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Labor as a Payment Vehicle for Valuing Soil and Water Conservation Practice: An Application of Contingent Valuation Method in Abaro- Toga Watershed, Southern Ethiopia

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Abstract
This paper examines the determinants of farmers' willingness to pay (WTP) for soil and water conservation (SWC) practices applied Contingent Valuation Method in terms of labor contribution in Abaro-Toga Watershed. The paper is based on analysis of data collected from 150 randomly selected households through face to face interview. Descriptive statistics and econometrics logit models were applied. Results of the study showed that most respondents were WTP for SWC practices because of severity of soil erosion problem. Response to the hypothetical scenario revealed that sampled households expressed their mean WTP to be 36.01 labor days per year with an aggregate benefit of 1334247 labor days per year which is equivalent to 23349329.8 Birr. While, from the open ended elicitation methods total WTP was computed at mean of 32.21 labor days per year with an aggregate benefit of 1193449.3 labor days per year which is equivalent to 20885362.76 birr (1 US$=20.8 birr). This indicated that the total WTP from double bound elicitation format is greater than the WTP from open ended question. Hence, policy makers should target double bounded elicitation method than open ended elicitation method to eliciting the WTP for SWC practice. The results of logistic regression analysis also show that farmers' decisions to participate in SWC practices are influenced by a host of factors (Age, HH size, education, income, sex, slop of land, number of livestock holding, perception, labor shortage, and bid value). The implication is that taking these factors into account while planning SWC measures enables policy makers to come up with projects that win acceptance by the local people.
Keywords: Determinants ,Soil and water conservation, Logit, Contingent valuation, willingness to pay

1. Background

The economic development of Ethiopia is highly dependent on the performance of its agricultural sector. Agriculture contributes 53% of the country's Gross Domestic Product (GDP), 85% of all exports (coffee, livestock and livestock product and oil seeds) and provides employment for 85% of the population (FAO, 2007). Agriculture provides raw material for 70% of industries in the country (MOFED, 2006). In spite of its remarkable potential, the performance of Ethiopian agriculture has been sluggish in the last decades. However the population grows at an average rate of 2.52% per annum (World Bank, 2004; FAO 2007). That means, food production lagged far behind population growth leading to food shortage and thereby resulted in national poverty of 44.2% of the population (FAO, 2007). The dominant economic activity is undertaken by smallholder farm household which are subsistent oriented. Low agricultural productivity due to land degradation mainly accelerated soil erosion is a critical problem throughout Africa (FAO, 2002).

Several studies in Ethiopia have revealed that soil erosion has become an alarming problem (Wagayehu and Drake (2003); Admasu (2005); Bewket and Teferi (2009); Haile and Fetene (2012); Wolka et al, 2015) and it is the major factor affecting the sustainability of agricultural production. The loss of soil and essential nutrients due to unsustainable agricultural practices is costing $139 million or 3-4% of its agricultural GDP (Berry, 2009). Similarly, Hurni (1993) estimated, soil loss due to water erosion is about 1493 million Mg per annum. On croplands, average soil loss rates reach 42 t/ha/year or 4 mm of soil depth per annum in the country as a whole. In individual fields however, the rate may reach up to 300 t/ha/year, which is by all measures exceeds the rate of soil formation.

Although estimates of the extent and rate of soil erosion lack consistency, the results of various studies highlight the severity of the problem (Amsalu & De Graaff, 2007). However, policy makers largely neglected land conservation until 1970s (Shiferaw & Holden, 1999), and the problem attracted policy attention only after the devastating famine problem in 1973/1974 (Shiferaw & Holden, 1998). Since then, several SWC and land reclamation projects were initiated with the support of donor agencies and efforts have been put in place in order to rehabilitate degraded areas. For these purpose various SWC measures were introduced (Dejene, 2003; Amsalu, 2006). The SWC works include planting trees on hillsides and catchments areas, water harvesting in drier areas, stream development, construction of earth dams, pond, gully plugging, traces, diversion of drains, and check dam (Asrat et al., 2004).

According to Wegayehu (2003), among the various forms of land degradation, soil erosion is the most

important and an ominous threat to the food security and development prospects of Ethiopia and many other developing countries. In the study area Abaro Toga watershed is faced by intensive soil erosion problem because, it shares a common catchment with Abro Mountain that runs a long distance. Due to such distant setting flow of water it exhibits high runoff velocity that results in damaging fertile top soil resources. As perceived by local people year to year the productivity of crop production is decline. Hence, to grapple with the problem of soil erosion massive reforestation and soil and water conservation practices were launched since the 1970 and 1980s by mobilizing farmers in the country as well as in the study area (Bewket, 2007; kebede, 2014).

