Factors Leading to Implementation of Agricultural Best Management Practices on the Neuse River Basin

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Introduction

Nonpoint source pollution contributes as the largest source of degradation to surface water quality in the United States (U.S. Environmental Protection Agency, 1993). One of the leading sources of this pollution comes from agriculture. Much of the pollution finding its way into surface waters from agriculture comes in the form of sediment, the related nutrients, and chemicals used as herbicides and insecticides. The sediments and nutrients, as well as the chemicals used in various management practices, find their way to rivers, leading to the decline in water quality. Finding solutions for nonpoint source pollution can be vexing due to the lack of identifiable starting places for the pollution - hence the term nonpoint source pollution. One of the solutions to this problem lies in finding adequate management techniques, often called "Best Management Practices," or BMPs, that decrease the levels of pollutants that escape farmlands and other sources.

The Neuse River of North Carolina is no stranger to such problems. The Neuse River Watershed's drainage area covers 6,192 square miles and is entirely within the borders of North Carolina. The river flows roughly 207 miles from the Piedmont to the Coastal Plain, transforming from a man made reservoir, to a somewhat quickly flowing freshwater river, to a wide, expansive tidal estuary (North Carolina Department of Environment and Natural Resources, 2002). The importance of the river is not lost on North Carolina residents since the watershed supports roughly 1.01 million people or 14.9 percent of the state's residents, including large parts of Raleigh, the state capital. Agricultural land use makes up 35 percent of the basin's area, showing the importance of farming for the area's economy and social fabric.

The water quality problems in the Neuse are well documented. According to the United States Geological Service, the Neuse River contributes higher levels of nitrogen and phosphorus to the Albemarle-Pamlico Sounds than any of the other major tributaries (Spruill and Harned, 1997). This nutrient loading has led to numerous problems, especially downstream in the slower moving estuary. The resulting problems include eutrophication and Pfiesteria, which have had negative impacts on aquatic life in the estuary. As a result, state and local leaders have searched for viable solutions to nutrient loading in the Neuse. The North Carolina Environmental Management Commission set the goal of reducing nitrogen levels in the Neuse River by 30 percent. All Neuse Rules became effective August 1998 and address agricultural nitrogen reduction, nutrient management, protection and maintenance of riparian areas, urban stormwater management, and wastewater dischargers.

Under the agricultural rule the farmers of the Neuse River basin are given two options for reaching the nitrogen reduction goal. The first option involves participating in a local nitrogen reduction strategy that includes specific plans for each farm that would collectively meet the nitrogen reduction goal. The second option involves the implementation of standard best management practices such as buffers, water control structures, and nutrient management plans. The state favors the first option, since the state feels that it involves cooperation between agricultural agencies and farmers, which could lead to the most cost effective and site specific solutions (North Carolina Department of Environment and Natural Resources, 2002). The first option also allows for better prioritization and coordination of funding sources. The second strategy gives farmers another choice if they are not interested in the local nitrogen reduction strategies.

This study statistically analyzes economic and other factors that contribute to farmer adoption of nine different agricultural best management practices in the Neuse River basin. In this case, the nine best management practices are conservation or reduced tillage, grass waterways, permanent vegetation cover, cover crops in rotation, grasses or legumes in rotation, filter or buffer strips, integrated pest management or scouting, fertilizer or nutrient management, and controlled drainage. Each of these management practices has an important role in reducing non point source pollution.

Several studies, starting with Ervin and Ervin (1982), have developed economic models that have dealt a number of decisions related to BMPs use. In this study, due to limited data, the analysis focuses on BMP adoption. The data come from farmers living in the Neuse River basin, and reflects the characteristics of the farmers, their farms, and their perceptions concerning environmental issues. This study should give policy makers a better understanding of which farmers adopt agricultural BMPs in the Neuse River basin and what policies can effectively improve future BMP implementation. The study should also show that factors contributing to BMP adoption in the Neuse River basin are not uniform across conservation techniques. Each BMP may have different factors that influence adoption.

Literature Review

There have been numerous studies related to implementation of Best Management Practices in agriculture. The literature reviewed in this section pertains specifically to determining the factors leading implementation as well as the degrees of implementation. The majority of the studies reviewed are related to BMPs in agriculture. All the papers reviewed dealt with management practices in developed countries with the exception of

Ramirez and Shultz (2000), which deals with BMPs in developing countries. It is important to note the differences in methodology when studying the BMP implementation in developed and developing countries.

In a paper by Gould, Saupe, and Klemme (1989), a very important question was posed, "Given the high social costs associated with soil erosion, how can state and federal agencies effectively motivate farmers to implement soil conserving technologies?" In the case of this paper, the question focused on tillage practices. In the evolution of literature related to participation in best management practices, this question remains at the root of the problem.

In their study of farm operators from Southern Wisconsin, Gould, Saupe, and Klemme (1989) try to address their problem with a two-stage analysis. The basis of their model, originally used by Ervin and Ervin (1982), broke this decision-making process into (1) identifying the existence of a problem, (2) deciding whether or not to adopt the BMP given the existence of the problem, and (3) having decided to adopt the BMP, deciding the intensity of adoption. Gould, Saupe, and Klemme address the three-stage decision making process of Ervin and Ervin by using a model for identification of the existence of the problem and another model that combines the decision to adopt and intensity of adoption.

Gould, Saupe, and Klemme's (1989) first stage uses a single probit equation to examine the factors influencing the farm operator's level of awareness of soil erosion as a problem in agriculture. In the second stage, they use a two-limit Tobit model in determining whether or not the farmers implemented the BMP and if so, to what extent. In this analysis, they determined that adoption and use of BMPs depends on farm characteristics, financial characteristics, and operator characteristics. Gould, Saupe, and Klemme found that the age of the operator had a negative relationship to adoption. They pose that younger farmers are more likely to adopt the practices, but older, more experienced farmers are more likely to recognize a problem. Gould, Saupe, and Klemme hypothesize that if younger farmers can recognize the problem, they will adopt the conservation practices. Gould, Saupe, and Klemme also came to similar results with farm size as a variable. They argue that smaller farms are more likely to recognize a problem, but larger farms are more likely to adopt conservation practices.

Lohr and Park (1995) also study participation and intensity in soil conservation, but they conclude that the single equation method used by Gould, Saupe, and Klemme (1989) is not the best method since they argue that it is not utility-consistent. They argue that different factors may influence participation and the intensity of participation. If this is the case, then these different factors can only be accounted for by modeling participation and intensity separately. By doing this, they are able to account for correlation between the unexplained variation (i.e., the error terms) in the discrete model (participation) and the continuous model (intensity). Lohr and Park then use a modified version of Roy's identity that links the discrete and continuous models to the same utility function.

Lohr and Park's pooled logit model representing participation is applied to two counties in Illinois and Michigan. Lohr and Park find that participation decisions are affected by factors only indirectly related to on-farm returns. These factors include environmental concern, contact with government agencies, and household and farm characteristics.

Traore, Landry, and Amara (1998), in their study of the adoption of conservation practices by potato farmers in Quebec, used a variation of the two-stage analysis used by Gould, Saupe, and Klemme (1989). In this case, Traore, Landry, and Amara (1998) use a two-stage probit model. The first stage involved the estimation of perceptions about BMP adoption. In the second stage, the predicted values from the first equation are used as explanatory variables in the second equation. From this, the structural equations are estimated using maximum likelihood procedures. Since Traore, Landry, and Amara (1998) avoid mixing discrete and continuous dependent variables, they avoid the problems of utility-inconsistency. They do, however, miss some of the results associated with intensity of BMP implementation.

In Traore, Landry, and Amara's probit model variables include farmer characteristics such as education, membership in producers organizations, experience, participation in government programs, and ownership status; farmer perception variables which include perceived health threat from farm chemicals, adequacy of information on conservation practices, and expected crop loss to pests and weeds; and farm characteristic variables which include size of operations and share of potato revenues in total farm income. This study puts less emphasis on financial aspects than other reviewed studies. Traore, Landry, and Amara argue the importance of including factors such as perceptions of health hazards of farm chemicals and availability of BMPs. Other than these two factors, they find that extent of perception, education, and the expected loss to pests and weeds all influence adoption of conservation practices.

Fuglie (1999) studies the relationship between conservation tillage and pesticide use in farming practices. In this analysis, the choice of tillage system was determined through the use of a multinominal logit model. The second stage of this analysis examines the effect of tillage on the quantity and quality of chemicals applied and on crop yield. Here the analysis switches from the connection between perception and implementation to a connection between implementation and chemical use or crop yield. This shows a natural progression in the areas studied.

In his multinominal logit model for tillage adoption, Fuglie includes the commonly used farm and farmer characteristic variables such as experience, farm size, and technical experience. Fuglie also adds other variables such as a variable for those farmers with a college education, farm owners, those who comply with conservation practices, as well as various erosion and soil related variables. Since the geographical area studied is larger than in other studies, Fuglie includes dummy variables representing those observations in Illinois, Indiana and Nebraska. An interesting aspect of Fuglie's model specification is the inclusion of variables representing conditions that would lead to erosion problems. Fuglie's study found that larger farm size, college education, and having off-farm work were important factors in explaining the adoption of conservation tillage. He found that the results of variables associated with the higher opportunity cost of labor indicate that reducing labor costs may be the main motivation for the adoption of less-intensive tillage practices. Larger farm size and higher education are also associated with reducing per-unit adoption costs.

Cooper (1997) uses yet another technique in his analysis of farmer adoption of water quality protection practices. In this study, hypothetical and market data is mixed. In this case, a two-stage analysis is used. Here, the first stage studies BMPs implementation and the related characteristics. A major difference between this and prior studies is the inclusion of hypothetical (contingent behavior) data. This model has a discrete choice as the dependent variable. The second stage of this analysis is a continuous model, which again combines the actual and hypothetical data. In this model the dependent variable is stated acres allocated to the conservation practice for non-users of the practice and actual acres allocated to the conservation practice for the current users. Cooper (1997) argues that by combining hypothetical survey data with actual market data, his results are more reliable than those from studies that only use hypothetical data.

The studies above are all varying methods for analyzing aspects of BMP implementation in developed countries, specifically the United States and Canada. Ramirez and Shultz (2000) study the implementation of BMPs in developing countries – in this case Central America. The reasons for studying BMPs implementation are similar in developing countries, but the institutional situations are drastically different. Ramirez and Shultz use a Poisson Count Regression Model to study adoption factors in this study. They argue that the use of an integer-valued gradient is necessary for the dependent variable because BMPs are almost never adopted fully. Because of this, the authors find a range of adoption, the integer-valued gradient, more effective in determining statistically efficient and sound evaluation of the factors affecting technology adoption in these countries.

Ramirez and Shultz find several different factors that contribute to BMP implementation in developing countries. They find that participation in community organizations is positively related to adoption. Other factors, such as access to credit, labor availability, education, farm size, and type of cropping system also seem to influence adoption. One interesting outcome was the finding that higher farm net income and the existence of incentives does not appear to have a positive impact on adoption.

Model

Our objective is to empirically examine the adoption of various Best Management Practices of farmers in the Neuse River Basin. The equation determines the optimal choices for nine different agricultural BMPs. In this model, the surveyed farmers made a participation decision of whether to use the various BMPs on their farms. When making these decisions, these farmers are taking part in a utility maximizing model of choice (Lohr and Park, 1995). The farmer compares participation in the BMPs and non-participation in BMPs, and they implement the BMPs if the utility from participation is greater than utility from non-participation. It is assumed in this case that utility is a mixture of observed and unobserved variables that contribute toward a decision.

This model is an example of a Bernoulli or binary response model. This class of binary response models comes in the form

$$P(y=1 \mid \mathbf{x}) = P(y=1 \mid x_1, x_2, \ldots, x_k)$$

where we use **x** to denote the full set of explanatory variables. The probability of participation in BMPs looks as follows:

$$\Pr(Participation) = \Pr[V_1(X, F, P, B, C) + e_1 > V_0(X, F, P) + e_0]$$

where V_1 and V_0 represent utility with participation and non participation;

X, F, P, B, C represent personal traits (X), farm traits (F), perception of current conditions (P), benefits of participation (B), costs of participation (C), and e represents the error term.

The model of choice in the determination of participation is the binary logistic regression model. The logistic regression model is chosen over the OLS model for several reasons. First, in the OLS model, the error terms are heteroskedastic when using a binary dependent variable. This means that the variance of the dependent variable is different with different values of the independent variables. Second, the error is not normally distributed due to the fact that the independent variable only takes on two values. Third, the predicted probabilities can be greater than 1 or less than 0. This can cause problems if the predicted values are used in other analyses.

The logistic regression model, or logit model, solves these problems. In this case we are choosing a binary response model in the form

$$P(y=1 \mid \mathbf{x}) = G(\boldsymbol{b}_0 + \boldsymbol{b}_1 x_1 + \ldots + \boldsymbol{b}_k x_k) = g(\boldsymbol{b}_0 + \mathbf{x}\hat{\mathbf{a}})$$

where G is a function with values between zero and one: 0 < G(z) < 1, for all real numbers z (Wooldridge, 2000). The logit model looks as follows:

$$G(z) = \frac{e^z}{1+e^z} = \Lambda(z)$$

where Λ is the cumulative distribution function for a standard logistic random variable. A major benefit of the logit model is that it can be derived from a latent variable model that satisfies the classic linear model assumptions (Wooldridge, 2000). This model looks as follows

$$y^* = \boldsymbol{b}_0 + \mathbf{x}\hat{\mathbf{a}} + e, \; y = 1[y^* > 0]$$

where 1[.] represents the indicator function. The indicator function takes on the value 1 when the event in the brackets is true and 0 when the event in the brackets is false. This means that $y=1$ when $y^*>0$, and $y=0$ when $y^* \leq 0$. A particularly important assumption is that the error term, e, is independent of x and that the e has a standard logistic distribution. With a standard logistic distribution, e is symmetrically distributed around zero.

