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Conservation Tillage and Farm Programs
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One of the major environmental initiatives of current commodity programs is Conservation Compliance, a provision that requires highly erodible land to be cropped according to a locally approved conservation plan. Farmers who fail to carry out the directives of conservation compliance can lose their program payments. It is widely accepted that increased adoption of conservation practices over the last ten years has resulted in fairly large reductions in soil erosion. As Congress considers 1995 farm bill options, a key issue is the extent to which these erosion reductions can be attributed to conservation compliance. If farmers have adopted conservation practices solely to remain eligible for program payments, then large reductions in payment rates from cuts in the federal budget will likely lead to large increases in soil erosion rates. However, if farmers have adopted soil-conserving practices because they are more profitable than traditional practices, then reduction or elimination of payments will have little effect on soil erosion rates.

Clearly, crop residue management is an important aspect of most approved conservation plans. According to Keith Collins, acting chief economist of the USDA, nearly 75 percent of acreage subject to conservation compliance will use some sort of crop residue management. In general, increased residue results in decreased erosion. Crop residue management is accomplished by varying tillage practices. Alternative tillage practices include conventional tillage, reduced tillage, and no-till. While conventional tillage involves extensive field cultivation with minimum residue cover (less than 30 percent), conservation tillage (reduced tillage and no-till) is characterized by minimum soil disturbance and increased residue cover.

(Continued, page 10)
Soil erosion benefits attributable to conservation tillage are significant. However, the economic benefits of conservation tillage have not been conclusively determined for all crops. Adoption of conservation tillage typically involves some substitution of herbicides for mechanical weed control. The reluctance of some farmers to adopt conservation tillage is believed by some analysts to be due to the lack of adequate information regarding its economic benefits.

Evidence about the extent to which conservation compliance has influenced the adoption of conservation practices is also inconclusive at best. It is in this context that CARD researchers in the Resource and Environmental Policy Division conducted a farm-level study of the relationship between adoption of conservation tillage practices and participation in government programs. The study is CARD Working Paper 95-WP 136, “Program Participation and Farm-Level Adoption of Conservation Tillage: Estimates from a Multinomial Logit Model” by Bruce A. Babcock, Nabil M. Chaherli, and P. G. Lakshminarayan. The central question addressed in the study is: if future farm program benefits are not tied to conservation practices, will there be a significant decline in the use of conservation tillage?

Features of the Model

The study considers tillage adoption as a choice by farmers from among three types of tillage practices: conventional till, reduced till, and no-till. The three tillage systems are defined by the amount of crop residue left on the field. Conventional tillage is any system that leaves zero to 30 percent residue in the field, reduced tillage leaves 30 percent to 70 percent residue, and no-till leaves more than 70 percent residue. Farmers' observed choice of tillage practice is related to the crop they grow, whether they rotate crops, whether they participate in government commodity programs, and whether they farm on soil that has been classified as highly erodible. The statistical technique used to establish the relationship is known as “multinomial logit.”

The data used in the study is taken from the Cropping Practices Survey, an annual USDA survey of farmers that collects information on production practices and behavioral practices such as program participation.

Data is used for corn and wheat in the major producing states from 1990 to 1994. These two program crops accounted for between 70 and 80 percent of government payments over this period. Fully 75 percent of the corn and wheat conservation compliance plans emphasize residue management.

Table 1 reports the fraction of sampled corn and wheat fields under each of the tillage systems as well as the fraction that was enrolled in the commodity program, the fraction that was under crop rotation system, and the fraction that was classified as being highly erodible. Use of conservation tillage (reduced-till and no-till) is much more widespread on corn (37 percent of sampled corn fields vs. 19 percent of wheat fields). Both corn and wheat farmers enrolled a high percentage of their fields in the government commodity programs. About 60 percent of sampled corn fields were in a corn-soybean rotation, and 56 percent of wheat fields were in a wheat-fallow rotation. And wheat was more likely than corn to be grown on a field classified as being highly erodible. Wheat is generally considered to be less erosive than corn, which perhaps explains why the frequency of planting wheat on highly erodible fields is higher than for corn.

<table>
<thead>
<tr>
<th>Tillage System</th>
<th>Corn</th>
<th>Wheat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional till</td>
<td>.63</td>
<td>.81</td>
</tr>
<tr>
<td>Reduced-till</td>
<td>.23</td>
<td>.14</td>
</tr>
<tr>
<td>No-till</td>
<td>.14</td>
<td>.05</td>
</tr>
<tr>
<td>Other Variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Program participation</td>
<td>.81</td>
<td>.90</td>
</tr>
<tr>
<td>Crop rotation</td>
<td>.60</td>
<td>.56</td>
</tr>
<tr>
<td>Highly erodible</td>
<td>.20</td>
<td>.34</td>
</tr>
</tbody>
</table>

*Fraction of sampled fields

**Estimation Results**

Insight into the determinants of tillage adoption can be obtained by estimating the relationship between adoption decisions and the factors that affect adoption. To determine this relationship, we estimate how crop rotation, participation in commodity programs, and a field's soil erosion potential affect a farmer's tillage adoption choice. In addition, a time trend is included to capture possible “demonstration effects” that may increase the probability that a nonadopter of a technology adopts in a given year, independently of the other explanatory variables. The demonstration effect can be an important factor influencing adoption decisions because a new technology's feasibility is increasingly demonstrated as adoption rates increase over time.
Planting continuous wheat is likely to be associated with conventional tillage and a wheat-fallow rotation tends to encourage the use of no-till.

