STATUS OF PRECISION AGRICULTURE TECHNOLOGY ADOPTION BY LOUISIANA COTTON PRODUCERS

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Abstract

Precision agriculture technologies for cotton production have been commercially available for only a short time. It is important to know what producers attitudes are toward these technologies and what factors they consider important in making an adoption decisions. A mail survey of cotton producers was conducted in 2009 to obtain information on the status of precision agriculture technology adoption. Results of the survey indicated that over half of respondents had adopted precision agriculture technologies for cotton production. The primary reason given for adoption was improving profit potential.

Introduction

Cotton producers have adopted precision agriculture technologies as these technologies became commercially available. Since the commercialization of these technologies, the economic environment of cotton production has changed dramatically. This study was initiated to assess the adoption of precision agriculture technologies in Louisiana cotton production. This study is part of a larger study on precision agriculture technology adoption in the Southeastern United States.

Methods

A survey of Louisiana cotton producers was conducted in 2009 to obtain information on precision farming technology adoption. A total of 614 questionnaires were mailed to individuals identified as cotton producers by the Louisiana Agricultural Statistics Service. Mail survey techniques suggested by Dillman were followed. A total of 89 surveys were returned for a response rate of approximately 14%. Several respondents indicated they no longer produced cotton or no longer farmed. There were 71 completed questionnaires used to compile the results reported below.

Results

Respondent Characteristics

Precision agriculture technology adopters operated an average of 1,892 acres of cropland in 2007 and 1,821 acres in 2008 (Figure 1). Non-adopters operated 1,509 acres in 2007 and 1,647 acres in 2008. Cropland acres ranged from a low of 350 acres to a maximum of 3,180 acres.

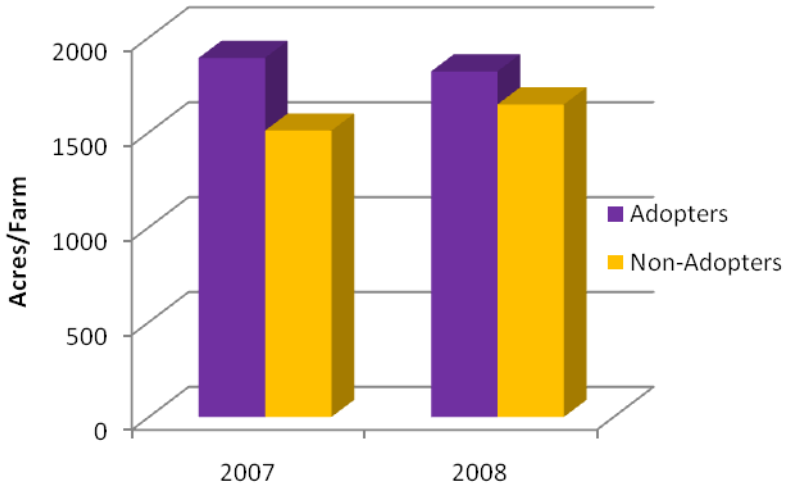

Figure 1. Total Cropland per Farm, Precision Agriculture Adopters versus Non-adopters, Louisiana, 2007-08.

Farm Size

Cotton farmers adopting precision farming technologies operated an average of 693 acres of cotton in 2008 compared to an average of 447 for non-adopters (Figure 2). The 2007 acreage was 446 per farm for adopters and 351 for non-adopters. Overall, approximately 30 percent of the cotton was produced on rented acres. This is about half of the historic average for rented acreage on cotton farms in Louisiana.