However, reports indicate that these conservation structures have not been as successful as they could be, because the farmers were not enthusiastic enough in accepting widely and maintaining the soil and water conservation practices (Fisum, et al, 2002; Betru, 2002; Yeraswork, 2000). Belay (1992) the failure of conservation practices partly emerge from the fact that planners and implementing agencies ignore or fail to consider socio-cultural factors as key determinants of the success or failure of conservation programs. According to Amarasekara *et al*. (2009), and Ulimwengu and Sanyal (2011), willingness to invest in soil and water conservation measures increases with farm income, level of awareness and ownership security of land. Thus, this study assess determinants of farmers' willingness to pay (participate) in soil and water conservation practices so as to solve existing problem in the area using CVM. This study, therefore, attempts to explore the following research objectives:

- To identify factors that determine farmers' willingness to participate in soil and water conservation practice;
- To measure the relative importance of the hypothesized explanatory variables in the farmers' willingness to pay (participate) in soil and water conservation practices;
- To provide information on the farmers willingness to participate in soil and water conservation in practice;

2. Materials and Methods

Abaro Toga watershed is located at Shashemene district, West Arsi Zone, Oromia Regional State, Ethiopia. This watershed is situated at 259 km from capital city of Ethiopia to the south direction of Shashemene town. The watershed is bordered by Kofele district from the east, by Wondo district from the south direction, by Shashemene town from the north and by Bulchana Danaba peasant association from the west direction. According to woreda agricultural office the total land area of the watershed is 7,126 km^2. The watershed comprise of six peasant association kebele such as Abaro, Ebicha, Idola Burka, Alache Harabate, Waransa and Toga.

Sample Size and Data Collection Methods

A two-stage simple technique was used when selecting respondents. In the first stage, four kebeles were randomly selected out of the 6 kebeles found in the watershed. These numbers of kebeles were considered to be sufficiently large for drawing valid statistical inferences and were also manageable to be surveyed with the available resources of finance and time. In the second stage, total of 156 households were selected using random sampling techniques. Both secondary and primary data were used for this study. The primary data were collected from sample respondents through a structured questionnaire via face to face interview with the heads or working members of householdes. CVM method in the form of double-bounded dichotomous choice elicitation method with open ended follow up question was also employed to elicit households' WTP for soil and water conservation practice in terms of labor contribution/porsons per day/. The double-bounded dichotomous choice format (yes-no, no-yes responses) makes clear bounds on unobservable true WTP. Besides, the yes-yes, no-no response sharpens the true WTP (Haab and McConnell 2002). Finally, the double-bounded dichotomous choice format help to elicited more information about respondent's WTP than single bounded format (Hanemann *et al.* 1991; Arrow *et al*. 1993).

Preliminary Survey and Bids

Before the final survey was conducted a pre-test was done using 45 randomly selected households. Then based on the pilot results three starting point price were introduced in terms of labor days was 31, 35 and 48 labor days per year for five years. Therefore, the total sampled households were divided randomly into three equal groups (about 52 households). The field survey was successfully completed with relatively small number of protest zeros (about 3.2%). These protesters provided wrong value and after checked for sample selection bias they excluded from the data set. The criteria for selecting protest zero was based on the report of the NOAA Panel on contingent valuation by Arrow *et al*. (1993). Arrow *et al*. (1993) suggested that a respondent actually willing to pay the stated amount might answer in the negative, if the respondent believes the proposed scenarios distributed the burden unfairly, doubt on the feasibility of the proposed action and refusal to accept the hypothetical choice problem.

Empirical Model Specification

Logit and probit models are popular statistical techniques in which the probability of a dichotomous outcome

(such as continued use or non-continued use) is related to a set of explanatory variables that are hypothesized to influence the outcome (Neupane et al., 2002). However, Pindyck and Rubinfeld (1981) acknowledged logistic probability function as computationally easier to use than the other types. That is why logistic regression model was used for this study. The logit model based on the cumulative probability function was adopted to determine the mean willingness to pay SWC practice by households and factors influencing households' willingness to pay because of its ability to deal with a dichotomous dependent variable. The logistic regression analysis is a uni/multivariate technique which allows for estimating the probability that an event will occur or not, through prediction of a binary dependent outcome from a set of independent variables Roopa, (2000). The Logit model was adopted for this study as used by Hanemann (1989), Whittington, *et al*, (1990), Branka and Kelly (2001), Yusuf *et al*, (2007), Adepoju and Omonona (2009). To identify the factors that determine the willingness to pay SWC practice by households, the households responses to the willingness to pay questions were regressed against the prices the households are willing to pay and other socioeconomic characteristics of the household. The regression logit model is specified as:

$$Pi = E(Y = 1/Xi) = \frac{1}{1 + e^{-(\beta o + \beta 1 x 1)}} \quad \text{.....(1)}$$

Y = response of household to willingness to pay question which is either 1 if Yes or 0 if No
β0 = constant, β1 = coefficient of the bid price that the households are willing to pay for SWC practice, X_1 = the bid price that the household was willing to pay for SWC practice.

$$Y = \frac{1}{1 + \exp^{z}} \quad \text{.....(2)}$$

Where Y = responses of household WTP which is either 1 for Yes and 0 for No
$Z = \beta 0 + \beta 1\ X1 + \beta 2\ X2 + \ldots\ldots\ldots\ldots + \beta n\ Xn$
X_1, X_2, X_3 = Explanatory variables and β0, β1, β2 = coefficient of explanatory variable
The Mean willingness to pay for SWC practice with no covariates i.e. WTP checked against the offered amount by households was calculated using the formula adopted by Yusuf et.al given as:

$$MeanWTP = \frac{1}{\beta} * \ln(1 + \exp \alpha) \quad \text{.....(3)}$$

Where α is a coefficient for the constant term, and β is a coefficient for offered bids to the respondents.

