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Determinants for Farmers' Perception of Soil Erosion: The Case of Elfeta District, West Shoa Zone, Oromia Regional State, Ethiopia

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Abstract
Soil erosion is one of the major causes of land degradation and often results in reduction of agricultural production and productivity in Ethiopia. Although it is a natural process, its rate has increased significantly due to anthropogenic activities. Thisresearch was conducted in Elfeta district, central Ethiopia with the purpose of assessing farmers` perception of soil erosion. A mixed research design (a combination of quantitative and qualitative methods of data collection and analysis) was employed and both primary and secondary data were collected. Data were collected through interview schedule assisted survey questionnaire, focus group discussion, personal observation, and life history methods. Descriptive, inferential, and econometric were employed for quantitative analysis while description, narration and content analysis were employed for qualitative analysis. The findings of the study reveal that the major causes of soil erosion identified by farmers were: deforestation, ceaseless cultivation and absence of fallowing and population growth. Farmers` perception of soil erosion wasfound to have statistically significant association with sex, education, land holding size, tenure security, farming experience, access to training, access to information, past awareness, on soil conservation and extension contact. The ordered logit analysis employed with statistically significant variables to analyze determinants for farmers' perception in the study area showed that farmers land holding size, tenure security, years of schooling, and farmers experience were significant factors determining farmers` perception of soil erosion in the study area.Ensuring community involvement in planning, designing and implementation process of conservation activities deserves special attention in the study area to improve the understanding of farmers about the dynamics of soil erosion in their area which is of paramount importance for sustainable soil and water conservation in the study area.
Keywords: Farmers perception, Soil Erosion, Elfeta District

INTRODUCTION

Soil is the living outer layer of our planet, a basic natural and non-renewable resource which serves as a medium for plant growth and a habitat where animals and other micro-organisms live (NAAS, 2012). Soil erosion is the process by which soil are detached from their original sites, transported, and then eventually deposited at some new areas (Yusuf & Ray, 2011). Farmers` perception of soil erosion refers to individual farmer's evaluation or awareness of soil erosion which is caused by socio-economic, demographic as well as others like topographic factors (Alemayehu, 2007).

In most developing countries, agriculture remains one of the largest sectors in the economy both in terms of its contribution to the GDP and generating employment (Wolka, 2014). Thus, exercising environmental rehabilitation, such as reducing soil erosion, for survival and development by implementing appropriate approaches and technology would have paramount importance. Scholars in the field contend that effect of soil erosion vary by management and location, soil erosion deteriorates the chemical property of soil by loss of organic matter and loss of materials containing plant nutrient (Pender, 2004; Wolka, 2014). Intolerable soil erosion and its impact occur when the practiced farming system fails to make into account the ease with which soil can be washed away (Wolka, 2014). Due to inappropriate farming system and less attention given to conservation, soil erosion has been one of the major problems of Africa (Shiferaw& Holden, 1999; Pimentel *et al*., 2006;Wolka, 2014).

Soil erosion creates severe limitations to sustainable agricultural land use, as it reduces on-farm soil productivity and causes food insecurity (Tadesse, 2001; Sonneveld, 2002; Beshah, 2003; Moges& Holden, 2006; Bewket, 2010). In most developing countries, including Ethiopia, human activity triggers these losses (Mohammad *et al*., 2001; Belyaev*et al*., 2004; Bewket&Sterk, 2005). This is associated with rapid population growth, inadequate attention to the basic natural resources (soils, water and vegetation), and the need to maximize production to meet the needs of the growing population (Shiferaw& Holden, 1999, 2000; Bewket, 2002; Feoli*et al*., 2013). This situation is more serious in poor developing countries like Ethiopia (Feoli*et al*., 2013), where subsistence production predominates. The Ethiopian farmer, who on average cultivates one hectare

of food crops and keeps some livestock, is now a day's dependent on natural conditions and cannot tolerate further deterioration of soil productivity (Sonneveld&Keyzer, 2003). Increasing population, intense land cultivation, uncontrolled grazing, and deforestation often lead to, or exacerbate, soil erosion (Tadesse, 2001; Bewket, 2002). These factors undermine agricultural productivity and frustrate economic development efforts, especially in developing countries where there is heavy land dependence (Shiferaw& Holden, 2000; Feoli*et al*., 2013) in low external-input farming systems (e.g., the Ethiopian highlands).