In the logit model, the magnitude of each parameter, $\boldsymbol{b}_j$, are not necessarily useful, for most cases we want to test the effect of x_j on the probability of success. This can be complicated because of the nonlinear nature of the logit regression model. Finding the partial effect of these variables on the response probability looks as follows

$$\frac{\partial p(x)}{\partial x_j} = g(\boldsymbol{b}_0 + \mathbf{x\hat{a}})\boldsymbol{b}_j \text{, where } g(z) \equiv \frac{dG}{dz}(z)$$

where g is the probability density function. For logit, G( ) is an increasing cumulative distribution function, so g(z) > 0 for all z. Therefore, the partial effect of x_j on $p(x)$ depends on the positive quantity $g(\boldsymbol{b}_0 + \mathbf{x\hat{a}})$. This means that the partial effect always has the same sign as $\boldsymbol{b}_j$.

In these models we can estimate the partial or marginal effects with the formula

$$m\,\mathrm{arg}\,inal\ effect\ of\ \ x_j\ = \bar{p}(1-\bar{p})*\boldsymbol{b}_j$$

where $\bar{p}$ equals the mean value of y and $\boldsymbol{b}_j$ is the estimated coefficient of x_j (Wooldridge, 2000). We will use these marginal effects to analyze some of the parameter estimates. In some cases, the logit coefficients are best interpreted with the odds ratios. The odds ratio is the probability of the event, divided by the probability of the nonevent. The odds ratio is estimated with the formula

$$Odds\ Ratio = e^{b_j}$$

where e^{b_j} is interpreted as the rate of change in the "log odds" as x_j changes.

The likelihood ratio test is used to determine which model best explains the implementation of each BMP. This is determined by the formula

$$LR(k) = -2[LL(a,B) - LL(a,B,C)]$$

where the model LR statistic is distributed with k degrees of freedom, where k is the number of independent variables in the C coefficient vector. In the "unconstrained model," LL(a,B,C) is the log-likelihood function evaluated with all the independent variables included. In the "constrained model" the log-likelihood function evaluated with only the constant and basic variables included is LL(a,B).

Empirical Model

We estimate the agricultural best management practices implementation model for nine different BMP types (i = 1,…,9): conservation or reduced tillage (i = 1), grass waterways (i = 2), permanent vegetation cover (i = 3), cover crops in rotation (i = 4), grasses or legumes in rotation (i = 5), filter or buffer strips (i = 6), integrated pest management or scouting (i = 7), fertilizer or nutrient management (i = 8), and controlled drainage (i = 9). Five specifications of the model are estimated. Based on findings from the literature review, each model specification includes the following basic demographic variables: education, work experience, income, farm acres, farm acres squared, percentage of farm sales from livestock, percentage of income from farming, and a financial assistance dummy. The model specification I is

$$\Pr(y = 1) = \Lambda(\hat{a}_0 + \mathbf{x}\hat{\mathbf{a}}), \quad \text{(I)}$$

where **x** is the vector for the basic demographic variables.

The model specification II is

$$\Pr(y = 1) = \Lambda(\hat{a}_0 + \mathbf{x}\hat{\mathbf{a}} + R\boldsymbol{b}_1), \quad \text{(II)}$$

where R represents a vector of the geographical region dummies defining where the respondent lives within the Neuse River Watershed - all other variables remain the same. For the purpose of this study, the Neuse River is divided into three subsections, the Upper Region, which is in the Piedmont; the Middle Region, which flows through the upper Coastal Plain; and the Lower Region found in the lower Coastal Plain where the Neuse empties into the Pamlico Sound. The three subsections of the Neuse are all somewhat different in composition, together forming a diverse ecosystem. The relationship between geographical region and BMPs participation is not clear. The lower region of the Neuse has more water quality problems, but much of this could be due to the changes in the physical morphology of the watershed rather than farming practices.

Model specification III includes all the variables from the previous specifications and it adds a group of variables representing the perception of the farmer concerning Neuse River water quality conditions. The model is

$$\Pr(y=1) = \Lambda(\hat{a}_0 + \mathbf{x}\hat{\mathbf{a}} + R\boldsymbol{b}_1 + P_C\,\boldsymbol{b}_2) \quad \text{(III)}$$

where P_C represents a vector of the perception variables for water quality conditions. These variables include the following: a dummy variable for those rating the water quality poor, a dummy variable for those who have heard or read a lot about problems facing the Neuse, a dummy variable for those who have talked with someone about the problems on the Neuse, a dummy variable for those who do not think water quality on the Neuse is important at all, and a dummy variable for those respondents who feel that the Neuse River is not safe for recreation.

Model specification IV again includes all previous variables, but this time adds a group of variables representing the respondent's perception of politics related to water quality on the Neuse. The model is

$$\Pr(y=1)=\Lambda(\hat{a}_0+\mathbf{x}\hat{\mathbf{a}}+R\boldsymbol{b}_1+P_C\boldsymbol{b}_2+P_P\boldsymbol{b}_3) \text{ (IV)}$$

where P_P represents a vector of political perception variables. In this model the new perception variables are (1) the respondent disagrees that current regulations are sufficient to protect water quality in the Neuse, (2) the respondent disagrees that those who pollute the Neuse River should pay higher fines, (3) the respondent disagrees that most people will do the right thing for the Neuse river on their own without more government regulations, and (4) the respondent disagrees that agriculture should be regulated for its environmental impacts just like any other industry.

Model specification V includes all previous variables, but in this model a group of variables are added representing use of the Neuse and knowledge of pollution terms related to water quality. The model is

$$\Pr(y=1)=\Lambda(\hat{a}_0+\mathbf{x}\hat{\mathbf{a}}+R\boldsymbol{b}_1+P_C\boldsymbol{b}_2+P_P\boldsymbol{b}_3+U\boldsymbol{b}_4) \text{ (V)}$$

where U represents a vector of use variables and knowledge variables.

Data

The data come from a 1998 telephone survey of landowners from twelve counties in the Neuse River basin (Hoban and Clifford, 1998). The original sample consisted of 422 farm and 617 non-farm landowners. This study is restricted to farmers who answered the relevant questions concerning BMPs in the survey. These restrictions limit the data to 389 observations. There are 39 variables used in this analysis.

Table 1 shows demographic information for the 389 observations and the expected effect of these variables on implementation. The average income (INCOME) of the farmers surveyed is $81.41 (measured in thousands of dollars). The average farm size of the respondents (FARMACRE) is 228 acres. The average percent income received from farming (PERCENTY) is 46 percent. Also 34 percent of respondents receive financial assistance for BMPs (FINASST). There are a number of financial assistance programs available to farmers – see the appendix for a description. Other averages for demographic variables include education (EDUC), experience (EXPER), percentage of total farm sales from livestock (ANIMALS), residence in the upper section of the Neuse watershed (UPPER), residence in the middle section of the Neuse watershed (MIDDLE), residence in the lower section of the Neuse watershed (LOWER), residence in a town (TOWN), residence in a suburb (SUBURB), residence in a rural area (RURAL), age (AGE), race (NONWHITE), and gender (FEMALE). EDUC is measured in years of schooling. EXPER is a proxy for potential work experience (AGE – EDUC – 6). AGE is measured in years.

Table 2 shows perceptions held by the respondents, use and knowledge of the river, and the expected effect of these variables on implementation. WQPOOR gives the percentage of the number of respondents who felt the water quality was poor in their communities. WQIMPORTN gives the percentage of the number of respondents who felt the water quality was not at all important to themselves personally. READALOT shows the percentage of respondents who felt they have heard or read a lot about problems facing the Neuse River. TALKSOME represents the percentage of respondents who have talked with other people about the problems on the Neuse before the survey. NOTSAFE shows the percentage of respondents who felt the river is not safe to use. CURREGAS gives the percentage of respondents who disagree that the current regulations are sufficient to protect water quality in the Neuse River. HIGHFINE gives the percentage of respondents who disagree that those who pollute the Neuse River should pay higher fines. RIGHTTHI gives the percentage of respondents who disagree that most people will do the right thing for the Neuse River on their own without more government regulations. AGRIREGS gives the percentage of respondents who disagree that agriculture should be regulated for its environmental impacts just like any other industry. BOATABLE shows the percentage of respondents who feel the Neuse River is safe for boating. TRIPS2 shows the average number of trips the respondent would take to the Neuse River for swimming, fishing, or other recreational purposes in the next 12 months. PFIESTER gives the percentage of respondents who have heard of Pfiesteria and NONPOINT gives the percentage of respondents who have heard of nonpoint source pollution.

Table 3 gives the percentage of implementation for the nine agricultural best management practices: filter or buffer strips (BMP_BUFF), controlled drainage (BMP_CODR), fertilizer or nutrient management (BMP_FNMA), grass waterways (BMP_GRAS), integrated pest management or scouting (BMP_IPMS), cover crops in rotation (BMP_ROT1), grasses or legumes in rotation (BMP_ROT2), conservation or reduced tillage (BMP_TILL), and permanent vegetation cover (BMP_VEGE).

Buffer or filter strips are strips of vegetation that intercept sediment, pesticides and other pollutants before they reach bodies of water. These vegetative strips may be used adjacent to riparian areas or in other areas where runoff occurs. 54 percent of the farmers surveyed implemented filter or buffer strips.

Farmers use controlled drainage to manage water flow to and from water sources. This management technique often uses water control structures and pumps to better manage water flow on a property. Controlled drainage leads to more efficient water use for crops as well as reduction of polluted runoff. 84 percent of the farmers surveyed implemented controlled drainage on their farms.

Fertilizer or nutrient management involves accounting for all fertilizer or nutrient inputs so to meet the needs of crops or livestock, while reducing potential runoff. These plans deal with feed management, manure handling and storage, land application of manure, nutrient management, land management, record keeping, and acceptable alternatives for use or disposal of excess nutrients produced or imported onto the farm. These plans are usually site specific and are written to meet the goals of the farmer. 82 percent of the farmers surveyed implemented this BMP.

Grass waterways are a vegetative filter system meant to carry water at a nonerosive velocity away from fields. Grass waterways trap sediment and help reduce pesticides and nutrients from surface runoff. 63 percent of the farmers implemented grass waterways.

Integrated pest management involves using a multifaceted approach to pest management. With integrated pest management, farmers deal with weeds, diseases, insects, and other pests utilizing avoidance, prevention, monitoring, and suppression strategies. Integrated pest management uses this multifaceted approach so to minimize negative environmental effects that may occur from overuse of one type of pest control. 52 percent of the surveyed farmers used integrated pest management.

Some farmers use different cover crops in their rotations for seasonal purposes. These cover crops prevent erosion and increase soil organic matter. In some cases these crops in rotation are grasses or legumes. Grasses can be used for forage for livestock or for human consumption. Legumes can be extremely important for the nitrogen fixation process, which can increase the productivity of other crops. 75 percent of the farmers used cover crops in their rotations and 53 percent of the farmers used grasses and legumes in their rotations.

Conservation and reduced tillage practices involve leaving different amounts of plant residue from past crops on the fields all year round. This practice helps prevent soil erosion and can increase the soils integrity through increases in organic matter. 74 percent of the farmers used conservation tillage practices.

The last management technique assessed in this study is permanent vegetative cover. The use of permanent vegetative cover involves establishing vegetative cover on terraces to enhance water quality and reduce soil erosion. This management technique is sometimes called a contour grass strip. Permanent vegetative cover is managed land that does not get used in crop rotation. 73 percent of the farmers used permanent vegetative cover as a management technique.

Results

Buffers

Table 4 presents the logit regression coefficients for the implementation of the buffer best management practice in the five different specifications. The results from specification 1, the basic model, indicate four significant variables at or above the .1 level. There is a positive relationship between years of education and implementation at the .1 level. As the number of acres of farmland increase, farmers in the Neuse River basin are more likely to implement buffers. The negative sign of farm acres squared, however, indicates that the positive relationship of farm size on implementation is reduced for large farms. Both farm acres and farm acres squared are significant at the .01

level. There also proves to be a significant positive relationship between farmers who receive financial assistance and implementation. This relationship is significant at the .01 level. The overall model is significant at the .01 level according to the Model chi-square. The McFadden's R^2 is .11.

Table 5 gives the marginal effects and odds ratios for the logit coefficients. Each additional year of education leads to a 1.8 percent increase in the implementation of buffers. It is important to note that education is not significant in any of the other models for the implementation of buffers. The implementation of buffers increases by roughly 1.4 percentage points with each additional 10 acres of farming. However, since there is a diminishing marginal effect, additional acres no longer increases buffer implementation when the farm size reaches 460 acres. Farms that receive financial assistance for BMP implementation are 3 times more likely to implement buffers than those farms that do not receive financial assistance.

The second model includes variables representing the geographical areas within the watershed. In this model income has a significant positive effect at the .1 level. Those farms in the lower and middle regions of the Neuse are less likely to implement buffers than those on the upper regions. The model 2 likelihood ratio is 11.98 indicating that the additional vector of coefficients is jointly statistically significant at the .01 level. The McFadden's R^2 is .13.

Income, which is significant at the .1 level, increases the implementation of buffers by roughly nine percent with each additional $10,000 increment. The odds ratio for farms in the lower region is less than one, showing farms in the lower region are 1.85 times less likely to adopt buffers than those in the upper region. The odds ratio for those farms in the middle region is .4, showing that those farms in the middle region are 2.5 times less likely to adopt buffers than those in the upper region.

The third model adds variables representing perceptions of water quality conditions on the Neuse. In this model, the only additional significant variable is one that represents those who feel that water quality is not important at all. This variable has a negative sign and is significant at the .1 level. The model 3 likelihood ratio is 9.13 indicating that the additional vector of coefficients is jointly statistically insignificant at the .1 level.

The fourth model adds variables representing farmer's political or ethical responses to water quality conditions on the Neuse. The only additional significant variable is one that represents those who disagree that agriculture should be regulated for its environmental impacts just like any other industry. This variable has a positive sign and is significant at the .1 level. The odds ratio shows that these farmers are 1.6 times more likely to implement buffers. The model 4 likelihood ratio is 4.61 indicating that the additional vector of coefficients is not jointly statistically significant. The McFadden's R^2 is .16.

The fifth model for implementation of buffers adds variables representing use of the river and knowledge of scientific jargon. In this model none of the new variables are statistically significant. Also, the variables added in models 3 and 4 are all insignificant. The model 5 likelihood ratio is 2.56 indicating that the additional vector of coefficients is not jointly statistically significant. The likelihood ratio tests indicate that the second model gives the best description of the implementation of buffers.

