1	0
Leflore	107 (7%)	26 (11%)	7 (11%)	19 (10%)
Lowndes	18 (1%)	5 (2%)	0	5 (3%)
Madison	42 (3%)	7 (3%)	2 (3%)	5 (3%)
Monroe	27 (2%)	4 (2%)	0	4 (2%)
Montogomery	36 (2%)	3 (2%)	0	3 (2%)
Noxubee	14 (.9%)	4 (2%)	0	4 (2%)
Panola	53 (3%)	4 (2%)	2 (3%)	2 (1%)
Pontotoc	17 (1%)	4 (2%)	0	4 (2%)
Prentiss	8 (.6%)	1 (.4%)	0	1 (.6%)
Quitman	56 (4%)	7 (3%)	4 (6%)	3 (2%)
Rankin	15 (1%)	2 (.8%)	0	2 (1%)
Sharkey	41 (3%)	10 (4%)	2	8 (4%)
Sunflower	81 (5%)	10 (4%)	3 (2%)	7 (4%)
Tallahatchie	93 (6%)	5 (2%)	4	1 (.6%)
Tate	30 (2%)	2 (.8%)	0	2 (1%)
Tippah	5 (.5%)	1 (.4%)	0	1 (.6%)
Tunica	35 (2%)	8 (3%)	5 (8%)	3 (2%)
Union	13 (.9%)	1 (.4%)	0	1 (.6%)
Warren	14 (.9%)	1 (.4%)	0	1 (.6%)
Washington	123 (8%)	30 (12%)	10 (16%)	20 (11%)
Webster	53 (3%)	3 (1%)	0	3 (2%)
Yazoo	102 (7%)	13 (5%)	4 (6%)	9 (5%)
Total	1564 (+/-100%)	244 (+/-100%)	62 (+/-100%)	182 (+/-100%)

[a] Survey question 27. [b] Reported in the 1997 Census of Agriculture, USDA. [c] Numbers in parenthesis indicate the percentage of respondents who gave the associated answer.

Table 2. Results experienced by precision farming adopters for Mississippi cotton farms - 2001 Southern Precision Farming Survey

Survey Question	Number of Responses	Yes	No
Was precision farming profitable on your fields? [a]	43	31(72)[b]	12(28%)
Have you experienced any improvements in environmental quality as a result of precision farming? [c]	42	14(33%)	28(67%)

[a] Survey question 16. [b] Number in parenthesis indicate the percentage of respondents who gave the associated answer. [c] Survey question 18.

Table 3. Opinions regarding precision farming reported by Mississippi cotton farms - 2001 Southern Precision Farming Survey

	Adopters		Non-adopters	
Do you think it would be profitable for you to use precision farming technologies in the future? [a]	Yes 50 (88%)[b]	No 7 (12%)	Yes 117 (66%)	No 61 (34%)
If you believe it would be profitable, would you prefer to own or rent your equipment? [c]	Own 28 (61%)	Rent 18(39%)	Own 71 (53%)	Rent 64 (47%)

[a] Survey question 20. [b] Number in parenthesis indicate the percentage of respondents who gave the associated answer. [c] Survey question 21.

Table 4. Years of experience with alternative precision farming technologies for cotton reported by Mississippi cotton farms - 2001 Southern Precision Farming Survey[a]

Technology	Number of Responses	Average	Standard Deviation	Minimum	Maximum
		----------Number of Years----------			
Yield monitoring - with GPS [b]	8	1.63	.92	1	3
Yield monitoring - without GPS	3	4	1	3	5
Yield monitoring - without a yield monitor	15	12.47	9.36	2	25
Soil sampling – grid	23	2.96	1.94	1	7
Soil sampling - management zone	23	12.43	7.5	1	25
Remote sensing - aerial photos	2	14	15.56	3	25
Remote sensing - satellite images	2	12.5	10.61	5	20
Soil survey maps	27	19.67	9.97	1	40
Mapping topography, slope, soil depth, etc.	7	14.71	8.10	3	25
Plant tissue testing	17	6.05	3.49	1	10
On-the-go sensing	3	7.33	5.51	1	11
Variable rate nitrogen application	13	4.31	3.15	1	10
Variable rate phosphorous and potassium application	20	3.45	2.98	1	10
Variable rate lime application	14	4.07	3.58	1	11
Variable rate seed application	5	7	4.3	1	11
Variablerate growth regulator application	11	7.36	3.96	2	15
Variable rate defoliant application	6	11	4.56	7	20
Variable rate fungicide application	4	7.75	4.57	1	11
Variable rate herbicide application	10	5.9	4.12	2	12
Variable rate insecticide application	4	8.25	3.60	3	11
Variable rate irrigation	3	7	4.36	2	10

[a] Survey question 1. [b] Global positioning system.