Although soil degradation is often acknowledged as an insidious and slow process (Ervin & Ervin, 1982; Odendo*et al*, 2010), farmers need to perceive severity of the problem and associated yield losses before they can consider investing in soil fertility enhancing technologies. In particular, if farmers underestimate soil fertility status, they may fail to replenish soil nutrients because they erroneously view such investments as unnecessary, unprofitable or both (Odendo*et al*, 2010). Many development projects and policies have collapsed because of failure to understand local knowledge and its influence on the way farmers manage natural resources (Yeraswork, 2011). Thus, sustainability of agricultural production depends largely on actions of farmers and their ability to make decisions given the level of knowledge and information available to them, which is based on their perceptions (Rahman, 2003; Yeraswork, 2011).

The Elfeta district of West Shoa zone has been exploited and degraded continuously (Elfeta District Agricultural Office Report, 2013). As a result, majority of rural inhabitants are suffering from food insecurity. This is mainly because of the soil is incapable to support cultivation caused by soil erosion and its related problems. In the other case, population in the rural areas of Elfeta district is increasing from time to time and as a result more food is required to feed this population. Consequently, the land size used by the families in the study area is reducing from time to time while the food need is ever increasing. These situations force the family to use the land intensively throughout the year which resulted in soil erosion. In the study area soils are conventionally ploughed repeatedly, crop residue is removed completely at harvest leaving no soil cover and aftermath overgrazing of crop fields is common, which results in aggravated land degradation in general and soil erosion in particular. Thus, severe erosion continues to affect the farmers' livelihoods. The rich top-soils have been washed off by runoff and the remaining sub-soils are exposed and generally deficient in available minerals.

Farmers` identification of soil erosion and their management practices cannot be understood without studying how people perceive soil erosion. Perceiving soil erosion as a problem by farmers is an important determinant of conservation practice. Moreover, the farmers' perception towards the soil erosion and implementation of measures can be influenced by different factors. Yet, these factors have not been closely examined in the area and often poorly understood. This study, therefore, attempted to investigate determinants of farmers' perception on soil erosion in two Rural Villages of Elfeta District, West Shoa Zone, Oromia, Ethiopia. The specific objectives of the study were to assess causes and consequences of soil erosion in the study area and to analyze determinants for farmers` perception of soil erosion in the study area.

The key research questions of the study were: what are the major causes of soil erosion in the area? ; What are the major consequences of soil erosion in the area? & what are Socioeconomic, demographic, institutional and physical factors determining farmers` perception of soil erosion in the study area?

The results of this study have contributions in identifying farmers` perception of soil erosion. Secondly, it could be used as a stepping stone to examine farmers' perception on soil erosion in other study areas with modification to immediate issue. Thirdly, it would be an input for planners and development practitioners who are primarily working on land degradation in general and soil erosion in particular. Moreover, it is helpful to be as a reference for other studies in the area with similar or other themes of study. Finally conclusions and recommendations given would help in designing and implementing soil erosion management practice in the study area.

RESEARCH METHODOLOGY

This section deals with description of the study area, sampling methods and procedures, methods of data collection, and methods of data analysis.

Description of the Study Area

Elfeta District is one of the 18 districts of West shoa Zone. It is located 120Km West of Addis Ababa; capital of the country and 68Km from Ambo to the North. The district is bounded by Ambo District in the West, Jeldu in the East, Dandi and Ambo in South and Jeldu in the Northern direction(Figure 1).