Controlled Drainage

Table 6 presents the logit regression coefficients for the implementation of the controlled drainage BMP. The results from specification 1, the basic model, indicate four coefficients are significantly different from zero. As the number of acres of farmland increase, farmers in the Neuse River basin are more likely to implement controlled drainage. The negative sign of farm acres squared indicates a diminishing return to implementation for farm size. Both farm acres and farm acres squared are significant at the .01 level. There also proves to be a significant positive relationship between farmers who receive financial assistance and implementation. This relationship is significant at the .05 level. There is also a positive relationship between the percent of income from farming and the implementation of controlled drainage at the .05 level. The overall model is significant at the .01 level according to the Model chi-square statistic. The McFadden's R^2 is .11.

Table 7 presents the marginal effects and odds ratios. In this model, implementation increases by 10 percentage points with each additional 100 acres. When a farm reaches 430 acres in size, size no longer effects implementation of controlled drainage. The odds ratio indicates that those farmers with financial assistance are 2.16 times more likely to implement controlled drainage. The affect of financial assistance seems to be constant throughout the five models. With each 10 percent increase of income coming from farming, implementation increases by 1.3 percent.

The model 2 likelihood ratio is .038 indicating that the additional vector of coefficients is not jointly statistically significant. The third model also adds no additional significant variables to the model. The model 3 likelihood ratio is 4.74 indicating that the additional vector of coefficients is not jointly statistically significant.

The fourth model adds two significant variables to the model. There is a negative relationship between implementation and those who disagree that those who pollute the Neuse River should pay higher fines. This coefficient is significant at the .1 level. The other negative relationship is between implementation of controlled drainage and those who disagree that most people will do the right thing for the Neuse River on their own without more government regulations. This coefficient is significant at the .05 level. The model 4 likelihood ratio is 10.98 indicating that the additional vector of coefficients is jointly statistically significant at the .05 level. The McFadden's R^2 is .15.

The odds ratio for those farmers who disagree that those who pollute the river should pay higher fines is .36, showing that these farmers are 2.78 times less likely to implement controlled drainage. Those who disagree that most people will do the right thing for the Neuse River on their own without more government regulations have an odds ratio of .5, showing that these farmers are 2 times less likely to implement controlled drainage.

The model 5 likelihood ratio is 5.75, indicating that the additional vector of coefficients is not jointly statistically significant. The likelihood ratio test shows that the best model for explaining the implementation of controlled drainage is the model 4.

Fertilizer or Nutrient Management

The logit regression coefficients for the implementation of the fertilizer or nutrient best management practices are presented in table 8. There is a positive relationship between farmers who receive financial assistance and implementation at the .01 level. There is also a positive relationship between the percent of income from farming and the implementation of fertilizer or nutrient management at the .01 level. The overall model is significant at the .01 level according to the Model chi-square statistic. The McFadden's R^2 is .09.

Table 9 presents the marginal effects and odds ratios for the logit. The odds ratio indicates those farmers receiving financial assistance for implementation of BMPs are over 3 times more likely to adopt fertilizer or nutrient management. The marginal effects and odds ratios do not change much over the five models for the financial assistance variable. Farmers also increase implementation by 1.9 percent with each additional ten percent of their total income that is gained from farming.

In the second model, geographical location seems to do little to improve the explanation of fertilizer and nutrient management implementation. The model 2 likelihood ratio is 0.15 indicating that the additional vector of coefficients is not jointly statistically significant. The third and fourth models also add no additional significant variables for explanation of implementation. The likelihood ratios are 3.28 and 1.04 indicating that the additional vectors of coefficients are not jointly statistically significant. The model 5 likelihood ratio is 6.87 indicating that the additional vector of coefficients is not jointly statistically significant. The base model is the best model to explain the implementation of fertilizer or nutrient management.

<u>Grass Waterways</u>

Table 10 presents the logit regression coefficients for the implementation of grass waterways as a best management practice. There is a positive relationship between farm size and the implementation of grass waterways. This positive relationship increases at a decreasing rate. Both farm acres and farm acres squared are significant at the .01 level. There proves to be a significant positive relationship between farmers who receive financial assistance and implementation at the .01 level. The percent of income from farming also has a positive relationship with the implementation of grass waterways at the .1 level. The overall model is significant at the .01 level according to the Model chi-square statistic. The McFadden's R^2 is .15.

The marginal effects and odds ratios for the logit coefficients are presented in table 11. Implementation of this BMP increases by 21 percentage points with each additional 100 acres. When a farm reaches 538 acres in size, its size no longer effects implementation of grass waterways. The odds ratio shows that implementation of grass waterways becomes 2.63 times more likely when farmers receive financial assistance. Farmers also increase implementation by 1.6 percentage points when an additional ten percent is added to their total income gained from farming.

In the second model the significance and sign of the base model variables do not change. Those farms in the lower and middle regions of the Neuse are less likely to implement buffers than those on the upper regions. The likelihood ratio is 12.94 indicating that the additional vector of coefficients is jointly statistically significant at the .01 level. The McFadden's R^2 is .17. Those farmers in the lower region of the watershed are 2.94 times less likely to implement grass waterways than those in the upper regions. Those farmers in the middle region of the watershed are 1.75 times less likely to implement grass waterways than those in the upper region.

The third and fourth models add no additional significant variables to the explanation of the implementation of grass waterways. The likelihood ratios for the third and fourth models are 0.95 and 4.98 indicating that the additional vectors of coefficients are not jointly statistically significant.

In the fifth model those who disagree that most people will do the right thing for the Neuse River without more government regulation are less likely to implement grass waterways at the .1 level. There is also a positive relationship for those who feel the Neuse is safe for boating. This relationship is significant at the .05 level. The overall model is significant at the .01 level according to the Model chi-square statistic. The likelihood ratio is 8.03 indicating that the additional vector of coefficients is jointly statistically significant at the .1 level. The McFadden's R^2 is .20.

Those farmers who disagree that farmers will do the right thing for the river are 1.61 times less likely to implement grass waterways. The odds ratio shows that those farmers who feel the Neuse is safe for boating are over 2 times more likely to implement this BMP.

<u>Integrated Pest Management</u>

Table 12 presents the logit regression coefficients for the implementation of the integrated pest management BMP. In this model there is a positive relationship between income and implementation at the .05 level. As the number of acres of farmland increase, farmers in the Neuse River basin are more likely to implement grass waterways. The negative sign of farm acres squared indicates that the positive relationship of farm size on implementation is reduced for large farms. Both farm acres and farm acres squared are significant at the .01 level. There is a significant positive relationship between farmers who receive financial assistance and implementation at the .05 level. The overall model is significant at the .01 level according to the Model chi-square statistic. The McFadden's R^2 is .06.

Table 13 presents the marginal effects and odds ratios. As income increases in $10,000 increments, implementation of integrated pest management increases by 10 percentage points. Implementation increases by 12 percentage points with each additional 100 acres. When a farm reaches 396 acres in size, an increase in farm size no longer effects implementation of integrated pest management. Farms that receive financial assistance for BMP implementation are 1.66 times more likely to implement this BMP than those farms that do not receive financial assistance.

The likelihood ratios in models 2-5 are 2.28, 8.21, 4.71, and 4.36. The additional vectors of coefficients are not jointly statistically significant, therefore, the base model remains the best model to explain the implementation of integrated pest management.

<u>Rotation 1</u>

Table 14 presents the logit regression coefficients for the implementation of cover crops in rotation as a best management practice for the five different specifications. As the number of acres of farmland increase, farmers in the Neuse River basin are more likely to implement cover crops in rotation. The negative sign of farm acres squared indicates that implementation increases at a decreasing rate. Farm acres and farm acres squared are significant at the .01 level. There is also a positive relationship between the percent of income from farming and the implementation of cover crops in rotation at the

.05 level. The overall model is significant at the .01 level according to the Model chi-square statistic. The McFadden's R^2 is .15.

Table 15 presents the marginal effects and odds ratios for the logit coefficients in the five specifications. In the base model, implementation increases by 13 percent with each additional 100 acres. When a farm reaches 660 acres in size, its size no longer effects implementation of cover crops in rotation. Farmers also increase implementation by 1.6 percentage points when an additional ten percent is added to their total income gained from farming.

The likelihood ratios in models 2-5 are 4.26, 4.43, 1.86, and 6.04. The additional vectors of coefficients are not jointly statistically significant. The base model remains the best model to explain the implementation of cover crops in rotation.

<u>Rotation 2</u>

Table 16 presents the logit regression coefficients for the implementation of the grasses or legumes in rotation in the five different specifications. There is a positive relationship between implementation of this BMP and the percentage of total farm sales from livestock. This relationship is significant at the .01 level. Also as the number of acres of farmland increase, farmers in the Neuse River Basin are more likely to use grasses or legumes in rotation. The negative sign of farm acres squared indicates that the positive relationship of farm size on implementation is reduced for large farms. Both farm acres and farm acres squared are significant at the .01 level. There is a significant positive relationship between farmers who receive financial assistance and the use of grasses and legumes in rotation at the .01 level. The percent of income gained from farming also has a positive relationship to implementation at the .1 level. The overall model is significant at the .01 level according to the Model chi-square statistic. The McFadden's R^2 is .12.

Table 17 presents the marginal effects and odds ratios. Implementation increases by 15 percentage points with each additional 100 acres. When a farm reaches 377 acres in size, its size no longer effects implementation of grasses or legumes in rotation. Farms that receive financial assistance for BMP implementation are 2.9 times more likely to implement buffers than those farms that do not receive financial assistance for BMP implementation. Farmers also increase implementation by 1.5 percentage points when an additional ten percent is added to their total income gained from farming.

The likelihood ratio for the second model is 4.66 indicating that the additional vector of coefficients is jointly statistically significant at the .1 level. The McFadden's R^2 is .13. Those farmers in the lower region of the Neuse are 1.82 times less likely to implement grasses or legumes in rotation than those farmers in the upper region.

In the third model three additional variables have significant relationships with implementation of this BMP. There is a negative relationship between implementation and those respondents who felt the water quality was poor in their communities at the .05 level. There is a positive relationship between implementation and respondents who felt they have heard or read a lot about problems facing the Neuse River at the .1 level. There is also a positive relationship between implementation and respondents who have talked with other people about the problems on the Neuse before the survey. This is significant at the .05 level. The likelihood ratio for the third model is 16.06 indicating that the additional vector of coefficients is jointly statistically significant at the .01 level. The McFadden's R^2 is .16.

Those who feel the water quality is poor in the Neuse River are 1.72 times less likely to implement rotation 2. Those farmers who felt they had heard or read a lot about problems facing the Neuse were 1.69 times more likely to implement legumes or grasses in rotation. Those farmers who have talked with other people about problems on the Neuse before the survey were 2 times more likely to implement grasses or legumes in rotation.

In the fourth and fifth models the likelihood ratios are 2.07 and 3.50 indicating that the additional vectors of coefficients are not jointly statistically significant. The third model best explains the implementation of legumes or grasses in rotation out of the five different models.

Conservation or Reduced Tillage

Table 18 presents the logit regression coefficients for the implementation of the conservation or reduced tillage in the five different specifications. As the number of acres of farmland increase, farmers in the Neuse River basin are more likely to implement conservation or reduced tillage. The negative sign of farm acres squared indicates that the positive relationship of farm size on implementation is reduced for large farms. Both farm acres and farm acres squared are significant at the .01 level. There is a significant, positive relationship between farmers who receive financial assistance and implementation. This relationship is significant at the .01 level. The overall model is significant at the .01 level according to the Model chi-square statistic. The McFadden's R^2 is .16.

Table 19 presents the marginal effects and odds ratios for the logit coefficients in the five specifications. In this model, implementation increases by 20 percentage points with each additional 100 acres. When a farm reaches 542 acres in size, its size no longer effects implementation of conservation or reduced tillage. Farms that receive financial assistance for BMP implementation are 2.5 times more likely to implement conservation or reduced tillage than those farms that do not receive financial assistance for BMP implementation.

The likelihood ratio statistics for models 2-5 are all below the .1 critical value. This means the base model is the specification that best explains the implementation of reduced and conservation till practices.

Permanent Vegetation Cover

Table 20 presents the logit regression coefficients for the implementation of the permanent vegetative cover as a best management practice in the different specifications. As the number of acres of farmland increase, farmers in the Neuse River Basin are more likely to implement permanent vegetative cover. The negative sign of farm acres squared indicates that the positive relationship of farm size on implementation is reduced for large farms. Both farm acres and farm acres squared are significant at the .01 level. The overall model is significant at the .01 level according to the Model chi-square statistic. The McFadden's R^2 is .07.

Table 21 presents the marginal effects and odds ratios for the logit coefficients in the five specifications. In this model, implementation increases by 11 percentage points with each additional 100 acres. When a farm reaches 423 acres in size, its size no longer effects implementation of permanent vegetative cover.

In the second model, those farmers in the lower and middle regions of the Neuse River basin have negative coefficients, both significant at the .05 level. The likelihood ratio for the second model is 8.42 indicating the additional vector of coefficients is jointly statistically significant at the .025 level. The McFadden's R^2 is .09. Those farmers in the lower region of the Neuse are 1.89 times less likely to implement the permanent vegetation strips than those in the upper region. The farmers in the middle region of the Neuse are 2.22 times less likely to implement permanent vegetation strips.

In the next three models the significance and signs of the variables brought over from the base model do not change. There are also no additional significant variables added in models 3-5. The likelihood ratios are 4.06, 2.07, and 3.50. All these likelihood ratio statistics indicate that the additional vectors of coefficients add little to the model. Model 2 best explains the implementation of the permanent vegetation BMP out of the five models.

Conclusions

In this study, voluntary participation in nine different agricultural best management practices is characterized by farmer characteristics, farm characteristics, financial characteristics, and varying categories of farmer perception concerning water quality. Our models are applied to a sample of farms in the Neuse River basin in North Carolina. The implementation of these nine best management practices have been shown to decrease the amounts of pollution reaching surface waters. The hope of this study was to determine the factors that contribute to implementation of agricultural best management practices so future policy decisions can be made more efficiently and effectively.