3. Results and Discussion

Awareness of Farmers' about the Causes and Indicators of Soil Erosion Problems in the Study Area

To corroborate the presence of soil erosion in the study area sampled households were asked the indicator of soil erosion problem on their own farm plots, 75.3% of farmers reported that the presence of gullies and rills as a major indicator on their cultivated plot and communal grazing land. The rest, 17.3% and 7.4%, of farmers also reported that the decline of agricultural productivity of their farm plots and the change of soil color were the indicators of soil erosion, respectively. This observation of the farmers is most closely associated with the scientific finding of most researchers. According to the survey result, soil erosion was severe on farm plots and communal grazing lands at rainy or summer season. This shows that the major causes of soil erosion in the study area is water erosion. Hence, this is a call for community awareness about the problem and causes of soil erosion as well as its consequences will help to motivate farmers to use soil conservation practices.

Major Soil Conservation Practice Implemented by Farmers in the Study Area

According to the finding of the survey, most of household farmers agreed that soil and water conservation practices are important to minimize the rate of soil erosion on farm plots and communal lands. This indicates that households had good perception and participation towards the importance of soil and water conservation methods on farm plots and communal lands. All sampled farmers stated that they use both traditional and introduced soil and water conservation methods on their own farm plots to prevent soil erosion and enhance soil fertility.

According to the survey results there are various soil and water conservation practices applied by farmers on their own farm plots and communal lands erosion control methods used in the study area include, plantation of trees (especially *kulkual*), contour plowing, check dams, soil and stone bunds, diversion ditches (cut of drain) locally called *"feses"*, crop rotation and terracing, application of manure. Terracing, soil and stand protection, Tree planting are the three top practices appreciated by the respondents, on the other hand, the check dam, intercropping and diversion of ditches are also less appreciated SWC methods (fig 1).

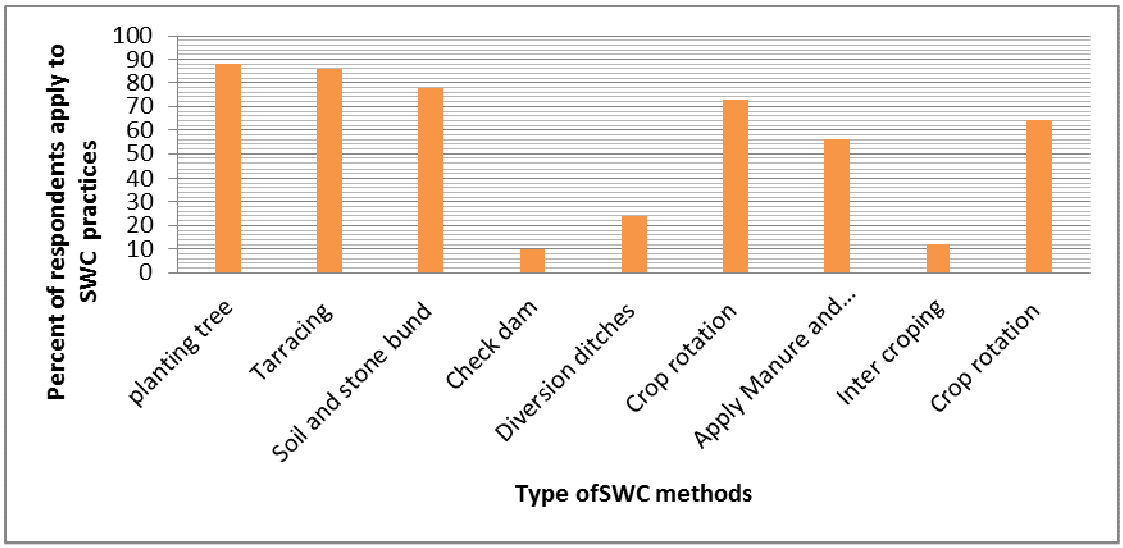

Figure 1. *Farmers' response regard to the major soil conservation methods they implemented*

Households WTP for Soil and Water Conservation

Using double bounded dichotomous choice format the mean WTP from responses of both the first and the second bids were estimated. The analysis was conducted using logistic model without covariates i.e. WTP[1] checked against the offered amount model. The result revealed that the correlation coefficient of the error term is less than one implying that the random component of WTP for the first question is not perfect correlation with the random component from the follow-up question.

The annual open ended response mean WTP was computed at 32.21 labor days per year per household for five year (see table 1). At 95% confidence interval the WTP for SWC practice varies between 53.64 to 36.01 labor per households for the initial bid and second bid amount respectively (See Table 2). The result shows that the mean WTP from logit was greater than the mean value from the open ended response.

Table1: Households' WTP from Open-Ended Questions

WTP in person days	Number of HHs	%
0	19	12.67
20- 30	58	38.67
40.5 - 50.5	45	30.00
60 - 70.5	22	14.67
80.5 - 90.5	6	4.00
Number of households =150 Mean = 39.32 Maximum =75 Sta.dev54.24		100

This may indicate free riding and lack of base for answering question in the open ended questions. This result is consistent with the findings of Jonse, (2005), Bamlaku et al 2015, Alem et al 2013.