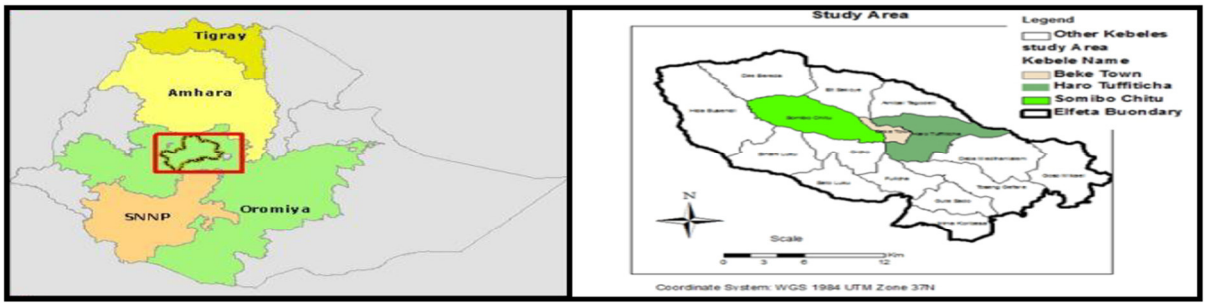

Figure 1: Map of the study Area

Agro-ecologically District is divided into Dega 45%, Woinadega 40% and Kolla 15% agro ecologies. The district has the population of 75,902 out of which 37,649 are male and 38,253 are female (CSA, 2008). The economic activity of the district is mostly agriculture plus very small percent of trade and others. The District has 17 PAs out of which 15 PAs are Rural and the remaining 2 are Urban (Elfeta District Agricultural development office, 2013).

Elfeta District has total land area of 39,342 hectares out of which 66% hectares used for farming, 19.57% are used for grazing, 9.3 %hectares are covered by forest, 2.5% are covered by river and water bodies and 2.78 % hectares are unusable land. The farming system farming, 19.57% are used for grazing, 9.3%hectares are covered by forest, 2.5% are covered by river and water bodies and 2.78 % hectares are unusable land. The farming system covered by river and water bodies and 2.78 % hectares are unusable land. The farming system farming, 19.57% are used for grazing, 9.3 %hectares are covered by forest, 2.5% are covered by river and water bodies and 2.78 % hectares are unusable land.The farming system is mixed type of livestock rearing and crop production (Elfeta District Agricultural development office, 2013).

Sampling Methods and Procedures

Multistage sampling procedure was implemented to select sample representatives. In the first stage district were purposively selected based on an ever increasing of population and its threatening effect on high soil erosion and deforestation in the area as well as the population environment situation may not be the same throughout the country even within the same region. So, wide ranges of study about population environment nexus at micro level were essential to achieve a certain conclusion. In the second stage sample PA were selected purposively based on their degrees of degradability (rough estimation of land degradation made by district agricultural office). Accordingly, the most environmentally vulnerable and degraded farmers' PAs of the study District (HaroTufticha and SomboChitu) were selected purposively. Finally, 144 sample respondents were selected by using random sampling technique and 144 respondents were identified using Yemane formula.

Methods of Data Analysis and Model Specification

To address the objectives of the study data were coded and analyzed through descriptive statistics (frequencies and percentages) with help of Statistical Package for Social Sciences (SPSS version 20). Moreover, chi-square test was used to identify association between farmers` perception of soil erosion and explanatory variable. Data collected through Focus group discussion (FGD) and personal observation were analyzed through narration, description, and content analysis. Moreover, Econometric Statistics (Ordered logit) were used to analyze major determinants for farmers` perception of soil erosion in the area.

In the econometrics literature, logit and probit models may be used to analyze factors that influence farmers' perceptions of soil erosion (Verbeek, 2003). These models use a binary choice variable as the dependent variable. The use of a binary choice variable as the dependent variable may not capture the levels of perceptions of soil erosion. As Baidu, (1999) point out; there is possible loss of information if a binary variable is used as the dependent variable. This is because knowledge of whether a farmer perceives or does not perceive soil erosion may not provide sufficient information about the farmer's behavior as farmers have various extent of perception on soil erosion.

The use of ordered dependent variable is very informative because severity of the problem such as soil erosion is likely to determine actions taken to alleviate it. Following Verbeek, (2003), the general ordered logit model can be specified as;

$$Y_i^* = \beta' Xi + \in_i \text{..... Equation 1}$$

Where;

- Y_i is the underlying unobserved (latent) variable that indexes the level of perception of soil erosion,
- **Xi** is a vector of explanatory variables describing farm, household and institutional characteristics, β' are parameters to be estimated and

- $\in_i$ is the error term, assumed to follow standard normal distribution. The latent variable exhibits an ordinal scale, which will be observed and coded as discrete extent of perception of soil erosion (1=low, 2=moderate, 3=high), where 1<2<3.

