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Carbon Incentive Mechanisms and Land-Use Implications for Canadian Agriculture

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Abstract

This research examines effects of various factors on participation in agricultural tree plantations for economic, environmental, social and carbon-uptake purposes. Using survey data from 2000 mail surveys of Canadian farmers, a discrete choice random utility analysis is used to determine probability of farmers' participation and the corresponding mean willingness to accept a tree-planting program. Estimation results show that the required compensation for accepting a tree-planting program is higher than the compensation suggested by a normative approach.

Introduction

Climate change will likely remain a widely debated issue on the agenda of many concerned governments in the world. On scientific grounds, there appears to be consensus that emissions of greenhouse gases, carbon dioxide in particular, are responsible for the relatively recent rising in global temperatures. To mitigate the process of global warming, some countries may decide to increase carbon storage capacity through forest sinks in place of costly emissions reductions. Despite disagreement over the role of terrestrial carbon sinks, management of terrestrial biomass in forests, grasslands and agricultural land could play a role in a comprehensive land-use policy of any country in the world. Land-use management in agriculture and forestry requires evaluation in terms of relative economic efficiency and cost effectiveness.

One option for achieving significant carbon offsets is to plant trees on marginal agricultural land. In addition to providing C-uptake benefits and potential commercial timber benefits, tree planting could provide extra-market benefits such as reduced soil erosion, improved water quality, increased wildlife habitat, riparian buffer zones and aesthetic appeal. Afforestation could thus be pursued regardless of concerns about climate change. Since benefits

of planting trees would accrue to society, compensation would need to be provided to landowners if they are to change their land use from agriculture to forestry.

The purpose of the current study is to determine how much landowners would need to be compensated to convert their crop land to forested land. This is not straightforward for several reasons: (1) there is uncertainty about the costs of tree planting, actual yields and stumpage values due to geographical differences in proximity to saw mills, pulp mills or biomass burning facilities; (2) returns to current investments may accrue in the distant future causing disruptions in income flows that could increase the required compensation; (3) landowners may perceive the financial risks of planting trees to be too great for lack of knowledge and skills; and, (4) by planting trees, farmers may feel that their ability to participate in current and future government agricultural programs is threatened because of their reduced capacity to produce agricultural commodities.

In addition, the compensation amount should include forgone agricultural returns (including any price support or subsidy payments) from the land and any other associated non-market values that the landowner realizes from agriculture. Since non-market values often play a significant role in farming decisions, a compensation amount equal to agricultural rents may not be enough to convince landowners to change the use of the land. A contingent valuation methodology allows for the incorporation of non-market values and other unobservable opportunity costs into the compensation amount.

This research uses data from surveys mailed to western Canadian farmers to examine their willingness to accept (WTA) compensation for participation in tree planting programs. A discrete choice random utility framework is constructed to represent landowners' preferences towards adopting tree planting on their most marginal land. Landowners are offered a

compensation bid for removal of land from production. The random utility framework models the choice between rejecting the bid and keeping the land in production, and accepting the bid and removing the land from production in favor of tree planting. The landowner will accept the bid and allow conversion of the land as long as the compensation offered is at least as much as the opportunity cost of not producing. The applied probit model estimates the probability of accepting a tree-planting program.

The paper is organized as follows. A general overview of theory is presented followed by a discussion the data and explanation of the empirical model. The paper concludes with model results and discussion of policy implications.

Random Utility Model

Hanemann (1984) derives a theoretical random utility maximization (RUM) framework for analyzing binary data that usually depict an individual's yes or no stand on a particular issue. The basic premise of RUM is that an individual chooses rationally the option that yields the highest utility. Assuming constant prices, the utility of an individual can be written as

$$(1) \quad u_{i,a}(m, s),$$

where i indicates an individual, a the discrete decision, $\{a = 1$ if yes; $a = 0$ if no $\}$; m is income; and, s represents other observable attributes that set individuals apart.

Hanemann (1984) assumes that an individual knows his or her utility with certainty, but the yes/no outcome is probabilistic since the researcher will never be able to account for all relevant exogenous variables and variations among individuals. The utility function $u_{i,a}(m, s)$ can be specified as a function of a deterministic component $v_{i,a}(m, s)$, and an additive stochastic component $\varepsilon_{i,a}$,

$$(2) \quad u_{i,a}(m, s) = v_{i,a}(m, s) + \varepsilon_{i,a},$$

where $\varepsilon_{i,0}$ and $\varepsilon_{i,1}$ are i.i.d. random variables with zero means and variance σ^2 . The utility function (2) is itself a random variable with mean $\bar{u}_{i,a}(m, s)$. The RUM models the difference in utilities of the two (yes and no) alternatives that can be thought of as an underlying continuous index function (Greene, 1997). Hanemann (1984) applies the difference in indirect utilities of two alternatives and thus proposes a way of calculating the compensating surplus welfare measure.