Effect of Highly Erodible Fields
The results in Table 2 indicate that corn and wheat farmers who grow crops on highly erodible fields are more likely to adopt reduced-till and no-till than those farmers who do not. The effect is especially pronounced for corn. A separate set of unreported results demonstrates that this result holds even for nonparticipating farmers who are not subject to conservation compliance provisions. In other words, our research suggests that farmers are not looking primarily to the government to tell them how to farm. Rather they are looking at their own farming situation to determine the most appropriate farming practices to adopt.

Farm Policy Implications
The central issue facing Congress is the extent to which use of soil-saving tillage practices would be reduced if commodity programs were eliminated or made significantly less attractive. As shown in Table 2, participating farmers in the corn program were significantly more likely to adopt reduced tillage practices between 1990 and 1994 than nonparticipants. But program participation had little, if any, impact on adoption of no-till. Furthermore, a separate set of results not reported here suggests that the effect of program participation is the same whether or not highly erodible fields were being cropped. Thus our results suggest that any reductions in soil erosion from conservation compliance are due to an increase in adoption of reduced tillage by program participants. With regard to increases in adoption of no-till corn, these increases cannot be attributed to conservation compliance. Rather it appears that farmers have increased no-till use because of its direct benefits. Thus, we conclude that increased erosion on corn fields from elimination of conservation compliance would result only from decreased use of reduced-till in the production of corn.

The story is different for wheat farmers. From 1990 to 1994, wheat farmers who participated in commodity programs were actually less likely to have adopted soil-saving tillage practices. Conservation tillage practices on wheat farms are not beneficial unless farmers rotate wheat with fallow. These results suggest that wheat farmers who adopted conservation tillage to satisfy conservation compliance after the 1990-94 period would be less likely than corn farmers to revert to conventional tillage if commodity programs were eliminated.
Our results also imply that because most wheat farmers do not find either no-till or reduced-till profitable, the cost of conservation compliance plans that include conservation tillage might be quite high.

In summary, there is some evidence that there would be a significant decline in reduced-till on corn if farm program benefits are reduced. There is no evidence, however, that adoption rates for no-till would be similarly affected. For wheat, the results imply that conservation tillage practices are costly and not widely used. However, there is some evidence that program participation actually reduces adoption of no-till by a small amount in favor of conventional till. This result would indicate that elimination of government programs would increase adoption of no-till on wheat. And, for both corn and wheat, if program modifications include increased planting flexibility, then no-till adoption should increase as farmers move away from continuous corn and continuous wheat.

CARD researchers continue to explore the factors that influence tillage adoption. The analysis reported in this article is being extended to look at how geographic differences affect the results. Preliminary findings indicate that there may be significant differences in adoption patterns across production regions. These early results indicate that the costs and benefits of complying with conservation compliance provisions may vary significantly across production regions.

Emerging Issues

Income Support or Subsidized Risk Management? Two Agricultural Policy Approaches

(Bruce A. Babcock, 515/294-5764)

As Congress prepares to adopt a new set of agricultural commodity programs, farmers are debating among themselves about the proper role of government in agriculture. Fundamental questions include:

- Should government be in the business of supporting farmers' incomes?
- Should government be restricted to supporting income only when times are rough, providing an income “safety net?”
- Or should the U.S. government limit its involvement in agriculture to facilitating private provision of risk management tools?

These issues have come to the forefront because a group of Iowa farmers has proposed scrapping the current loan rates and deficiency payments in favor of revenue assurance, which would pay farmers only when revenue falls below a predefined threshold, whether triggered by low yields, low prices, or a combination of the two.

The premise of the Iowa group is that current government programs are set up largely to transfer income to farmers and that government programs should reduce risk, not increase income. Opponents of revenue assurance claim that the current set of programs provides an efficient set of risk management tools, so why should they be replaced by a new, untested program? A better understanding of what actually characterizes an income support program relative to a risk management program should help clarify the issues surrounding this debate.

Risk Management vs. Income Support

As all farmers know, farming is quite risky. Crops are subject to the whims of nature, and prices are subject to both supply shocks, such as drought and flood, as well as demand shocks, such as a change in trade policy. Most farmers invest heavily in establishing their crop before the outcome of the demand and supply shocks are known. The risk that matters to these farmers is that the eventual returns from the market may not cover expenses. A risk management program is one that helps farmers cope with this risk by providing payments when market revenue is low. Examples of risk management tools include crop insurance that pays out when yields are low, an option on a futures contract that pays off when price is low, and revenue insurance that pays off when market revenue is low.

- The transfer of wealth to farmers is the central objective of an income support program. That is, payments under a pure income support policy arrive even when farmers are not under financial stress. Probably the best example of an income support policy is the deficiency payment program as it was run in the mid-1980s. For most program crops, the target price was set well above the market price so that payments were made even when market price was higher than average. In addition, the number of bushels on which deficiency payments were made was fixed at a farm's program yield. As a result farmers received large deficiency payments even in years when prices and yields were better than average.

Improved timing of government payments so that they are received when farmers need them most, could greatly improve the efficiency with which commodity