DOI: 10.36347/sjebm.2015.v02i09.006

Scholars Journal of Economics, Business and Management e-ISSN 2348-5302
Yibeltal Walle.; Sch J Econ Bus Manag, 2015; 2(9):934-943 p-ISSN 2348-8875

(An International Publisher for Academic and Scientific Resources)

Local Community's Valuation of Ecological Conservation Benefits of Semien Mountain National Park

Yibeltal Walle
University of Gondar, Department of Economics, Gondar, Ethiopia

*Corresponding Author
Yibeltal Walle
Email: yibeltal_walle@yahoo.com

Abstract: Although, protected areas are established to conserve biodiversity, enhance eco-tourism, and contribute to the country's national income; the country's protected areas are under enormous pressure from local communities. To save these resources, appropriate conservation strategy must be put in place. The attitudes of people concerning protected area conservation affect their behaviour, and valuing this is important in involving local people in conservation planning and decision-making processes. So, this study has analyzed the economic values of biodiversity conservation for local communities, taking Semien Mountain National Park as a case, using contingent valuation method (CVM). Data from A sample of 250 households from six villages living adjacent to Semien Mountain National Park has been collected. Descriptive statistics and econometric probit model were used to analyze the data collected. Most respondents have given positive WTP response for ecological protection. Mean WTP was 24.21 Birr/household/year according to the single dichotomous choice WTP survey responses. Considering large number of people living in the area the aggregate WTP for improved SMNP ecology protection, using this mean WTP response, would be very high. This higher WTP amount may provide funding for a possible ecological management program so as to generate solutions to environmental problems associated with SMNP. The results of Probit econometric model showed that age of the respondent, education level of the respondent, income of the household, benefits generated from protected areas and awareness of the respondent influences positively respondents probability of WTP for SMNP protection while household size and initial bid value influences negatively.

Keywords: Semein Mountain National Park, Contingent valuation method, Economic valuation, Ecological protection, Willingness to pay.

INTRODUCTION

Environmental resources are used intensively since they have a wide range of functions. National parks and other protected areas play significant role in the conservation of biological diversity and expansion of ecotourism which can enhance national income, and have economic impacts to society around the area of national park. However, in developing countries, protected areas established to conserve biodiversity and enhance eco-tourism are under serious threat [1, 2].

The degradation of environmental resources in national parks, where considerable people live in and around the park depending on park resources for their livelihoods, is of crucial issue nowadays. People who get benefit from natural resources are likely to support the wildlife conservation efforts and protected areas [3]. Mutually supportive relationships between communities and nearby protected areas are critical to the long-term success of conservation efforts. However, evidence from different countries indicates many important protected areas are being increasingly degraded as a result of large scale development projects, expanding agricultural frontiers, illegal hunting and logging, fuel wood collection and uncontrolled burning [1]. Ignoring the dependency of local community on the parks has also made the sustainability of national parks questionable [4]. Nowadays, in many of these areas there are conflicts over land tenure and resource use [5]. These conflicts may create tensions between local communities, protected area staff, and conservation goals [6].

As a strategy for biodiversity conservation Protected Areas (PAs) are very important, providing bases for conservation of biodiversity, and being an important element of any sustainable development plan [7]. Furthermore, national parks and other PAs contribute to human well-being in a variety of ways [8]. However, economically efficient resource management requires knowledge of the flow of park benefits and costs, including non-market benefits [9]. Public benefits derived from a national park in the form of environmental amenities and ecosystem services implies that the park contributes to public welfare, and decline in park quality could result in a loss in welfare

[10]. Information on the welfare contribution or economic value of protected areas in developing countries, however, is scarce.

Ethiopia is among those countries known for their rich biodiversity and natural resource, but losing their environmental assets at an alarming rate. Most of the endemic animals and other habitats are found in the country's twenty protected areas. However, these areas face many challenges due to growing populations, border conflicts, and recurring drought. A chronic and growing issue for Ethiopia's rural people is local access to grazing and farming lands [11]. As in other parts of the developing world, increased concern over the burden that conservation often places on local communities has led to efforts to incorporate development goals into conservation practices [12]. In 1991, community-based conservation programs were established in several Ethiopian national parks in an effort to gain local support for conservation. Participatory management and benefit-sharing were also adopted, along with the granting, to local communities, of limited ownership rights for some resources.