Survey of Canadian Farmers

A mail survey was chosen that identified 2000 randomly selected farmers from the grain belt region of Canada, which includes northeastern British Columbia, Alberta, Saskatchewan and Manitoba. Farmers with less than 160 acres of land were omitted from the survey sample since small landowners were unlikely to contribute relatively significant portions of their land.¹ Dairy farmers were also excluded from the sample for their presumed high opportunity cost of tree planting due to value-added production.

The survey includes a brief, personalized cover letter explaining the purpose of the questionnaire and a definition of carbon credit. The actual survey is split into six sections beginning with a short explanatory page that attempts to motivate farmers into responding, while pointing out the climate-change mitigation benefits of tree planting. Section one of the survey comprises opinion questions and a history of former contracts of which a farmer may have been

¹ Bell, Robers, Englis and Park (1994) consider landowners with 100 or more acres in their study of participation in Tennessee's Forest Stewardship Program.

involved. In section two, farmers are asked to describe their farming enterprise by identifying their least productive fields. This information is helpful in determining the ability of marginal land to support growing trees. The remainder of section two asks farmers to identify the livestock they own. The questions are meant to obtain insights into economies of scale associated with raising livestock that could be disrupted as a result of tree planting. Section three is a one-page sub-survey of adaptation strategies that farmers might employ in order to avert losses from agriculture or take advantage of new opportunities brought about by warmer climate.

The aforementioned sections allow the respondents to become familiar with the topic and issues under investigation. This is followed by the section most relevant for this particular study, which focuses on farmers' willingness to plant trees. Farmers are presented with a hypothetical program that covers all costs of tree planting and compensates for the lost value of production by offering farmers a bid to convert their most marginal plot of land to tree planting under a 10 year contract. In the absence of *a priori* valuation information, the compensation levels are selected based on the results of a pilot study and range from \$1 to \$60 per acre annually. The distribution of these bids is skewed towards the lower bound of the range in order to provide more efficient estimates of WTA, as recommended by Cooper (1993). The contingent contract indicates that farmers have no right to harvest the trees before the contract expires, but trees become their property at the end of the contract. No compensation is provided for the reversed conversion back to agriculture. The farmers also respond to a second follow-up bid proposed for the same program under a longer contract length.

The final two sections of the survey include a section on institutions where farmers are given an opportunity to identify their willingness to engage in contracting with various parties for carbon credits and questions eliciting the demographic information of respondents, some of

which is used in this study and will be described in further detail later. The survey data provide a wealth of information and data on farmers' roles and perceptions towards climate change. Options for further research will be discussed in the conclusion to this paper².

The survey was completed in the summer of 2000. The response rate is calculated by subtracting the number of undelivered surveys from the total number of surveys distributed. Out of the initial 2000 surveys sent out, 379 were returned undelivered, casting a doubt on the overall reliability of the address list.³ However, reminder cards accomplished an effective response rate of 13 percent.⁴ This response rate is just slightly higher than the 12 percent response rates reported by the Environics Research Group (2000) in their study of stewardship of Canadian farmers and Bell et al. (1994). The actual response rate is likely significantly higher than 13 percent, but remains unknown due to some unreliable addresses.

Empirical Model

Assuming that a farmer derives his or her utility from income and either tree planting or current agricultural activities, farmer i will say "yes" ($a = 1$) to tree planting with a proposed compensation if

$$(3) \quad v_{i,1}(m + \Delta m, s) + \epsilon_{i,1} \geq v_{i,0}(m, s) + \epsilon_{i,0},$$

and "no" otherwise. The observed change in income when tree planting is accepted, Δm , is comprised of the compensation amount (B) plus annualized future timber harvest benefits minus the forgone annual agricultural benefits (OC), all discounted over the contract period. Since

² See Suchanek (2001) for complete survey details and a copy of the survey.

³ See Suchanek (2001) for more details.