One thing that makes this study different from other studies is its attention to numerous BMPs and the premise that the contributing factors for implementation of these best management practices vary depending on which practice is viewed. There are, however, several common factors that did influence the implementation of almost all nine BMPs studied. Farm size has a significant, positive relationship with adoption of BMPs. The only best management practice that is not affected by farm size is fertilizer or nutrient management. Farm size's positive effect on implementation of BMPs range from a 12 percentage point increase per hundred acres for permanent vegetation strips to a 25 percentage point increase for grass waterways. The mean percentage point increase for implementation of these BMPs is 16.5.

When farm size affected implementation of the BMPs, the magnitude of the increase diminished as the size of the farm increased. In each case, there was a specific farm size after which BMPs' implementation did not increase. This farm size ranged from 369 acres for integrated pest management to 800 acres for the implementation of cover crops in rotation. The mean farm size where size no longer affected implementation was 519 acres.

Financial assistance in BMPs adoption also had positive impacts on implementation of most BMPs in the study. The only BMPs that were not significantly affected by financial assistance were rotation 1 and permanent vegetation strips. The affect of financial assistance on implementation ranges from an 11 percentage point increase for integrated pest management to a 28 percentage point increase for buffers. The mean positive effect of financial assistance in this data set is roughly 20 percentage points.

Geographical location appeared to be important in adoption of numerous practices. Farms in the upper region of the Neuse Basin were more likely to implement buffers, grass waterways, rotation 1, rotation 2, and permanent vegetation strips than farms in the lower region of the Neuse Basin. Similarly, farms in the upper region of the Neuse Basin were more likely to implement buffers, grass waterways, and permanent vegetation strips than those farms in the middle region of the Neuse. There were no significant differences in the implementation of the other BMPs between regions. One interesting study would be to determine why the regions within this river basin were different since several important demographic factors such as education were already accounted for.

The implementation of cover crops in rotation, fertilizer or nutrient management, controlled drainage, grasses or legumes in rotation, and grass waterways were all affected by the percentage of income from farming. The effect was not constant, however. The implementation of grasses or legumes and grass waterways were both negatively affected by the percentage of income from farming. Both decreased implementation by roughly 2 percentage points per 10 percent increase in income from farming. The implementation of cover crops in rotation, fertilizer or nutrient management, and controlled drainage all had positive affects of around 2 percentage points per 10 percent increase in income from farming.

Several BMPs were positively affected by the percentage of total sales from livestock. Not surprisingly, these BMPs - controlled drainage, grasses or legumes in rotation, and grass waterways – are all commonly used conservation practices in livestock operations. Implementation is increased between roughly 1 and 2 percent for every 10 percent increase in the percentage of total sales from livestock.

One of the aims of this study was to determine if water quality related perceptions impacted adoption of best management practices. In some cases, perceptions appeared to have little or no influence on implementation. Neither permanent vegetation strips nor integrated pest management had any water quality related perception that influenced their adoption. Fertilizer and nutrient management and rotation 1 BMPs only had one significant water quality related perception impacting adoption. Controlled drainage and rotation 2 appeared to be most influenced by water quality related perceptions. Controlled drainage was influenced by reading a lot about water quality issues on the Neuse, disagreeing that those who pollute the Neuse should receive higher fines, disagreeing that farmers will do the right thing for water quality if given the chance, and knowledge of the term Pfiesteria as a proxy for scientific knowledge. Rotation 2 was influenced by those who thought water quality is poor on the Neuse, reading a lot about water quality issues on the Neuse, talking with someone about water quality issues on the Neuse before the survey, disagreeing that farmers will do the right thing for water quality if given the chance, and knowledge of the word nonpoint as a proxy for scientific knowledge. The fact that implementation of these best management practices had such varied relationships to perceptions indicates that the issue may deserve more study. It would be difficult to formulate effective policy related to farmers' water quality related perceptions due to the variability of results.

This study shows that any policy aimed at improving BMPs implementation in the Neuse River basin should take a flexible approach. The two most important factors in participation in BMPs are farm size and financial assistance. The impact of financial assistance amplifies the importance of proper funding in the implementation of such policies. The fact that farm size plays an important role shows the potential for some selectivity in producing the most effective policy.

One explanation of the influence of farm size is that average cost of BMPs implementation decreases as farm size increases. This shows how economies of scale affect implementation. As a farm increases in size, the average cost of implementation decreases, leading to higher rates of implementation. There is a point where increases in farm size no longer influence BMPs implementation. This suggests that medium sized farms have the lowest average costs for implementation of BMPs. In order to provide more incentives for small farms to adopt BMPs, small farms could receive higher per acre payments to address the higher costs of BMPs implementation. The higher payments would balance out the higher per acre cost of BMPs implementation that occurs with smaller farms.

Small farms generally missed out on financial assistance in the Neuse River compared to the medium and large farms. A frequency distribution of farm size and financial assistance shows that small farms are less likely to receive financial assistance for adoption of best management practices. The chi square statistic for this test is 22.76 with one degree of freedom. This result is potentially explained by the relative difficulty of communication between government agencies and small farmers. It is much easier to write medium and large sized farms several large checks that pay for BMP implementation than to write numerous small checks. If an efficient policy to include small farms could be implemented, adoption of conservation practices would be much more prevalent in small farms. The key might be to approach this problem on a much more localized level. This may mean allowing the local government employees to determine how money should be allocated and running seminars for small farm operators to increase communication.

Future studies should focus on determining factors of BMPs intensity in the region. With the proper analysis of participation and intensity, nonpoint source pollution policy formulation should become more effective. Knowing who to target should lead to the most effective and efficient way to improve water quality on the Neuse.

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Appendix I: Financial Assistance for Best Management Practices

The costs associated with best management practices are installment and maintenance costs. These costs include installation costs for putting the BMPs onto farms and annual maintenance costs such as opportunity costs of the land, labor, and equipment used to maintain the BMPs on the farm. Several cost-share programs have been developed to help farmers implement these management practices. These programs are available from both the state and federal governments.

The state and federal governments run the North Carolina Conservation Reserve Enhancement Program (CREP) in order to address water quality problems in areas such as the Neuse River basin. This voluntary program protects land in agricultural production along the state's water bodies. CREP supplements payments made under the Conservation Reserve Program (CRP) which is a federal program run by the US Department of Agriculture. CREP easement contracts tend to last from 10 to 30 years or permanently. Land under CREP contracts cannot be grazed, harvested or used in any other commercial way other than hunting. Under the cost share component, fifty percent of the payments come from the CRP program and the other fifty percent come from the state or the Federal Agricultural Cost-Share Program. There is also an annual incentive payment.

Another program that gives financial assistance is the Environmental Quality Incentive Program (EQIP). Payments from EQIP come from changes in land management practices such as buffers, no-till, and nutrient management. EQIP contract lengths are 5 to 10 years with an annual limit of $10,000 per annum.

The North Carolina Agricultural Cost-Share Program (ACSP) is a program administered by the North Carolina Department of Environment and Natural Resources' Division of Soil and Water Conservation. This program aims to reduce agriculture's contribution to nonpoint source pollution. It is administered at the local level by elected and appointed District Supervisors. District Supervisors are assisted by the U.S. Department of Agriculture's Natural Resources and Conservation Service, North Carolina Department of Agriculture and Consumer Services, the Cooperative Extension Service, the Division of Soil and Water Conservation, and district or county officials.

Under the North Carolina ACSP, farmers receive 75 percent of the average costs of the BMPs. The remaining 25 percent is paid by the farmer or from other sources. The program also pays districts with matching funds to hire personnel to plan and install BMPs. Farmers who fail to maintain the BMPs are required to repay some or all of the associated costs.

The USDA's Wetlands Reserve Program (WRP) and the North Carolina Wetlands Reserve Program (NCWRP) give farmers financial assistance for protecting wetlands and riparian areas. Most of these programs award easements for restoring agricultural land back into wetlands. These wetlands serve as important buffers to larger bodies of water. The WRP easements are 10-year, 30-year, and permanent, and they cover anywhere from 50 to 100 percent of restoration costs. The NCWRP program pays up to 100 percent of costs and is a permanent program.

Table 1 Descriptive Statistics: Demographics

Variable	N	Mean	Std Dev	Min	Max	Expected Sign
EDUC	389	13.589	3.388	5	22	+
EXPER	389	36.733	13.039	0	71	+
INCOME	389	81.407	58.667	2.5	200	+
ANIMALS	389	26.033	38.317	0	100	-
FARMACRE	389	227.946	223.167	1	965	+
FINASST	389	0.342	0.475	0	1	+
PERCENTY	389	46.488	39.551	0	100	-
LOWER	389	0.265	0.442	0	1	-
MIDDLE	389	0.342	0.475	0	1	-
UPPER	389	0.393	0.489	0	1	
SUBURB	389	0.041	0.199	0	1	
TOWN	389	0.059	0.236	0	1	
RURAL	389	0.882	0.323	0	1	
AGE	389	56.319	11.728	22	89	
NONWHITE	389	0.062	0.241	0	1	
FEMALE	389	0.100	0.301	0	1	

Table 2 Descriptive Statistics: Perception

Variable	N	Mean	Std Dev	Min	Max	Expected Sign
WQPOOR	389	0.481	0.500	0	1	+
WQIMPORTN	389	0.049	0.216	0	1	-
READALOT	389	0.720	0.450	0	1	+
TALKSOME	389	0.789	0.408	0	1	+
NOTSAFE	389	0.249	0.433	0	1	+
CURREGUSD	389	0.424	0.495	0	1	+
HIGHFINED	389	0.072	0.259	0	1	-
RIGHTTHID	389	0.350	0.477	0	1	+
AGRIREGSD	389	0.249	0.433	0	1	-
BOATABLE	389	0.285	0.452	0	1	+
TRIPS2	389	6.710	21.867	0	300	+
PFIESTER	389	0.835	0.371	0	1	+
NONPOINT	389	0.314	0.465	0	1	+

Table 3 BMP Descriptive Statistics

Variable	N	Mean	Std Dev
BMP_TILL	389	0.740	0.439
BMP_GRAS	389	0.632	0.483
BMP_VEGE	389	0.725	0.447
BMP_ROT1	389	0.753	0.432

BMP_ROT2	389	0.532	0.500
BMP_BUFF	389	0.535	0.499
BMP_IPMS	389	0.519	0.500
BMP_FNMA	389	0.817	0.387
BMP_CODR	389	0.835	0.371

Table 4 Estimated Logit Coefficients for the Implementation of Buffers

	Model I	Model II	Model III	Model IV	Model V
Variables	Estimate (Std Error)	Estimate (Std Error)	Estimate (Std Error)	Estimate (Std Error)	Estimate (Std Error)
Intercept	-2.3904* (0.8928)	-1.9467** (0.9236)	-2.3447** (0.9559)	-2.7446* (0.9932)	-2.7109* (1.0139)
EDUC	0.0759*** (0.0408)	0.0656 (0.0415)	0.0518 (0.0425)	0.0596 (0.0433)	0.0496 (0.0445)
EXPER	0.00132 (0.0102)	0.000506 (0.0104)	0.00313 (0.0107)	0.00392 (0.0109)	0.00465 (0.0110)
INCOME3	0.00310 (0.00206)	0.00360*** (0.00210)	0.00428** (0.00218)	0.00438** (0.00220)	0.00398*** (0.00223)
ANIMALS	0.00182 (0.00320)	0.00285 (0.00328)	0.00314 (0.00341)	0.00353 (0.00344)	0.00284 (0.00350)
FARMACRE	0.00554* (0.00172)	0.00595* (0.00175)	0.00612* (0.00178)	0.00602* (0.00180)	0.00585* (0.00183)
FARMACRE2	-6.41E-6* (2.131E-6)	-6.71E-6* (2.178E-6)	-6.9E-6* (2.21E-6)	-6.78E-6* (2.227E-6)	-6.63E-6* (2.268E-6)
FINASST	1.0950* (0.2512)	1.1517* (0.2583)	1.1337* (0.2667)	1.1613* (0.2704)	1.1340* (0.2748)
PERCENTY	0.00417 (0.00357)	0.00540 (0.00369)	0.00507 (0.00378)	0.00517 (0.00381)	0.00524 (0.00382)
LOWER	-----	-0.6136** (0.2886)	-0.8228* (0.3062)	-0.8539* (0.3099)	-0.9221* (0.3188)
MIDDLE	-----	-0.9131* (0.2747)	-1.1148* (0.2915)	-1.1886* (0.2973)	-1.2318* (0.3028)
WQPOOR	-----	-----	0.0481 (0.2471)	0.0493 (0.2542)	0.1024 (0.2746)
WQIMPORTN	-----	-----	-0.9402*** (0.5565)	-0.9872*** (0.5618)	-0.9262 (0.5681)
READALOT	-----	-----	0.2121 (0.2841)	0.2253 (0.2866)	0.1502 (0.2919)
TALKSOME	-----	-----	0.4637 (0.3056)	0.4962 (0.3091)	0.4341 (0.3113)
NOTSAFE	-----	-----	0.2505 (0.2725)	0.1964 (0.2765)	0.2123 (0.3196)
CURREGUSD	-----	-----	-----	0.1711 (0.2447)	0.1929 (0.2485)
HIGHFINED	-----	-----	-----	-0.1643 (0.4559)	-0.2148 (0.4637)
RIGHTTHID	-----	-----	-----	0.2333	0.2066

				(0.2548)	(0.2577)
AGRIREGSD	-----	-----	-----	0.4705*** (0.2756)	0.4349 (0.2774)
BOATABLE	-----	-----	-----	-----	-0.0591 (0.3089)
TRIPS2	-----	-----	-----	-----	0.00151 (0.00560)
PFIESTER	-----	-----	-----	-----	0.1856 (0.3558)
NONPOINT	-----	-----	-----	-----	0.4085 (0.2833)
Wald (Global c^2)	50.2275	56.6926	61.2132*	63.5332*	64.6972*
McFaddens R^2	.1105	.1328	.1498	.1584	.1631
Likelihood Ratio		11.976	9.126	4.613	2.56

* Significant @ 99% Confidence
** Significant @ 95% Condidence
*** Significant @ 90% Confidence