While Ethiopia's protected areas and natural ecosystems may provide protection to many important species and habitats, and contribute to the country's national income; they are hardly the most preferred land use systems for the local poor who largely bear the costs of conservation. The country's protected areas are under enormous pressure from local communities, wildlife populations continue to decline severely, habitats are being lost, and rates of landuse change to agriculture and grazing land are increasing at disturbing rates [19. The level of rural poverty, lack of incentives, increasing demand for grazing and cultivable land etc. put a lot of stress on the conservation strategy of the country. The situation in SMNP can be a case in point.

Simen Mountain National Park is one of the most well-known nature based recreational sites due to it's an impressive landscape and endemic wild animals. It was established in 1969 and was inscribed in the list of world heritage sites by UNESCO in 1978. But this park has been in the list of world heritage in danger since 1996 due to heavy settlement by farmers, declining numbers of Walia ibex, widespread deforestation and continuous reduction in recreational qualities of the site [13]. Furthermore, the site has been unable to improve the qualities of ecotourism experience and expand the types and variety of its recreational services for a long time because of lack of sustainable income from internal sources.

The human threat has drastically increased in recent years and it is imperative to put appropriate conservation strategy in place to protect the endangered national park under study. This, however, requires appreciation of the economic value of the park to the local community; and it is critical that conservationists better understand local views with respect to wildlife and the park.

Given the recurring nature of conflict between conservationists and local communities, it is critical that conservationists better understand local community's valuation and views with respect to wildlife and protected areas. Public understanding of the general environment and population related issues is critical for successful conservation efforts. For this, the perception and valuation of local people towards the natural resources should be studied. Toward that end, we sought to better understand local community's valuation of the park.

METHODOLOGY

Sampling Design and Sample Size

The target sample households for the study have been selected as follows. In order to represent the population with sufficient accuracy and to infer the sample results to the population, from 20 villages 6 of them were selected based on their location and presumed dependency on the park. These numbers of villages are considered to be sufficiently large for drawing valid statistical inferences and will also be manageable to be surveyed with the available resources of finance and time. Then, a total of 250 sample households of the local community were selected randomly from selected villages using proportional to size sampling technique.

For determining the minimum number of sample households required to conduct the study, we have used a method developed by Green [16]. Green [16] suggested a rule-of-thumb that $N \geq 50 + 8m$, where N is minimum number of sample households required to conduct multiple regression analysis and m is the number of explanatory variables used in the regression analysis.

Data Source and Method of Data Collection

The primary data that is utilized in the descriptive and empirical analysis of this study was mainly collected using structured questionnaire survey with both closed and open-ended questions. Villager's WTP to conserve SMNP resources; the respondents' economic activity; environmental issues; local peoples' attitude towards natural resources in general and SMNP in particular; views towards wildlife and wildlife conservation; views towards protected area management and staff; and a series of socio-economic and demographic characteristics of the households were collected using structured questionnaire. However,

additional information has been gathered through key informant interviews, focus group discussion and secondary data.

Method of Data Analysis

The survey data has been analyzed using both descriptive statistics and econometric models. Probit regression model, which is specified below, has been used to determine relationships between socio-economic variables and other factors affecting WTP. Descriptive statistics used to present the socio-economic characteristics of sample respondents, perception responses, valuation responses and others. The descriptive statistics includes Chi-square tests, means, percentages, frequency distribution and graphs.

Empirical Model Specification

As stated in value elicitation section above the respondents have been asked single bounded dichotomous choice yes/no question followed by open-ended maximum WTP question to elicit the local community's WTP for conservation of SMNP to avoid the welfare losses as a result of further degradation of the park resources. For dichotomous choice (yes/no) valuation responses of the proposed initial bid values the probit/logit model better fits the problem at hand. Given the binary nature of the data a probit econometric model used to estimate local communities mean WTP; and to include respondents' socio-economic factors into WTP functions which further help the researcher to gain information on validity and reliability of the CV results [15].