Table 2: Reason for not Willing to Pay

Variables	Coefficient	Standard error	Wald	df	sig	Exp
Initial bid	-0.018	0.0201	1.148	1	0.002*	1.040
Constant	1.755	0.7538	0.113	1	0.005*	1.584
second bid	-0.1978	0.0234	7.095	1	0.008	1.000
Constant	7.1223	0.8024	8.731	1	0.003*	0.155

Chi-squared 55.57and 38.6, df 1, Pseudo R-squared 0.5294, & 0.251, Log likelihood-23.364264 & -112.707

The willing respondents were also asked to point out their reasons for maximum WTP in labor contribution. The respondents provided different reason for their maximum WTP. About 66.41% of the respondents reported that they could not provide more because of labor shortage. While, the rest 33.59 % reported that the amount they decided to pay is enough (See Table 3).

[1] The mean WTP from logit model was computed using the formula specified by (Yusuf et.al.,2007)

$MeanWTP = \frac{1}{\beta} * \ln(1 + \exp\alpha)$ α is a coefficient for the constant term, and β is a coefficient for offered bids to the respondents

Table 3: Reason for their Maximum WTP in labor days

Reason	Frequency	%
I could not provided more because of labor shortage	87	66.41
That amount is enough	44	33.59
Total	131	100

However, about 12.66 % of the sample respondents' were not willing to pay for SWC practice. Specifically, of the unwilling sampled respondents about 89.14 % of the households were categorized as genuine zero bidders. Whereas, about 10.86% of the respondents stated protest[1] zero (See Table 4).

Table 4: Reason for not Willing to Pay

Respondents reasons for zero bid	Frequency	%
We do not believe that the labor days we pay will actually be used for the proposed change	16	27.11
Lack of money and shortage of labor	38	64.40
We believed that the proposed project is unnecessary	5	10.86
Total	59	100

Determinants of Households' WTP for soil and water conservation practice

Before running the econometric model, the independent variables were tested for the presence of multicollinearity (table 5). The result showed that there were no multicollinearity problems between the variables. The value for Contingency Coefficient(CC5[2]) for the dummy variables were less than 0.75 and the value of Variance Inflation Factor (VIF4[3]) for the continuous variables were less than 10; which are obviously the indicators for the absence of multicollinearity.

The chi-square ($\chi 2$) distribution is used as the measure of overall significance of a model in logistic model estimation. The result of the logistic model shows that, the probability of the chi-square distributions was 45.678 with 16 degree of freedom less than the tabulated counter factual is 0.0000, which is less than 1%. So, this shows that, the variables included explaining willingness to pay fits the logistic model at less than 1% probability level.

Table 4:Contingency coefficient and Variance inflating factor of variables used in regression.

Contingency coefficients for dummy explanatory variables								
	sex	Marital status	credit	Land use	fertility	slop	Perception	Labor shortage
sex	1.000							
Marital status	0.421	1.000						
credit	0.059	-0.245	1.000					
Land use type	0.331	0.2327	0.109	1.0000				
fertility	0.113	-0.0761	0.561	0.1372	1.0000			
slop	-0.113	0.1086	0.027	-0.0753	0.2148	1.00		
Perception	0.0481	0.1346	0.072	0.3185	0.1445	0.00	1.0000	
Labor shortage	0.0107	0.01270	0.323	0.0235	0.0549	0.10	0.0415	1.0000

Variance Inflating Factor for Continues variable								
Variables	Age	Income	Education	HHsize	Livestock unit	Farm size	Distance	Bid
VIF	1.37	1.51	1.55	1.31	1.60	2.49	3.44	3.29

The estimated result on factors affecting the households' WTP for SWC practice is presented in Table 6 and it shows both the significant and insignificant variables. However, only the significant variables are

[1] The criteria for selecting protest zero was based on the discussion on NOAA panel guide on Arrow *et al.* (1993)

[2] $VIF = \frac{1}{1+R_i^2}$ Where, Ri 2 is the coefficient of determination in the regression of one explanatory variable (X) on the other explanatory variables (Xj).

[3] $CC = \sqrt{\frac{x^2}{N+x^2}}$ where**,** CC= coefficient of contingency, $\chi 2$= Chi-square test and N= total sample size

discussed.

Table 14: The Logistic model estimation results of households' WTP

Variables	β	Std.error	wald	sig	Exp(B)
Age	-0.069	0.051	1.854	0.017	0.933
HH_hsize	0.975	1.149	0.720	0.013	0.377
Educ.	0.431	0.876	0.242	1.623	1.539
Marital st.	-0.923	1.88	0.061	1.730	0.923
Income	0.123	0.047	6.781	0.070	1.131
Sex	-0.309	0.644	0.230	0.062	0.734
Farm_size	0.110	0.454	0.058	1.809	1.116
Distance	0.000	0.001	0.006	0.939	1.000
Fertility	1.340	1.052	1.622	1.203	0.262
Slop	0.629	0.739	0.726	0.023	1.876
Land_use	1.968	1.300	2.293	0.130	0.140
Credit	2.611	2.572	1.031	0.131	13.619
Livestock	-0.304	0.312	0.951	0.029	0.738
Percep	1.612	1.966	0.672	0.041	5.014
Labour shortage	.051	0.040	1.601	0.016	1.052
BID	-2.410	1.237	3.795	0.001	11.134
constant	2.410	1.237	3.791	0.51	9.654

