DETERMINANTS OF FARMER PERCEPTIONS OF THE SEVERITY AND YIELD IMPACT OF SOIL EROSION: EVIDENCE FROM NORTHERN ETHIOPIA

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ABSTRACT

Farmers must perceive soil erosion as a problem before they will invest in preventing it. However, perceptions are often overlooked in the conservation literature. This study analyzes the levels and determinants of farmer perceptions of soil erosion in northern Ethiopia. Results are based on a survey of 250 farmers managing 900 fields during the 1995-96 cropping season. Farmer perceptions of the severity and productivity impact of soil erosion were measured at plot level as ordinal variables. Ordered probit and ordinary probit statistical regressions were used to analyze the levels and determinants of farmer perceptions.

Farmers were more likely both to perceive soil erosion and to perceive resultant yield loss if land degradation in their village was already severe, if they owned fields on steeply sloped land, and if their fields had convex or concave slope shape. On the other hand, farmers were less likely to view soil erosion as a problem or perceive yield loss if they were older, had fields far from the homestead, or had contact with the extension service. Farmers were more likely to perceive soil erosion (but not associated yield loss) if they had managed their fields for a longer period or had larger fields. Perceived yield loss was reduced on fields that had benefited from public conservation campaigns.

Educational programs to raise awareness of soil erosion should be an integral component of conservation extension services. A focus on technology transfer alone will not necessarily result in awareness of the erosion problem and enhanced adoption of conservation technologies. Educational programs need to target older household heads. Stable land tenure can facilitate conservation investment through its impact on erosion perception, in addition to its effect through tenure security.

Key words: soil erosion, perception, conservation, Ethiopia.

Before a problem can be addressed, it must be perceived. Addressing soil erosion with the adoption of conservation practices is no exception. Unfortunately, the literature on determinants of the adoption of conservation technologies has given little attention to perception variables (Wossink et al., 1997; Negatu and Parikh, 1999; Adesina and Baidu-Forson, 1995). Agricultural technology adoption studies in Ethiopia started in the 1970's, but few of them considered the role of farmer perceptions in the adoption of improved varieties (Yirga, 1993; Dadi, 1992). The paucity of adoption studies that incorporate the effect of perceptions led Adesina and Baidu-Forson (1995) to call for more research into how farmers' perceptions of technology characteristics affect their adoption decisions.

Perceptions are important in the introduction of sustainable farming techniques at the farm level (Wossink, et. al., 1995). Feather and Amacher (1994) found that fostering adoption of improved natural resource management practices through education can be more cost effective than direct regulations or financial incentives. A prevalent natural resource management challenge in developing countries is soil erosion. Soil erosion is an insidious, gradual process, and farmers may not easily perceive its severity. An understanding of the levels and determinants of farmer perceptions of soil erosion and conservation can facilitate the development and transfer of appropriate conservation technologies. However, as in the general agricultural technology adoption literature, perceptions have often been overlooked in the conservation literature.

In this paper, we examine the levels and determinants of farmer perceptions regarding (1) the severity of soil erosion, and (2) the productivity effect of soil erosion. Results are based upon a 1995 survey of 250 households in the Tigray region of northern Ethiopia.

The Setting

The study area, Tigray, is located in northern Ethiopia in the semi-arid Sudano-Sahelian climatic zone. A mountainous plateau of 2500 to 3400 meters above sea level (m.a.s.l.) crosses the center of Tigray with associated mountains on both sides. In the west the plateau joins lowlands of less than 500 m.a.s.l.. In the east an escarpment sharply extends into the salt mining depression of the Danakil desert.

The tropical semi-arid climate (Virgo and Munro, 1978) receives annual rainfall ranging from 450 to 980 mm, with an annual average of about 600 mm. In general, rainfall increases as one moves from east to west and from north to south. Most precipitation in the region occurs during the months of June to August, falling with high intensity that contributes to soil erosion. An estimated 75 percent of precipitation falls at more than 25mm/hr (Virgo and Munro, 1978). The region receives about 63 percent of the average national rainfall amount, and the inter-annual co-efficient of variation of the precipitation was once estimated to be 28 percent (REST, 1995).