The basic model used to analyze dichotomous choice valuation responses based on the random utility theory is constructed by [14]. This study adopts this model to identify the actual WTP of the local community to protect the endangered SMNP and its determinants. According to the theory the basic issue is that although the individual knows his/her utility certainly, it has some components which are unobservable from the view of the researcher. As a result, the researcher can only make probability statement about respondent's yes/no responses for conservation of the park. The indirect utility for the j^{th} respondent can be specified as follows:

$U_{ij} = U_i (y_j, X_j, \epsilon_{ij})$

Where

Y_j = J^{th} respondent income

i = 1 denotes the final state of the park and i = 0 the initial state of the park

X_j = vector of household socio-economic characteristics

ϵ_{ij} = stochastic components of the given indirect utility function

When the initial bid value, β_i^*, introduced to the respondent for changes in the quality or quantity of SMNP through improved conservation system, the respondent accepts the proposed initial bid value if and only if the utility with the establishment of SMNP management program, net of the required payment (β_i^*), exceeds utility of the status quo reject it otherwise. That is;

$$U_{1j} (Y_j - \beta_i^*, X_j, \epsilon_{1j}) > U_{0j} (Y_j - \beta_i^*, X_j, \epsilon_{0j})$$

For the researcher, however, the random components of preferences cannot be known with certainty and she/he can only make probability statement of yes/no single bounded dichotomous valuation responses. Thus, the probability that the respondent says 'yes' is the probability that she/he thinks that she/he is better off in the proposed SMNP conservation program. For individual j, the probability (Pr) is:

$$\Pr (\text{yes}) = [U_{1j} (Y_j - \beta_i^*, X_j, \epsilon_{1j}) > U_{0j} (Y_j - \beta_i^*, X_j, \epsilon_{0j})]$$

This probability statement provides an intuitive basis to analyze dichotomous choice responses. Assuming the utility function is additively separable in deterministic and stochastic preferences:

$$U_{ij} = U_i (y_j, X_j) + \epsilon_{ij}$$

Given the additive specification of the utility function the probability statement for respondent j becomes:

$$\Pr (\text{yes}) = \Pr [U_{1j} (Y_j - \beta_i^*, X_j) + \epsilon_{1j} > U_{0j} (Y_j - \beta_i^*, X_j) + \epsilon_{0j}]$$

This probability statement is the point of departure for the linear utility function in income and covariates, which is assumed by our empirical model.

The probit model now can be defined as:

$$Y_i^* = \beta' X_i + \epsilon_i$$

Where

- β' is vector of parameters of the model
- X_i is vector of explanatory variables
- ϵ_i is the error term and is assumed to have random normal distribution with mean zero and common variance δ^2 [16].
- Y_i* is unobservable respondents actual WTP for improved park conservation services. It is simply a latent variable. What we observe is a dummy variable WTP_i, which is defined as:

$Y_i = WTP_i = 1$ if, $Y_i^* \geq \beta_i^*$

$Y_i = WTP_i = 0$ if, $Y_i^* < \beta_i^*$

In the single bounded dichotomous value elicitation format the j^{th} respondent is asked if he/she is willing to accept the proposed initial bid value, to get

say a given improvement in environmental quality, quantity or both, in our case improved conservation of the park. Thus, the probability that a respondent is willing to pay the proposed initial bid value to ensure the improved conservation of the park is given by:

$$\Pr(Y_i = 1/X_i) = \Pr(Y_i^* \geq \beta_i^* / X_i)$$
$$= \Pr(X_i \beta' + \epsilon_i \geq \beta_i^* / X_i)$$
$$= \Pr(\epsilon_i \geq -X_i \beta' + \beta_i^* / X_i)$$

If we assume the distribution is symmetric

$$\Pr(Y_i = 1/X_i) = \Pr(\epsilon_i \geq -X_i \beta' + \beta_i^* / X_i)$$
$$= F(X_i, \beta')$$

Where F is a cumulative distribution function (cdf). Depending on the assumption on the distribution of the error term we can estimate the probability either using logit or probit model. In this case the main assumption is the error has mean zero and constant variance δ^2 to have a probit model [16].

Note that the probability that the household is not willing to pay for the proposed bid is given by:

$$\Pr(Y_i = 0/X_i) = \Pr(Y_i^* < \beta_i^* / X_i) = 1 - \Pr(Y_i = 1/X_i) = 1 - F(X_i, \beta')$$

The standard approach to estimating binary choice models according to [16] is the maximum likelihood estimation. The resulting log-likelihood function for the responses to a CV survey using the single bounded dichotomous choice format for a sample of n observations is.

