ADOPTION OF COTTON PRECISION FARMING TECHNOLOGIES IN TENNESSEE

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Abstract

This article summarizes Tennessee cotton farmers' responses to the 2009 Southern Cotton Precision Farming Survey. A mail survey of 13,579 cotton producers across the southern United States was conducted from February to March of 2009. Of the 631 cotton farmers surveyed from Tennessee, 105 responded for a response rate of 16.6%. Initial analyses suggest that 79 respondents (75%) are precision farming adopters. Initial findings are as follows. The majority of precision farming adopters combined the use of one or more information gathering, variable rate management, and GPS guidance technologies. Three-fourths of precision farming adopters indicated that variable rate management had no effect on yield. Half of adopters also indicated an increase in environmental benefits. Profit was the most important reason for adopting precision farming. On average, cotton precision farming adopters in Tennessee grow more cotton acres, rely more on farm income, and are younger than non-adopters. They also utilize more computer and university services on average than do non-adopters. Cost and current satisfaction were the most important reasons for not adopting precision farming technologies. Insights obtained from this survey will help guide university research and extension efforts to develop timely and meaningful outreach materials.

Introduction

A cotton precision farming survey was conducted in February and March of 2009 to assess the present status and future prospects for adoption of precision farming technologies by cotton producers across the southern United States (Mooney et al., 2010). This is the third in a series of southern cotton precision farming surveys, previously conducted in 2001 and 2005 (Roberts et al., 2002; Roberts et al., 2006). Results from the 2005 survey for producers from the state of Tennessee were previously summarized by Larson et al. (2006). With the 2009 data now available, a need exists to reevaluate producers' experiences with precision farming technologies. The objective of this study is to present initial findings from this survey for respondents hailing from the state of Tennessee.

Materials and Methods

A mail survey of cotton producers located in Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, Missouri, North Carolina, South Carolina, Tennessee, Texas and Virginia was conducted in 2009 to establish the current use of cotton precision farming technologies in these states. A mailing list of 13,579 cotton producers was furnished by the Cotton Board, 631 whom lived in Tennessee.

A questionnaire was developed to elicit cotton farmer attitudes toward and use of precision farming technologies. Following Dillman's (1978) 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. A reminder post card was sent two weeks after the initial mailing. A second mailing of the questionnaire to producers not responding to previous inquiries was then conducted three weeks later. The second mailing included a letter indicating the importance of the survey, the questionnaire, and a postage-paid return envelope. In total, 105 Tennessee cotton producers responded for a statewide response rate of 16.6%.

The following statement was printed on the survey questionnaire: "Precision farming involves collecting site-specific information about within-field variability in yields and crop needs, linking that information to specific locations within a field, and acting on that information to determine and apply appropriate input levels. This may result in varying input levels within each field." This broad definition of precision farming encompasses technologies that may or may not use Global Positioning Systems and Geographical Information Systems.

Results and Discussion

Results are presented in four sections. The first summarizes preliminary precision farming adoption figures for the state of Tennessee. Adopters' perception about and reasons for adopting precision farming technologies are discussed in section two. In the third section, reasons for not adopting precision farming technologies are shown for non-adopters. Selected characteristics of adopters and non-adopters are compared in the fourth section.

Overall Precision Farming Adoption
Initial finding: The majority of adopters (> 70%) combined the use multiple technologies from among information gathering, variable rate management, and GPS guidance categories (Figure 1).
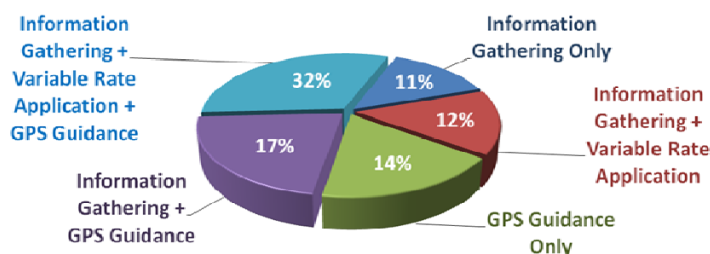

Figure 1. Adopter Use of Precision Farming Technologies.

