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Determinant of Household Willingness to Conserve Gibe Sheleko National Park: An Application of Contingent Valuation Method (CVM)

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Abstract

The problems related to Natural Resources and Environmental Goods has been the main topic of discussion in every Conference and Panel discussions as worldwide and country level. Among all, this study focused on Conservation of Gibe Sheleko National Park, which is very threated by society. For this reason this study examined determinant of Household's willingness to pay or labor force contribution for conservation of the park. Contingent valuation method used to estimate household's WTP for the conservation of the park in terms of money as well as labor force contribution; seemingly unrelated bivariate probit model was used to analyze the determinants of households' WTP and to estimate the mean WTP which obtained from Double Bounded Dichotomous choice (DBDC). Results of the model shows that age of the household head, income related to park resource, distance of home to park and training were negatively and statistically significant. Whereas marital states, family size, household income Occupation of household's TLU and frequent contact were positive and statistically significant. The study also show that the mean willingness to pay estimated from the Double Bounded Dichotomous Choice formats was computed at 98.72 ETB and 43.8 labor force days per annum per household, respectively. The respective total aggregate value of conservation was computed to 395336.28 ETB and 175331.4 labor force day per annum, respectively. When we convert the labor force contribution in to local labor wage price on average one person daily laborer wage is 60 ETB then the aggregation labor force contribution is 10,519,890 ETB per annum. To close the implication is that any policy direction towards conservation of the parks and other natural resource should integrate the community at large.

Keywords: Contingent valuation method; Double bounded dichotomous choice; Willingness to pay; Bivariate probit model

Introduction

Natural resources are categorized as non-renewable and renewable. The term non-renewable means that the resource system ultimately has a fixed stock (fixed size of total reserves) and their potential reserves can be exhausted within the human time frame. On the other hand, renewable resources such as forests are differentiated from non-renewable resources primarily by the fact that they can be replenished. According to Perman environmental resources are renewable when they have a capacity to reproduce and grow [1]. However, for some renewable resources the continuation and volume of their flow depend crucially on human intervention.

Many natural resource such as lakes, rivers, streams, estuaries, forests and national parks are used extensively by people for various types of recreational activities, for daily income generation activity specially fishery, small enterprise restaurant and cafe and boating, and also for research purpose. Natural resource systems provide valuable services to people. From an economic perspective, these services have two important features. First, the economic value of these services depends upon the characteristics of the natural resource system. Knowledge of the value of these services is therefore important for a variety of resources management decisions. Second, access to the resource for recreation is typically not allocated through markets [2].

To conserve park resources, Ethiopia has established protected areas at different levels and dedicated environmental resources to biodiversity and wildlife protection area. Almost 84% of the population lives in rural areas, most of the population lives in the highland areas and their major occupation of the settled rural population are farming, and a large part of this population depends directly or indirectly on natural resources [3].

According to Anemut, inclusion of local community's priorities, problems, needs and views is important to design and implement conservation strategies. Similarly, the participation of the local community in producing and implementing National park management plans, policies and strategies is necessary.

Larger areas are being designated for conservation of biodiversity at the same time as forests are meeting increasing demand for forest products and services. Thus, significant development has been made towards reversing the general trend of forest area degradation. However, deforestation (including unrestrained conversion of forests to agricultural land), continues at an alarmingly high rate in many countries. Significant efforts are needed to ensure the general trend in scope of forest resources is positive or stable in all regions.

Gibe sheleko National park is among the recently established National Parks of the country, the Park is home to a diverse array of unique bird species, woodland and Animal species. Protecting and conserving the park is use full for specially three purposes: First, it increases the income for community and revenue for government as it is recreational site attracting tourists. Second, it balances the environmental weather condition because of the surrounding area is covered by forest. Third, endemic animals and birds living in and around the lake will be saved.

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However, the park was exposed to severe pressure from anthropogenic activities, these pressure come from unsustainable human activities and livelihoods needs of the surrounding community. The major problems that Gibe Sheleko National parks faced were extensive overgrazing, increasing demand for fuel wood and charcoal as a source of income, farm land expansion, uncontrolled fire and hunting, cutting of tree for house hose construction and fence. The direct results of all these externality activities harmed the biodiversity and ecosystem of the park through serious environmental degradation and deforestation.