$$\ln L(Y,X, \beta) = \sum_{i=1}^{n} \{yi \ln F(Xi\beta) + (1 - yi)\ln[1 - F(Xi\beta)]\}$$

or

$$\ln L(Y,X, \beta) = \sum_{i=1}^{n} \{yi \ln Pi + (1 - yi)\ln[1 - Pi)\}$$

Where: P_i is the probability of the respondents to choose the park conservation improvement by accepting the proposed initial bid value and $(1 - P_i)$ is the respondents' probability of choosing no for the proposed bid. Where $y_i = 1$ if the i^{th} response is yes and zero otherwise. Based on the above justification, we specify the probit model for local community respondents' choice for the improved ecological restoration of SMNP by contributing some amount of money as follows:

$$WTP_i = \beta_0 + \beta_1 AGR + \beta_2 SEX + \beta_3 EDUC + \beta_4 INC + \beta_5 DPR + \beta_6 TSWC + \beta_7 PPB + \beta_8 DSP + \beta_9 SCR + \beta_{10} BPA + \beta_{11} AED + \beta_{12} TS + \beta_{13} ACV + \beta_{14} BID + \epsilon_i$$

Where WTP_i is response to the initial bid value = 1 if the response to the initial bid value is yes; = 0 if the response is no; β_0 is a constant term, β_i, i from 1 to 14, are regression parameters; ϵ_i is the error term and the explanatory variables included in the above equation are defined under the variable description section.

Mean WTP Estimation

As it is stated above the probit model in this study we used to calculate local community's mean willingness to pay for the improved conservation of SMNP by regressing the WTP variable on bid variable [14]. And it can be used as a measure of aggregate WTP. It is also one of the reason why the probit model is used in WTP study for calculating the aggregate and the mean WTP in a CV study.

Assuming the probability of a household's WTP for improved conservation of the park to ensure some benefits from it is a linear function of bid value, the following bivariate probit model is specified to calculate the mean WTP (15, 2002):

$$\text{Prob}(Y = 1/\text{Bid}) = \alpha + \beta \, VWTP + \epsilon$$

Mean WTP using the model for the single bounded dichotomous probit model format is defined as:

$$\text{Mean WTP} = -\alpha/\beta$$

Where: α is the constant (intercept) term, and β is the initial bid value (BID) coefficient.

RESULTS AND DISCUSION

The results and discussion part is organized as follows. The first section describes the socio-economic characteristics of sample respondents included in the survey, and WTP of sample respondents for park protection for both open-ended and single dichotomous choice WTP questions. The second section presents the multivariate analysis of the determinants of respondents' WTP for park protection. The multivariate econometric analysis is estimated to analyze factors affecting WTP responses and determine if WTP estimates follow theoretical validity. In the final section, the aggregate WTP of the total population in the study area is presented.

Descriptive Statistics Results

Socio-economic Characteristics

The socio-economic characteristics of total respondents as well as willing and non-willing to pay respondents are summarized in table 1 and table 2 for categorical and continuous variables, respectively. Independent sample t-test was used to see whether the differences in mean values of continuous variables of willing and non-willing differed significantly. Chi-square statistics was employed to see the associations between categorical variables.

The majority of the respondents (58.3 %) were male. Since males have decision-making power in the family, the proportion of male was slightly higher. The

share of male in the willing respondents is higher (58.7 %) than the share of male (57.3 %) from the non-willing respondents. But, the association between sex and willingness to pay decisions was not statistically significant.

The educational status figure reveals that 59.6 % of the respondents were literate. Share of literate respondents was 73.5 % of the willing and 30.7 % of the non-willing. The proportion of willing and non-willing respondents did vary significantly with educational status. This might be because as years of education increases respondents will become more concerned of environmental degradation and aware of the benefits of park protection. In addition, more educational attainment has a positive impact on ability to pay which in turn increases their probability of willing to pay.

The educational status figure reveals that 74.4 % of the respondents has got some kind of benefit from protected areas. Share of beneficiary respondents was 81.9 % of the willing and 58.7 % of the non-willing. The proportion of willing and non-willing respondents did vary significantly with benefits generated. This might be because as more benefits generated from the park individuals do have a desire to secure that benefit so are willing to pay for park conservation.