Adopter Responses
Initial finding: Three-fourths of precision farming adopters indicated that variable rate management had no effect on yield. Half of adopters also indicated an increase in environmental benefits. Profit was the most important reason for adopting precision farming (Table 2).

Table 2. Adopter Responses about Precision Farming Technologies

Variable	N	Value
Found variable rate management:		
Increased yield (%)	26	23%
Did not affect yield (%)	26	77%
Decreased yield (%)	26	0%
Found precision farming:		
Increased cotton quality (%)	28	29%
Improved environmental quality (%)	33	52%
Adopted precision farming:		
To increase profits (Rank 1-5)	50	4.6
For environmental benefits (Rank 1-5)	45	3.8
To be at technological forefront (Rank 1-5)	46	3.0

Non-Adopter Responses
Initial finding: Cost and current satisfaction were the most important reasons for not adopting precision farming technologies as reported by non-adopters in Tennessee who responded to the survey (Figure 2).
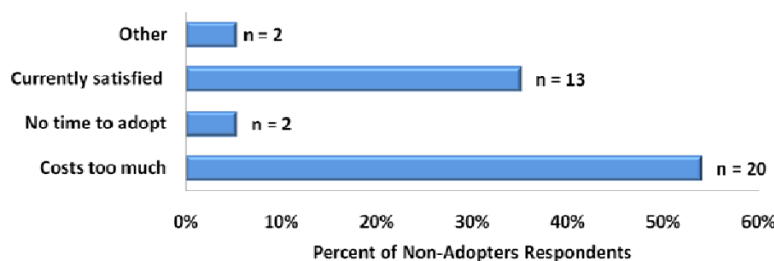

Figure 2. Reasons for not practicing precision farming.

Characteristics of Adopters and Non-Adopters
Initial finding: On average, cotton precision farming adopters in Tennessee grow more cotton acres, rely more on farm income, and are younger than non-adopters. They also utilize more computer and university services on average than do non-adopters (Table 2).

Table 2. Characteristics of Precision Farming Adopters and Non-Adopters

Variable	Adopters (n=79)	Non-Adopters (n=26)
Cotton area planted 2008 (acres)	1037	652
Age (years)	52	55
Education (years)	14.3	12.6
Farming experience (years)	28.9	32.7
Use computer for farm management (1=yes)	73%	35%
Use laptop or handheld computer in field (1=yes)	22%	4.3%
Household income from farming (%)	65%	61%
University precision farming events attended since 2003 (number)	5.0	7.3
University precision farming publication consulted (number)	0.57	0.33

Summary

This article presents initial findings from the 2009 Southern Cotton Precision Farming Survey for the state of Tennessee. A mail survey of 13,579 cotton producers across southern U.S. states was conducted from February to March of 2009; approximately 631 of which were located in Tennessee. In total, 105 producers responded for a response rate of 16.6%.

To summarize, 75% of these Tennessee respondents were classified as precision farming adopters in 2008. The majority of these adopters (> 70%) combined the use multiple technologies from among information gathering, variable rate management, and GPS guidance categories. Three-fourths of precision farming adopters indicated that variable rate management had no effect on yield. Half of adopters also indicated an increase in environmental benefits. Profit was the most important reason for adopting precision farming. Cost remains a significant barrier to increased precision farming technology adoption. These results may be used to focus precision farming research and extension resources on producers who are most likely to use these technologies and to develop decision aids to assist with purchase or custom hiring decisions.

These results represent only a small selection of survey results for the state of Tennessee. Adopter and non-adopters also indicated their yield variability, listed their primary information sources, related their perceptions about the value and future profitability of precision farming technologies, and provided additional farm and farm operator characteristics. Future analyses using this survey data will further investigate these topics.

Acknowledgements

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