No. of observation 150 -2 Log likelihood=151.1 X^2 = 45.678 R Square= 0.104

Age of the household head (AGE): Age of the household head had negative and significant effect on households‟ WTP in labor days contribution at less than 1% level of significant. This may be older age may shorten planning time horizon and reduce the WTP. On the other hand, young farmers may have a longer planning horizon and, hence, may be more likely to be willing for conservation. Besides, an older aged household heads are more likely to have a labor shortage and reduce willingness to pay for soil and water conservation practices. Keeping the influence of other factors constant, an increase in household head age by one year the probability of willingness to pay in labor days reduces by 1.071 times. The negative relationship between WTP and age is inconsistent with the finding of Mallios and Latinopoulos (2005), Bamlaku *et al* 2015, Tegegne (1999), Alem *et al*, 2013, Solomon (2004).

Family size of the household (FSIZE): The estimated coefficient of the total family size, which is one of the most crucial explanatory variables of probability of WTP, was found to be statistically significant with the expected positive sign ($p<0.05$). This indicates that the probability of WTP to support the proposed soil conservation practices increases as the total household size increases under the hypothetical market scenario. Keeping the influence of other factors constant, an increase in household size by one member increases the probability of willingness to pay by 2.65. This could be explained by the fact that, soil conservation practices are labor intensive; hence, households with large labor supply are willing to invest more in soil conservation practices. This result is consistent with the findings of (Gebrelibanos*, 2012).* In contrary with these finding of Bamlaku et al., 2015 and Alem et al., 2013.

Education level: the education level of the respondents is positively and significantly related to WTP. That is, respondents with more years of schooling are WTP for SWC practice. This might be due to the fact that educated household heads perceive and are willing to pay more than less educated households. This clearly calls the importance of human capital development for implementation of soil conservation practices. This is consistent with the findings of Tiwari (1998), Whittington et al. (1990), Genanew (1999), Tegegne (1999), Tsegabrihan (1999) and Jonse (2005) Tesfaye *et al,* 2013, Bamlaku et al 2015, Ogunniyi et al 2011. In contrary with these finding of Angella et al 2014.

Annual income of the respondent shows expected positive and significant relationship with the households' WTP. Keeping the influence of other factors constant, when farm income of a household increases by one birr, households' willingness to pay for soil conservation increases by 0.64 labor days. A study by Adugnaw and Desalew, 2013 Genanew (1999), Tsegabrihan (1999), SANREM CRSP (2003), W/Giorgis (2004) and Jonse (2005), recognizes significant association between households income and willingness to pay .

Slop of farm land of the respondents had positive effect on households' WTP for SWC practice 5% level of significant. The implication is that the farmer who has a plot with steep slope is more likely to understand soil erosion problem and apply conservation structures than the farmer who has flat sloped plot. This is consistent with Bekele, 1998; Wagayehu, and Lars, 2003; and Bett, 2004.

Total Livestock Unit (TLU) has been found to relate to the probability of WTP for SWC practices positively and significantly at 5%. TLU could be a proxy for wealth under Ethiopian farmers condition. When

the wealth of a household increases, the WTP will also increase. The odds ratio show that for each additional increment of TLU, the probability of the willingness of the household to pay for the conservation practices will 1.35 times increase keeping the other explanatory variables. This is consistent with the findings of Alem et al, 2013, Gebrelibanos et al , 2012.

Perception about the existence of problem of soil erosion positive and significant at less than 5% probability level. Holding other things constant, the probability of a household WTP for SWC practice increases by 0.199 for perceived farmers than the other counter factual respectively. The implication is that a farmer who feels that his/her farmlands are prone to soil erosion is more likely to continuously use SWC measures than those who do not perceive the problem of soil erosion. Which is consistent with the result of Abera (2003).

labor shortage: labor shortage is positively and significantly related to WTP at 5% significant level . This indicates that SWC practices are labor intensive; hence, households with low labor shortage are willing to invest less in soil conservation practices.

Consistent with the earlier expectation and economic theory, the **initial bid offered (BID1**) has a negative and significant effect on the WTP for SWC practices at less than 1% level of significance. The odds ratio indicates that a one labor days increase for the contribution of the proposed project reduces the probability of being willing to pay by 0.089 .

Mean WTP and Estimation of Consumer Surplus of Soil Conservation Practices

According to Mitchell and Carson (1989) there are four important issues to be considered regarding sample design and execution in order to have a valid aggregation of benefits: population choice bias, sampling frame bias, sample none response bias and sample selection bias. Random sampling method was used in this study using a list of household. Protest zero responses were not excluded from the analysis and a face to face interview method is used. Hence, none of the above biases was expected in the analysis.