⁴ Effective response rate = returned / (sent - undelivered) * 100%.

utility is a random variable, the probability distribution of a farmer's choice to accept the bid amount can be written (suppressing subscript i) as

$$(4) \quad \begin{aligned} \Pr\{a = 1\} &= \Pr\{v_1(m + \Delta m, s) + \varepsilon_1 \geq v_0(m, s) + \varepsilon_0\} \\ &= \Pr\{(\varepsilon_1 - \varepsilon_0) \geq -[v_1(m + \Delta m, s) - v_0(m, s)]\} \end{aligned}$$

Replacing $[v_1(m + \Delta m, s) - v_0(m, s)]/\sigma$ with Δv and $(\varepsilon_0 - \varepsilon_1)/\sigma$ with ε , where $\varepsilon \sim N(0,1)$ yields the probit model

$$(5) \quad \Pr(a = 1) = \Pr\{\varepsilon \geq -\Delta v\} = F_\varepsilon(\Delta v),$$

where F_ε is the normal cumulative distribution function (cdf).⁵ Its argument represents the difference in utilities of yes and no responses. One simplification is made by not including timber benefits in the Δm measure even though the contingent valuation scenario stipulates that trees become farmer's property when contract matures. It is assumed that annualized timber benefits will not significantly impact the decision to accept the tree-planting bid since the reversed conversion costs offset, at least to some extent, the timber returns. Stump removal and root raking put land out of production for one to two years and require, therefore, compensation for the production lost. Timber returns also occur relatively far in the future, thus creating a considerable risk premium further offsetting any timber benefits. The alternative to converting the land back to agriculture is keeping it in forestry, which requires farmer's long-term commitment to growing trees and learning about forestry practices, timber marketing or forestry

⁵ Initially, two discrete responses to two different program levels were modeled using a bivariate probability density function with non-zero error correlation. The two valuation errors were consistently found to be significantly uncorrelated, therefore, the analysis proceeded with a single probit estimation for the first program level.

as a whole. As Plantinga (1997) points out, other studies of large-scale tree planting programs also ignore timber benefits even though, "in theory, forestry rents will be capitalized into the value of the land and may therefore decrease the level of required compensation" (p. S270-S271).

Therefore, a farmer will base his or her decision to accept the proposed compensation on returns from the least economically marginal acre of land, by comparing $v_1(m+B-OC, s)$ and $v_0(m, s)$, where B is the bid and OC is the opportunity cost or current agricultural returns from the acre.⁶ Following Hanemann's (1984) example, when the least marginal acre of land is considered (i.e., the first acre to be made available for tree planting), the deterministic parts of the two utility functions can be written as:

$$(6) \quad \begin{aligned} v_1(m+B-OC, s) &= \alpha_1 + \beta'(m+B-OC) + \delta_1 s \\ v_0(m, s) &= \alpha_0 + \beta' m + \delta_0 s \end{aligned} .$$

Subtracting v_1 from v_0 and dividing by σ results in

$$(7) \quad \Delta v(B-OC, s) = (\alpha_1 - \alpha_0) / \sigma + \beta' / \sigma (B-OC) + (\delta_1 - \delta_0) / \sigma (s),$$

which can be rewritten as

$$(8) \quad \Delta v(B-OC, s) = \alpha + \beta(B-OC) + \delta s ,$$

where $\alpha = (\alpha_1 - \alpha_0) / \sigma$, $\beta = \beta' / \sigma$ and $\delta = (\delta_1 - \delta_0) / \sigma$. This provides an empirical estimate of $\Pr(a=1)$ that is also the conditional mean probability of a . The $E[a | X]$ is then equal to:

⁶ For convenience, the error terms associated with each of the utilities have been dropped.

$$(9) \quad E[a | X] = \Pr(a = 1) = F_{\varepsilon}(\Delta v) = \int_{-\infty}^{+\infty} \phi(\Delta v) = \int_{-\infty}^{+\infty} \frac{1}{\sqrt{2\pi}} e^{-\frac{\Delta v^2}{2}} d\Delta v,$$

where X is a vector of exogenous variables, F_{ε} is the standard normal cumulative distribution function and ϕ is the corresponding density function (see Greene, 1997).

The log-likelihood function is given as

$$(10) \quad \log L(\Delta v) = \sum_{i=1}^n \left\{ (I) \log \left[\int_{-\infty}^{(\Delta v)} h(z_1) dz_1 \right] + (1 - I) \log \left[\int_{-\Delta v}^{(\infty)} h(z_1) dz_1 \right] \right\}.$$

where $h(\cdot)$ represents standard normal distribution function.