Table-1: Descriptive statistics of some socio-economic characteristics for total respondents, willing and non-willing to pay respondents (frequency, percentages, and chi-square)

Variables		Non-willing to pay (N = 75)	Willing to pay (N = 155)	Total (N = 230)	$\chi 2$
		F (%)	F (%)	F (%)	
SEX	Female	32 (42.7)	64 (41.3)	96 (41.7)	0.039
	Male	43 (57.3)	91 (58.7)	134 (58.3)	
EDUC	Illiterate	52 (69.3)	41 (26.5)	93 (40.4)	38.589***
	Literate	23 (30.7)	114 (73.5)	137 (59.6)	
TSWC	No	71 (94.7)	148 (95.5)	219 (95.2)	0.074
	Yes	4 (5.3)	7 (4.5)	11 (4.8)	
BPA	No	31 (41.3)	28 (18.1)	59 (25.6)	14.349***
	Yes	44 (58.7)	127 (81.9)	171 (74.4)	

Note: Variables in which willing respondents have significant differences from non-willing respondents: *** = at 0.01 levels of significance.

The data on age revealed a wide range of responses starting from 21 to 74 years where the average was found to be 40.09 years. The mean age of willing respondents is higher than mean age of non-willing respondents, and the difference is statistically significant. This might be because old individuals might have bad experience with regard to environmental degradation.

The average household size of sampled respondents was 4.04 with a minimum of 1 household member and a maximum of 8 household members. The average family size was is lower but closer to the town average of 3.85 persons per household of CSA, 2010 report of population statistics. The average household size was about 4.03 and 4.07 for willing and non-willing households, respectively. The mean difference is not significantly varied between households in the two groups.

The surveyed households on the average earn Birr 12914.09 yearly income. Willing households earn Birr 15377.03 mean income per year which is significantly higher ($p<0.01$) than Birr 7824 mean yearly income of the non-willing households. This shows that as yearly income of the household increases their probability of willingness to pay also increases. This might because higher income earners are more flexible to invest for a good/service which secures them a higher level of utility.

Table-2: Descriptive statistics of some socio-economic characteristics for total respondents, willing and non-willing to pay respondents (Mean, Std. Dev, and t-value)

Variables	WTP	N	Mean	St. Dev.	Mean diff
AGR	NW	75	38.6	10.41	-2.87**
	Willing	155	41.03	10.04	
	Total	230	40.09	10.23	
HHSIZE	NW	75	4.07	1.91	0.04
	Willing	155	4.03	1.67	
	Total	230	4.04	1.74	
INCOME	NW	75	7824	7151.49	-7553.03***
	Willing	155	15377.03	12873.28	
	Total	230	12914.09	11855.97	

Note:

- Variables in which willing respondents have significant differences from non-willing respondents: *** = at 0.01 level of significance
- mean diff = mean (non wiling)-mean (willing), H_0: mean diff=0 and H_A: mean diff > < = 0

Of the total respondents 34.8 % of the respondents are aware of the various service provisions of protected areas. The share of respondents who are aware of protected area benefits was higher (46.4 %) for the willing than the non-willing (10.7 %). The proportion varies significantly with awareness level of the respondent to protected area benefits.

Households' Responses of the Single Dichotomous Choice Valuation

Table 3 presents the descriptive statistics of sampled respondents' responses to the randomly proposed initial bid values of single dichotomous choice valuation question. The majority of the respondents (67.4 %) were found to be willing to pay the proposed initial bid values to assist improved park management practices ; whereas the remaining 32.6 % rejected the proposed initial bid values.

As it is shown in table 3, the proportion of respondents who were willing to pay the randomly offered initial bid decreases as proposed initial bid value increases. When we compare percentages of 'yes' responses for the lowest bid value, 5 Birr/year, and highest bid value, 30 Birr/year; 87.2 % of the respondents offered randomly 5 Birr/year saying 'yes' to the lowest initial bid amount while 34.2 % of the respondents who were randomly offered the highest initial bid value were willing to pay that amount yearly. The WTP percentage was found to be consistent with economic theory when analyzed across bid amounts. The percentage of 'yes' and 'no' responses along the bid values also illustrate our argument and hypothesis that states the probability of 'yes' responses decline with increased bid price. Economic theory predicts that for normal goods/services individual are less willing to purchase the good/service as the price of the good/service increases. According to studies conducted by Andreoni, *et al.* [20] and Sugden [21] on environmental service user households WTP for watershed quality improvement, randomly assigned monthly initial bids influenced respondents' answers to the single dichotomous choice valuation responses. The result of the studies showed that the proportion of respondents' willing to pay the proposed initial bid value for improved watershed protection declines as the proposed initial bid value increases, which confirms our result.