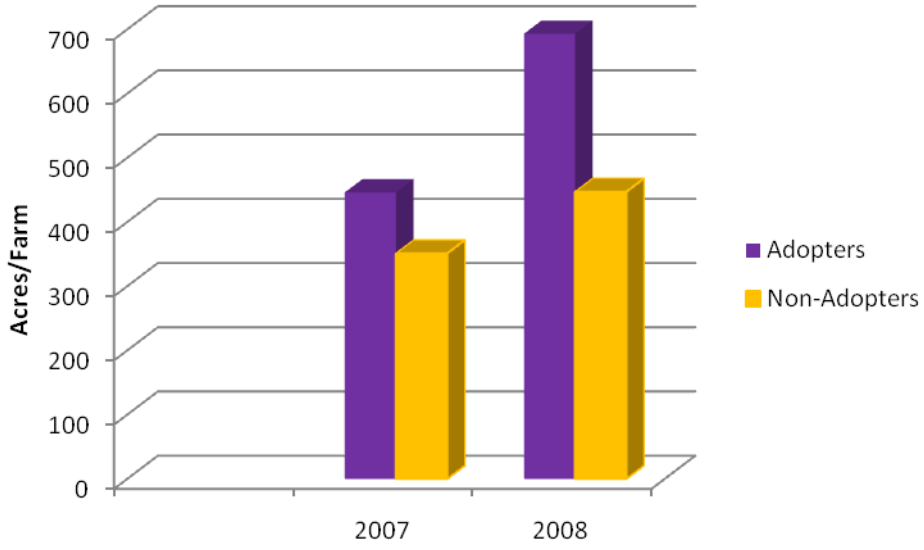

Figure 2. Comparison of Cotton Acreage per Farm, Adopters versus Non-Adopters, Louisiana, 2007-08.

Age and Education

The age and education of respondents was similar between adopters and non-adopters. Average age for adopters was 54.5 compared to 57.2 for non-adopters. Adopters averaged about one more year of education than non-adopters. The average number of years farming was about 29.8 for adopters and 34.2 for non-adopters.

Use of Precision Agriculture Technologies

A total of 49 of the 71 respondents indicated that they had adopted some form of precision agriculture technology. Producers adopting the technology indicated that improving profits was the most important reason. Generating environmental benefits was the second most important reason for adopting the technology. A total of 22 respondents indicated they did not adopt at least one precision agriculture technology. The following sections summarize the use of selected technologies.

Assessing Within Field Variability

One of the keys to adoption of precision agriculture technologies is being able to assess within-field variability of a number of factors. Respondents indicated that a wide variety of techniques were used to assess variability. Figure 3 shows the number of producers using each technique. Respondents were asked to indicate all that were used, so the total number of responses is greater than the number of respondents. Field records were the most frequently noted method used to assess within-field variability.

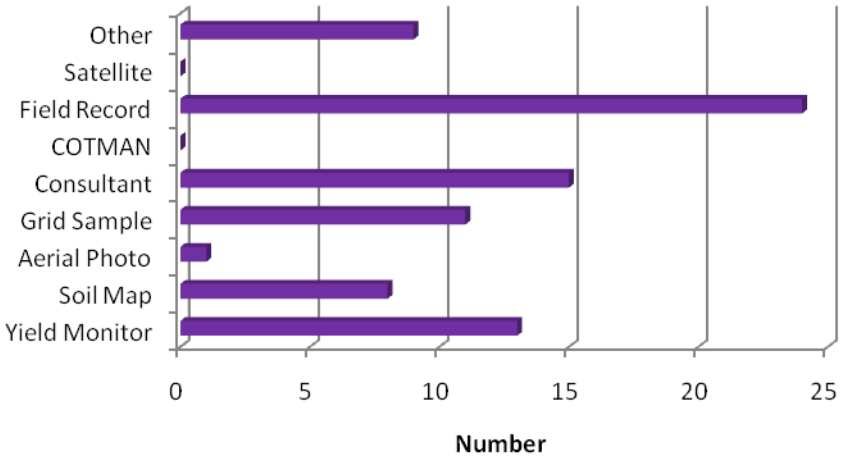

Figure 3. How Producers Assessed Within-Field Variability, Louisiana, 2007-08.

Use of Information Gathering Technologies

Producers use information gathering technology rather extensively as indicated in Figure 4. This figure shows the total number of acres of use for each of the information gathering technologies. As shown here, the yield monitor with GPS was the most extensively used technology followed by zone soil sampling. The average cost for grid soil sampling was $8.60 per acre and for zone sampling the cost was $7.50 per acre.

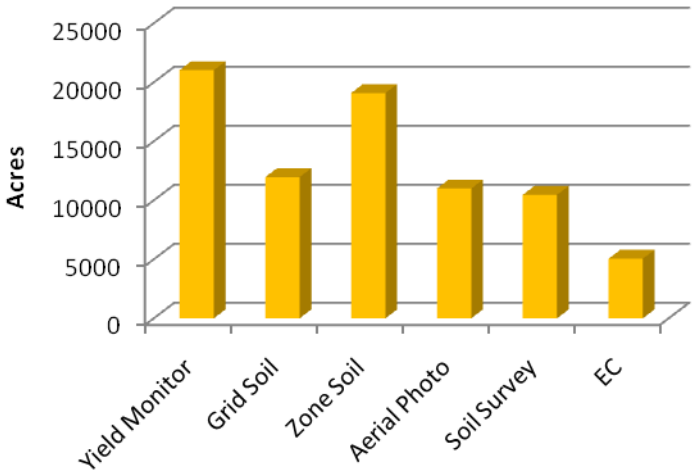

Figure 4. Use of Information Gathering Technology for Crop Production, Louisiana, 2007-08.