Land degradation in Tigray is severe, notably soil erosion and deforestation. The severity of land degradation in the region is apparent from gullies cutting arable lands, exposure of stones and rocks on cultivated lands and grazing areas, heavy run-off during the rainy season, and declining yields. As Micheal Stahl remarked, "If any region [in

Ethiopia] would need an environmental first aid, that would be Tigray." (Ornas and Salih, 1989, p.192). Despite the severe land degradation, more than 85 percent of the population depends on agriculture for its livelihood. The rural population's half a million farm households rely on cereal crops for more than 80 percent of their cultivated area (Berhanu Gebremedhin, 1998).

Soil moisture is usually available to crops for less than three months a year, due to the short, concentrated rainy season, the shallow soils, the removal of fine soil particles by soil erosion, and the lack of soil organic matter. The lack of soil moisture reduces the vegetative cover of the land, further exposing it to soil erosion. The practices of letting crop residue be grazed right after harvest, followed by repeatedly plowing to combat weeds leaves cultivated land without cover when the rains begin.

Over the past two centuries, Tigray's forests have been lost to cutting for fuel wood, timber and agricultural implements, as well as to expand agricultural land. While cultivated land was operated under individual households, forest areas were either communally utilized or else open access resources. The resultant deforestation has caused severe fuel wood shortages. Many households have responded by using animal dung and crop residues for fuel, thereby reducing the organic matter and nutrients returned to the soil. Given the severity of soil erosion and the declining yields in the region, Tigray provides an ideal place to investigate whether and why farmers perceive soil erosion as a problem.

Conceptual Model and Hypotheses

Farmer perceptions of soil erosion are influenced by the natural physical factors that condition erosion, as well as the socio-institutional factors and household characteristics that affect how physical processes are viewed (Figure 1). Physical factors include village level factors (rainfall, topography and level of land degradation) and field level factors (soil type, slope, shape of slope, and location of plot) that may aggravate soil erosion. Socio-institutional factors include contact with the agricultural extension service (affecting access to information), availability of a food-for-work (FFW) project in the village, prior public conservation campaign works on the farmer's own land (for demonstration effects), and the current tenure status of the field. Household characteristics include education, age and gender.

The physical factors that aggravate soil erosion, such as higher rainfall intensity, steep slopes and erodible soils, are hypothesized to raise farmer perceptions of soil erosion by aggravating soil loss. Distance of plot from homestead is expected to reduce perception, as distant plots are less frequently observed by farmers. The period of time the plot has been operated by the current owner is expected to raise erosion perceptions for the opposite reason. Field area (size) should raise perception since the absolute amount of soil and crop yield losses may be higher from larger plots.

Farmers who have contact with extension services are expected to have higher erosion perception, since extension is expected to serve as a source of technical information to farmers. The availability of a resource conservation FFW project in the village is expected to raise erosion perception through its demonstration effect on the need for conservation measures. The effect of public campaign conservation work on the farmer's own plot is ambiguous; it may raise erosion perception through its demonstration effect or reduce perception through its effect on soil loss.

Specification of Empirical Models

The determinants of farmer perceptions of soil erosion can be analyzed using qualitative response statistical models. The simplest of these models has a binary dependent variable, so the outcome of interest can take on the values 0 or 1: 1 if erosion is perceived and 0 if it is not. The binary response models focus on the factors that determine the probability of perception. It is assumed that there exists a perception function, Y, which governs whether erosion is perceived (Y=1) or not (Y=0). The probability that observation Y_i takes on the value 1 can be represented as a function of a vector of explanatory variables, X_i, representing the physical setting, the farm household and the institutional environment. In general, the probability of perception of a given condition can be represented as

$$P_i = \text{Prob}(Y_i = 1) = F(X_i, B) + \varepsilon_i, \text{ for } i = 1,2, ..., n$$

where X_i is a vector of explanatory variables, B is a vector of unknown parameters (to be estimated), and ε is a random error term.