Based on economic theory and previous empirical research on soil conservation (e.g. Shiferaw& Holden, 1999; Mbaga-Semgalawe&Folmer, 2000; Rahman, 2003), the explanatory variables included in the ordered logit model were household-specific variables (level of education and sex of the household head), household assets (farm size, household size, livestock ownership), variables that condition the diffusion of information (technology awareness, access to extension services, participation in land management programs).

ANALYSIS OF RESULT

Demographic and socio-economic characteristics of Respondents

Surveyed result shows that overall mean age of sampled respondent was 36.82, having standard deviation of 9.271. Maximum and minimum age was 58 and 18 respectively. 76.4% of sampled respondents were from male headed households while 23.6% of them werefrom female headed households. Overall mean family size of sampled respondent was found to be 6.2 people, which are higher than national average of 4.2 people (CSA, 2008) with the standard deviation of 2.26. The minimum and maximum family size of surveyed sample was 1 and 11 respectively. Mean years of schooling for sampled respondents was 3.47 having the standard deviation of 3.36. Overall average land holding size was 2.03 hectare, having standard deviation of 1.2. Minimum and maximum land holding size was 0.25 hectare and 5.5 hectare respectively. Mean land holding sizes of both rural villages werenearly comparable (2.09 and 1.98 respectively).

Causes of Soil Erosion in the Study Area

27.8% of the respondents in the study area reported deforestation as the major cause of soil erosion. This was followed by 18.1%, 13.9% and 12.5% of sample respondents who reported ceaseless cultivation, slope steepness and intensity of rain fall respectively as the major cause of soil erosion in the study area. Moreover, 11.1% and10.4% of the farmers considered population growth and the overgrazing respectively as the major cause of soil erosion on their land (table 1).

Table 1: Causes of Soil Erosion identified in the Study Area

SN	Causes of Soil Erosion identified	SomboChitu (%)	HaroTufticha (%)	Total (%)
1	Slope steepness of the cultivated land	20.6	8.6	13.9
2	Ceaseless cultivation and absence of fallowing	16	19.8	18.1
3	Population growth	14.2	8.6	11.1
4	Intensity of rainfall	6.3	17.3	12.5
5	Overgrazing	4.8	14.8	10.4
6	Deforestation	30.2	25.6	27.8
7	Flooding	7.9	4.9	6.2
	Total	**100**	**100**	**100**
	χ^2 = 12.547* **P=0.041;** Significant at<5% level			

Source: Field Survey, 2015

Consequences of Soil Erosion in the Study Area

Surveyed farmers identified nine consequences of soil erosion in the study area. Accordingly, 29.2% opted for reduction of yield overtime as the major consequence of soil erosion in the study area. Moreover,15.3% and 12.5% of respondents identified high input requirements and loss of top soil respectively as the other consequences soil erosion in the study area. Other consequences like poverty, food insecurity, lack of farm land and grazing field, reproduction of gullies, desertification and out migration, and loss of vegetation cover and grasses received 9.7%, 8.3%, 7.6%, 7%, 6.2% and 4.2% respectively (**see table 2**).

Table 2: Consequences of Soil Erosion in the Study Area

SN	Consequences of Soil Erosion	SomboChitu (%)	HaroTufticha (%)	Total (%)
1	Poverty	9.5	10	9.7
2	Food Insecurity	9.5	7.4	8.3
3	Loss of topsoil	16.1	9.9	12.5
4	Reduction in yield over time	19	37	29.2
5	Reproduction of gullies	9.5	4.9	7
6	Loss of vegetation cover and grasses	6.3	2.5	4.2
7	Require high input and management	14.3	16	15.3
8	Lack of farm land and grazing field	7.9	7.4	7.6
9	Desertification and out migration.	7.9	4.9	6.2
	Total	**100**	**100**	**100**
		χ^2 = 8.095	**P=0.424**	

Source: Field Survey, 2015

Determinants for Farmers' Perception of Soil Erosion in the Study Area

This section presents farmers perception of soil erosion in the study area and analysis of determinants for farmers` perception of soil erosion in the study area. Both descriptive and inferential statistics discusses demographic, socio-economic, institutional and topographic factors significantly associated with farmers` perception of soil erosion in the study area.