Hanemann (1984) proposes a conceptual approach for deriving farmer's minimum WTA compensation, denoted by B^* . In effect, this can be accomplished by determining the amount of money needed to keep the farmer just indifferent between accepting the bid and retaining his or her marginal land in agriculture. Analogously, one can express this indifference by setting the probability of accepting a bid to 0.5 and solving for B^* ,

$$(11) \quad \Pr(a = 1) = \Pr \left\{ v_1(m + B^* - OC, s) + \varepsilon_1 \geq v_0(m, s) + \varepsilon_0 \right\} = 0.5.$$

In (12), the probability of accepting the bid, B^* , is the same as the probability of rejecting it.

Given the symmetric properties of the standard normal c.d.f. yields

$$(12) \quad \Delta v = \alpha + \beta(B^* - OC) + \delta s = 0 \Rightarrow B^* = OC - \left(\frac{\alpha}{\beta} + \frac{\delta}{\beta} s \right).$$

This result facilitates the interpretation of two basic welfare measures, the median and the mean willingness to accept. The median is the value of B that corresponds to a value of $\Pr(a = 1) = 0.5$

and is equivalent to B^* . Hanemann (1984) shows that specifying utility as in (6) results in the mean being equal to the median and ensures that no 'income effects' occur since probabilities are independent of the individual's income⁷. Hanemann (1984) ascertains that only the median and mean "are fully compatible with the notion of cardinal utility" (p. 336). In the case that they differ, the choice of measure is left to the researcher's discretion.⁸

Variable Description

Many survey data were applied to model estimation, but only a particular set of variables seemed to fit the model best. The choice of variables is summarized in Table 1, but the opportunity cost estimate deserves further attention. Farmers have the opportunity to indicate land-use of up to four of their least marginal fields. The land-use types are combined into three categories: pasture, hay and grain.⁹ For each of these categories, average contribution margins are calculated using crop revenues and variable costs of production across the commodities, soil zones and provinces that incorporate average prices for the past four to eight years.¹⁰ Each field provided by a farmer is assigned an opportunity cost based on its land-use. The opportunity cost is simply the minimum of the four (or less if a farmer provided less than four) least marginal fields. Table 2 illustrates values for the opportunity cost variable used in the regressions.

Not all returned surveys can be used for the probit estimation. The efficient design of the survey does not allow those respondents unwilling to accept compensation in principle to answer the contingent valuation questions. While these responses could be construed as a "no" response

⁷ The assumption of no income effects (or a constant marginal utility of income is common in random utility modeling in order to facilitate welfare calculations. Recent literature has relaxed this assumption (e.g. Herriges and Kling (1999))

⁸ See Hanemann (1984) for more detailed discussion of the merits of each measure.

⁹ The category grain includes the following: wheat, canola, barley, rye, oats, flax, lentils, peas and summerfallow.

¹⁰ These numbers are provided by Suchanek (2001) and are based on information supplied by provincial governments.

for any bid amount, they are not included in this analysis. As a result of this and some missing data, only 86 observations are used in the estimation of willingness to accept.

Results

The coefficients of the probit model are estimated using the Maximum Likelihood Module of GAUSS 3.1. The likelihood ratio test is used to evaluate the overall significance of the model. The likelihood ratio test under the null hypothesis that all the coefficient estimates except the constant are equal to zero is equal to 42.12, which is rejected at five-percent significance level and with 13 degrees of freedom. The likelihood ratio index can also be used to derive a goodness of fit measure, which in this case is equal to 0.37 (Greene, 1997).¹¹

A natural extension of the 'goodness of fit' discussion is to present prediction results for this model. This model accurately predicts roughly 81.5 percent of observed 'yes' and 'no' answers (see Table 3). This prediction is based on a threshold probability of a 'yes' response equal to 0.5. That is, if the computed probability of a 'yes' answer is less than 0.5, a 'no' response is predicted. On the other hand, computed probability of a 'yes' response greater or equal to 0.5 indicates a prediction of a 'yes' response. To put these results into perspective, a naive model is often presented. A naive model always predicts a 'yes' or a 'no' response depending on whose sample proportion is higher. In this sample, the proportion of 'no' responses is 0.62, which means that a naive model would accurately predict 62 percent of responses (only the 'no' responses would be predicted successfully). The probit model improves the prediction by almost 20 percent in this case.

¹¹ The Shazam User's Reference Manual (1993) discusses a wide range of other R-square measures, among them Maddala R-Square: $R^2 = 1 - \exp\{2[\ln L_0 - \ln L]/n\}$. For this sample, this measure is equal to 0.40.