Use of Cotton Yield Monitor

A total of 12 respondents indicated using cotton yield monitors to generate yield maps. Four of the respondents indicated that cotton yields were approximately 25 percent more variable than they originally thought. For those not utilizing a yield monitor, the perceived value was estimated to be $28.21 per acre. The distribution of values is shown in Figure 5.

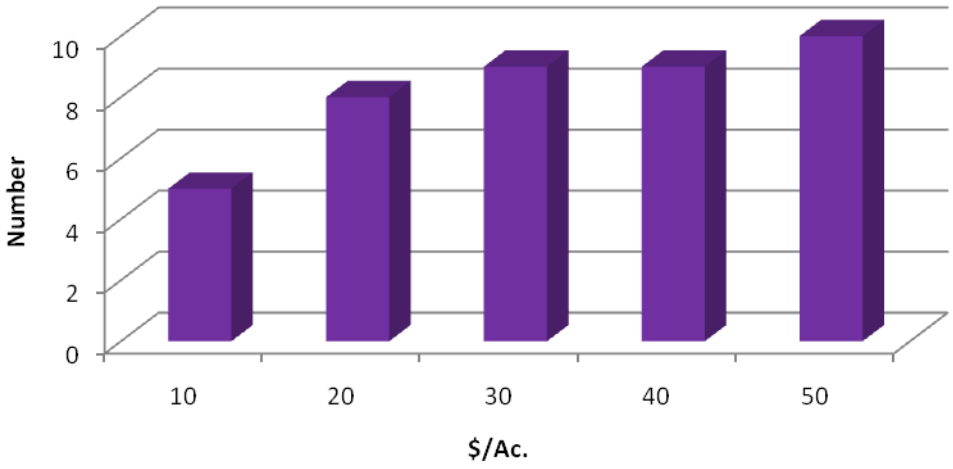

Figure 5. Perceived Value of Cotton Yield Monitors, Per Acre, Louisiana, 2007-08.

GPS Guidance Systems

Twenty seven of the 49 respondents who adopted precision agriculture technology indicated they used some type of GPS guidance system. Only two of these indicated that the system had not met their expectations. The reasons producer gave for adopting the guidance system are summarized in Figure 6. The most frequently mentioned reason was to replace row markers. Increasing overall efficiency was the second most frequently cited reason for using the GPS guidance system. Figure 7 shows the kind of systems purchased. The AutoSteer system was the most

frequently purchased system. When asked the benefits of using the system, producers ranked reduced operator fatigue and longer operating hours as the greatest benefit. Labor cost saving ranked second followed by more time for other tasks and input cost savings. When asked about cost savings on inputs, producers indicated they saved an average of about four dollars per acre on both fertilizer and chemicals and just under one dollar per acre on seed.

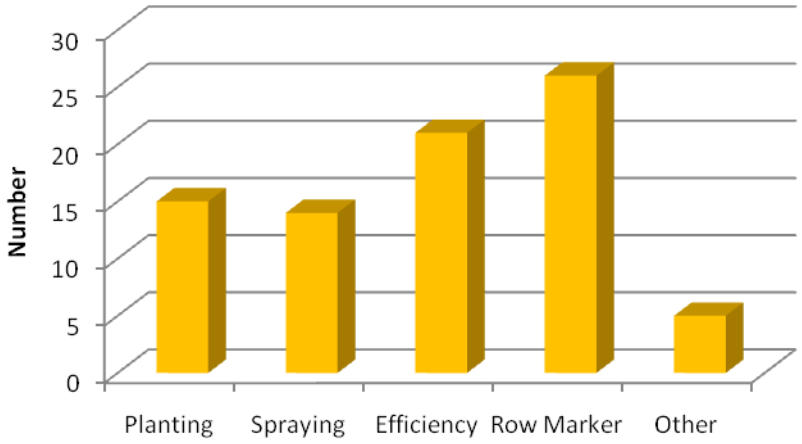

Figure 6. Reasons for Purchasing Guidance Systems, Louisiana, 2008.