Farmers` perception of soil erosion were measured using summated scale presented to farmers as they rate the level to which they agree or disagree with statements presented to them. Accordingly, surveyed result shows that 59.7% of sampled respondents have moderate level of perception. Moreover, the remaining 39.6% and 0.7% of sampled respondents' perception of soil erosion were high and low respectively (seeFigure2).

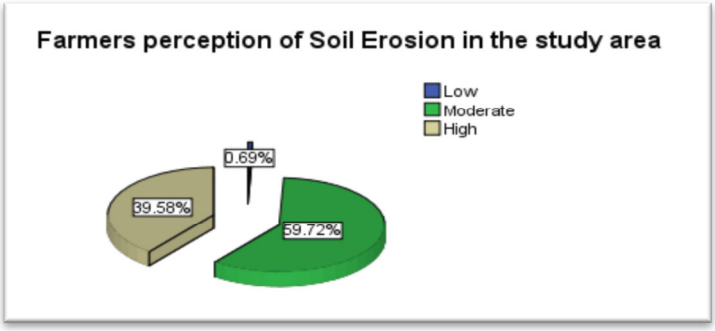

Figure 2: Farmers` perception of soil erosion in the study area

[Source: Field Survey, 2015**]**

Number of explanatory variables proposed for determining farmers` perception of soil erosion is identified and discussed hereunder.

Descriptive Analysis

This section employed two step procedures to analyze major determinants of farmers` perception of soil erosion in the area.In the first stage determinants (Independent variable) having significant association with dependent variable were filtered for the next stage which is econometric analysis (ordered logit).Accordingly; Sex, access to information, Training, Farming experience, Past awareness on soil conservation, Land size, Years of schooling, extension contact and tenure security were found to have statistically significant association with dependent variable.Family size, Off farm income, field slope and livestock ownership showed no significant association with farmers` perception of soil erosion in the study area.

Econometric Analysis

The test for multi collinearity showed that the highest VIF was 1.577. The rule of thumb is that if VIF is more than 10, then multi collinearity exists (Oddendo*et al*, 2010). Therefore, multi collinearity was not found to be a problem to this analysis. Results of an ordinal logit estimation of the model appear in Table 3 below.

Table 3: Ordered Logit Estimate of Determinants for Farmers` Perception of Soil Erosion in the Study Area

Variables	Estimate (β)	Std. Error	Wald	Sig.	Odds Ratio (Expected β)
[Perception = 1]	2.695	2.57	1.098	0.295	
[Perception = 2]	15.181	3.83	15.71	0.000	
LANDS	**-1.155**	**0.34**	**11.62**	**0.001*****	**0.32**
FAREX	**4.538**	**0.93**	**23.92**	**0.000*****	**93.5**
EDUYEARS	**0.246**	**0.12**	**4.536**	**0.033****	**1.28**
GENDH	0.663	0.78	0.716	0.397	1.94
AWARE	-0.344	1.76	0.038	0.844	0.71
TRAIN	2.428	2.07	1.371	0.242	11.34
INFOR	-0.327	1.03	0.101	0.751	0.72
EXTCONTACT	0.221	1.04	0.046	0.831	1.25
TENUR	**1.795**	**0.79**	**5.163**	**0.023****	**6.02**
SLOPE	0.991	0.770	1.655	0.198	2.694
TLU	0.172	0.103	2.782	0.362	1.188
FSIZE	0.062	0.135	0.210	0.646	1.064
OFINC	-0.382	0.592	0.415	0.519	0.682
Chi-square value χ^2 (9) 139.222				**P = 0.000**	
-2Log likelihood			**62.257**	**N = 144**	
NagelkerkeR^2			**0.818**		

**Significant at <5%
***Significant at <1%
Source: Researchers Computation, 2015

The likelihood ratio, goodness of fit test shows a good fit for the model. The χ^2 statistics testing that the coefficients of the model excluding the constant term, are highly significant (at P<0.001) supporting the specification. The signs of most of the estimated parameters conform to the expectations.