Given that the model is highly significant and fits the data reasonably well provides credibility for discussion of parameter estimates that are presented in Table 4. In this table, the marginal effect of a continuous variable x is computed as

$$(13) \quad \frac{\partial E[y | x]}{\partial x} = \left\{ \frac{dF(\beta x)}{d(\beta x)} \right\} \beta = f(\beta \bar{x}) \beta,$$

where $f(\cdot)$ is the standard normal probability density function (Greene, 1997). As usual, the slope is evaluated at the sample mean of x since the marginal effect is a function of x .¹² The appropriate marginal effect of a dummy variable d is equal to

$$(14) \quad \frac{\partial E[y | d]}{\partial d} = \Pr[Y = 1 | \bar{X}, d = 1] - \Pr[Y = 1 | \bar{X}, d = 0],$$

where the matrix X represents all the other variables in the probit model evaluated at their sample means.

Table 4 shows that only two coefficient estimates are significant at the five-percent level. The difference between the offered compensation and the forgone agricultural return (on per acre basis) has a significant positive effect on the 'yes' probability. A one-dollar increase in the difference between the offered bid and forgone agricultural returns implies an average increase of almost one-percent in the probability of accepting the bid. Similarly, the more trees a farmer has, according to the reported forested area on a given farm, the more likely he or she is to engage in more tree planting. However, the effect of an additional acre of tree cover currently on a farm produces only a 0.1 percent increase in the probability to say 'yes' to future tree planting.

¹² Another approach is to compute a marginal effect for each observation and calculate a sample average of the individual effects (Greene, 1997).

The visual variable is significant at ten percent level. This means that for a farmer who perceives further increase in local tree cover as visually unappealing, the probability of accepting a tree-planting program is lower than for a farmer fond of trees. The marginal effect on the probability to accept for a one-step increase on the scale of the visual variable is approximately 14 percent. So the difference in probabilities to accept a tree-planting program between a farmer who very much enjoys the esthetics of trees and a farmer who prefers the look of fewer-tree landscape can be as high as 56 percent. Other coefficients are not significantly different from zero even at the ten-percent significance level, but some come close such as age, dummy for brown soil type and network. Even though a coefficient estimate is not significantly different from zero, its sign may provide information about the possible direction of the overall effect on the dependent variable.

As discussed in the previous section, the estimated coefficients can be used to compute the minimum amount of compensation required to make the respondent just indifferent between accepting and rejecting it. It has been shown that this amount is the mean and median willingness to accept and is, therefore, referred to as the expected willingness to accept. Using

$$(15) \quad B^* = OC - \left(\frac{\hat{\alpha}}{\hat{\beta}} + \frac{\hat{\delta}}{\hat{\beta}} s \right),$$

provides such compensation level for each observation. This new variable has its own sample distribution whose measures are depicted in Table 5.

Table 5 shows that the average compensation of about 40 dollars per acre is required in order to encourage farmers to plant blocks of trees. Interestingly, some farmers are willing to pay as much as 28 dollars per acre to have a tree-planting program introduced to them, while others demand over 100 dollars per acre to plant trees. The negative WTA, interpreted as

positive WTP indicates the benefits to the farmer from forested land. It is important to keep in mind that this discussion pertains to the least marginal acre. Based on the results of this research, a compensation of 40 dollars per acre would entice farmers to plant at least one acre of their farmland (the least marginal) to blocks of trees.

Conclusion

Assuming that a farmer chooses to plant trees on the least marginal field that is likely to be used as pasture and/or for hay production, this compensation is roughly equal to the opportunity cost of the land. However, what is not included in the compensation demanded by farmers is the cost of establishing, monitoring and management of tree planting that would have to be incurred by farmers were the government not willing to subsidize it. Even if timber provided farmers with relatively guaranteed returns equal to forgone returns from agriculture, farmers would be unwilling to plant blocks of trees on their land without financial incentives. This result indicates that there are some non-market benefits of not planting entire blocks of trees on marginal agricultural land that a farmer need to be compensated for.

The main reason for retaining land in agriculture is that tree plantations appear to be financially unattractive, but other factors can also play an important role. While farmers with land already planted to more trees demand lower compensation for their forgone agricultural returns than farmers with fewer trees, others who perceive increased tree cover as visually unappealing need greater timber returns to offset their current economic activities than those fond of trees.

In addition, the results suggest that older farmers would be willing to accept lower compensation for conversion of their agricultural land to trees. Moreover, wealthier farmers have likely a competitive advantage to less-well-off farmers because of their higher skills and

abilities that provide them with greater agricultural returns. As a result, these farmers appear to require higher compensation in order to forgo agricultural production and could be less likely to participate in a tree-planting program.

