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SURVEY OF FLORIDA COTTON PRODUCERS ON PRECISION FARMING PRACTICES AND PERCEPTIONS

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Abstract

This poster describes survey results of Florida cotton producers administered in February 2001. Survey instruments were sent to all 192 active producers in 2000, responses were received from 50 (26 percent). Survey questions inquired about the current use of precision farming technologies for all crops grown (cotton, peanuts, corn, soybeans, wheat, tobacco, and rice) and the benefits derived from the use of such technologies, including the impact on input use, yields, and environmental quality. Adopters and non-adopters of precision farming technologies (PFTs) were asked to state the future importance and profitability of such technologies for each crop in 5 years. Approximately 90 percent of respondents stated that precision farming will be profitable in the future, however, average importance scores ranged from 2.12 to 3.38 on a scale of 1 ("not important") to 5 ("very important"). Cotton received the highest average importance score and several farmers rated the importance of precision farming technologies for cotton "very important" in 5 years.

Background and Objectives

The technologies used for precision farming are relatively new, particularly with regards to yield monitoring using the global positioning system (GPS). The profitability of many of these technologies, especially in regards to their use for different crops and in different combinations, has not been proven for field crops in Florida. However, the profitability of use may not be the sole motivation since one of the frequently touted benefits of using such technologies involves a reduction in the total quantity of inputs used (although reducing total input quantities will also increase profits). Using fewer inputs can reduce waste and limit environmental degradation. To ascertain more information about the current status and future use of precision farming technologies, a study of all cotton farmers was initiated.

The population for this study consisted of all Florida farmers with registered sales of cotton to Cotton Incorporated ® in 2000. Of the 196 active farmers that were contacted, 50 returned completed surveys for a 26 percent response rate. The majority of respondents lived in Santa Rosa, Escambia, and Jackson Counties (36 percent, 18 percent, and 18 percent, respectively).

The primary objectives of this study are three-fold. First, to determine the current status of precision farming technologies by cotton farmers in Florida. Second, to determine if precision farming technologies have benefited farmers by increasing crop yields and or improving environmental quality. Third, to identify the impediments (if any) to future adoption of precision farming technologies.

Precision Farming Defined

Precision farming entails the assessment of site-specific land and crop needs in order to develop management practices that precisely match the needs. Consequently, the adoption of precision farming technologies (PFTs) will likely vary across fields. A total of 21 technologies were identified for this survey. These technologies fall into six major categories, namely: yield monitoring (3 technologies), soil sampling (2 technologies), testing (1 technologies), mapping (2 technologies), sensing (3 technologies), and variable input use (10 technologies). All but the latter are commonly referred to as "diagnostic and mapping" technologies. The complete list of PFTs include:

1. yield monitoring with GPS
2. yield monitoring without GPS
3. yield monitoring without a monitor
4. soil sampling by grid method
5. soil sampling by management zone
6. plant tissue testing
7. soil survey maps
8. mapping topography, slope, soil depth, etc.
9. on-the-go sensing

10. remote sensing using aerial photos
11. remote sensing using satellite images
12. variable rate nitrogen application
13. variable rate phosphorus and potassium (P & K) application
14. variable rate lime application
15. variable rate seed application
16. variable rate growth regulator application
17. variable rate defoliant application
18. variable rate fungicide application
19. variable rate herbicide application
20. variable rate insecticide application
21. variable rate irrigation application

Respondent Information

Of the 212 cotton farmers with registered sales to Cotton Incorporated in 2000, 16 (7.5 percent) had quit farming or could not be contacted. Of the remaining 196, 50 (26 percent) returned completed surveys.

Farming operations of the 50 respondents in 2000 are summarized in Table 1. On average, Florida cotton farmers planted 380 acres of cotton, 245 acres peanuts, 91 acres of corn, 155 acres of soybeans, and 156 acres of wheat. However, not every farmer planted all crops. Of farmers reporting cotton plantings in 2000, the majority (76 percent) also reported planting peanuts. This proportion fell to 26 percent, 15 percent, and 9 percent for corn, wheat, and soybeans, respectively.

The relatively wide range of reported values for planted acreage (for all crops) indicates significant differences among farming operations. For example, cotton acreage planted in Florida in 2000 ranged from 18 acres up to 1,500 acres. Peanut acreage was also highly variable, ranging from 11 to 4,000 acres. This heterogeneity suggests that future empirical analysis consider differences in farm size and crop mix.

Production yields averaged 707 pounds per acre for cotton, with reported values ranging from 460 to 881 pounds per acres. Peanut yield averaged 3,191 pounds per acre. Yields for corn soybeans, and wheat averaged 99, 33, and 44 bushels per acre, respectively. The reported minimum and maximum (range) values are included in Table 1.