Assuming the model's random disturbance term, ε_i, follows the normal probability distribution $(0,\sigma^2)$, the probability of perception can be defined in terms of an index which is converted into a probability value through the cumulative normal distribution function. The probit model takes the form $P[Y=1]=\Phi(\beta'X)$, where P is probability of perception and $\Phi(.)$ is the normal cumulative probability distribution function. The statistical relationship $P(Y) = F(\beta'X)$ is estimated using maximum likelihood estimation. The marginal effect of an additional unit of some X variable can be computed using the estimated parameter coefficients (Green, 1990).

Also of interest for erosion perceptions is the case where a dependent variable is not binary, but rather may take graduated discrete values, as when respondents are asked to rate the severity of erosion on a scale that takes several different values. This instance is an extension of the binary case known as ordered probit, where it is assumed that the probability of perceiving a specified level of erosion is the probability that the perception function falls in a range around that value, given that random disturbances in the perception function follow the normal probability distribution.

Modeling Farmer Perception of Soil Erosion and its Yield Impact

Farmer perception of the severity of soil erosion and its productivity impact were modeled in two steps. As detailed above, perception was modeled as a function of objectively verifiable physical measures, socio-institutional factors, and household demographic characteristics. The physical measures could be subdivided between 1) topographic and ecological characteristics of village, and 2) physical characteristics of the fields managed. By substituting the objectively verifiable factors into the perception equation, the following specification was developed:

***Farmer Perception** = F(**1.** village topographic and ecological characteristics, **2.** field physical characteristics, **3.** socio-institutional factors, and **4.** household demographic characteristics).*

Data was collected from 900 plots operated by a random sample of 250 rural households in 30 villages during 1995. The study area was classified in to four topographical zones: steep, moderately steep, moderately steep and hilly, and flat. Representative villages were purposively selected in each topographical class. The number of villages selected was proportional to the land area covered by each class, and the number of households selected in each village was proportional to the number of households in each village.

The measures of soil erosion used as dependent variables in the perception models were generated from two questions. Farmers were asked to rate the severity of soil erosion on each of their plots before any conservation was done[1]. Perceptions were solicited in four ordinal categories (0= no problem, 1= slight, 2= moderate, 3= severe). These four ordinal categories were then converted into binary categories by classifying farmers into those who perceive erosion as a problem (moderate or severe) and those who do not (no problem or slight). Ordered probit was used for the ordinal dependent variable (ERSEV) while ordinary probit was used with the binary dependent variable (ERSEV1). In order to investigate the determinants of farmer perceptions of the severity of soil erosion, the two models were estimated using the same explanatory variables:

1. *Village topographic and ecological characteristics*

Village in rainy highlands, village in hilly topography, dung used as fuel, distance traveled for fuel wood)

2. *Field physical characteristics*

Field age, sandy soil[2], silt soil, loam soil, degree of slope, convex slope[3], concave slope, mixed slope, distance from home, area of plot, location at upper slope[4], location at middle slope, location at lower slope

3. *Socio-institutional factors*

Owner operator, FFW available, prior public conservation campaign on fields, extension contact

4. *Demographic characteristics of household head*

Age, male gender, literacy.

Contrasting the results of the probit (ERSEV1) and ordered probit (ERSEV) models helped in testing the robustness of the results to model specification.

In order to understand how farmers perceive the productivity effect of soil erosion, farmers were asked to estimate the perceived proportion of yield reduction due to soil erosion (1=no reduction, 2= 20% reduction, 3=25% reduction, 4= 33% reduction, and 5=50% reduction) on each of their plots during a normal cropping year before any conservation had been done on the plot. These responses were represented both as continuous and ordinal values in separate models. The continuous values are the

[1] By the time the survey was conducted, some farmers already had conservation practices on their plots. This may have caused some bias in the reported perceptions.

[2] Soil dummies are contrasted against clay soil.

