Farmers' Willingness to Grow Cover Crops: Examining the Economic Factors of Adoption in Alabama

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Abstract

The inclusion of cover crops in cropping systems brings both direct and indirect costs and benefits. The literature has shown that cover crops can improve soil conservation and productivity, potentially improving cash crop yields and decreasing cash crop production costs. Farmers will adopt cover crops if the net economic benefit of utilizing them is positive. This study examines farmers' willingness to grow cover crops as a soil conservation practice and to examine the socio-economic factors affecting their decision. Survey data collected in 2007-8 from Alabama farmers about cover crop adoption and management is utilized to estimate a cover crop adoption model.

Introduction

➢Cover crops provide benefits to farmers through reductions in soil erosion and increases in soil nutrition.

➢Costs to produce cash crops following cover crops are often lower than they would otherwise be due to increased soil fertility, but sometimes, excessive cover crop residue can adversely affect planting, and, in turn, crop yields.

➢Environmental benefits include reduced chemical runoff, reduced nitrate leaching, lowered insect pressure, and increased water filtration (Sustainable Agriculture Network, 2007).

➢Cover crops help retain soil organic carbon, which may become an important revenue source for farmers (Olson, Ebelhar, and Lang, 2010).

➢Not all farmers plant cover crops due to time constraints, negative perceptions about the costs, or lack of knowledge about cover crops' benefits.

Figure 1. Benefits of cover crops are reduced soil erosion and improvements in soil productivity and health.

Background

➢Leguminous crops are especially useful for increasing soil fertility and crop yields.

➢Farmers who plant cover crops tend to employ other conservation practices, but cover crop planting is not sensitive to topography (Lichtenberg, 2004).

➢Over 50% of farmers surveyed in the U.S. Corn Belt would plant cover crops if some cost sharing were available (Singer, Nusser, and Alf, 2007).

➢Farmers' knowledge of cover crop benefits, their participation in conservation practices, their education level, and the variety of crops they grow all impact their chances of using cover crops (Singer, Nusser, and Alf, 2007).

➢Other analyses have determined that direct, indirect, and opportunity costs are important for farmers considering whether to grow cover crops (Snapp, et al., 2005).

➢Other benefits include winter annual grazing, a second cash crop, or cover crops' use as biofuel feedstock.

Data

➢A mail survey was sent to Alabama row crop producers in November 2007 and asked questions regarding their experience with growing cover crops. The sample represented and was pulled from the 2002 Census of Agriculture.

➢362 surveys were returned, with 301 usable surveys returned. This corresponds to a 28% response rate and 23% of row crop producers in Alabama.

➢Figure 2. below indicates the number of farmers who indicated the occurrence of certain benefits or problems with growing cover crops.

Figure 2. Most commonly reported benefits/concerns with growing cover crops.

Methodology

➢Respondents answered a series of four questions asking the percentage yield increase in increments from 0% to 20% they required to make growing cover crops economically feasible at cost levels of $15, $30 $50, and $75.

➢A generalized ordered logit model is used to estimate the effects variables have on farmers' decisions whether to grow cover crops. A generalized ordered logit model relaxes assumptions found in an ordered logit model that explanatory variables have the same effects on the odds of the dependent variable being above a dividing point (threshold) and allows the explanatory variables' effects to change at the point of dependent variables' categorical divisions (Fu, 1998; Williams, 2006). It is a more general form of the ordered logit that does not require parameters (betas) to be equal across levels of dependent variables (Williams, 2006). Rather, betas can vary like threshold values. This model takes into account repeated observations from respondents by including a random effect across respondents.

➢Per acre cover crop planting and maintenance cost (in increments of $15, $30, $50, and $75) is the dependent variable in the estimation.

➢Independent variables include whether the farmer has a conservation plan, amount of land used to grow row crops, amount of land rented, whether the farmer irrigates, crops grown in the last three years, gross sales, how much information and experience they have growing cover crops, percentage yield increase expected from cover crops at a specific cost, demographics, and reasons farmers grow cover crops including residue management, nitrogen fixation, soil benefits, and yield benefits.

➢The parallel lines assumption was used to fix betas across all independent variables **except** the percentage yield increase expected from cover crops' production. This allows the yield increase parameter to vary with changing cost levels.

Table 1. Parameter Estimates (significant only)

Cost level	Variable	Coefficient
$15	Constant	-4.2751***
	Yield Increase Required	0.1999***
$30	Constant	-5.9256***
	Yield Increase Required	0.1965***
$50	Constant	-7.8546***
	Yield Increase Required	0.2276***
Fixed Parameter Estimates	Rent	-0.0004**
	Gross Sales	0.1907*
	Cover Crop Experience	0.7349***
	Residue Management	0.8182**

*, **, *** indicate significance at 10, 5, and 1 percent levels, respectively.

Results

➢Parameter estimates for $15, $30, and $50 cost levels are shown. The $75 cost level estimates are dropped to normalize the estimation.

➢The value for yield increase is positive, as expected, indicating higher required yield increases are necessary to convince farmers to grow cover crops. In addition, the value increases when costs are highest.

➢Four significant variables' coefficients are fixed across all cost levels. The negative sign on rent indicates that uncertainty with regard to short term leases may dissuade farmers from planting cover crops.

➢Gross sales' positive sign indicates farmers may be more willing to adopt new technologies when they have higher revenue as a cushion against losses.

➢Farmers will most likely continue growing cover crops if they have done so in the past. The positive sign is expected.

➢Environmentally-conscious farmers likely view cover crop planting as very important, which explains the sign and magnitude of the coefficient.

➢While farmers' decisions to grow cover crops is an economic decision, environmental stewardship plays a role. As seen in Figure 2, many farmers noted environmental benefits to growing cover crops. Future research should examine the role of trailing and mentoring in the process to full farm adoption.

References

➢Fu, V. K. 1998. "Estimating Generalized Ordered Logit Models." (H. J. Newton, Ed.) *STATA Technical Bulletin* 44:27-30.

➢Lichtenberg, E. 2004. "Cost-Responsiveness of Conservation Practice Adoption: A Revealed Preference Approach." *Journal of Agricultural and Resource Economics* 29(3):420-435.

➢Olson, K. R., S.A. Ebelhar, and J.M. Lang. 2010. Cover Crop Effects on Crop Yields and Soil Organic Carbon Content. *Soil Science* 175(2):89-98.

➢Singer, J. W., C.J. Nusser, and C.J. Alf. 2007. "Are Cover Crops Being used in the US Corn Belt?" *Journal of Soil and Water Conservation* 62(5):353-358.

➢Snapp, S. S., S.M. Swinton, R. Labarta, D. Mutch, J.R. Black, R. Leep, J. Nyiraneza, and K. O'Neil. 2005. "Evaluating Cover Crops for Benefits, Costs and Performance within Cropping System Niches." *Agronomy Journal* 97:322-332.

➢Sustainable Agriculture Network. 2007. *Managing Cover Crops Profitability*, 3rd ed. Beltsville, Maryland: Sustainable Agriculture Network.

➢Williams, R. 2006. "Generalized Ordered Logit/ Partial Proportional Odds Models for Ordinal Dependent Variables." *The Stata Journal* 6(1):58-82.