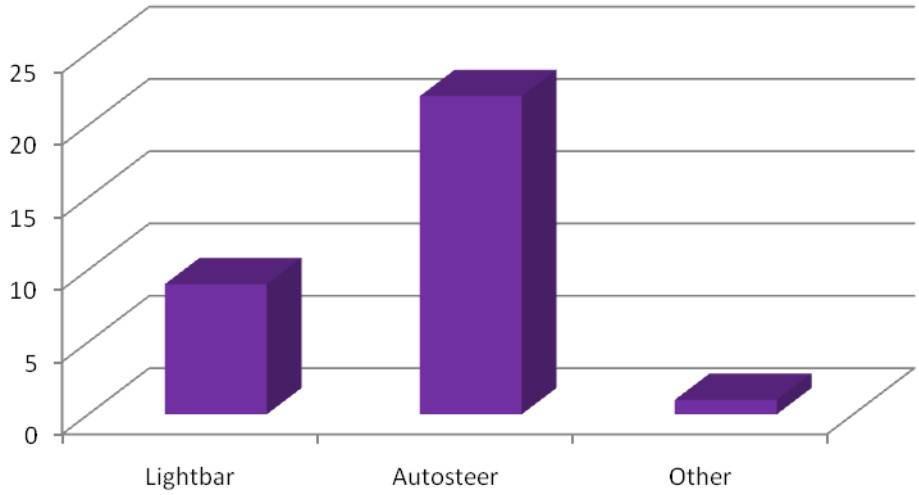

Figure 7. Type of GPS Guidance System Used by Cotton Producers, Louisiana, 2008.

These technologies were used to gather information for variable rate applications. Respondents indicated that the predominant technologies were a yield monitor with GPS and Electrical Conductivity (EC) measures. Information gathered was primarily used to make variable rate applications of fertilizer, seed, growth regulators, and harvest aids. Figure 8 summarizes the total acreage on which these technologies were used. Using these technologies, producers reported input savings of 9.5 percent for fertilizer, 21.3 percent for lime, 27 percent for growth regulators, and 20 percent for harvest aids.

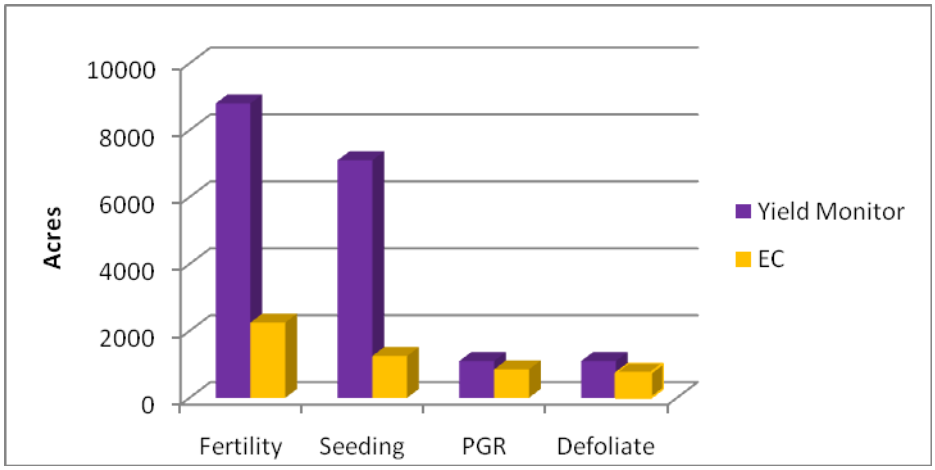

Figure 8. Use of Information Gathering Technologies in Variable Rate Applications, Louisiana, 2008.

Grid Soil Sampling

Seventeen respondents indicated they used GPS to collect grid/zone soil samples for cotton production. Most of these producers used the information to make a variable rate fertilizer management plan. Eleven producers developed plans for variable rate application of nitrogen. Variable rate application of phosphorus was made by 14 respondents. Sixteen producers used the plans to make variable rate applications of potash and lime. Producers using VRT reported and average yield increase of 85 pounds of lint per acre.

Summary

This study was undertaken to determine the status of precision farming technologies adoption by Louisiana farmers. Data for the study was obtained from a mail survey of cotton producers. A total of 614 surveys were mailed to Louisiana cotton producers and 71 useable questionnaires were received. Over two-thirds of the respondents indicated they had adopted at least one precision farming technology. The primary reason for adopting these technologies was to improve profitability. Farmers using variable rate technology indicated cost savings in selected inputs. The use of GPS guidance technology improved labor efficiency and also reduced input costs.

References

Dillman, D.A. *1978. Mail and Telephone Surveys: The Total Design Method,* Wiley, New York.