The results are reported using odd ratios. Each odds ratio shows the effects of marginal change in the corresponding dependent variable specifically, on the level of farmers` perception of soil erosion in the study area. An odds ratios greater than one indicate positive relationship between the independent variable and the dependent variable; higher farmers perception of soil erosion is associated with increase in the values of independent variable and negative odds ratio suggest the converse.Accordingly, the estimate of parameters of the independent variables expected to influence farmers` perception of soil erosion are displayed in **table 3**. Out of thirteen explanatory variables, only four of them were found to be significantly influencing farmers` perception of soil erosion in the study area.

DISCUSSION

Causes of Soil Erosion

The finding of the study indicates that causes of soil erosion between the study rural villages were somewhat different. For instance, farmers in Sombochitu identified slope steepness of cultivated field and population pressure among major causes of soil erosion. On the other hand, respondents from HaroTuftichaopted for ceaseless cultivation and intensity of rain fall as major causes of soil erosion on their field. Despite the aforementioned difference in their option for major causes of soil erosion in their villages, respondents from both rural villages commonly claimed that deforestation has immensely contributed for prevalence of soil erosion on their field. A chi-square test also shows statistically significant difference in perception between these two rural villages (χ^2 **= 12.547, P < 0.05**). The finding of focus group discussion in the study area also complements the aforementioned analysis as the study area was reported to be more susceptible and relatively populated. This finding comply with the assertion of Aklilu& de Graff (2006) who assert that vast areas of the highlands of Ethiopia may be classified as areawhich suffer from severe to moderate soil degradation which is mainly attributed to pupation pressure and topographic factors like field slope.

Consequences of soil erosion

Respondents from both rural villages identified almost similar consequences of soil erosion on their field. Accordingly, reduction of yield over time, loss of top soil and high input requirement among the other were identified. Chi square test also shows no statistically significant difference between the farmers' perception on consequences of soil erosion in the two rural villages (χ^2 **= 8.095; P > 0.05**). This implies that soil erosion had

similar negative effect in the two rural villages.

Those farmers who choose the severity level as highly understood related the existence of soil erosion on their plots to development of gully and rill erosions in their farms and the detachmentof topsoil. On the other hand sheeterosion was claimed as the major causefor the existence of moderate to severe soil erosion problem on their cultivated fields.In a nutshell, soil erosion was claimed as a threat to their economy by the farmers in the study area as agriculture is the major livelihood in the study area.

A land that is poorly fertile couldn't give yield as expected and gradually turns to bare land and lacks any form of vegetation cover. As noted during personal observation, many hectares of arable land in the area have been left uncultivated and became un-crossable gullies. The slope of these degraded lands ranges from 25% to 33% creating difficulty for construction of soilconservation structures. Historically, these degraded areas were covered by natural forests before few decades. However, due to increasing need for cultivable land, deforestation had taken place. Moreover, after using land for only 4 or 5 years without appropriate conservation methods, farmers left uncultivatedbecause the land became infertile and inconvenient even for grazing (see figure 3).

Figure 3: Gullies in HaroTufticha [*UlaHuri Area*]

[Source: Researchers observation, 2014]

Findings of focus group discussion also support the above assertion as these consequences of soil erosion are drivers of each other and they have multiplier effects. For example, if yields are reduced, it`s quite clear that there would be reduction of food to eat and hence poverty and food insecurity prevails. As these things occurred, farmer starts to lose asset and capacity to purchase input. This may easily lead to outmigration and other socioeconomic problems. This finding complies with Shimeles, (2012) who contends that consequences of soil erosion are complex leading to reduction in soil depth and moisture storage capacity together with soil nutrient losses, and ultimately resulting in reduced agricultural production and productivity.

Determinants for Farmers` Perception of Soil Erosion

Here, the model outputs are discussed by relating the dependent variable (farmers' level of perception on soil erosion) and the independent variables with significant influence.