Table 5 Estimated Marginal Effects for the Logit Coefficients for the Implementation of Buffers

	Model I	Model II	Model III	Model IV	Model V
Variables	Estimate (Odds Ratio)	Estimate (Odds Ratio)	Estimate (Odds Ratio)	Estimate (Odds Ratio)	Estimate (Odds Ratio)
Intercept	-.5946*	-.4843**	-.5833**	-.6827*	-.6744*
EDUC	.0188***	0.0656	0.0128	0.0148	0.0123
EXPER	0.0003	.000125	0.000778	0.00098	0.0012
INCOME3	0.00077	.000895***	0.00106**	0.00109**	0.0010***
ANIMALS	0.00045	0.000709	0.00078	0.000878	0.0007
FARMACRE	0.00138*	0.00148*	0.00152*	0.00149*	0.00145*
FARMACRE2	-.0000015*	-.00000166*	-.0000017*	-.0000016*	-0000016*
FINASST	.2724* (2.989)	.2865* (3.164)	.282* (3.107)	.288* (3.194)	.2821* (3.108)
PERCENTY	0.00103	0.00134	0.00126	0.00128	0.0013
LOWER	-----	-0.1526** (0.541)	-0.2047* (0.439)	-0.2124* (0.426)	-0.2294* (0.398)
MIDDLE	-----	-0.2271* (0.401)	-.2773* (0.328)	-.2957* (0.305)	-.3064* (0.292)
WQPOOR	-----	-----	0.0119 (1.049)	0.01226 (1.050)	0.0255 (1.108)
WQIMPORTN	-----	-----	-0.2339*** (0.391)	-0.2456*** (0.373)	-0.2304 (0.396)
READALOT	-----	-----	0.0527 (1.236)	0.056 (1.253)	0.0373 (1.162)
TALKSOME	-----	-----	0.1154 (1.590)	0.1234 (1.642)	0.1080 (1.544)

NOTSAFE	-----	-----	0.0623 (1.285)	0.04885 (1.217)	0.0528 (1.236)
CURREGUSD	-----	-----	-----	0.04256 (1.187)	0.0480 (1.213)
HIGHFINED	-----	-----	-----	-0.04087 (0.849)	-0.0534 (0.807)
RIGHTTHID	-----	-----	-----	0.05803 (1.263)	0.0514 (1.229)
AGRIREGSD	-----	-----	-----	0.11704*** (1.601)	0.1079 (1.545)
BOATABLE	-----	-----	-----	-----	-0.0147 (0.943)
TRIPS2	-----	-----	-----	-----	0.000375 (1.002)
PFIESTER	-----	-----	-----	-----	0.04617 (1.204)
NONPOINT	-----	-----	-----	-----	0.10162 (1.505)

* Significant @ 99% Confidence
** Significant @ 95% Condidence
*** Significant @ 90% Confidence

Table 6 Estimated Logit Coefficients for the Implementation of Controlled Drainage

	Model I	Model II	Model III	Model IV	Model V
Variables	Estimate (Std Error)	Estimate (Std Error)	Estimate (Std Error)	Estimate (Std Error)	Estimate (Std Error)
Intercept	-0.8966 (-0.8966)	-0.8408 (1.1627)	-0.9153 (1.1940)	-0.5646 (1.2345)	-0.6033 (1.2578)
EDUC	0.0483 (0.0483)	0.0462 (0.0530)	0.0512 (0.0547)	0.0577 (0.0565)	0.0238 (0.0590)
EXPER	0.0109 (0.0109)	0.0111 (0.0135)	0.0126 (0.0138)	0.0141 (0.0140)	0.0127 (0.0142)
INCOME3	-0.00021 (-0.00021)	-0.00007 (0.00276)	0.000191 (0.00280)	-0.00053 (0.00288)	-0.00101 (0.00296)
ANIMALS	0.00723 (0.00723)	0.00746*** (0.00447)	0.00912** (0.00461)	0.00912*** (0.00471)	0.00915*** (0.00477)
FARMACRE	0.00763* (0.00763)	0.00769* (0.00237)	0.00819* (0.00243)	0.00893* (0.00252)	0.00974* (0.00260)
FARMACRE2	-9.08E-6* (-9.08E-6)	-9.09E-6* (2.753E-6)	-9.77E-6* (2.813E-6)	-0.00001* (2.917E-6)	-0.00001* (3.029E-6)
FINASST	0.7703** (0.3877)	0.7859** (0.3890)	0.7710*** (0.3957)	0.7937*** (0.4053)	0.8730** (0.4169)

PERCENTY	0.0100** (0.00495)	0.0102** (0.00497)	0.0107** (0.00508)	0.0117** (0.00518)	0.0122** (0.00524)
LOWER	-----	-0.0239 (0.3668)	-0.0108 (0.3884)	0.0358 (0.4039)	-0.0290 (0.4190)
MIDDLE	-----	-0.2045 (0.3501)	-0.3048 (0.3645)	-0.2721 (0.3809)	-0.3710 (0.3853)
WQPOOR	-----	-----	0.2213 (0.3215)	0.2411 (0.3361)	0.1920 (0.3694)
WQIMPORTN	-----	-----	-0.3481 (0.6644)	-0.2365 (0.6832)	-0.2051 (0.6955)
READALOT	-----	-----	-0.5633 (0.3787)	-0.5966 (0.3855)	-0.7298*** (0.4006)
TALKSOME	-----	-----	0.3951 (0.3769)	0.4155 (0.3830)	0.3359 (0.3947)
NOTSAFE	-----	-----	-0.3984 (0.3356)	-0.3687 (0.3464)	-0.1519 (0.4118)
CURREGUSD	-----	-----	-----	-0.3289 (0.3143)	-0.4539 (0.3258)
HIGHFINED	-----	-----	-----	-1.0226*** (0.5647)	-1.1494** (0.5736)
RIGHTTHID	-----	-----	-----	-0.6904** (0.3192)	-0.7810** (0.3567)
AGRIREGSD	-----	-----	-----	-0.2816 (0.3512)	-0.3444 (0.3567)
BOATABLE	-----	-----	-----	-----	0.3632 (0.4129)
TRIPS2	-----	-----	-----	-----	-0.00924 (0.00639)
PFIESTER	-----	-----	-----	-----	0.7835*** (0.4525)
NONPOINT	-----	-----	-----	-----	0.3114 (0.4067)
Wald (Global c^2)	31.3053*	31.4952*	34.4052*	41.5311*	44.0898*
McFaddens R^2	.1057	.1068	.1204	.1519	.1685
Likelihood Ratio		0.379	4.737	10.983	5.745

* Significant @ 99% Confidence
** Significant @ 95% Condidence
*** Significant @ 90% Confidence

Table 7 Estimated Logit Marginal Effects for the Implementation of Controlled Drainage

	Model I	Model II	Model III	Model IV	Model V
Variables	Estimate (Odds Ratio)	Estimate (Odds Ratio)	Estimate (Odds Ratio)	Estimate (Odds Ratio)	Estimate (Odds Ratio)
Intercept	-0.1235	-0.1158	-0.1261	-0.0777	-0.0831
EDUC	0.0066	0.0064	0.0071	0.0079	0.0033
EXPER	0.0015	0.0015	0.0017	0.0019	0.0017

INCOME3	-0.000029	-0.000009	-0.000026	-0.00053	-0.00013
ANIMALS	0.00102	0.00102***	0.00126**	0.00126***	0.00126***
FARMACRE	0.00105*	0.00106*	0.00113*	0.00123*	0.00134*
FARMACRE2	-.0000012*	-.0000012*	-.0000012*	-0.0000013*	-0. 0000013*
FINASST	0.1061** (2.160)	0.1082** (2.194)	0.1062*** (2.162)	0.1093*** (2.212)	0.1202** (2.394)
PERCENTY	0.0013**	0. 0014**	0.0015**	0.0016**	0.0017**
LOWER	-----	-0.0033 (0.976)	-0.0015 (0.989)	0.0049 (1.036)	-0.0039 (0.971)
MIDDLE	-----	-0.0282 (0.815)	-0.0419 (0.737)	-0.0374 (0.762)	-0.0511 (0.690)
WQPOOR	-----	-----	0.0305 (1.248)	0.0332 (1.273)	0.0264 (1.212)
WQIMPORTN	-----	-----	-0.0479 (0.706)	-0.0326 (0.789)	-0.0283 (0.815)
READALOT	-----	-----	-0.0776 (0.569)	-0.0822 (0.551)	-0.1005*** (0.482)
TALKSOME	-----	-----	0.0544 (1.485)	0.0572 (1.515)	0.0463 (1.399)
NOTSAFE	-----	-----	-0.0548 (0.671)	-0.0508 (0.692)	-0.0209 (0.859)
CURREGUSD	-----	-----	-----	-0.0453 (0.720)	-0.0625 (0.635)
HIGHFINED	-----	-----	-----	-.1408*** (0.360)	-.1584** (0.317)
RIGHTTHID	-----	-----	-----	-0.0951** (0.501)	-0.1076** (0.458)
AGRIREGSD	-----	-----	-----	-0.0388 (0.755)	-0.0474 (0.709)
BOATABLE	-----	-----	-----	-----	0.0500 (1.438)
TRIPS2	-----	-----	-----	-----	-0.0013 (0.991)
PFIESTER	-----	-----	-----	-----	0.1079*** (2.189)
NONPOINT	-----	-----	-----	-----	0.0429 (1.365)

* Significant @ 99% Confidence
** Significant @ 95% Condidence
*** Significant @ 90% Confidence

Table 8 Estimated Logit Coefficients for the Implementation of Fertilizer or Nutrient Management

	Model I	Model II	Model III	Model IV	Model V
Variables	Estimate (Std Error)	Estimate (Std Error)	Estimate (Std Error)	Estimate (Std Error)	Estimate (Std Error)
Intercept	1.7494*** (1.0533)	1.8593*** (1.0995)	1.9133*** (1.1177)	1.1502*** (-0.0262)	1.9593*** (1.1692)
EDUC	-0.0283 (0.0481)	-0.0313 (0.0489)	-0.0204 (0.0498)	0.0505 (-0.0181)	-0.0578 (0.0535)
EXPER	-0.0183 (0.0128)	-0.0189 (0.0129)	-0.0174 (0.0131)	0.0132 (0.00210)	-0.0170 (0.0135)
INCOME3	0.00168 (0.00265)	0.00166 (0.00267)	0.00208 (0.00270)	0.00272 (-0.00496)	0.00164 (0.00276)
ANIMALS	-0.00586 (0.00383)	-0.00586 (0.00384)	-0.00487 (0.00392)	0.00394 (0.00155)	-0.00541 (0.00406)
FARMACRE	0.00170 (0.00208)	0.00174 (0.00208)	0.00148 (0.00212)	0.00214 (-3.57E-6)	0.00135 (0.00223)
FARMACRE2	-3.77E-6 (2.492E-6)	-3.8E-6 (2.495E-6)	-3.51E-6 (2.528E-6)	-3.57E-6 (2.552E-6)	-3.39E-6 (2.65E-6)
FINASST	1.2163* (0.3661)	1.2173* (0.3678)	1.1782* (0.3731)	1.1717* (0.3760)	1.2419* (0.3906)
PERCENTY	0.0130* (0.00488)	0.0130* (0.00489)	0.0138* (0.00505)	0.0138* (0.00510)	0.0141* (0.00514)
LOWER	-----	-0.1318 (0.3454)	-0.0563 (0.3615)	-0.0592 (0.3644)	-0.3021 (0.3820)
MIDDLE	-----	-0.0393 (0.3377)	-0.0530 (0.3502)	-0.0263 (0.3532)	-0.1342 (0.3600)
WQPOOR	-----	-----	-0.3694 (0.3033)	-0.4007 (0.3096)	-0.4340 (0.3411)
WQIMPORTN	-----	-----	-0.4797 (0.5721)	-0.4649 (0.5773)	-0.3052 (0.5917)
READALOT	-----	-----	-0.2474 (0.3593)	-0.2578 (0.3597)	-0.3547 (0.3743)
TALKSOME	-----	-----	0.0751 (0.3781)	0.0732 (0.3797)	-0.0826 (0.3944)
NOTSAFE	-----	-----	0.0462 (0.3233)	0.0898 (0.3271)	0.1661 (0.3898)
CURREGUSD	-----	-----	-----	-0.0904 (0.2905)	-0.1790 (0.3011)
HIGHFINED	-----	-----	-----	0.1765 (0.6059)	0.0814 (0.6111)
RIGHTTHID	-----	-----	-----	0.0104 (0.3063)	0.00643 (0.3145)
AGRIREGSD	-----	-----	-----	-0.3112 (0.3278)	-0.3205 (0.3317)
BOATABLE	-----	-----	-----	-----	0.0121 (0.3875)
TRIPS2	-----	-----	-----	-----	0.0107 (0.0107)
PFIESTER	-----	-----	-----	-----	0.9594** (0.4210)

NONPOINT	-----	-----	-----	-----	0.2851 (0.3701)
Wald (Global c^2)	26.1826*	26.1711*	28.8104*	29.5033*	34.6539*
McFaddens R^2	.0850	.0855	.0943	.0971	.1157
Likelihood Ratio		0.148	3.281	1.041	6.872

* Significant @ 99% Confidence
** Significant @ 95% Condidence
*** Significant @ 90% Confidence

Table 9 Estimated Logit Marginal Effects for the Implementation of Fertilizer or Nutrient Management