If the logit model is estimated on a dichotomous choice CV question with a follow up and the parameter shows that either the mean, or variance or both differ between the initial bid price and the follow up, the researcher must decide which estimates to use to calculate the WTP measure (Haab and McConnell, 2002). Hence, in order to choose the appropriate WTP among the two loget estimates, we looked into the data and the total amount for the YY and NN responses accounted for about 74.6 % of the total responses. This means that the 2nd bid amount was closer to the unobserved true value of the individual. For example, let the first random bid for the individual be 35 labor days per year and let the respondent accept the first bid. Then the 2nd bid becomes 48 labor days per year, again, let the respondent accept the second bid. This means that the respondents' true WTP is greater than or equal to labor days per year so the 2nd bid will be a better estimate than the 1st one. The same is true for NN answer. Even for the rest 25.34 % of the NY and YN responses, both the first and the second bid amounts will have equal chances to be closer estimates of the true value. Hence, using the second estimate of the double bounded logit model the mean willingness to pay for SWC is 36.01 labor days per year.

As it is indicated in Table 7, the aggregate WTP was calculated by multiplying the mean WTP by the total number of households who are expected to have a valid response in the study area. Following this, in this study the aggregate WTP for soil and water conservation practices was computed at 1334247 labor days per year which is equivalent to 23349329.8Birr.

Total HHs	Expected HHs to have a protest zero A[1]	Expected HHs' with Valid Responses B[2]	Mean WTP3 C[3]	Aggregate Benefit (Labor) D[4]	Aggregate Benefit (in Money) E[5]
38277	1224.864	37052	36.01	1334247	23349329.8

Conclusions

The paper has estimated the total WTP for SWC practices and assessed the determinants of WTP practices in abaro - toga watershed, Ethiopia. The value elicitation method used is a double bounded dichotomous choice with an open ended follow-up question, which is closer to the market scenario respondents are familiar with in

[1] 6(3.2 %) of our 156 sampled households were protest zeros. We excluded those protest zeros from further analysis after we have tested for sample selection bias. So A is the expected number of households which are expected to protest for the proposed project. It is calculated by multiplying the percentage of sampled protest zeros (3.2 %) with the total population 38277 (A).

[2] Is A-B which is the total households in the study area which are expected to have a valid response

[3] The mean WTP calculated from the maximum amount of labor that a household could pay for SWC

[4] Is mean multiplied by the number of total households which are expected to have valid response (C*Mean WTP) measured in labor

[5] Is the total aggregate benefit in monetary equivalent in Ethiopian local Currency (Birr), which is calculated by multiplying the total labor of the households with the minimum wage rate in the study area (17.50 birr) at the time of data collection.

Ethiopia. Evidence from the study support that, age, household size, education, income, slop, perception of soil erosion, total livestock units, labor shortage for farm practices, are significant factors that explain households' WTP. The mean WTP is found to be 36.01 labor days per year with an aggregate benefit of 1334247 labor days per year which is equivalent to 23349329.8 Birr. Policy thrust should focus on enhancing land tenure security through land certification among others.

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REFERENCES

Abera Birhanu (2003). Factors influencing the adoption of soil conservation practices in north-western Ethiopia. M.Sc. Thesis, Institute of Rural development, University of Göttingen, Germany.

Adepoju and Omonona (2009). Determinants Of Willingness to Pay for Improved Water Supply in Osogbo Metropolis, Osun State, Nigeria". *Research Journal of Social Sciences*, 4: 1-6.

Admasu Amare (2005). Study of sediment yield from the Watershed of Angereb reservoir. M.Sc thesis, Department of Agricultural Engineering, Alemaya University, Ethiopia. 98 p.

Adugnaw Birhanu and Desalew Meseret, (2013). Structural Soil and Water Conservation Practices in Farta District, North Western Ethiopia: An Investigation on Factors Influencing Continued Use. Journal of Science, Technology and Arts Research 2(4): 114-121

Alem Mezgebu, Zbene Asfaw, worku Tessema, (2013). Economic value of irrigation water in Wondo Genet District, Ethiopia: An Application of Contingent valuation method. *Journal of Economics and Sustainable Development 4(2):23-36*

Amarasekara, M.G.T.S., Dayawansa, N.D.K. and de Silva, R. P. 2009. Effect of socio economic factors on adoption of soil conservation measures, tropical agriculture research vol.1 62-72, Postgraduate Institute of Agriculture University of Peradeniya Peradeniya, Sri Lanka.

Amsalu, A. (2006). *Caring for the Land Best Practices in Soil and Water conservation in Beressa Watershed, Highland of Ethiopia*. Tropical Resource Management Paper No.76: Wageningen University.

Amsalu, A., De Graaff, J. (2007). Determinants of adoption and continued use of stone terraces for soil and water conservation in an Ethiopian highland watershed. *Ecological Economics*, 61, 294 – 302.

Angella, N., Dick, S., Fred, B. (2014) "Willingness to pay for irrigation water and its determinants among rice farmers at Doho Rice Irrigation Scheme (DRIS) in Uganda. Journal of Development and Agricultural Economics, Vol 6(8) pp345-355.

Arrow, K., R., Solow, P.R., Portney, E. E., Leamer, R., Radner, H., Schuman (1993). Report of the NOAA Panel on Contingent Valuation. Federal Register.V.58:4601- 4614

Asrat P, Kassa, B. and Hamito, D. (2004). Determinants of farmers' willing to pay for soil conservation practices in the southern highlands of Ethiopia: Land degradation and development, 15, 423-438.