[3] Shape of plot slope dummies are contrasted against rectilinear shape.

[4] Location of plot dummies are contrasted against location at the flat (plain) part of a watershed.

perceived rates of yield reduction. Ordered probit was used for the ordinal variable (ERSPRD), and ordinary linear regression (OLS) was used for the continuous variable (ERSPRD1). The models of yield impact perception determinants used the same explanatory variables as the erosion severity models

Empirical Results and Discussion

Farmer Perceptions of the Severity of Soil Erosion

The two models of erosion perception determinants had modest explanatory power and gave similar results (Table 1). The Tigrayan farmer respondents generally perceived soil erosion as a serious problem. An average farmer had a 58 percent probability of perceiving soil erosion as a problem. Farmer perceptions of erosion severity were based chiefly on village and plot physical characteristics, although selected institutional and demographic factors were also important. For certain variables, the marginal effects calculated from the ordinary probit coefficient estimates at the mean of the data showed strong effects on the probability of perceiving erosion.

Among the village physical factors, three of the four significantly affected the likelihood of the farmer respondent perceiving soil erosion (Table 1). Living in a predominantly hilly village raised the likelihood of perceiving moderate to severe soil erosion by 17 percent, since hilly topography aggravates erosion. In villages with more degraded lands, as indicated by the use of dung for fuel, the perception of erosion was 15 percent more likely, as expected. On the other hand, farmers in the rainier highland zone were less likely to perceive erosion (by almost 19%). This finding was contradicted the expectation that higher rainfall intensity would increase erosion and thus raise the probability of perceiving erosion. However, this unexpected result could be due to the fact that the highland zone has deeper soils and the loss of soil is less apparent than in areas with shallow soils.

Six of the twelve plot-level physical factors significantly affected the probability that farmers perceived soil erosion (Table 1). Farmers were more likely to perceive erosion on steeply sloped plots (by 1.8 percent per degree of slope), as they were on plots with convex or concave slope shapes that aggravate erosion. These results are consistent with the findings of Ervin and Ervin (1982) in Missouri, USA, where farmer perception of the severity of soil erosion was higher where erosion potential was higher. In Tigray, the likelihood of erosion perception was not influenced by plot location factors, suggesting that plot locations may not be important once we control for degree and shape of slope. Farmers were more likely to perceive more erosion on plots with loam soils than on plots with clay soils.

Among socio-institutional factors, Tigrayan farmers were more likely to perceive erosion on plots they had cultivated longer, suggesting that more stable tenure adds to the likelihood of erosion perception (Table 1). Farmer perception of erosion was, however, not influenced by current ownership status of plot. These two results suggest that farmer perceptions develop over time. Larger plots raised the likelihood of operators perceiving erosion by almost 18 percent per hectare, perhaps because erosion features on cultivated land are more recognizable on larger plots. Plots that are more distant from the homestead were associated with nearly 20 percent lower probability of erosion perception, as such plots are observed infrequently and may also be cultivated less frequently.

Contact with the extension service for natural resource conservation was associated with lower probability of erosion perception. Although it contradicts expectations, this result raises intriguing questions about the message and approach of the extension services. To the extent that the extension services offered technical assistance for soil conservation, rather than on raising erosion awareness, farmers may have concluded that soil erosion was a manageable problem, thus reducing their likelihood of perceiving it to be severe. It may also be that the extension system did not focus on soil erosion as a problem, suggesting a need to evaluate its message if the objective is to raise farmer awareness of resource degradation problems. When the statistical models were re-estimated without including the extension service variable, the same variables were significant with the same signs as in the models that included the extension variable. Ervin and Ervin (1982) found that in Missouri, USA, technical assistance programs failed to have a significant effect on farmer perception of erosion severity.

Neither the availability of FFW projects nor campaign conservation work on private land was important in explaining erosion perception. This suggests that the demonstration effects of the FFW projects and the public conservation works had insignificant impact to affect farmer perceptions.