Further research could investigate the costs of establishing and running the program on provincial and national levels and provide guidance to the kinds of incentives and mechanisms that would make the program implementation as effective as possible. While total cost of implementing the program including farmers' compensation is unknown, the government could use the results of this study for targeting farmers with characteristics that make them accept the least compensation.

To what extent biological mitigation of climate change in the form of afforestation of marginal agricultural land in the grain-belt region of Canada can contribute to the country's carbon emissions reduction remains unknown for lack of knowledge about the supply relationship between the WTA and acres provided. Using additional data from this survey on the number of acres provided at a given compensation level together with the findings of this study could provide this information. Further analysis on the types of institutions, trees and programs necessary for afforestation on Canadian agricultural land is also undergoing¹³.

This research has developed and estimated a model for farmers' WTA compensation for converting marginal agricultural land for tree planting programs. Using a discrete choice random utility framework, the probability of accepting a proposed bid was estimated and the mean WTA was calculated to be approximately \$40 per acre. This provides valuable and necessary information and insights into the costs of afforestation for Canadian farmland.

¹³ See van Kooten, Shaikh and Suchanek (2001)

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Table 1. Definitions of Variables.

Name	Variable Description
BOC1	Compensation offered in the first question minus the opportunity cost.
ProvAB	Dummy variable that takes value one if the respondent farms in Alberta or British Columbia, and zero otherwise.
ProvMB	Dummy variable that takes value one if a respondent farms in Manitoba, and zero otherwise.
Soilbr	Dummy variable that takes value one if a respondent farms in brown soil-type zone, and zero otherwise.
Soildb	Dummy variable that takes value one if a respondent farms in dark brown soil-type zone, and zero otherwise.
Visual	A scale variable that takes value from one if a respondent strongly disagrees with the statement that increased tree cover in the region will detract from the visual appeal of the landscape, to five if a respondent strongly agrees. A value of zero corresponds to no opinion/do not know answer.
Trees	Number of acres of farmland covered with trees.
Leave	Dummy variable that takes value of one if a respondent would leave agriculture if a warmer climate change scenario became a reality, and zero otherwise.
Previous	Dummy variable that takes value of one if a respondent previously participated in a tree-planting program, and zero otherwise.
Educ	Number of years of post-secondary education.
Age	Median of an age category checked by a respondent (from 33 to 68 years with 5 year intervals)
Kids	Dummy variable that takes value of one if a respondent expects their children to continue farming.
Networth	Normalized median of a networth category checked by a respondent (from \$50,000 to \$1,000,000 with \$100,000 intervals)

Table 2. Opportunity Cost Values For A Given Land-Use.

Land-use	Per Acre Opportunity Cost (dollars)
Pasture	42.00
Hay	47.25
Grain	71.85

Table 3. Prediction Summary.

		Actual Responses	
		0	1
Predicted Responses	0	46	9
	1	7	24
Number of Actual Responses	86	53	33
Number of Right Predictions	70		
Percentage of Right Predictions	81.4		

Table 4. Probit Estimation Results (n=86)

Variable Name	Coefficient Estimate	Standard Error	T-Ratio (Estimate/standard error)	Marginal Effect
Constant	-1.1548	1.2962	-0.891	-
BOC1 ^c	0.0338	0.0103	3.288	0.009
Age ^c	0.0287	0.0201	1.430	0.003
Trees ^c	0.0028	0.0012	2.251	0.001
Soilbr	0.7056	0.6156	1.146	0.271
Visual ^c	-0.3573	0.2032	-1.758	-0.142
Leave	0.3792	0.3085	1.229	0.086
Educ ^c	-0.1074	0.1014	-1.059	-0.042
Networth ^c	-0.3066	0.1921	-1.596	-0.122
ProvAB	-0.4247	0.4810	-0.883	-0.149
ProvMB	0.0418	0.6208	0.067	0.015
Soildb	-0.1266	0.4559	-0.278	-0.045
Kids	0.2332	0.4179	0.558	0.083
Previous	-0.1735	0.3961	-0.438	-0.063

Note: Superscript c indicates a continuous variable.

Table 5. Distribution of Expected Willingness to Accept Tree-Planting Program (\$/acre).

Mean	Standard Deviation	Variance	Minimum	Maximum
\$ 40.52	29.99	899.14	- \$ 27.78	\$ 106.50