	Model I	Model II	Model III	Model IV	Model V
Variables	Estimate (Odds Ratio)	Estimate (Odds Ratio)	Estimate (Odds Ratio)	Estimate (Odds Ratio)	Estimate (Odds Ratio)
Intercept	0.2615***	0.2779***	0.2860***	0.1719***	0.2615***
EDUC	-0.00423	-0.00468	-0.00305	0.00755	-0.00423
EXPER	-0.00273	-0.00282	-0.00260	0.00197	-0.00273
INCOME3	0.00025	0.00024	0.00031	0.00040	0.00025
ANIMALS	-0.00087	-0.00087	-0.00072	0.00058	-0.00080
FARMACRE	0.00025	0.00026	0.00022	0.00032	0.00020
FARMACRE2	-0.000001	-0.000001	-0.000001	-0.000001	-0.000001
FINASST	0.1818* (3.375)	0.1820* (3.378)	0.1761* (3.249)	0.1751* (3.227)	0.1856* (3.462)
PERCENTY	0.0019*	0.0019*	0.0020*	0.0020*	0.0021*
LOWER	-----	-0.0197 (0.876)	-0.0084 (0.945)	-0.0088 (0.943)	-0.0451 (0.739)
MIDDLE	-----	-0.0058 (0.961)	-0.0079 (0.948)	-0.0039 (0.974)	-0.0200 (0.874)
WQPOOR	-----	-----	-0.0552 (0.691)	-0.0599 (0.670)	-0.0648 (0.648)
WQIMPORTN	-----	-----	-0.0717 (0.619)	-0.0695 (0.628)	-0.0456 (0.737)
READALOT	-----	-----	-0.0369 (0.781)	-0.0385 (0.773)	-0.0530 (0.701)
TALKSOME	-----	-----	0.0112 (1.078)	0.0109 (1.076)	-0.0123 (0.921)
NOTSAFE	-----	-----	0.0069 (1.047)	0.0134 (1.094)	0.0248 (1.181)
CURREGUSD	-----	-----	-----	0.0069 (0.914)	0.0134 (0.836)
HIGHFINED	-----	-----	-----	-0.0135 (1.193)	-0.0267 (1.085)
RIGHTTHID	-----	-----	-----	0.0263 (1.010)	0.0121 (1.006)
AGRIREGSD	-----	-----	-----	0.0015 (0.733)	0.0009 (0.726)
BOATABLE	-----	-----	-----	-----	.0018

					(1.012)
TRIPS2	-----	-----	-----	-----	.0016 (1.011)
PFIESTER	-----	-----	-----	-----	.1434** (2.610)
NONPOINT	-----	-----	-----	-----	.0426 (1.330)

* Significant @ 99% Confidence
** Significant @ 95% Condidence
*** Significant @ 90% Confidence

Table 10 Estimated Logit Coefficients for the Implementation of Grass Waterways

	Model I	Model II	Model III	Model IV	Model V
Variables	Estimate (Std Error)	Estimate (Std Error)	Estimate (Std Error)	Estimate (Std Error)	Estimate (Std Error)
Intercept	-0.0714 (0.9260)	0.7668 (0.9684)	0.7532 (0.9886)	0.5580 (1.0186)	0.1932 (1.0474)
EDUC	-0.00952 (0.0428)	-0.0299 (0.0436)	-0.0302 (0.0444)	-0.0240 (0.0453)	-0.0238 (0.0471)
EXPER	-0.0146 (0.0109)	-0.0191*** (0.0112)	-0.0186 (0.0115)	-0.0177 (0.0116)	-0.0153 (0.0119)
INCOME3	0.000672 (0.00219)	0.000433 (0.00222)	0.000447 (0.00225)	0.000355 (0.00228)	0.000628 (0.00234)
ANIMALS	0.00456 (0.00347)	0.00501 (0.00352)	0.00535 (0.00361)	0.00531 (0.00363)	0.00680*** (0.00373)
FARMACRE	0.00926* (0.00187)	0.00999* (0.00193)	0.0101* (0.00194)	0.0101* (0.00196)	0.0107* (0.00202)
FARMACRE2	-8.48E-6* (2.253E-6)	-9.1E-6* (2.313E-6)	-9.27E-6* (2.329E-6)	-9.24E-6* (2.339E-6)	-9.87E-6* (2.391E-6)
FINASST	0.9671* (0.2784)	0.9508* (0.2854)	0.9434* (0.2922)	0.9841* (0.2958)	1.1129* (0.3085)
PERCENTY	-0.00721*** (0.00378)	-0.00690*** (0.00388)	-0.00696*** (0.00391)	-0.00671*** (0.00394)	-0.00734*** (0.00399)
LOWER	-----	-1.0807* (0.3075)	-1.1275* (0.3192)	-1.1156* (0.3231)	-1.2166* (0.3419)
MIDDLE	-----	-0.5625*** (0.2925)	-0.5847*** (0.3002)	-0.5554*** (0.3052)	-0.6052*** (0.3122)
WQPOOR	-----	-----	0.1684 (0.2620)	0.2517 (0.2699)	-0.0363 (0.2912)
WQIMPORTN	-----	-----	-0.2675 (0.5610)	-0.2348 (0.5662)	-0.3662 (0.5746)

READALOT	-----	-----	0.0685 (0.3034)	0.0532 (0.3054)	0.0151 (0.3182)
TALKSOME	-----	-----	-0.0968 (0.3179)	-0.1275 (0.3219)	-0.1339 (0.3295)
NOTSAFE	-----	-----	-0.1436 (0.2817)	-0.1907 (0.2873)	0.2189 (0.3371)
CURREGUSD	-----	-----	-----	0.2967 (0.2597)	0.2608 (0.2656)
HIGHFINED	-----	-----	-----	0.4507 (0.5280)	0.5000 (0.5305)
RIGHTTHID	-----	-----	-----	-0.4233 (0.2660)	-0.4753*** (0.2710)
AGRIREGSD	-----	-----	-----	0.2090 (0.2918)	0.2327 (0.2962)
BOATABLE	-----	-----	-----	-----	0.7897** (0.3378)
TRIPS2	-----	-----	-----	-----	0.0147 (0.0104)
PFIESTER	-----	-----	-----	-----	0.0466 (0.3772)
NONPOINT	-----	-----	-----	-----	-0.1395 (0.3096)
Wald (Global χ^2)	60.0021*	66.6412*	67.0503*	68.9108*	71.2706*
McFaddens R^2	.1476	.1729	.1748	.1845	.2002
Likelihood Ratio		12.937	0.945	4.983	8.025

* Significant @ 99% Confidence
** Significant @ 95% Condidence
*** Significant @ 90% Confidence

Table 11 Estimated Logit Marginal Effects for the Implementation of Grass Waterways

	Model I	Model II	Model III	Model IV	Model V
Variables	Estimate (Odds Ratio)	Estimate (Odds Ratio)	Estimate (Odds Ratio)	Estimate (Odds Ratio)	Estimate (Odds Ratio)
Intercept	-0.0166	0.1783	0.1751	0.1297	0.0449
EDUC	-0.00221	-0.00695	-0.00702	-0.00558	-0.00553
EXPER	-0.00339	-0.00444	-0.00432	-0.00411	-0.00355
INCOME3	0.00015	0.00010	0.00010	0.00008	0.00014
ANIMALS	0.00106	0.00116	0.00124	0.00123	0.00158***
FARMACRE	0.00215*	0.00232*	0.00234*	0.00234*	0.00248*
FARMACRE2	-0.000002*	-0.000002*	-0.000002*	-0.000002*	-0.000002*
FINASST	0.2249* (2.630)	0.2211* (2.588)	0.2194* (2.569)	0.2288* (2.676)	0.2588* (3.043)
PERCENTY	-0.00167***	-0.001605***	-0.00161***	-0.00156***	-0.0017***
LOWER	-----	-0.2513*	-0.2622*	-0.2594*	-0.2829*

		(0.339)	(0.324)	(0.328)	(0.296)
MIDDLE	-----	-0.1308*** (0.570)	-0.1359*** (0.557)	-0.1291*** (0.574)	-0.1407*** (0.546)
WQPOOR	-----	-----	0.0391 (1.183)	0.0585 (1.286)	-0.0084 (0.964)
WQIMPORTN	-----	-----	-0.0622 (0.765)	-0.0546 (0.791)	-0.0851 (0.693)
READALOT	-----	-----	0.0159 (1.071)	0.0123 (1.055)	0.0035 (1.015)
TALKSOME	-----	-----	-0.0225 (0.908)	-0.0296 (0.880)	-0.0311 (0.875)
NOTSAFE	-----	-----	-0.0333 (0.866)	-0.0443 (0.826)	0.0509 (1.245)
CURREGUSD	-----	-----	-----	0.0690 (1.345)	0.0606 (1.298)
HIGHFINED	-----	-----	-----	0.1048 (1.569)	0.1162 (1.649)
RIGHTTHID	-----	-----	-----	-0.0984 (0.655)	-0.1105*** (0.622)
AGRIREGSD	-----	-----	-----	0.0486 (1.232)	0.0541 (1.262)
BOATABLE	-----	-----	-----	-----	0.1836** (2.203)
TRIPS2	-----	-----	-----	-----	0.0034 (1.015)
PFIESTER	-----	-----	-----	-----	0.0108 (1.048)
NONPOINT	-----	-----	-----	-----	-0.0324 (0.870)

* Significant @ 99% Confidence
** Significant @ 95% Condidence
*** Significant @ 90% Confidence

Table 12 Estimated Logit Coefficients for the Implementation of Integrated Pest Management

	Model I	Model II	Model III	Model IV	Model V
Variables	Estimate (Std Error)	Estimate (Std Error)	Estimate (Std Error)	Estimate (Std Error)	Estimate (Std Error)
Intercept	-0.5671 (0.8480)	-0.5421 (0.8713)	-0.7067 (0.8957)	-0.4695 (0.9205)	-0.5065 (0.9399)
EDUC	-0.0252 (0.0392)	-0.0255 (0.0395)	-0.0279 (0.0404)	-0.0282 (0.0410)	-0.0363 (0.0422)
EXPER	-0.00753 (0.00987)	-0.00871 (0.00997)	-0.00611 (0.0102)	-0.00574 (0.0104)	-0.00426 (0.0105)

INCOME3	0.00401** (0.00201)	0.00369*** (0.00202)	0.00402*** (0.00207)	0.00363*** (0.00209)	0.00310 (0.00212)
ANIMALS	0.000722 (0.00310)	0.000562 (0.00312)	0.00163 (0.00323)	0.00158 (0.00326)	0.000848 (0.00334)
FARMACRE	0.00508* (0.00167)	0.00515* (0.00169)	0.00540* (0.00171)	0.00575* (0.00174)	0.00534* (0.00177)
FARMACRE2	-6.38E-6* (2.087E-6)	-6.53E-6* (2.105E-6)	-6.99E-6* (2.133E-6)	-7.45E-6* (2.168E-6)	-7.03E-6* (2.213E-6)
FINASST	0.5045** (0.2384)	0.4766** (0.2401)	0.4483*** (0.2482)	0.4570*** (0.2510)	0.4415*** (0.2573)
PERCENTY	0.00518 (0.00341)	0.00492 (0.00342)	0.00508 (0.00348)	0.00540 (0.00351)	0.00569 (0.00355)
LOWER	-----	-0.0994 (0.2698)	-0.1834 (0.2818)	-0.1710 (0.2857)	-0.3076 (0.2992)
MIDDLE	-----	0.2934 (0.2537)	0.1837 (0.2620)	0.2173 (0.2673)	0.1818 (0.2710)
WQPOOR	-----	-----	0.2360 (0.2365)	0.2427 (0.2436)	0.2786 (0.2635)
WQIMPORTN	-----	-----	-0.6758 (0.5385)	-0.6360 (0.5465)	-0.5267 (0.5550)
READALOT	-----	-----	-0.3188 (0.2726)	-0.3371 (0.2751)	-0.4046 (0.2815)
TALKSOME	-----	-----	0.4345 (0.2923)	0.4382 (0.2945)	0.3704 (0.2983)
NOTSAFE	-----	-----	-0.3814 (0.2619)	-0.3472 (0.2654)	-0.3432 (0.3057)
CURREGUSD	-----	-----	-----	-0.2136 (0.2303)	-0.1869 (0.2356)
HIGHFINED	-----	-----	-----	-0.4086 (0.4292)	-0.4648 (0.4345)
RIGHTTHID	-----	-----	-----	-0.2727 (0.2431)	-0.2901 (0.2464)
AGRIREGSD	-----	-----	-----	-0.2676 (0.2560)	-0.2914 (0.2579)
BOATABLE	-----	-----	-----	-----	-0.1181 (0.2954)
TRIPS2	-----	-----	-----	-----	0.00936 (0.00794)
PFIESTER	-----	-----	-----	-----	0.2328 (0.3289)
NONPOINT	-----	-----	-----	-----	0.3688 (0.2707)
Wald (Global c^2)	29.6446*	31.4069*	37.8631*	41.0821*	43.4146*
McFaddens R^2	.0601	.0631	.0796	.0883	.0964
Likelihood Ratio		2.279	8.212	4.711	4.362

* Significant @ 99% Confidence
** Significant @ 95% Condidence
*** Significant @ 90% Confidence

Table 13 Estimated Logit Marginal Effects for the Implementation of Integrated Pest Management

	Model I	Model II	Model III	Model IV	Model V
Variables	Estimate (Odds Ratio)	Estimate (Odds Ratio)	Estimate (Odds Ratio)	Estimate (Odds Ratio)	Estimate (Odds Ratio)
Intercept	-0.1415	-0.1353	-0.1764	-0.1172	-0.1264
EDUC	-0.00629	-0.00636	-0.00696	-0.0070	-0.00906
EXPER	-0.00187	-0.00217	-0.00152	-0.00143	-0.00106
INCOME3	0.00100**	0.00092***	0.00100***	0.00090***	0.00077
ANIMALS	0.00018	0.00014	0.00040	0.0003	0.00021
FARMACRE	0.00126*	0.00128*	0.00134*	0.00143*	0.00133*
FARMACRE2	-1.59E-06*	-1.63E-06*	-1.74E-06*	-1.86E-06*	-1.75E-06*
FINASST	0.1259** (1.656)	0.1189** (1.611)	0.1119*** (1.566)	0.1140*** (1.579)	0.1102*** (1.555)
PERCENTY	0.0012	0.00122	0.00126	0.00134	0.00142
LOWER	-----	-0.0248 (0.905)	-0.0457 (0.832)	-0.0426 (0.843)	-0.0767 (1.006)
MIDDLE	-----	0.0732 (1.341)	0.0458 (1.202)	0.0542 (1.243)	0.0453 (0.735)
WQPOOR	-----	-----	0.0589 (1.266)	0.0605 (1.275)	0.0695 (1.199)
WQIMPORTN	-----	-----	-0.1687 (0.509)	-0.1587 (0.529)	-0.1314 (0.591)
READALOT	-----	-----	-0.0795 (0.727)	-0.0841 (0.714)	-0.1010 (0.667)
TALKSOME	-----	-----	0.1084 (1.544)	0.1093 (1.550)	0.0924 (1.448)
NOTSAFE	-----	-----	-0.0952 (0.683)	-0.0866 (0.707)	-0.0856 (0.709)
CURREGUSD	-----	-----	-----	-0.0533 (0.808)	-0.0466 (0.829)
HIGHFINED	-----	-----	-----	-0.1020 (0.665)	-0.1160 (0.628)
RIGHTTHID	-----	-----	-----	-0.0680 (0.761)	-0.0724 (0.748)
AGRIREGSD	-----	-----	-----	-0.0668 (0.765)	-0.0727 (0.747)
BOATABLE	-----	-----	-----	-----	-0.0294 (0.889)
TRIPS2	-----	-----	-----	-----	0.0023 (1.009)
PFIESTER	-----	-----	-----	-----	0.0581 (1.262)
NONPOINT	-----	-----	-----	-----	0.0920 (1.446)