Among the household demographic characteristics, older household heads were less likely to perceive erosion. That younger farmers were more prone to perceive erosion may be due to greater education, a longer planning horizon, or simply the fact that older farmers might have grown accustomed to soil erosion, considering it a normal process.

Farmer Perceptions of the Yield Effect of Soil Erosion

The results from the two models of yield impact were similar and generally consistent with the results obtained from the analysis of the determinants of farmer perceptions of severity of soil erosion (Table 2). Factors associated with greater probability of farmer perception of the severity of soil erosion were also generally associated with higher perception of crop yield loss due to soil erosion.

Physical determinants of perceived yield loss were especially important. Farmers living in villages with more degraded land tended to perceive greater productivity loss due to soil erosion. Farmers also perceived greater yield loss on steeper plots and on plots with slope shapes that aggravate soil loss. These factors were associated with higher erosion perception. The perception of yield impact of erosion was not influenced by soil type or location of plot. More distant plots were associated with lower yield reduction, consistent with the result that such plots were also associated with less likelihood of perceived soil loss.

Once again, the effect of agricultural extension service contact was anomalous. Farmers who had contact with extension services perceived productivity losses associated with soil conservation. As with the erosion perception models, the yield regressions were re-estimated without the extension variable, and the same set of explanatory variables were significant with the same signs as in the models that included the extension variable.

Farmers who had benefited from public campaign conservation works on their private land perceived lower yield loss due to soil erosion, although such benefit did not influence farmer perception of the severity of soil erosion. This result suggests that although the demonstration effect was not important enough to affect the perception of erosion *per se*, the effect on reducing yield loss (presumably as a result of less soil loss) was noticeable to farmers. Finally, younger farmers tended to perceive higher yield loss, consistent with the parallel finding that younger farmers perceived higher erosion.

Conclusions and Implications

Farmers in northern Ethiopia clearly perceive soil erosion as a problem. Their likelihood of perceiving it as moderate to severe was chiefly determined by physical factors, although selected institutional and demographic factors also proved important. In general, farmers perceived more erosion and higher yield loss where the physical risk of erosion was higher. The yield loss that farmers perceived in connection with soil erosion was determined by largely the same factors that affected the probability of perceiving soil erosion to be severe.

Most of the physical factors that explained farmer perception of erosion severity also explained yield loss perceptions with the same direction of effect, suggesting that farmer perceptions of yield loss depend on their perceptions of soil loss.

The socio-institutional determinants of perceived erosion and crop yield loss point to policy implications for public conservation interventions. The fact that farmer perceptions of soil erosion are consistent with physical erosion risk factors implies that farmers understand the general problem and deserve to be involved in the design and implementation of public conservation activities. Stable and secure land tenure systems can facilitate farmer awareness of soil erosion since perceptions tend to form over time.

Educational programs to raise farmer awareness of soil erosion and conservation need to be an integral component of conservation extension services. Regardless of the unexpected signs on the extension service variables, their consistent significance points to their importance in affecting farmer perceptions. Norris and Batie (1987) found in Virginia, USA, that a one per cent increase in the proportion of farm operators who perceived erosion problems on their farms resulted in a 0.65 percent increase in conservation expenditures and a 0.34 percent increase in the probability of adopting conservation measures. Feather and Amacher (1994) also indicate that educational programs to raise farmer perceptions may be a reasonable alternative to financial assistance to encourage the adoption of conservation practices. A focus on technology transfer alone may not result on increased awareness of the erosion problem and enhanced adoption of conservation technologies.