Respondents were asked to select the farm management goal that most closely matched their own. Four goals were included. The most cited goal (56 percent) was to acquire enough assets to generate sufficient income for family living. The second most cited goal (36 percent) was the consideration of retirement and transfer of resources to his/her next generation. The third most cited goal (8 percent) corresponded to farmers trying to expand the size of his/her operation. None of the respondents stated that they are considering selling the farm and changing occupations (the fourth option). Six percent opted not to answer this question.

Respondents ranged in age from 25 to 82 years old, averaging 52 years. A total of 88 percent completed high school. When asked if they use a computer for farm management, 51 responded “yes”. The average duration of farm experience was 27 years, however, reported values ranged from 6 to 78 years. The majority of farmers (54 percent), all of which produced cotton in 2000, reported owning a cotton picker. An additional 35 percent own livestock, but only a s mall fraction use the manure as fertilizer. In terms of income, 67 percent cite farming as their primary source of income. The share of total income a household receives annually ranged from 10 to 100 percent, averaging 66 percent. The total household income of the respondents was recorded into five categories (Figure 1). Over 60 percent (62 percent) of respondents earned less than $100,000. Only 5 percent earned at least $500,000.

All cotton farming in Florida is located in counties adjacent to Alabama and Georgia to the north. A total of 85 percent of respondents were from four counties, namely: Santa Rosa (38 percent), Escambia (18 percent), Jackson (18 percent), and Walton (11 percent). All of the top four counties are located just south of Alabama. Responses were also received from cotton farmers in Okaloosa, Holmes, Columbia, and Jefferson Counties (between 2 and 6 percent each).

According to the Florida Agricultural Statistics Service (F.A.S.S.), the majority of planted acreage was used to farm cotton (40 percent) and peanuts (34 percent). An additional 15 percent of the land was planted in corn. The share of acreage used for each crop is presented in Figure 2. Figure 3 compares the same crops but in terms of total cash receipts in 2000.

Results

Objective (1): Current Status of PFTs

Of the 50 Florida cotton farmers that responded to the survey, 9 reported using at least one of the 21 PFT technologies on at least one of their field crops. Thus, there was an observed 18 percent PFT adoption rate in 2000. The following PFTs (# 4-7, 12-16, 18-20) were used to produce cotton by the respondents in our survey in 2000:

- Soil Sampling (grid method)
- Soil Sampling (zone method)
- Soil Survey Maps
- Plant Tissue Testing
- Variable Rate Application (nitrogen, P & K, lime, seed, herbicide, insecticide, fungicide, growth regulator)

Respondents were asked to select the importance of four alternative motivations for adopting PFT technologies for cotton. Results are summarized in Figure 4. The primary motivation, receiving an average of nearly 4.5 out of 5 (which was "very important"), was to increase profits. A close second, averaging above 4, was to improve the quality of the environment. A distant third was "to be an industry leader", with an average importance of approximately 2.6. The least important factor, averaging just 2.0 (where 1.0 was "not important"), was a fear of being left behind.

Objective (2): Observed Benefits of PFTs

The use of PFTs has benefited farmers by increasing profit (reported by 90 percent of respondents) and improving environmental quality (reported by 56 percent of respondents). These benefits are reported to have resulted from reduced input use, which further reduces run-off.

The reasons cited for increased profits can be distinguished into two groups: (1) lower costs or (2) higher yields. Lower costs result from using smaller quantities of inputs, including time. Higher yields, particularly in poor spots, improved field uniformity. The potential yield increases from using or adopting PFTs by crop are shown in Figure 5. In summary, based on reported "low" and "average" yield, the most gains in productivity could result from applying PFTs to soybean (110 percent) and corn (70 percent) production. Since yield could increase from the low to high categories, these potential yield increases may be conservative and actual yields could be higher.

Objective (3): Anticipated Future Use of PFTs

The use of PFTs is expected to be more profitable in the future by 70 percent of respondents. The importance of PFTs in 5-years is believed highest for cotton and peanuts by Florida cotton farmers (Figure 5). However, the average importance scores for future industry-wide adoption of PFTs (which could range from 1 = "not important" to 5 = "very important"), differed little by crop, from 2.3 for tobacco up to 3.4 for cotton.

