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Soil Science News & Views

Vol. 23, No.2, 2003

Precision Farming in Central Kentucky: Evaluating Public and Private Sector Influence On the Adoption Decision

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Introduction

The Cooperative Extension Service is challenged to assess the needs of customers who are unable or unwilling to try new production techniques with the potential to increase profitability. *Precision Farming* (PF) is a production technique that has the goal of maximizing economic potential by using technology that recognizes variability within fields. Ample research from the last decade shows that precision technologies hold promise for enhanced agricultural profitability. A study conducted in three Central Kentucky counties in 2001 shows that farmers obtain information for decision-making related to PF technologies from their local fertilizer dealer and the Cooperative Extension Service but are dissatisfied with the level of service from both sources.

The fertilizer industry has made substantial investments in equipment for variable-rate fertilizer application (Patrico, 2000). In some cases, grid mapping and variable-rate fertilizer application services were provided below dealer cost in an attempt to establish a customer database and a business relationship (Stowell, 1997). Understanding why farmers adopt PF and the level of satisfaction with PF services would guide local fertilizer dealers and Cooperative Extension personnel in making future investments for PF adoption at the farm level.

A standard PF practice is to divide fields into subunits, measure variability of a defined agronomic feature, and then apply inputs to each subunit independently. Nationwide only 4% of all farms use precision technology but in the "Heartland" region, dominated by corn and soybean production, 11% of the farms have adopted PF (Daberkow and McBride, 2000). The adoption of PF in the South lags behind

Educational programs of the Kentucky Cooperative Extension Service serve all people regardless of race, color, age, sex, religion, disability, or national origin.
UNIVERSITY OF KENTUCKY, KENTUCKY STATE UNIVERSITY, U.S. DEPARTMENT OF AGRICULTURE, AND KENTUCKY COUNTIES, COOPERATING

other regions, possibly because no single group has taken the lead in promoting the technology.

Recent studies provide good evidence that there is significant variation in adoption rates of PF by region, farm size, and farm type. Grain farms have the highest PF adoption rate (14%), especially those with annual gross sales over $500,000 (18%). Among the most likely to try PF are farmers who are younger, better educated, have low debt to asset ratios, and farm large acreage. The objective of the 2001 study was to compare farmers' level of satisfaction with PF services available through the public and private sector in Central Kentucky and to evaluate reasons for adoption or non-adoption.

Study Design

Before 2001 there was little empirical evidence about the characteristics of farmers who had adopted PF in Kentucky, and nothing about those who were unwilling to adopt PF. In the 2001 cross sectional study, farm operators in three Central Kentucky counties were surveyed to determine which PF techniques were used, by whom, and the level of satisfaction with PF services and programs from the Cooperative Extension Service and local fertilizer dealers. The study considered opinions of PF users and non-users.

Prior to 2001, the extent to which farmers in Central Kentucky were using PF for the application of fertilizer, seed, and other inputs was uncertain. A self-administered mail survey of 397 farmers in Hardin, Meade, and LaRue counties was used to determine the extent to which PF has been practiced in the region, and the level of satisfaction with products and services from the public and private sector. Survey respondents' addresses were obtained from county Cooperative Extension Service producer mailing lists. Convenience groups established to study PF adoption consisted of "principal farm operators" for farms defined as (1) grain only, (2) grain and livestock, and (3) livestock only farms. When comparing the level of satisfaction with the service and programs of local fertilizer dealers and the Cooperative Extension Service, the convenience groups consisted of (1) PF users and (2) PF non-users.

Results are based on 325 valid surveys (82% of all surveys returned). The return rate for valid surveys was 28%, based on all Extension users in the three-county region. Familiarity with the Extension Service may bias the level of satisfaction with Extension PF education and research. Kentucky agriculture is also diverse, and care should be taken in generalizing the results to other parts of the State.

Use and Adoption of PF

The structure of agriculture in Central Kentucky is a diverse mixture of grain and livestock farms that are primarily owned and operated by family members. Farms that have livestock as the principle commodity comprise nearly two-thirds of all farms in the region. Grain farms represent less than 10% of all farms in the three-county study group and are typically highly mechanized with full-time operators.

Survey results show that PF is being practiced by 15.9% of the farm operators responding to the survey. Seventy-two percent indicated they use grid soil sampling, 62% use variable-rate technology (VRT), 29% own a yield monitor, and 23.4% use computer generated yield and profit maps for decision-making. Variable-rate seeding is practiced by 21.2% of all PF users and 8.5% indicate they use variable-rate application of herbicides.

Custom services offered by local fertilizer dealers are the most widely used PF practices. Among regional PF users, 72.3% have hired custom services for grid soil sampling with 61.7% of the PF users having used variable-rate fertilizer application services. In 2001, 24,500 acres were estimated to have been grid soil sampled in the three-county region.

Farm operators who made a capital investment in at least a yield monitor were considered to be in the "early adopter" stage for this study (Rogers, 1995). Among those producers defined as "PF users", only 1.2% own computer software for generating yield maps. The survey showed that 23.4% of all "PF users" have yield and profit maps for decision-making

– indicating that most PF users depend on an outside source for mapping services.

The percentage of farmers by age group closely mirrors farmer age data reported in the 1997 USDA Census of Agriculture (US Ag Census, 1997). The largest group was those in the 46–55 year old age bracket, representing 30% of all respondents. This group also had the highest percentage of PF users (47%). Producers under 30 represented only 2% of valid responses but 6% of all PF users. By contrast, those over 70 represented 12% of all respondents and only 4% of all PF users.