* Significant @ 99% Confidence
** Significant @ 95% Condidence
*** Significant @ 90% Confidence

Table 14 Estimated Logit Coefficients for the Implementation of Rotation 1

	Model I	Model II	Model III	Model IV	Model V
Variables	Estimate (Std Error)	Estimate (Std Error)	Estimate (Std Error)	Estimate (Std Error)	Estimate (Std Error)
Intercept	0.4155 (0.9960)	0.9604 (1.0474)	0.6355 (1.0688)	0.6980 (1.0917)	0.5556 (1.1187)
EDUC	-0.0600 (0.0467)	-0.0752 (0.0480)	-0.0852 (0.0495)	-0.0856*** (0.0501)	-0.0984*** (0.0515)
EXPER	0.00261 (0.0118)	-0.00055 (0.0121)	0.00312 (0.0124)	0.00358 (0.0125)	0.00287 (0.0126)
INCOME3	0.00254 (0.00256)	0.00244 (0.00261)	0.00279 (0.00266)	0.00738 (0.00268)	0.00315 (0.00276)
ANIMALS	-0.00556 (0.00349)	-0.00561 (0.00353)	-0.00520 (0.00366)	-0.00508 (0.00368)	-0.00449 (0.00371)
FARMACRE	0.00710* (0.00231)	0.00751* (0.00232)	0.00747 (0.00237)	0.00738* (0.00239)	0.00860* (0.00249)
FARMACRE2	-5.51E-6*** (3.205E-6)	-5.94E-6*** (3.177E-6)	-5.96E-6*** (3.239E-6)	-5.86E-6*** (3.272E-6)	-7.32E-6** (3.397E-6)
FINASST	0.4938 (0.3079)	0.5085 (0.3138)	0.4126 (0.3213)	0.4025 (0.3238)	0.4766 (0.3314)
PERCENTY	0.00893** (0.00414)	0.00888** (0.00416)	0.00889** (0.00422)	0.00923** (0.00426)	0.00943** (0.00432)
LOWER	-----	-0.6519** (0.3214)	-0.8154** (0.3408)	-0.7825** (0.3442)	-0.7263** (0.3539)
MIDDLE	-----	-0.1960 (0.3235)	-0.3254 (0.3371)	-0.3130 (0.3406)	-0.3650 (0.3468)
WQPOOR	-----	-----	-0.1439 (0.2866)	-0.0717 (0.2952)	-0.2040 (0.3249)
WQIMPORTN	-----	-----	-0.5118 (0.5744)	-0.4655 (0.5758)	-0.6139 (0.5816)
READALOT	-----	-----	0.1949 (0.3371)	0.1865 (0.3385)	0.1731 (0.3494)
TALKSOME	-----	-----	0.4807 (0.3447)	0.4792 (0.3478)	0.5161 (0.3582)
NOTSAFE	-----	-----	0.0134 (0.3090)	0.0292 (0.3143)	0.1828 (0.3676)
CURREGUSD	-----	-----	-----	-0.2165 (0.2789)	-0.3283 (0.2869)
HIGHFINED	-----	-----	-----	-0.1481 (0.5359)	-0.1833 (0.5418)

RIGHTTHID	-----	-----	-----	-0.1654 (0.2872)	-0.1885 (0.2936)
AGRIREGSD	-----	-----	-----	0.2452 (0.3229)	0.2799 0.3297)
BOATABLE	-----	-----	-----	-----	0.4249 (0.3694)
TRIPS2	-----	-----	-----	-----	-0.0107** (0.00531)
PFIESTER	-----	-----	-----	-----	0.2951 (0.4227)
NONPOINT	-----	-----	-----	-----	-0.2576 (0.3327)
Wald (Global c^2)	47.0523*	49.1467*	52.3032*	53.3744 *	56.5204*
McFaddens R^2	.1451	.1549	.1651	.1694	.1833
Likelihood Ratio		4.255	4.426	1.86	6.044

* Significant @ 99% Confidence
** Significant @ 95% Condidence
*** Significant @ 90% Confidence

Table 15 Estimated Logit Marginal Effects for the Implementation of Rotation 1

	Model I	Model II	Model III	Model IV	Model V
Variables	Estimate (Odds Ratio)	Estimate (Odds Ratio)	Estimate (Odds Ratio)	Estimate (Odds Ratio)	Estimate (Odds Ratio)
Intercept	0.0772	0.1786	0.1181	0.1298	0.1033
EDUC	-0.01115	-0.01398	-0.01584	-0.01592	-0.01830
EXPER	0.00048	-0.00010	0.00058	0.00066	0.00053
INCOME3	0.00047	0.00045	0.00051	0.00137	0.00058
ANIMALS	-0.00103	-0.00104	-0.00096	-0.00094	-0.00083
FARMACRE	0.00132*	0.00139*	0.00138*	0.00137*	0.00160*
FARMACRE2	-0.000001***	-0.000001***	-0.000001***	-0.000001***	-0.000001**
FINASST	0.0918 (1.639)	0.0945 (1.663)	0.0767 (1.511)	0.0748 (1.496)	0.0886 (1.611)
PERCENTY	0.00166**	0.00165**	0.00165**	0.00171**	0.00175**
LOWER	-----	-0.1212** (0.521)	-0.1516** (0.442)	-0.1455** (0.457)	-0.1350** (0.484)
MIDDLE	-----	-0.0364 (0.822)	-0.0605 (0.722)	-0.0582 (0.731)	-0.0678 (0.694)
WQPOOR	-----	-----	-0.0267 (0.866)	-0.0133 (0.931)	-0.0379 (0.815)
WQIMPORTN	-----	-----	-0.0951 (0.599)	-0.0865 (0.628)	-0.1141 (0.541)
READALOT	-----	-----	0.0362 (1.215)	0.0346 (1.205)	0.0321 (1.189)

TALKSOME	-----	-----	0.0894 (1.617)	0.0891 (1.615)	0.0959 (1.675)
NOTSAFE	-----	-----	0.0024 (1.013)	0.0054 (1.030)	0.0339 (1.201)
CURREGUSD	-----	-----	-----	-0.0402 (0.805)	-0.0610 (0.720)
HIGHFINED	-----	-----	-----	-0.0275 (0.862)	-0.0340 (0.832)
RIGHTTHID	-----	-----	-----	-0.0307 (0.848)	-0.0350 (0.828)
AGRIREGSD	-----	-----	-----	0.0456 (1.278)	0.0520 (1.323)
BOATABLE	-----	-----	-----	-----	0.0790 (1.529)
TRIPS2	-----	-----	-----	-----	-0.0019** (0.989)
PFIESTER	-----	-----	-----	-----	0.0548 (1.343)
NONPOINT	-----	-----	-----	-----	-0.0479 (0.773)

* Significant @ 99% Confidence
** Significant @ 95% Condidence
*** Significant @ 90% Confidence

Table 16 Estimated Logit Coefficients for the Implementation of Rotation 2

	Model I	Model II	Model III	Model IV	Model V
Variables	Estimate (Std Error)	Estimate (Std Error)	Estimate (Std Error)	Estimate (Std Error)	Estimate (Std Error)
Intercept	-0.7645 (0.8777)	-0.3468 (0.9036)	-0.9122 (0.9422)	-0.8577 (0.9676)	-0.6848 (0.9876)
EDUC	-0.00094 (0.0407)	-0.0104 (0.0410)	-0.0238 (0.0427)	-0.0200 (0.0432)	-0.0293 (0.0447)
EXPER	-0.00132 (0.0102)	-0.00306 (0.0104)	0.00183 (0.0108)	0.00305 (0.0109)	0.00379 (0.0110)
INCOME3	-0.00123 (0.00206)	-0.00131 (0.00208)	-0.00065 (0.00214)	-0.00103 (0.00217)	-0.00164 (0.00224)
ANIMALS	0.0102* (0.00332)	0.0107* (0.00335)	0.0106* (0.00352)	0.0106* (0.00352)	0.0100* (0.00360)
FARMACRE	0.00608*	0.00637*	0.00625*	0.00646*	0.00665*

	(0.00175)	(0.00178)	(0.00183)	(0.00185)	(0.00190)
FARMACRE2	-6.22E-6* (2.16E-6)	-6.51E-6* (2.202E-6)	-6.36E-6* (2.261E-6)	--6.63E-6* (2.28E-6)	-6.85E-6* (2.334E-6)
FINASST	1.0702* (0.2515)	1.0467* (0.2539)	0.9388* (0.2626)	0.9591* (0.2652)	0.9098* (0.2710)
PERCENTY	-0.00610*** (0.00363)	-0.00578 (0.00367)	-0.00610 (0.00381)	-0.00583 (0.00383)	-0.00658*** (0.00389)
LOWER	-----	-0.6050** (0.2876)	-0.8148* (0.3075)	-0.8122* (0.3109)	-0.7990** (0.3204)
MIDDLE	-----	-0.3426 (0.2667)	-0.4717*** (0.2786)	-0.4412 (0.2831)	-0.4733 (0.2880)
WQPOOR	-----	-----	-0.5415** (0.2482)	-0.5169** (0.2561)	-0.4727*** (0.2779)
WQIMPORTN	-----	-----	-0.6111 (0.5572)	-0.5502 (0.5594)	-0.5723 (0.5691)
READALOT	-----	-----	0.5283*** (0.2857)	0.5202*** (0.2887)	0.4543 (0.2948)
TALKSOME	-----	-----	0.6749** (0.3076)	0.6652** (0.3099)	0.6203** (0.3135)
NOTSAFE	-----	-----	0.2560 (0.2726)	0.2511 (0.2763)	0.3898 (0.3205)
CURREGUSD	-----	-----	-----	0.0527 (0.2453)	0.1054 (0.2506)
HIGHFINED	-----	-----	-----	-0.2162 (0.4604)	-0.3153 (0.4648)
RIGHTTHID	-----	-----	-----	-0.4079 (0.2549)	-0.4957*** (0.2605)
AGRIREGSD	-----	-----	-----	-0.1367 (0.2756)	-0.2002 (0.2796)
BOATABLE	-----	-----	-----	-----	0.2215 (0.3104)
TRIPS2	-----	-----	-----	-----	-0.00467 (0.00544)
PFIESTER	-----	-----	-----	-----	-0.1684 (0.3522)
NONPOINT	-----	-----	-----	-----	0.6541** (0.2889)
Wald (Global c^2)	52.8856*	56.4583*	65.4752*	67.3294*	70.1185*
McFaddens R^2	.1206	.1293	.1592	.1646	.1767
Likelihood Ratio		4.663	16.056	2.913	6.539

* Significant @ 99% Confidence
** Significant @ 95% Condidence
*** Significant @ 90% Confidence

Table 17 Estimated Logit Marginal Effects for the Implementation of Rotation 2

	Model I	Model II	Model III	Model IV	Model V
Variables	Estimate	Estimate	Estimate	Estimate	Estimate

	(Odds Ratio)	(Odds Ratio)	(Odds Ratio)	(Odds Ratio)	(Odds Ratio)
Intercept	-0.19034	-0.08635	-0.22712	-0.21355	-0.17049
EDUC	-0.00023	-0.00259	-0.00593	-0.00498	-0.00729
EXPER	-0.00033	-0.00076	0.00046	0.00076	0.00094
INCOME3	-0.00031	-0.00033	-0.00016	-0.00025	-0.00040
ANIMALS	0.00254*	0.00266*	0.00263*	0.002674*	0.00249*
FARMACRE	0.00151*	0.00159*	0.00156*	0.00161*	0.00166*
FARMACRE2	-0.000002*	-0.000002*	-0.000002*	-0.000002*	-0.000002*
FINASST	0.2664* (2.916)	0.2606* (2.848)	0.2337* (2.557)	0.2387* (2.609)	0.2265* (2.484)
PERCENTY	-0.00152***	-0.00144	-0.00152	-0.00145	-0.00164***
LOWER	-----	-0.1506** (0.546)	-0.2028* (0.443)	-0.2022* (0.444)	-0.1989** (0.450)
MIDDLE	-----	-0.0852 (0.710)	-0.1174*** (0.624)	-0.1098 (0.643)	-0.1178 (0.623)
WQPOOR	-----	-----	-0.1348** (0.582)	-0.1286** (0.596)	-0.1176*** (0.623)
WQIMPORTN	-----	-----	-0.1521 (0.543)	-0.1369 (0.577)	-0.1424 (0.564)
READALOT	-----	-----	0.1315*** (1.696)	0.1295*** (0.577)	0.1131 (1.575)
TALKSOME	-----	-----	0.1680** (1.964)	0.1656** (1.945)	0.1544** (1.860)
NOTSAFE	-----	-----	0.0637 (1.292)	0.0625 (1.285)	0.0970 (1.477)
CURREGUSD	-----	-----	-----	0.0131 (1.054)	0.0262 (1.111)
HIGHFINED	-----	-----	-----	-0.0538 (0.806)	-0.0785 (0.730)
RIGHTTHID	-----	-----	-----	-0.1015 (0.665)	-0.1234*** (0.609)
AGRIREGSD	-----	-----	-----	-0.0340 (0.872)	-0.0498 (0.819)
BOATABLE	-----	-----	-----	-----	0.0551 (1.248)
TRIPS2	-----	-----	-----	-----	-0.0012 (0.995)
PFIESTER	-----	-----	-----	-----	-0.0419 (0.845)
NONPOINT	-----	-----	-----	-----	0.1629** (1.923)