Table 5. Factors that influenced the adoption of precision farming practices reported by Mississippi cotton farms - 2001 Southern Precision Farming Survey[a]

Item	Number of Responses	Level of Importance[b]				
		Not Important				Very Important
		1	2	3	4	5
Profit	65	1 (2%)[c]	1(2%)	1 (2%)	14 (22%)	48 (74%)
Environmental benefits	58	1 (2%)	5 (9%)	15 (26%)	22 (38%)	15 (26%)
Be at the forefront of agricultural technology	57	13 (23%)	9 (16%)	15 (26%)	10 (18%)	10 (18%)
Fear of being left behind	59	25 (42%)	9 (15%)	12 (20%)	7 (12%)	6 (10%)

[a] Survey question 3. [b] Level of importance ranges from not important (1) to very important (5). [c] Numbers in parenthesis indicate the approximate percentage of respondents who gave the associated answer.

Table 6. Use of variable rate application technology on cotton fields reported by Mississippi cotton farms – 2001 Southern Precision Farming Survey[a]

Input	Did you use variable rate technology to apply?			If you used variable rate technology, how did it affect total input use?			
	Number of Responses	Yes	No	Number of Responses	Increase	Decrease	Same
N fertilizer	68	16 (25%)[b]	52 (75%)	11	5 (45%)	3 (27%)	3 (27%)
P&K fertilizer	68	27 (40%)	41 (60%)	24	3 (13%)	15 (63%)	6 (25%)
Lime	67	20 (30%)	47 (70%)	17	4 (24%)	11 (65%)	2 (12%)
Manure application	59	3 (5%)	56 (95%)	0	0	0	0
Seed	61	6 (10%)	55 (90%)	0	1 (33%)	2 (67%)	0
Herbicide	64	8 (13%)	53 (87%)	9	4 (44%)	5 (56%)	0
Insecticide	61	8 (13%)	53 (87%)	5	1 (20%)	3 (60%)	1 (20%)
Nematicide	58	1 (2%)	57 (98%)	1	0	1 (100%)	0
Irrigation	60	3 (5%)	57 (97%)	3	2 (67%)	1 (33%)	0
Funigicide	0	2 (3%)	58 (97%)	0	0	0	
Growth regulator	62	11 (18%)	51 (82%)	10	0	10(100%)	0
	64	11 (17%)	53 (83%)	7	3 (43%)	3 (43%)	1 (14%)

[a] Survey question 9. [b] Numbers in parenthesis indicate the percentage of respondents who gave the associated answer.

Table 7. Degree of helpfulness assigned to information sources in learning about precision farming technologies reported by Mississippi cotton farms - 2001 Southern Precision Farming Survey[a]

Source	Average Level of Helpfulness[b]
Crop Consultants	3.62
Extension/Universities	3.28
Farm Dealers	2.58
Other Farmers	1.90
Trade Shows	1.38

Table 8. Respondents' willingness to purchase a yield monitoring system with a global positioning system for their 4 or 5-row cotton pickers at a specified dollar amount reported by Mississippi cotton farms - 2001 Southern Precision Farming Survey[a]

Purchase cost for a yield monitor system for a 4 or 5-row cotton picker	Number of Responses	Yes	No	Don't Know	Don't intend to purchase/lease a new picker
$4,500					
Adopters	6	2 (33%)[b]	2(33%)	2 (33%)	0
Non-adopters	26	1 (4%)	14 (54%)	8 (31%)	3 (12%)
$6,000					
Adopters	13	3 (23%)	4 (31%)	4(31%)	2(15%)
Non-adopters	35	1 (3%)	21 (60%)	7 (20%)	6 (17%)
$7,500					
Adopters	8	0	3 (38%)	3 (38%)	2(25%)
Non-adopters	26	1 (4%)	12 (46%)	8 (31%)	5 (19%)
$9,000					
Adopters	9	2 (22%)	3 (33%)	3 (33%)	1 (11%)
Non-adopters	31	3(10%)	16 (52%)	10 (32%)	2 (6%)
$10,500					
Adopters	12	1(8%)	8 (67%)	3(25%)	0
Non-adopters	28	0	12 (43%)	8 (29%)	8(29%)
$12,000					
Adopters	5	0		1 (20%)	1(20%)
Non-adopters	20	0	12 (60%)	6 (30%)	2 (10%)

[a] Survey question 31. [b] Number in parenthesis indicate the percentage of respondents who gave the associated answer.