Table 1: Farm Operations of Florida Respondents in 2000.

		area planted	Yields		
	farms	(min, max)	lowest	average	highest
Cotton	46	380 acres (18, 1500)	460 lb/ac	707 lb/ac	881 lb/ac
Peanuts	35	245 acres (11, 4000)	2,554 lb/ac	3,191 lb/ac	na
Corn	12	91 acres (8, 270)	58 bu/ac	99 bu/ac	141 bu/ac
Soybeans	4	155 acres (40, 350)	16 bu/ac	33 bu/ac	48 bu/ac
Wheat	7	156 acres (30, 400)	33 bu/ac	44 bu/ac	62 bu/ac

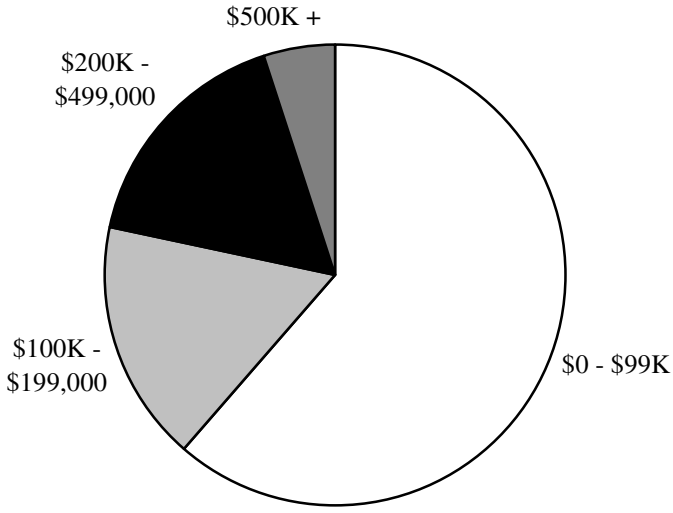

Figure 1. Breakdown of the annual total household income of Florida cotton farmers in 2000.

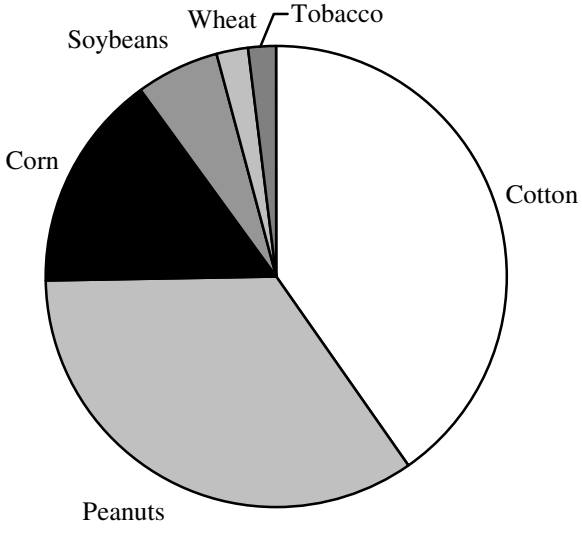

Figure 2. Shares of total crop acreage in Florida in 2000 (F.A.S.S.)

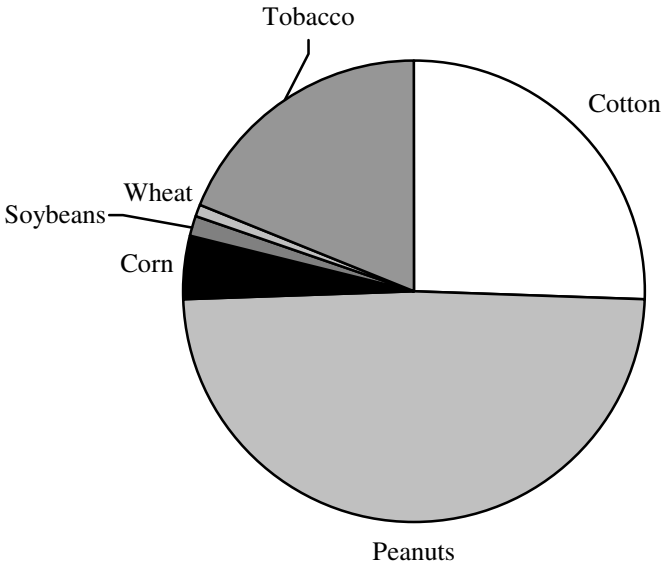

Figure 3. Shares of total cash receipts by crop in Florida in 2000 (F.A.S.S.)