Survey results show that most PF users in the region are young and are full-time farmers who are principal operators of grain or grain and livestock type farms. Livestock producers having no grain production are the predominant farm type (62.8% of all farms). These farms tend be smaller (< 50 acres), have off-farm employment, and do not utilize PF technologies. Farms described as "grain only" represent two-thirds of all farms using PF technology, are frequently 1,000 acres or more in size, and have full-time operators.

Farmers who use precision technologies are challenged to utilize the information database they have. The primary reason farmers were unwilling to implement PF was lack of information on how to utilize precision technologies. University and Extension were the most frequently cited source of PF information (38.4%). Additionally, 21.6% get their PF information from the Internet and farm magazines, 20% from their local fertilizer dealer, and the rest from other sources.

Despite the prevailing opinion that information about PF is lacking, most users (73.9%) do not regret their investment in PF or are confident of future benefits. Specifically, 42.6% of all users believe that PF has increased profits on their farm. An additional 27.7% feel that this technology has not met their expectation, but will in the future.

There are many obstacles to adopting PF. Determining which technologies are appropriate to a given farming system is problematic for most farmers. Grain farm operator opinion differs significantly from that of livestock farm operators concerning barriers to adoption. Livestock producers believe that a "lack of PF information" and "a planning horizon that is too short" are the greatest obstacles to PF adoption. Grain farmers believe that the "cost of PF" is the greatest limitation to adoption.

Because PF services are now offered statewide, PF users and non-users were asked to evaluate their level of satisfaction with ten products and services offered by local fertilizer dealers (Table 1). A scoring system of 1 to 4 was used with (1) indicating the farmer was very dissatisfied, (2) somewhat dissatisfied, (3) satisfied, and (4) very satisfied with the service.

Several conclusions may be drawn from Table 1. Based on the percentage of use, most farmers depend on their local fertilizer dealer for information about PF. Furthermore, the level of satisfaction with dealers as a PF information source is significantly higher among users than non-users of PF.

Although not a widely used service, farmers who use PF depend on their fertilizer dealer for technical support. While users express a significantly higher level of satisfaction for PF support than non-users, they feel that dealers could do more to support PF adoption.

The study also examined satisfaction of users and non-users of PF technology with the services and educational programs of the Cooperative Extension Service using the same scoring system described above (Table 2). The study did not attempt to differentiate between services offered at the county and state level.

Table 2 shows that users of PF technology are significantly more dissatisfied with Extension computer training for PF than non-users. Based on the percentage of respondents using the services and programs identified in Table 2, it would be reasonable to say that farmers in general are not satisfied with the level of support for PF training offered by the Kentucky Cooperative Extension Service.

Conclusions

This study showed that users of PF technology remain optimistic about future benefits but will be cautious about future

investments. Opinions concerning barriers to adoption differ depending on the type of farm operation. Grain farmers believe that cost is the most limiting factor while livestock producers see a lack of PF information and a short planning horizon as their greatest obstacles to adoption. Most grain and livestock farmers indicate that they do not have enough economic and agronomic information to fully adopt PF. The fertilizer industry and universities have an opportunity to provide research and technical assistance that farmers need to make the PF adoption decision.

A finding that should be of interest to the Cooperative Extension Service and local fertilizer dealers is the number of customers who do not use their programs or services. The study indicates that farm input suppliers and Extension agents are in key positions to educate and promote the diffusion of precision technologies. Further research is needed to determine the reasons for lack of interest and/or satisfaction with some PF programs and services offered by industry and Extension.

REFERENCES

Daberkow, S.G., & McBride, W.D. (2000). Adoption of precision agriculture technologies by U.S. farmers. Proceedings of the Fifth International Conference on Precision Agriculture, Madison, WI: ASA-CSSA-SSA.

Patrico, J. (2000, March). Time to be patient with precision? Progressive Farmer, 96.

Rogers, E.M., (1995). Diffusion of innovations. New York: The Free Press.

Stowell, D.M. (1997). Sales, marketing, continuous improvement: six best practices to achieve revenue growth and increase customer loyalty. San Francisco: Jossey-Bass.

United States Department of Agriculture National Agricultural Statistics Service (USDA NASS). (1999). 1997 Census of Agriculture. USDA, Washington, DC.

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Table 1. User and non-user satisfaction with services and products provided by local fertilizer dealers.

Products and Services	% Use of Service	PF User Mean	PF Non-User Mean
Soil Test Recommendations	67	3.1	3.1
Soil Testing	64	3.1	3.1
PF Information	54	3.1	2.8*
VRT Fertilizer Application	40	3.1	2.9
Record Keeping	36	2.9	2.9
Research & Demonstrations	36	2.8	2.6
Crop Scouting	26	3.0	2.7
Technical Support for PF	25	3.0	2.6*
PF Products	25	2.9	2.7
Management / Analysis / Mapping	24	3.0	2.8

*Significant difference (95% confidence level) between users and non-users for PF
n = 325

Table 2. User and non-user satisfaction with the services and educational programs of the Cooperative Extension Service.

CES Services and Programs	% Use of Service	PF User Mean	PF Non-User Mean
Soil Test Recommendations	69	3.6	3.5
Soil Testing	68	3.5	3.5
PF Information	62	3.0	3.3
PF Computer Training	55	2.1	2.7*
Information on PF Products	48	2.8	2.7
Integrated Pest Management	46	3.3	3.2
Research & Demonstrations	44	3.3	3.2
Record Keeping Training	22	2.5	2.9
PF Training	18	2.4	2.7
PF Consulting	17	2.3	2.7

*Significant difference (95% confidence level) between users and non-users for PF
n = 325