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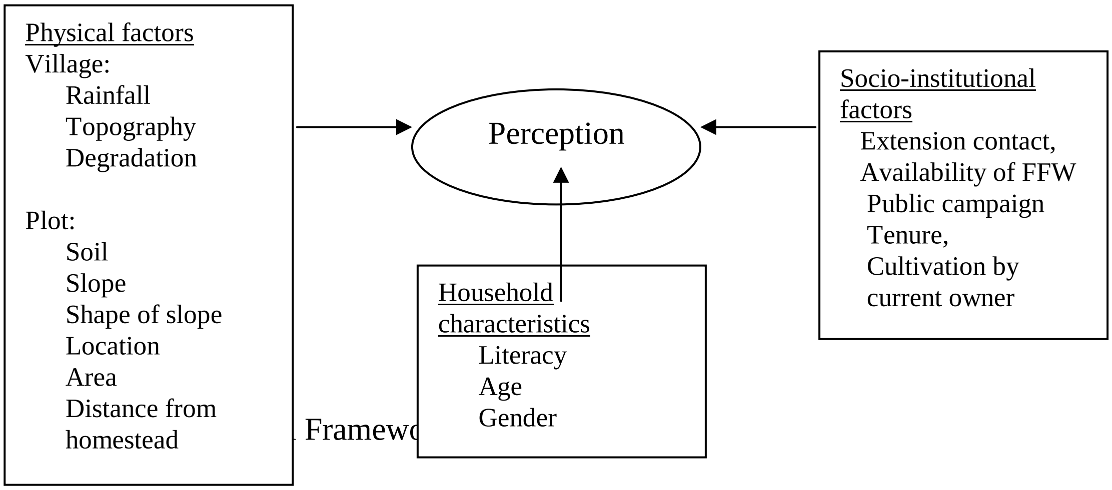
Physical factors
Village:
Rainfall
Topography
Degradation
Plot:
Soil
Slope
Shape of slope
Location
Area
Distance from homestead
Perception
Household characteristics
Literacy
Age
Gender
Socio-institutional factors
Extension contact,
Availability of FFW
Public campaign
Tenure,
Cultivation by current owner

Framewo

Table 1: Regression results for farmer perception of severity of soil erosion.

Variable	Erosion Severity (std.err) (ordered probit)	Erosion Severity (probit)	
		coefficient (robust std. err.)[a]	marginal effects[b]
1. Village physical factors			
Rainy highland (If village is above 2500 meters above sea level, (0,1))	-.702 (.204)***	-.472 (.253)*	-.186
Hilly village (If village is Predominantly hilly, (0,1))	.355 (.157)**	.438 (.193)**	.173
Dung as fuel (If dung is used primarily as fuel in village, (0,1))	.399 (.145)***	.386 (.172)**	.151
Distance to fetch fuel wood (round trip to village inhours)	-.005 (.023)	.009 (.028)	.003
2. Plot physical factors			
Sandy soil (If plot has sandy soil, (0,1)	.109 (.141)	.017 (.175)	.007
Silt soil (If plot has silt soil, (0,1))	-.162 (.348)	-.569 (.398)	-.224
Loam soil (If plot has loam soil, (0,1))	-.191 (.115)*	-.289 (.139)**	-.114
Degree of slope	.049 (.011)***	.045 (.014)***	.018
Convex slope (If shape of plot slope is convex, (0,1))	.467 (.229)**	.592 (.287)**	.209
Concave slope (If shape of plot slope is concave, (0,1))	.686 (.210)***	.601 (.245)**	.213
Mixed slope (If shape of plot slope is mixed)	.140 (.188)	.239 (.230)	.091
Distance from home (distance of plot from homestead (walking hours))	-.431 (.141)***	-.505 (.156)***	-.197
Area of plot (ha)	.389 (.160)**	.456 (.188)**	.178
Location at upper slope (If plot is located at upper slope of watershed, (0,1))	.017 (.188)	-.069 (.223)	-.027
Location at middle slope (If plot is located at middle slope of watershed, (0,1))	.005 (.171)	-.030 (.210)	-.012
Location at lower slope (If plot is located at lower slope of watershed, (0,1))	.144 (.128)	.230 (.157)	.089
3. Socio-institutional factors			
Age of plot (number of years since plot was cultivated by current owner)	.024 (.011)**	.019 (.013)	.007
Owner operator (if plot is owned by current operator, (0,1))	.039 (.145)	.138 (.170)	.054
FFW available (if food-for-work project is available in village, (0,1))	.042 (.112)	.052 (.132)	.020
Extension contact (if farmer had extension contact, (0,1))	-.452 (.107)***	-.520 (.130)***	-.198
Public conservation campaign (if farmer benefited (0,1))	.073 (.128)	.196 (.151)	.077
4. Demographic characteristics			
Age of household head (years)	-.016 (.004)***	-.018 (.005)***	-.007
Male head of household (0,1))	-.161 (.179)	-.248 (.210)	-.094
Literate head of household (0,1))	-.195 (.129)	.092 (.157)	-.036
Constant	-----	.213 (.454)	---