Table-3: Distribution of 'Yes' response per bid value and average WTP per household/month (in Birr) for the proposed initial bid prices

Bids (in Birr)	**Total number of respondents/bid**	**'Yes' response per bid**	
		F	%
5	39	34	87.2
10	39	36	92.3
15	38	33	89.8
20	38	26	68.4
25	38	13	34.2
30	38	13	34.2
Pooled	230	155	67.4

Results of the Probit Model

To identify the key factors that determine probability of respondents WTP for improved park protection; probit regression model was estimated. In the model, the dependent variable equals to 1, if the respondent accepted the proposed initial bid and 0, otherwise.

In the probit model estimation the magnitude of coefficients of explanatory variables is not important except the sign and the magnitudes of p-values to determine its significance. So as to analyze the effect of each explanatory variable on the probability that respondents are saying yes or no to the proposed bid, the partial derivatives of discrete responses to the initial bid with respect to explanatory variables must be taken [16]. For continuous variables the interpretation of marginal effects is for a unit increase/decrease in the independent variable from the baseline outcome may increase/decrease the probability of the occurrence of an event by the magnitude of the marginal change holding other variables constant. On the other hand for discrete explanatory variables (that takes 0 or 1); the interpretation of marginal effect is the probability of the occurrence of an event. It is expected to change based on the magnitude of the indicated change holding other variables constant when the explanatory variable change from 0 to 1. The marginal effects of the probit model estimation results are reported in table 4, column 4.

As the result of heteroskedastic corrected probit model estimate in table 4 shows, the sign of all variables were as expected. Of the total 11 explanatory variables hypothesized to influence the probability of WTP choice decision, 7 variables were found to have significant effect on probability of a respondent accepting the initial bid, and the remaining 4 variables were found to be insignificant.

Table-4: The probit regression model estimation results for determinants of households WTP choice for improved park protection (with robust standard errors)

Variables	Coefficient	Robust Std. Err.	dF/dx	z-value
BID	-0.132	.0224	-.0338	-5.92***
AGR	0.048	.0134	.0121	3.55***
EDUC†	1.083	.2761	.2988	3.92***
SEX†	-0.427	.2427	-.1053	-1.76
INC	0.001	.00002	.00002	4.78***
HHSIZE	-0.179	.0870	-.0459	-2.07**
TSWC†	0.496	.5059	-.1518	-0.98
BPA†	0.745	.3059	.2199	2.44**
APB†	1.078	.4707	.2346	2.29**
PPB†	-0.255	.3814	-.0659	-0.67
SCR†	0.251	.3128	.0671	0.80
Constant	-0.237	0.7394		-2.21**
No. of obs.	250			
Log likelihood	-62.24			
Pseudo R-square	0.5714			
LR chi2(11)	165.94***			
Prob > chi2	0.0000			

Note:

- Significant variables affecting WTP decisions at 0.01 (***), 0.05 (**) and 0.10 (*) levels of significance.
- †dF/dx is for discrete change of dummy variable from 0 to 1

The result of the probit model showed that the variable education level (EDUC) of the respondent is positively related to the probability of respondents WTP for improved park protection as expected (table 4). Education is highly significant at 1 %. The result of the marginal effect estimate of the probit model for education variable revealed that holding the influence of other factors constant, a literate respondent increases the probability that a respondent is WTP for watershed protection by 29.88 %.

This finding suggests that the probability of WTP by respondents with a higher educational attainment tend to be higher than those with lower educational attainment, thus confirming the importance of education in raising people's awareness about environmental protection benefits. A possible explanation is that respondents with more years of education can easily realize the benefits from improved watershed protection and negative impact of environmental degradation. And hence are more likely to attach high value for improved watershed protection benefits than those who have no or shorter years of education. In addition, higher educational attainment impress positive effect on probability of WTP since higher educational attainment indicates a higher ability to pay. The findings of Whittington *et al.* [18] and the Davies, et al.[22] which was done on developing countries; with regard to

households WTP for improved water services indicated that better educated households are more WTP for improved water services. This result is also supported by the findings of previous improved water resource valuation study in Ethiopia [17, 23].

The sign of the variable household size (HHSIZE) turned out to be consistent with the prior expectation. Household size has negative sign and significant at 5 % level of significance. That is, respondents with higher family size are less likelihood to say yes to the proposed bid. The marginal effect of probit model result shows that keeping all other variables constant if the number of family size increases by 1 person, the probability of households' WTP for park protection decreases by 4.59 %. This finding suggests that as family size increases, the household expense will also increase so that they will not be willing to incur additional expense. This might be because of the high opportunity cost of using income for water service, due to high demand for food and other necessities in such families. This result is consistent with [23] which founds that household size determines negatively households WTP for improved water supply service.