Therefore, it is important to recognize that societies inside and around the park are fundamental to the conservation of Gibe Sheleko National park as they are the primary beneficiaries and losers otherwise. To know the determines of households willingness to conserve the park is crucial to take any remedial action or conservation policy implementation, not only this but also to know household attitudes and perception about the value that attach to the park resource and their willingness to pay (WTP) for the conservation of Gibe Sheleko National park either in cash or labor force is vital to maintaining the park.

To the best knowledge of the researcher, no exertion has been made in the study area to determine household willingness to conserve the park and empathetic household's attitudes and perceptions regarding the park biodiversity resource using likert scale and measure households' willingness to pay to conserve. As a result, this study was conducted by using contingent valuation method. Therefore the General objective of the study was determining households' willingness to pay for conservation of Gibe Sheleko National park.

Research Methodology

Description of the study area

Gibe Sheleko National Park was established only in 2001 and is administered by the South Nation and Nationality of the People (SNNPR). The park is about 174 km southwest of Addis Ababa, on the edge of the Ethiopian highland massif and covers 36 thousand hectare or 360 km^2 in three districts zone (Hadiya, Gurague and Jima) and one special woreda (Yem). This park is unique due to its high bird species diversity different Animal species and woodland ecosystem. However, from its establishment in 2001 the Park and the local community live inside and outside the Park are facing a lot of challenges related with biodiversity conservation and livelihood needs. In principle, the communities seem as an opportunity to obtain economic benefits from the park but have not been generate any economic value because the park not conserved and protected to attract for visiting the park and recreate in the park, and this ample recreation opportunities available around and inside the park to domestic and foreign tourist and visitors.

In this thesis, we was used Gibe Sheleko National Park as a case to determine household willingness to conserve gibe sheleko national park using contingent valuation method.

Source of data and method of data collection

The primary data utilize in the descriptive and empirical analyses of this study was collected from four woredas which found in the surrounding of the park using one of the probability sampling techniques which is multi-stage sampling, the households in six villages (Kebeles) were selected by using Simple Random Sampling, those selected kebeles were four woreda administration of the SNNP Regional State of Ethiopia. The data was collect through CV survey questionnaire that the researcher was design and then organizes in a way that could capture all relevant information by employing face to face data collection techniques. A double bounded dichotomous choice with follow up format was used to elicit respondents' WTP for conservation of Gibe Sheleko National park in terms of cash or labor force contribution. In addition, information regarding the socioeconomic characteristics of households' was collected. Secondary data will collect from books, articles, magazines and source document about the park from Gibe Sheleko National park office, Gurage Zone forest and environment office.

Sample design and procedures

The study was followed one of the probabilities sampling technique type that was multi-stage sampling. Because of the advantage that it gives such as, it was easier to administer than most sampling technique, it was relatively convenient, less time consuming and less expensive method of sampling.

The sample size of the study was determined based on Kothari formula for determining the sample size of respondents from the finite population as follows [4]:

$$n = \frac{z^2 p \times q \times N}{e^2 (N-1) + z^2 \times p \times q}$$

Where**:**

N is total size of household population, n is Sample Size for finite population, Z is Z value which is 1.96 as per table of area under normal curve for the given confidence level of 95%, *e*=margin of error is the plus or minus figure usually, expressed as decimal (±0.06); the estimate should be within 6% of true value. The researcher desires to be used 95% confident that the percentage has been estimate.