Chi-square	128.27	89.78	
Prob >chi-square	0.0000	0.0000	---
Pseudo R-square	0.084	0.135	---
Predicted prob. at x-bar	---	---	.583
N	565	565	

[a] Robust standard errors are White-corrected standard errors

[b] All marginal effects are computed at mean values of variables

***, **, * Significant at 1%, 5% and 10% respectively

Table 2: Regression results for farmer perceptions of yield reduction effect of soil erosion.

Variable	Impact of erosion on productivity (std. err) (Ordered probit)	Impact of erosion on productivity (robust std.err)[a] (OLS)
1. Village physical factors		
Rainy Highland (If village is above 2500 meters above sea level, (0,1))	-.049 (.204)	-.003 (.030)
Hilly village (If village is predominantly hilly, (0,1))	-.226 (.198)	-.034 (.027)
Dung as fuel (If dung is used primarily as fuel wood in village, (0,1))	.318 (.153)**	.031 (.022)
Distance to fetch fuel wood (round trip (in walking hours))	-.066 (.206)	-.009 (.013)
2. Plot physical factors		
Sandy soil (If plot has sandy soil, (0,1))	-.160 (.144)	-.024 (.020)
Silt soil (If plot has silt soil, (0,1))	.178 (.324)	.029 (.027)
Loam soil (If plot has loam soil, (0,1))	-.175 (.122)	-.022 (.017)
Degree of slope (Degree of plot slope)	.031 (.010)***	.004 (.001)**
Convex slope (If shape of plot slope is convex, (0,1))	.362 (.230)	.061 (.028)**
Concave slope (If shape of plot is concave, (0,1))	.416 (.197)**	.058 (.030)
Mixed slope (If shape of plot is mixed, (0,1))	.174 (.185)	.023 (.028)
Distance from home (distance of plot from home (walking hours))	-.349 (.144)**	-.052 (.017)***
Area of plot (ha)	.136 (.171)	.019 (.024)
Location at upper slope (If plot is located at upper slope of watershed, (0,1))	-.264 (.187)	-.027 (.026)
Location at lower slope (If plot is located at middle slope of plot, (0,1))	.027 (.176)	.008 (.026)
Location at lower slope (If plot is located at lower slope of watershed, (0,1))	.186 (.133)	.027 (.019)
3. Socio-institutional factors		
Age of plot (number of years since plot was cultivated by current owner)	-.006 (.011)	-.001 (.002)
Owner operator (If plot is owned by current operator))	.149 (.154)	.021 (.022)
FFW available (If food-for-work project is available in village, (0,1))	-.015 (.119)	-.005 (.016)
Extension contact (If household had extension contact, (0,1))	-.344 (.111)***	-.050 (.016)***
Public conservation campaign (if farmer benefited (0,1))	-.286 (.141)**	-.036 (.021)***
4. Demographic characteristics		
Age of household head (years)	-.011 (.004)***	-.002 (.001)***
Male head of household (0,1)	-.055 (.198)	-.017 (.027)
Literate head of household, (0,1)	-.089 (.131)	-.010 (.018)
Cconstant	-----	.393 (.060)
Chi-square / F	72.44	4.52
Prob >chi-square / F	0.0000	0.0000
Pseudo R-square / R-square	0.0479	0.1487
N	487	487

[a] Robust standard errors are White-corrected standard errors.
*,**, *** Significant at 10%, 5% and 1%, respectively.