Household yearly income (INC) had expected positive sign and statistically significant at 1 % level of significance on households WTP for improved park protection. This indicated that a household with higher yearly income is more likely to pay for park protection than a household with lower yearly income. The significance and positive sign of income variable is consistent with economic theory that says income is positively related with demand in the case of normal goods. The marginal effect estimate for households monthly income (INC) variable shows that a 1 Birr increase in income of the household will increase the probability of households' WTP for improved park protection by 0.0002 %. This is likely due to the fact that households with higher income have more flexibility in being able to invest in the future sustainability of the improved park protection services. As individuals income increases the quality of goods/services they desire or demand for goods/services will rise as economic theory predicts. So, those with higher income are more likely to spend money for improved park protection, than those with lower income. A study result Amponin *et al.* [25] on WTP for environmental resource protection supports our result that household's income determines positively their WTP for improved environmental services.

The variable benefits from protected areas was found to have significant ($P<0.05$) effect with a positive parameter estimate on the probability of WTP decision for improved park protection. This means that as respondent get some kind of benefit from protected areas; he/she become more likely to pay for the park protection program. The marginal effect of this variable shows, those respondents having benefit will have 21.99 % more probability of paying for park protection than those who didn't get benefit. Benefit from such sources obviously would contribute to the improved welfare of the household that would motivate them more to contribute for park conservation.

The estimated coefficient of level of awareness of the respondent dummy variable had an expected positive effect related to the likelihood of saying yes to the proposed initial bid. The coefficient of this variable was statistically significant at 5 % probability level. That is, households who are aware of the benefits of park protection services are more likely to say yes to the proposed initial bid. Particularly, the marginal effect result of the probit model shows changing the awareness dummy variable from 0 to 1 will increase probability of respondents WTP for park protection by 23.46 %. One possible reason could be those respondents who are aware of improved park protection benefits wants to maximize their utility from these services. Those respondents who are aware of possible impacts of park resource degradation want not to face those problems. So, respondent's who are aware of improved park management importance are more likely to pay for improved park protection to maintain the desired utility.

The estimated coefficient of the bid value (BID) was found to be statistically significant at the 1 % level with the expected negative sign. The estimated marginal effect of the probit model for the initial bid value showed that keeping the influence of other variables constant; a 1 Birr increase in the proposed initial bid price for park protection reduces the probability of respondents WTP for park protection by 3.38 %. This indicates that the probability of WTP to support park protection practices decreases (increases) as the bid price increases (decreases) under the hypothetical market scenario, which is logical as economic theory predicts. As economic theory predicts, demand for good/service decreases as the price of the good/service increases given other factors constant. A study by Amponin *et al.* [25] on WTP for watershed protection by domestic water users in Tuguegarao city, Philippines using the CVM supports our finding that randomly assigned initial bid value determines WTP for improved watershed protection and the probability of WTP falls as monthly bid value proposed increases.

CONCLUSIONS

Majority of the hhs are WTP for improved ecological protection of SMNP so as to ensure a reliable benefit from the park. We found that protected area benefits, household income, education, age, and

awareness on environmental conservation values were key factors in explaining community views towards protected areas. The probit mean WTP for improved SMNP protection from the dichotomous choice value elicitation survey responses is 24.21 Birr per household/year. Respondents, those WTP for improved SMNP ecological protection, were better educated, economically better off and better aware of the benefits of protected area resources. From probit regression results seven variables were found to be significantly related to willingness to pay decision. The factors that significantly and positively determined willingness to pay decision were education level of the respondent, income of the household, age of the respondent, benefits generated from the park and awareness level of the respondent about watershed benefits. On the other hand, household size and proposed initial bid significantly and negatively determined decisions of willingness to pay.

Policy makers must embark on an intensive publicity campaign to educate the people. In order to improve residents' familiarity and awareness level, making everyone know the environmental philosophy "who profits, who pays". The higher probit mean WTP result; shows that there is still a possibility of increasing aggregate WTP by manipulating the influential determining factors like awareness variable. The provision of complementary services is important to boost the value attached by the community to improved ecological protection like awareness creation of the importance of protected areas. This recommendation stems from the fact that there is a positive relationship between WTP and variables like ecological conservation benefit awareness and educational level of the respondent.