As Andualem were used to give that *p* value being the proportion of defectives in the universe, let us assume it to be *p*=0 .7, *p*=sample proportion, success for each households to be include in the sample, *q*=1–*p*, failure for each households to be included in the sample (*1-P*=0.3).

$$\frac{1.96^2 \times 0.7 \times 0.3 \times 4003}{0.06^2 (4003-1) + 1.96^2 \times 0.7 \times 0.3} = 212$$

Econometric model specification

According to Habb and McConnell, the main objective of estimating econometric model in willingness to pay survey was to calculate mean willingness to pay and to allow inclusion of respondents' socio-economic factors in to willingness to pay functions which supports the researcher to obtain information on the validity and reliability of the contingent valuation results and hence increasing confidence in application of results obtained from the contingent valuation empirical analysis

The seeming unrelated bivariate probit model were employed to analyze the data, in the bivariate probit model of double bounded dichotomous format, individuals were asked two respective questions that had 'Yes' or 'No' responses where the second question involves another bid depending on the first answer. There was a need to derive the likelihood function of the model to get the parameter estimates of this bivariate probit model, which takes in to consideration the follow-up questions in the double bounded dichotomous choice.

The general expression for the model was framed following Greene two related equations as [5]:

$$Y_1 = \alpha_1 + \beta_1 T_1 + \sum_{i=1}^{n} \beta_i X_i + \varepsilon_1 \quad (1)$$

$$Y_2 = \alpha_2 + \beta_2 T_2 + \sum_{j=1}^{m} \beta_j X_j + \varepsilon_2 \quad (2)$$

corr[ε_1,ε_2]=ρ.

Where Y_1 and Y_2 the binary responses to the WTP questions; T_1 and T_2 are the bids in the first and second bid questions; X_i represents explanatory variables, α's and β's the coefficients were estimated. In this thesis the explanatory variables of both models were the same (X_i=X_j).

The two correlated WTP equations (eqns. (1) and (2) above) with jointly distributed normal error terms are simultaneously modeled as single bounded. This model provides information on what variables are crucial for each of the responses to the WTP question. They further state that estimation of the mean WTP is feasible using the bivariate probit CV model since bivariate normal probability density functions allow for a zero and non-zero correlation.

Haab and McConnell, they put that the essence of a double-bounded model was as follows [6]. Respondents were presented with initial bid prices. Following their initial responses, they were given new prices, lower if their initial responses are no, higher if the responses are yes. Double-bounded models substantially increase the complexity of the analysis, because now the second question may depend in some way on the first question. There is potential for changes in the incentive compatibility of the model, or at least some differences in the way respondents treat the first and second questions.

Let T_1 be the first bid price and T_2 be the second bid price. The bounds on WTP were:

I. $T_1 \leq WTP > T_2$ for the yes-no responses;

II. $T_1 > WTP \geq T2$ for the no-yes responses;

III. $WTP \geq T_2$ for the yes-yes responses;

IV. $WTP < T_2$ for the no-no responses.

Following Haab and McConnell, the most general econometric model for the double-bounded data is given as:

$$WTP_{ij}=\mu_i+\varepsilon_{ij} \quad (3)$$

Where WTP_{ij} represents the j^{th} respondent's willingness to pay, and i=1, 2 represents the first and second answers. The μ_1 and μ_2 are the means for the first and second responses. ε_{ij} is unobservable random component. Setting $\mu_{ij}=x_{ij}\beta_i$ allows the mean to be dependent upon the characteristics of the respondents (demographic and socio-economic variables).

To construct the likelihood function, we first derive the probability of observed each of the possible two-bid response sequences (yes-yes, yes-no, no-yes, no-no). To design the probability that respondent j^{th} answers yes to the first bid and no to the second was given by,

$$pr(yes, no)=pr(WTP_{1j}\geq T_1, WTP_{2j}<T_2)$$

$$pr(\mu_1+\varepsilon_{1j}\geq T_1\mu_2+\varepsilon_{2j}<T_2) \quad (4)$$

The other three alternative responses could be constructed as similarly too. Finally the j^{th} contribution to the likelihood function becomes:

$$\begin{aligned} L_j(\frac{\mu}{T}) &= pr(\mu_1+\varepsilon_{1j}\geq T_1, \mu_2+\varepsilon_{2j}<T_2)^{SN} \\ &\times pr(\mu_1+\varepsilon_{1j}> T_1, \mu_2+\varepsilon_{2j}\geq T_2)^{SS} \\ &\times pr(\mu_1+\varepsilon_{1j}< T_1, \mu_2+\varepsilon_{2j}< T_2)^{NN} \\ &\times pr(\mu_1+\varepsilon_{1j}< T_1, \mu_2+\varepsilon_{2j}> T_2)^{NS} \end{aligned} \quad (5)$$

Where SS=1 for a yes-yes answer, 0 otherwise; SN=1 for yes-no answer, 0 otherwise; NN=1 for no-no answer, 0 otherwise; NS=1 for no-yes answer, 0 otherwise.