* Significant @ 99% Confidence
** Significant @ 95% Condidence
*** Significant @ 90% Confidence

Table 18 Estimated Logit Coefficients for the Implementation of Conservation or Reduced Tillage

	Model I	Model II	Model III	Model IV	Model V
Variables	Estimate (Std Error)	Estimate (Std Error)	Estimate (Std Error)	Estimate (Std Error)	Estimate (Std Error)
Intercept	-0.3406 (1.0081)	-0.5323 (1.0468)	-0.7459 (1.0718)	-1.1415 (1.1028)	-1.4099 (1.1257)
EDUC	-0.00930 (0.0466)	-0.00495 (0.0472)	-0.00278 (0.0483)	0.00494 (0.0490)	-0.0168 (0.0505)
EXPER	-0.0104 (0.0121)	-0.00903 (0.0122)	-0.00507 (0.0125)	-0.00408 (0.0127)	-0.00201 (0.0129)
INCOME3	0.00374 (0.00255)	0.00392 (0.00257)	0.00475*** (0.00265)	0.00488*** (0.00267)	0.00441 (0.00269)
ANIMALS	0.000597 (0.00370)	0.000710 (0.00372)	0.00239 (0.00392)	0.00239 (0.00394)	0.00236 (0.00403)
FARMACRE	0.0107* (0.00212)	0.0107* (0.00213)	0.0109* (0.00219)	0.0107* (0.00221)	0.0109* (0.00227)
FARMACRE2	-0.00001* (2.524E-6)	-0.00001* (2.527E-6)	-0.00001* (2.597E-6)	-0.00001* (2.608E-6)	-0.00001* (2.68E-6)
FINASST	0.9128* (0.3269)	0.9301* (0.3280)	0.8593** (0.3372)	0.9263* (0.3420)	0.9794* (0.3496)
PERCENTY	0.00620 (0.00416)	0.00628 (0.00418)	0.00601 (0.00429)	0.00650 (0.00434)	0.00664 (0.00440)
LOWER	-----	0.2558 (0.3285)	0.1796 (0.3456)	0.1950 (0.3501)	0.0200 (0.3670)
MIDDLE	-----	-0.0157 (0.3089)	-0.1272 (0.3250)	-0.1160 (0.3307)	-0.2237 (0.3378)
WQPOOR	-----	-----	-0.3056 (0.2882)	-0.2765 (0.2963)	-0.3642 (0.3206)
WQIMPORTN	-----	-----	-1.3412** (0.5620)	-1.3521** (0.5645)	-1.2899** (0.5745)
READALOT	-----	-----	0.0753 (0.3277)	0.1131 (0.3313)	-0.0234 (0.3409)
TALKSOME	-----	-----	0.1748 (0.3383)	0.1292 (0.3443)	0.0512 (0.3504)
NOTSAFE	-----	-----	0.1736 (0.3072)	0.1041 (0.3119)	0.3038 (0.3634)
CURREGUSD	-----	-----	-----	0.4567 (0.2850)	0.4021 (0.2900)
HIGHFINED	-----	-----	-----	0.4928 (0.6324)	0.4184 (0.6323)
RIGHTTHID	-----	-----	-----	-0.1820 (0.2902)	-0.2436 (0.2960)
AGRIREGSD	-----	-----	-----	0.3356 (0.3341)	0.3245 (0.3382)
BOATABLE	-----	-----	-----	-----	0.2832 (0.3565)
TRIPS2	-----	-----	-----	-----	0.00497 (0.00998)
PFIESTER	-----	-----	-----	-----	0.6690*** (0.3936)

NONPOINT	-----	-----	-----	-----	0.3755 (0.3456)
Wald (Global c^2)	56.5395 *	56.9144*	61.2020*	62.8450 *	64.3593*
McFaddens R^2	.1626	.1644	.1820	.1930	.2039
Likelihood Ratio		0.785	7.878	4.885	4.829

* Significant @ 99% Confidence
** Significant @ 95% Condidence
*** Significant @ 90% Confidence

Table 19 Estimated Logit Marginal Effects for the Implementation of Conservation or Reduced Tillage

Variables	Model I Estimate (Odds Ratio)	Model II Estimate (Odds Ratio)	Model III Estimate (Odds Ratio)	Model IV Estimate (Odds Ratio)	Model V Estimate (Odds Ratio)
Intercept	-0.0655	-0.1024	-0.1435	-0.2196	-0.2713
EDUC	-0.0018	-0.0010	-0.0005	0.0010	-0.0032
EXPER	-0.0020	-0.0017	-0.0010	-0.0008	-0.0004
INCOME3	0.0007196	0.0007542	0.0009139***	0.0009389***	0.0008484
ANIMALS	0.00011	0.00013	0.00045	0.00046	0.00045
FARMACRE	0.00206*	0.00206*	0.00210*	0.00206*	0.00210*
FARMACRE2	-0.0000019*	-0.0000019*	-0.0000019*	-0.0000019*	-0.0000019*
FINASST	0.1756* (2.491)	0.1789* (2.535)	0.1653* (2.362)	0.1782* (2.525)	0.1884* (2.663)
PERCENTY	0.00119	0.00120	0.00116	0.00125	0.00128
LOWER	-----	0.0492 (1.292)	0.0346 (1.197)	0.0375 (1.215)	0.0038 (1.020)
MIDDLE	-----	-0.0030 (0.984)	-0.0245 (0.881)	-0.0223 (0.890)	-0.0430 (0.800)
WQPOOR	-----	-----	-0.0588 (0.737)	-0.0532 (0.758)	-0.0701 (0.695)
WQIMPORTN	-----	-----	-0.2580** (0.262)	-0.2601** (0.259)	-0.2482** (0.275)
READALOT	-----	-----	0.0145 (1.078)	0.0218 (1.120)	-0.0045 (0.977)
TALKSOME	-----	-----	0.0336 (1.191)	0.024856 (1.138)	0.0099 (1.053)
NOTSAFE	-----	-----	0.0334 (1.190)	0.0200 (1.110)	0.0582 (1.355)
CURREGUSD	-----	-----	-----	0.0879 (1.579)	0.0774 (1.495)
HIGHFINED	-----	-----	-----	0.0948 (1.637)	0.08050016 (1.520)
RIGHTTHID	-----	-----	-----	-0.0350 (0.834)	-0.0469 (0.784)
AGRIREGSD	-----	-----	-----	0.0646 (1.399)	0.0624 (1.383)
BOATABLE	-----	-----	-----	-----	0.0545 (1.327)

TRIPS2	-----	-----	-----	-----	0.0010 (1.005)
PFIESTER	-----	-----	-----	-----	0.1287*** (1.952)
NONPOINT	-----	-----	-----	-----	0.0722 (1.456)

* Significant @ 99% Confidence
** Significant @ 95% Condidence
*** Significant @ 90% Confidence

Table 20 Estimated Logit Coefficients for the Implementation of Permanent Vegetation Strips

	Model I	Model II	Model III	Model IV	Model V
Variables	Estimate (Std Error)	Estimate (Std Error)	Estimate (Std Error)	Estimate (Std Error)	Estimate (Std Error)
Intercept	-0.1089 (0.9565)	0.3960 (0.9967)	0.2178 (1.0193)	0.1178 (1.0421)	0.0588 (1.0603)
EDUC	0.0712 (0.0439)	0.0625 (0.0450)	0.0482 (0.0459)	0.0564 (0.0466)	0.0493 (0.0481)
EXPER	-0.0144 (0.0113)	-0.0158 (0.0115)	-0.0165 (0.0118)	-0.0149 (0.0119)	-0.0133 (0.0120)
INCOME3	-0.00051 (0.00222)	-0.00031 (0.00227)	-0.00035 (0.00230)	-0.00071 (0.00232)	-0.00134 (0.00236)
ANIMALS	0.00538 (0.00372)	0.00624 (0.00381)	0.00584 (0.00390)	0.00594 (0.00393)	0.00560 (0.00402)
FARMACRE	0.00556* (0.00186)	0.00592* (0.00190)	0.00611* (0.00193)	0.00630* (0.00195)	0.00609* (0.00198)
FARMACRE2	-6.79E-6* (2.246E-6)	-7.05E-6* (2.281E-6)	2.313E-6* (0.3461)	-7.52E-6* (2.336E-6)	-7.3E-6* (2.376E-6)
FINASST	0.3304 (0.2801)	0.3321 (0.2856)	0.2940 (-0.00087)	0.3754 (0.2972)	0.3619 (0.3044)
PERCENTY	-0.00127 (0.00382)	-0.00039 (0.00390)	0.00089 (0.00390)	-0.00059 (0.00396)	-0.00074 (0.00401)
LOWER	-----	-0.6404** (0.3120)	-0.7812** (0.3281)	-0.7740** (0.3324)	-0.8936* (0.3455)
MIDDLE	-----	-0.7968* (0.2927)	-0.9023* (0.3036)	-0.8943* (0.3101)	-0.9503* (0.3139)
WQPOOR	-----	-----	0.2030 (0.2660)	0.2279 (0.2725)	0.2020 (0.2930)
WQIMPORTN	-----	-----	-0.1537 (0.5887)	-0.1247 (0.5904)	-0.0724 (0.5933)
READALOT	-----	-----	0.1886	0.1781	0.0898

			(0.2963)	(0.2975)	(0.3045)
TALKSOME	-----	-----	0.2606 (0.3123)	0.2623 (0.3128)	0.1974 (0.3158)
NOTSAFE	-----	-----	0.2578 (0.2977)	0.2332 (0.3022)	0.3627 (0.3477)
CURREGUSD	-----	-----	-----	0.1434 (0.2604)	0.1672 (0.2641)
HIGHFINED	-----	-----	-----	-0.3101 (0.4870)	-0.3523 (0.4908)
RIGHTTHID	-----	-----	-----	-0.3468 (0.2660)	-0.3742 (0.2692)
AGRIREGSD	-----	-----	-----	0.00411 (0.2893)	-0.0275 (0.2910)
BOATABLE	-----	-----	-----	-----	0.1260 (0.3245)
TRIPS2	-----	-----	-----	-----	0.0102 (0.00984)
PFIESTER	-----	-----	-----	-----	0.1517 (0.3632)
NONPOINT	-----	-----	-----	-----	0.4337 (0.3161)
Wald (Global χ^2)	28.3359*	34.6462*	37.4718*	38.8086*	40.5680*
McFaddens R^2	.0687	.0871	.0960	.1005	.1081
Likelihood Ratio		8.418	4.063	2.073	3.50

* Significant @ 99% Confidence
** Significant @ 95% Condidence
*** Significant @ 90% Confidence

Table 21 Estimated Logit Marginal Effects for the Implementation of Permanent Vegetation Strips

	Model I	Model II	Model III	Model IV	Model V
Variables	Estimate (Odds Ratio)	Estimate (Odds Ratio)	Estimate (Odds Ratio)	Estimate (Odds Ratio)	Estimate (Odds Ratio)
Intercept	-0.0217	0.0789	0.0434	0.0234	0.0117
EDUC	0.0142	0.0125	0.0096	0.0112	0.0098
EXPER	-0.0029	-0.0032	-0.0033	-0.0030	-0.0027
INCOME3	-0.0001	-.00006	-.00006	-0.0001	-0.0003
ANIMALS	0.001072638	0.0012441	0.00116435	0.001184288	0.0011165
FARMACRE	0.0011*	0.0012*	0.0012*	0.0013*	0.0012*
FARMACRE2	-0.0000013*	-0.0000014*	-0.0000014*	-0.0000015*	-0.0000014*
FINASST	0.0659 (1.392)	0.0662 (1.394)	0.0586 (1.414)	0.0748 (1.456)	0.0722 (1.436)
PERCENTY	-0.00025	-.00007	0.00079	-0.00012	-0.00015
LOWER	-----	-0.1277** (0.527)	0.1557** (0.458)	-0.1543** (0.461)	-0.1782* (0.409)

MIDDLE	-----	-0.1589* (0.451)	0.1798* (0.406)	-0.1783* (0.409)	-0.1895* (0.387)
WQPOOR	-----	-----	0.0530 (1.225)	0.0454 (1.256)	0.0403 (1.224)
WQIMPORTN	-----	-----	-0.0306 (0.858)	-0.0249 (0.883)	-0.0144 (0.930)
READALOT	-----	-----	0.0376 (1.208)	0.0355 (1.195)	0.0179 (1.094)
TALKSOME	-----	-----	0.0520 (1.298)	0.0523 (1.300)	0.0394 (1.218)
NOTSAFE	-----	-----	0.0514 (1.294)	0.0465 (1.263)	0.0723 (1.437)
CURREGUSD	-----	-----	-----	0.0286 (1.154)	0.0334 (1.182)
HIGHFINED	-----	-----	-----	-0.0618 (0.733)	-0.07025 (0.703)
RIGHTTHID	-----	-----	-----	-0.0691 (0.707)	-0.07465 (0.688)
AGRIREGSD	-----	-----	-----	0.0008 (1.004)	-0.0055 (0.973)
BOATABLE	-----	-----	-----	-----	0.0251 (1.134)
TRIPS2	-----	-----	-----	-----	0.0020 (1.010)
PFIESTER	-----	-----	-----	-----	0.0302 (1.164)
NONPOINT	-----	-----	-----	-----	0.0865 (1.543)

* Significant @ 99% Confidence
** Significant @ 95% Condidence
*** Significant @ 90% Confidence

Table 22: Frequency Distribution and Chi Square Values for Financial Assistance * Farmsize

Farmsize		Small	Medium	Large
Financial Assistance	0	108	95	53
	1	24	74	35
Likelihood Ratio (Chi Square)	23.17			
Probability	<.0001			

Table 23: Frequency Distribution and Chi Square Values for Financial Assistance * Farmsize

Farmsize		Small	Large
Financial Assistance	0	148	95
	1	109	74
Likelihood Ratio (Chi Square)	22.17		
Probability	<.0001		