1. **Farming experience (FAREX)**:This variable was hypothesized to have positive effect on farmers` level of perception on soil erosion in the study area. It was significant at P value< 0.001 and has positive association with farmers` perception of soil erosion.The positive effect of this variable shows the importance of farming experience in influencing farmers` perception of soil erosion as a big challenge on their livelihood. All other variables remain constant,the odds ratio suggests that one unit increase in farming experience would increase farmers` perception of soil erosion by the factor of 93.5. As farmers experience gets higher, they may simply understand the influence of soil erosion on their farm land and livelihood. In relation to this finding, Odendo*et al.*(2010) attest that accumulated knowledge and experience obtained from the years of observation of the farming system and the farmers' interaction with the soil have immense contribution for enabling them have proper understanding on the nature and conditions of their soil.
2. **Tenure Security (TENUR):** This is another variable which is hypothesized to be positively associated with the farmers' level of perception on soil erosion. There was positive association between tenure security and the dependent variable. Moreover, the influence of tenure security on the farmers' level of perception on soil erosion was found to be statistically significantat P value <5% level of significance. All other variables remain constant; the odds ratio in favor of secured tenure increase farmers` perception of soil erosion by the factor of 6.02 as compared to reference category (unsecured tenure). This finding comply with the assertion of Lakew*et al.*(2005) who assert that farmers` awareness of soil erosion increase when tenure security is ensured.
3. **Farmers Year of Schooling (EDUYEARS):** This variable was hypothesized to be positively associated with farmers' level of perception on soil erosion. As expected, it was found to be positively associated with

farmers` level of perception of soil erosion and significantly determined farmers` level of perception on soil erosion at <5% significance level. All other variables remain constant; the odds ratio suggests that one unit increase in years of schooling would increase farmers` perception of soil erosion by the factor of 1.28.This finding agree with Paulos*et al.*, (2004), who clearly shows as farmers year of schooling increases the level of awareness and hence farmers can easily identify soil erosion on their fields for further management practices.

4. **Land Holding Size (**LANDS**):** As expected, the Betta coefficient for Land holding size was negative and significant at $p < 0.01$, indicating that a decrease in land holding size increases farmers' level of perception on soil depletion. This makes sense because small farms in the study area are frequently cultivated without adequate nutrient replenishment. All other variables remain constant; the odds ratio suggests one unit increase in land holding size would cause a decrement in farmers` level of perception on soil erosion by the factor of 0.32. This finding agrees with the results reported by Odendo*et al.*, (2010) on households' perceptions of soil erosion in rural Ethiopia, indicating indirect relationship between farmers` level of perception on soil erosion and their respective land holding size.

CONCLUSIONS AND RECOMMENDATIONS

In this study, determinants for farmers` perception of soil erosion were analyzed.In the study area, about 0.7% of sampled respondents perceived soil erosion at low level, 59.7% perceived at moderate level and the remaining 39.6% perceived at high level. Demographic, socio-economic, topographic and institutional factors were found to be responsible for varying level of farmers` perception of soil erosion in the study area.

The major causes of soil erosion identified by respondents in the study area include: deforestation, ceaseless cultivation and absence of fallowing, intensity of rain fall and population pressure. The majorconsequences of soil erosion identified in the study area include: reduction of yield over time, requirement for high agricultural inputs and management, and loss of fertile top soil.

Ordered logit model output indicates that farmers` land holding size, tenure security, farmer's year of schooling and farming experience significantly determine farmers` level of perception on soil erosion in the study area. It is worth recommending the following strategic measures for better future of soil and water conservation in the study area:

- Special attention should be given for individual farmers' soil conservation practices; especially farmers with large farm land size should be targeted as they were found to be with low perception on soil erosion on their fields;
- Farmers' individual experiences and their indigenous knowledge in conserving their soil should be scaled up and taken into consideration in planning, implementation as well as monitoring and evaluation stages of soil conservation activities as farming experience were found to determine farmers' perception of soil erosion in the area;
- Integrated adult education, specifically, soil erosion and soil conservation based education should get priority attention in the area as education was found to significantly determine farmers` level of perception on soil erosion in the area;
- Tenure security should be further ensured through appropriate policies and strategies as tenure security was confirmed to be one of the significant factors determining farmers` level of perception on soil erosion in the area; and
- Since preventing soil erosion is safer and cheaper than controlling it, land use planning and management practices should be promoted primarily for careful planning, management, and utilization of the existing fragile and marginal areas in the study area.

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DECLARATION OF CONFLICT OF INTEREST

The authors fully declare that they have no conflict of interest in publishing the manuscript.

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