Bamlaku Ayenew, Yemiru Tesfaye, Abrham Belay (2015). Economic Value of Wondo Genet Catchment Forest in Domestic Water Supply Services, Southern Ethiopia. *Journal of Economics and Sustainable Development* ISSN 2222-1700 (Paper) ISSN 2222-2855

Bekele Shiferaw (1998). Peasant Agriculture and Sustainable land use in Ethiopia. Economic Analysis of Constraints and Incentives for Soil Conservation. Agricultural University of Norway. Dissertation no: 1998:1.

Bekele Shiferaw and Holden, S.T. (1998). Resource degradation and adoption of land conservation technologies in the Ethiopian Highlands: A case study in Andit Tid, North Shewa. *Agricultural Economics* 18(3): 233-47.

Bekele, W., Drake, L. (2003). Soil and water conservation decision behavior of subsistence farmer s in the Eastern Highlands of Ethiopia: a case study of the Hunde-Lafto area. Ecol. Econ. 46(3), 437 – 451.

Belay, T., 1992. Farmers' perception of erosion hazards and attitude towards soil conservation in Gununo, Welayita. Ethiopia Journal of Development Research, 14(2), 32 P.

Berry, L. (2009). *Land Degradation in Ethiopia: Its Extent and Impact*. Global Mechanism and World Bank.

Betru, N. (2002). Soil and Water conservation program in Amhara National Regional State. Paper presented at a Conference on Natural Resources Degradation and Environmental Protection in the Amhara National Regional State held from July 24-26, 2002, Bahir Dar, Ethiopia.

Bewket W, Teferi E (2009) Assessment of soil erosion hazard and prioritization for treatment at the watershed level: case study in the Chemoga watershed, Blue Nile basin, Ethiopia. Land Degrad Dev 20:609–622

Bewket, W., (2007). soil and water conservation intervantion with conventional technologies in northwestern highland of Ethiopia: Acceptance and adoption by farmers. Land use policy,24:404-416.

Branka T and Kelly G. (2001). Contingent Valuation Willingness to Pay with Respect to Geographically Nested Samples: Case Study Of Alaskan Steller Sea Lion". 2001 W-133 Western Regional Project Technical Meeting Proceedings. Pp 2-4.

Cameron, T. A. and Quiggin, J. (1994). Estimation Using Contingent Valuation Data from A 'Dichotomous Choice with Follow-Up' Questionnaire. *Journal of Environmental Economics and Management*. 27(3):218-34

Central Statistical Agency (CSA). 2010. Summary and statistical report on the 2007 population and housing census of Ethiopia: Results for Amhara region. Federal Democratic Republic of Ethiopia, Population Census Commission, CSA, Addis Ababa, Ethiopia.

Dejene, A. (2003). Integrated national resources management to enhance food security: The case of community based approaches in Ethiopia. Rome: FAO.

FAO (Food and Agriculture Organization). New Partnership for Africa's Development: Comprehensive Africa Agriculture Development Program: FAO, Rome. 2002

FAO (Food and Agriculture Organization). Statistical database for Ethiopia, 2007 available at www.FOASTAT.FAO.ORG

Gebrelibanos Gebremedhin, (2012).Households' willingness to pay for soil conservation practices in adwa woreda, ethiopia: a contingent valuation study

Genanew, B.(1999). Analysis of Determinants of Households' Willingness to Pay and Demand for Improved Water Services: A Contingent Valuation Study in Harar Town (Ethiopia). Unpublished MSc. Thesis Economics Department, AAU.

Gujarati DN (2005). Basic Econometrics TATA McGRAW-HILL Publishing Co Limited. New Delhi, India, p.b4.

Haab, T.C. and K. E. McConnell (2002). Valuing Environmental and Natural Resources, the Econometrics of Non Market Valuation. Edward Elgar, Cheltenham U.K.

Haile GW, Fetene M (2012) Assessment of soil erosion hazard in kilie catchment, east shoa, Ethiopia. Land Degrad Dev 23:293–306

Hanemann, M., (1989). Welfare Evaluations in Contingent Valuation Experiments with Discrete Responses Data. *American Journal of Agricultural Economics*, 71(Nov.): 1057-61.

Hanemann, M., Loomis, J. and Kaninen, B.(1991). Statistical Efficiency of Double Bounded Dichotomous Choice Contingent Valuation. American Journal of Agricultural Economics, Vol. 73, No. 4. (Nov., 1991), pp. 1255-1263.

Hurni, H. (1993). *Land degradation, famine, and land resource scenarios in Ethiopia: World Soil Erosion and Conservation, Cambridge Studies in Applied Ecology and Resource Management* (Pimentel, D. ed., pp. 27- 62), UK: Cambridge University Press.

Illukpitiya, P.; Gopalakrishnan, C.(2004). Decision-making in soil conservation: Application of a behavioral model to potato farmers in Sri Lanka. Land Use Policy, v. 21, n. 4, p. 321-331, 2004.

Jonse, B.(2005).Valuing Non-Agricultural Uses of Irrigation Water: Empirical Evidences from the Abay River-Basin of the Amhara Regional State, Ethiopia. School of Graduate Studies, Addis Abeba University.