REFERENCES

1. Michealwell, Katrina; People and parks: Linking protected areas management with local community. World Bank. Washington D.C, 1992.
2. Nuva R, Mad NS; Willingness to Pay towards the Conservation of Ecotourism Resources at Gunung Gede Pangrango National Park, West Java, Indonesia. Journal of Sustainable Development, 2009; 2(2): 1-2.
3. Zelealem T; Common property resource management of an Afro-Alpine habitat: Supporting a population of a critically endangered Ethiopian Wolf (Canis simensis), PhD. Thesis, Durrel Institute of Conservation and Ecology, University of Kent, 2001.
4. Brandon KE, Wells M; Planning for people and parks: Design dilemmas. World Development, 1992; 20(4): 557-570.
5. International Institute for Environment and Development (IIED); Whose Eden? An Overview of Community Approaches to Wildlife Management. London: International Institute for Environment and Development, 1994.
6. Newmark WD, Manyanza DN, Gamassa DM, Sariko HI; The Conflict between Wildlife and Local People Living Adjacent to Protected Areas in Tanzania: Human Density as a Predictor. Conservation Biology, 1994; 8(1): 249-255.
7. Convention on Biological Diversity; Handbook of the Convention on Biological Diversity, 2005.
8. McNeely JA; Partnerships for Conservation: An Introduction. In J.A. McNeely (Ed.), Expanding Partnerships in Conservation. Washington, D.C.: Island Press, 1995; 1-10.
9. Mathieu LF, Langford IH, Kenyon W; Valuing marine parks in a developing country: a case study of the Seychelles. Environment and Development Economics, 2003; 8: 373-390.
10. Shah A; the Economics of Third World National Parks: Issues of Tourism and Environmental Management. Aldershot, UK: Edward Elgar, 1995.
11. Ashenafi ZT, Leader-Williams N; Indigenous common property resource management in the Central Highlands of Ethiopia. Human Ecology, 2005; 33(4): 539–563.
12. Hulme D, Murphree M, eds,; African wildlife and livelihoods: The promise and performance of community conservation. Oxford, U.K.: James Currey Ltd, 2001.
13. Falch F, Keiner M; Simien mountains national park management plan, final draft (unpublished). Amhara National Regional State, Bahir Dar, 2000.
14. Hanemann WM, Loomis L, Kanninen B; Statistical efficiency of double bounded dichotomous choice contingent valuation. American Journal of Agricultural Economics, 1991; 73(4): 1255-1263.
15. Habb TC, McConnell KE; valuing environmental and natural resource: The econometrics of non-market valuation. New Horizons in Environmental Economics, Edward Elgar publishing, 2002.
16. Greene WH; Econometric analysis. 5th edition, Prentce Hall, Inc, 2003.
17. Tegegne G; Willingness-to-pay for environmental protection: An application of contingent valuation method (CVM) in Sekota District, Northern Ethiopia. Ethiopian Journal of Agricultural Economics, 1999; 2(1).
18. Whittington D; improving the performance of contingent valuation studies in developing countries. Journal of Environmental and Resource Economics, 2002; 22(6): 323-367.
19. Foley JA, DeFries R, Asner GP, Barford C, Bonan G, Carpenter SR, Snyder PK, et al.; Global consequences of land use. Science, 2005; 309(5734): 570-574.

20. Andreoni J; Impure altruism and donations to public goods: a theory of warm-glow giving. The economic journal, 1990; 464-477.
21. Sugden R; Reciprocity: the supply of public goods through voluntary contributions. The Economic Journal, 1984; 772-787.
22. Davies S, Guppy N; Fields of study, college selectivity, and student inequalities in higher education. Social forces, 1997; 75(4): 1417-1438.
23. McPhail AA; The “five percent rule” for improved water service: can households afford more? World Development, 1993; 21(6): 963-973.
24. Diener E, Biswas-Diener R; Will money increase subjective well-being? Social indicators research, 2002; 57(2): 119-169.
25. Amponin JAR, Bennagen MEC, Hess S, Di J, de la Cruz S; Willingness to pay for watershed protection by domestic water users in Tuguegarao City, Philippines. Poverty Reduction and Environmental Management (PREM) Working Paper 07/06 ASEAN Center for Biodiversity, 2007-06. 2007.