



2008 USDA-CSREES National Water Conference  
Sparks, NV

## **Adoption of Environment-Oriented versus Profit-Oriented Technologies**

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### Abstract Text:

Studies that analyzed adoption of new technologies or practices have examined either primarily environment-oriented or primarily profit-oriented technologies (some technologies impact only environmental quality or profitability, while many impact both). However, the previous studies that analyzed adoption of environment-oriented technologies used adoption theories that are primarily developed for profit-oriented technologies. The hypotheses formed based on these theories may not be appropriate for environment-oriented technologies. A utility maximization framework rather than a profit maximization framework may be more appropriate for environment-oriented technologies and environmental attitudes may be important. Previous studies show inconsistent findings regarding the impact of some variables such as farm size and age on adoption of environment-oriented and profit-oriented technologies. For example, farm size has a positive impact on adoption of profit-oriented technologies, while it can have positive, negative or no-impact on adoption of environment-oriented technologies.

The contribution of this study is that by simultaneously incorporating both environment-oriented and profit-oriented technologies into the econometric analysis, it may provide insight about the similarities and differences regarding signs and relative magnitudes of factors affecting adoption of these technologies. This knowledge will help policy makers know whether different policies are needed to promote environment-oriented technologies.

Data from a mail survey of 3014 animal feeding operations (AFOs), which was conducted in Iowa and Missouri in spring 2006, is used in the econometric analysis. The questions were designed to learn whether farmers have adopted a range of practices or technologies and how the farmers' and the farm characteristics impacted the adoption decision.

Since adoption of multiple practices may involve correlation among different practices, a heteroskedasticity robust multinomial probit model is used for econometric analysis.

In the econometric analysis, the Roundup Ready soybean variety is used as a profit-oriented practice, and manure testing, record keeping on manure applications, and maintaining setbacks are used as environment-oriented practices. The multivariate probit results show that there is a positive and significant correlation between adoption of manure testing and record keeping. Overall, we found differences in adoption of environment- and profit-oriented practices, and some of the statistically significant results are mentioned below. To focus on voluntary adoption, farms that indicated they were CAFOs were excluded from the analysis. Regression implies all other variables are held constant in the results discussed below.

Younger farmers were more likely to adopt Roundup-Ready soybeans but less likely to adopt record keeping. Education level has little effect on the adoption of environmentally oriented practices although farmers with graduate degrees were less likely to adopt manure testing and record keeping than those

with a high school education. For Roundup-Ready soybeans, those with less than high school were less likely to adopt as were those with a graduate degree. Level of off-farm income had little effect; those with more than \$100,000 of income were less likely to adopt manure testing and record keeping than those with income of \$10,000-25,000.

One area where there is a distinction between practices is gross farm sales level. Adoption of Roundup Ready soybeans increased as farm sales increased. Farm size was not significant for record keeping. Farms with sales over \$500,000 were more likely to adopt manure testing than those with sales of \$100,000-250,000. Farms with sales less than \$100,000 were less likely to adopt setbacks than the base category.

If a farmer indicates the smell of manure bothers "me or my family", they are more likely to adopt Roundup Ready soybeans and less likely to adopt manure testing and record keeping. If a farmer indicates the smell of manure bothers neighbors, they are more likely to adopt Roundup-Ready soybeans and record keeping. If a farmer agrees that properly managing manure improves water quality, they are more likely to adopt setbacks. The more a farmer agrees that transportation costs and time affect which fields receive manure, the more likely they are to adopt a setback. Future plans for the farm are not significant for any practices. For all practices except record keeping, the perceived profitability of the practice increases adoption. If the farmer thinks the practice improves water quality, they are more likely to adopt setbacks and Roundup Ready soybeans. Many farmers indicated they were undecided as to whether manure testing and record keeping improve water quality. If farmers think that record keeping is time-consuming, they are less likely to adopt it but that factor was not significant for other practices. If farmers think manure testing is complicated, they are less likely to do it. Farmers with more animal units are more likely to adopt all practices except setbacks.

#### Impact Statement:

We are two years into a three-year project so environmental impact has been low. Some farmers who received the survey may have been made aware of some environmental issues and practices that they weren't aware of before. This coming year, the extension component of the project will begin now that the data has been collected and partially analyzed.