Kebede Wolka, Habitamu Tadesse , Efrem Garedew and Fantaw Yimer (2014). Soil erosion risk assessment in the Chaleleka wetland watershed, Central Rift Valley of Ethiopia. Environmental Systems Research (2015) 4:5 DOI 10.1186/s40068-015-0030-5

Mallios Z. and Latinopoulos P. (2001) Willingness to pay for irrigation water: a case study in Chalkidiki, Greece, In: Lekkas, T.D. (Eds), Proceedings 7th International Conference on Environmental Science and Technology, Ermoupolis, Greece

Mitchell R., and Carson, R. (1989). Using Surveys to Value Public Goods: The Contingent Valuation Method. Resources for the Future. Washington DC, 436 pp.

MoFED (Ministry of Finance and Economic Development), Ethiopia: Building on Progress a Plan for Accelerated and Sustained Development to End Poverty (PASDEP) (2005/06-2009/10).Volume I: Main text, Ministry of Finance and Economic Development (MoFED), September, 2006, Addis Ababa, 2006.

Ogunniyi LT,Sanusi WA, Ezekiel AA (2011). Determinant of rural household willingnes to pay safe water in Kwara State, Nigeria Aquaculture. Aquarium, conservation and Legislation.Int.J. Bioflux 4(5):660-669

Pro-poor Reward for EnvironmentalS ervices in Africa/World Agroforestry Centre (PRESA/ICRAF), (2011).The Willingness to pay (WTP) of water users for increased and reliable water supply via catchment management in Sasumua: Results from a contingent valuation survey in Nairobi city, Kenya

Roopa, K.S., (2000). Qualitative Choice and their uses in Environment Economics. *Land Economics*, 90(4): 499-506.

Shiferaw, B., Holden, S. (1998). Resource degradation and adoption of land conservation techno logies in the Ethiopian highlands: a case study in Andit Tid, North Shewa. *Agric. Econ.*18, 233 – 247.

Shiferaw, B., Holden, T.S. (2001). Farm -level benefits to investments for mitigating land degradation ion: empirical evidence from Ethiopia. *Environment and Development Economics*. 6, 335– 358.

Shiferw, B., Holden ST. (1999). Soil and small holders' conservation decision in the high lands of Ethiopia. *World Development, 27*(4), 739-752.

Solomon Jabessa. (2004). Contingent Valuation of Multi-Purpose Tree Resource. The Case of Arsi Zone, Ethiopia. Thesis submitted to the School of Graduate Studies of Addis Ababa University.

Tabachnick, B. G., & Fidell, L. S. (1989). Using Multivariate Statistics. 2nd edition. Cambridge, MA: Harper & Row.

Tegegne G/Egziabher (1999). Willingness to Pay for Environmental Protection: An Application of Contingent Valuation Method (CVM) in Sekota District, Northern Ethiopia. *Ethiopian Journal of Agricultural Economics*, V.3 No.1

Tesfaye G., Zerihun M., Menfese T., S.C., Narayana 2013. Adoption of Structural Soil and Water Conservation Technologies by Small holder farmers in Adama Wereda, East Shewa, Ethiopia. *International Journal of Advanced Structures and Geotechnical Engineering,* ISSN 2319-5347, Vol. 02, No. 02,pp 58-68.

Tsegabrihan G.(1999). Estimating Willingness to Pay for Irrigation Water: A Contingent Valuation Case Study on Small Scale Irrigation Schemes in Tigray Ethiopia. Unpublished MSc. Thesis Department of Economics, AAU.

Ulimwengu, J. and Prabuddha Sanyal, P. 2011. Joint estimation of farmers' stated willingness to pay for agricultural services, IFPRI Discussion Paper 01070 Internatinal Food Policy Research Institute.

Venkatachalam, L. (2004). The Contingent Valuation Method: A Review. Environmental Impact Assessment Review, no. 24, pp. 89 – 124.

W/Giorgis, T. (2004). Estimating Willingness to Pay for Irrigation Water: A Contingent Valuation Case Study on Small Scale Irrigation Schemes, paper submitted to the Second International Conference on the Ethiopian Economy organized by the Ethiopian Economic Association.

Wagayehu B, Lars D (2003) Soil and Water Conservation Decision ofSubsistence Farmers in the Eastern Highlands of Ethiopia: a case study ofthe Hunde-Lafto

Wagayehu, B and Drake L. Soil and Water Conservation Decision Behavior of Subsistence Farmers in the Eastern Highlands of Ethiopia: a Case Study of the Hunde-Lafto area. Ecological Economics, 2003, 46: 437-451.

Wegayehu, B. (2003). Economics of soil and water conservation: Theory and Empirical Application to Subsistence Farming in the Eastern Ethiopia highlands. PhD Dissertation, Swedish University of Agricultural Sciences, Uppsala.

World Bank,. Africa Data Base. CD on Africa data base extracted for Ethiopia. 2004

Yeraswork, A., 2000. Twenty years to nowhere: Property rights, and conservation in Ethiopia, Red Sea Press, Lawrenceville, NJ.

Yusuf S.A., Salimonu K.K. and Ojo, O.T. (2007). Determinants of Willingness to pay for improved household solid waste management in Oyo State, Nigeria. *Research Journal of Applied Sciences* 2(3) 233-239, 2007.

Zeller, M. (2000). Product innovation for the poor: the Role of microfinance. Policy Brief No 3: Rural Financial Policies for Food Security of the Poor. Washington DC: International Food Policy Research Institute

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