Figure 4. Average importance of each PFT motivation

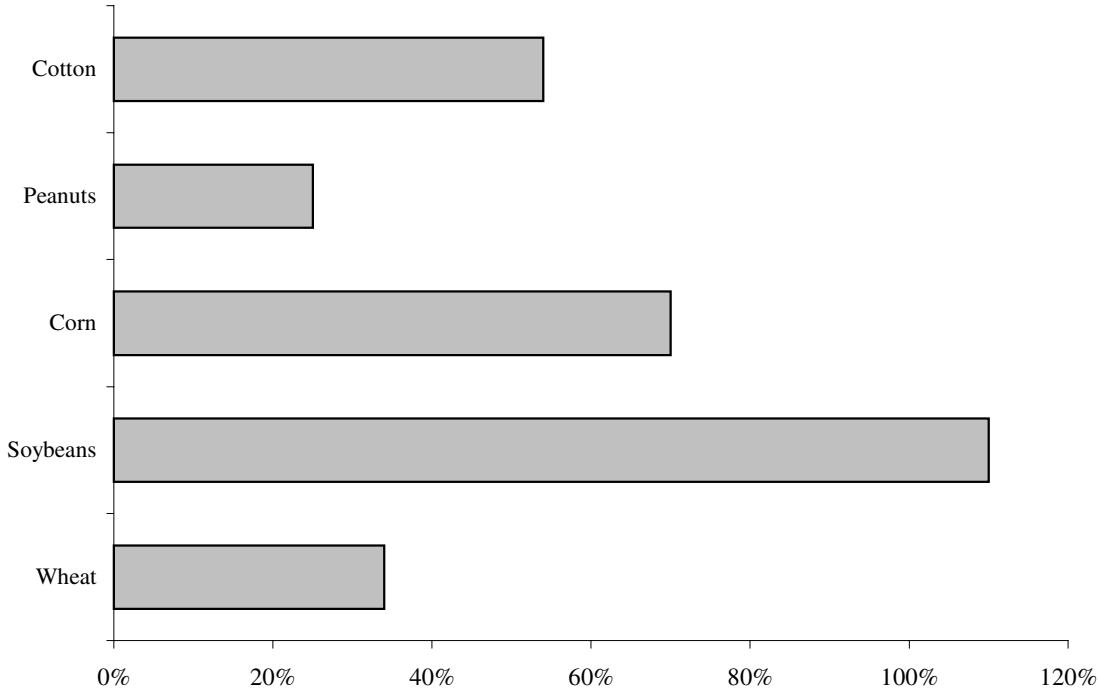

Figure 5. Average reported yield difference of Florida cotton farmers between fields with low and average productivity in 2000 by crop.

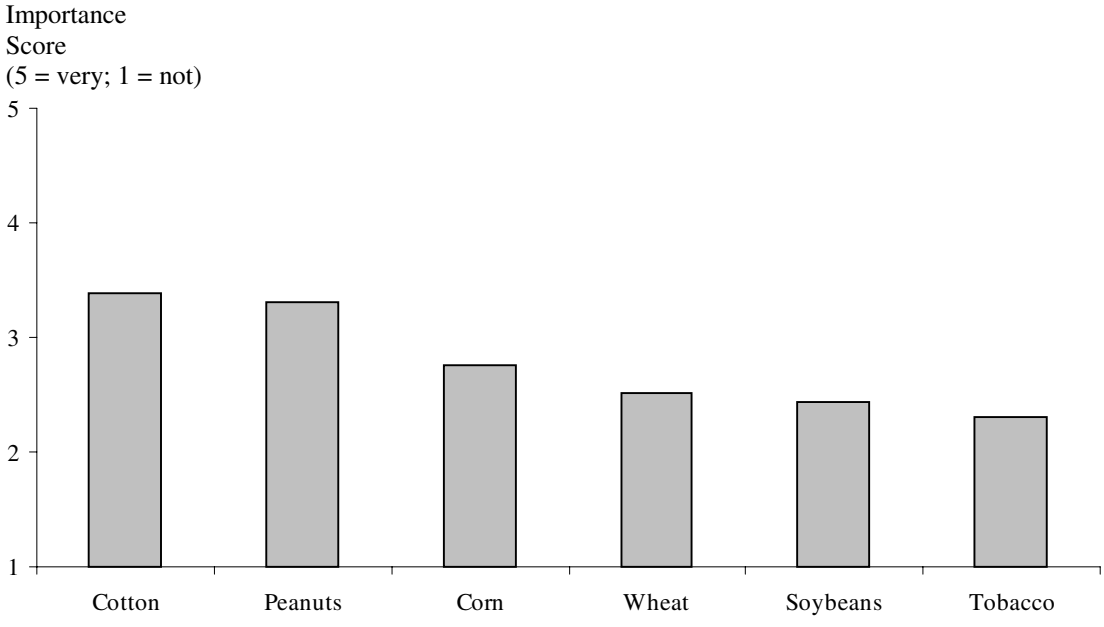

Figure 6. Average importance of PFT in 5-years for each crop.