This formulation was referred to as the bivariate discrete choice model. If the errors are assume to be normally distributed with means 0 and respective variances of σ_1^2 and σ_2^2, then WTP_{1j} and WTP_{2j} have a bivariate normal distribution with means μ_1 and μ_2, variances σ_1^2 and σ_2^2, respectively and correlation coefficient ρ.

$$L_j(\frac{\mu}{T}) = \Phi\varepsilon_1\varepsilon_2(d_{1j}(\frac{T_1-\mu_1}{\sigma_1}, d_{2j}(\frac{T_2-\mu_2}{\sigma_2}, d_{1j}d_{2j}\rho) \quad (6)$$

Where $\Phi\varepsilon_1\varepsilon_2$=the bivariate normal cumulative distribution function with zero means $d_{1j}=2Y_{1j}$ -1, and $d_{2j}=2Y_{2j}$ -1, Y_{1j}=1 if the response to the first question is yes, and 0 otherwise Y_{2j}=1 if the response to the second question is yes, and 0 otherwise ρ is correlation coefficient and σ standard deviation of the error.

Results and Discussions

Descriptive analysis

Attitudes and perceptions about biodiversity conservation: The first survey question asked households to state their participations and support of each other for the benefit of the communal they rate their level of perception based on the five likert scale as follows Households were measured via the 5 Likert scale and we asked them as *Please tell us how do you feel about the following statements using the scale from 1 to 5, 1 being strongly disagree (SD), 2 being disagree, 3 being neutral, 4 being agree, 5 being strongly agree.*

Attitudes and perception of households on gibe sheleko national park biodiversity importance and conservation proposed program were measured by asking respondents to express their feelings about statements as

i. People in this community are involved in activities that benefit the community

ii. Importance of the park is our country's pride and is essential to control desertification and healthy environment

iii. It is important to keep the park for the survival of various plants and animal species

iv. Park should be protect for the benefit of our future generations

v. The illegal cutting of trees, wildlife trapping and hunting should be discourage and

vi. Households can get more income because of park resource conservation.

Out of 201 households 70, 63, 64 and 62 household put their strongly agreed and 105, 110, 99 and 100 being agreed respectively, 17, 18, 17, 24 and 30 households put at state of being neutral, the rest household put strongly disagreed and being disagreed and the test of cronbach's alpha below.

Test scale=mean (unstandardized items)

Average interitem covariance: 0.4523765

Number of items in the scale: 6

Scale reliability coefficient: 0.9320.

A high value of the Cronbach's alpha implies a higher internal consistency of the construct scale, so the Cronbach's alpha of the overall perception and attitudes of the community conservation practices scale is 0.932 when the scores of all 6-items are combined in a scale under homogeneous weighting. This suggests the internal reliability of the scale is very high.

Econometrics analysis

Testing for starting point bias (anchoring) and unobserved exogeneity: Before presenting the regression results from the bivariate Probit model, first test whether Bivariate Probit is a better fit model by performing a likelihood ratio (LR) test and Wald test by testing unobserved exogeneity in the Bivariate Probit model by considering whether the correlation coefficient (ρ) between the two error terms is zero or not.

To test the significance of the seemingly unrelated bivariate probit estimates model the log-likelihood ratio test, the pseudo-R^2 is used. The computation result for pseudo R^2 27% and for the likelihood ratio test, the calculated LR chi square (28) is 81.78 and the critical value of the test with 28 degrees of freedom (x^2 28) at 1% significance level is 48.28. The calculated value is higher than the tabulated value at one percent significance level. Therefore, the likelihood ratio test of goodness of fit under the null hypothesis that all parameters are zero can be rejected. Hence, our seemingly unrelated bivariate probit model fit the data well.

Determinants of Household's willingness to pay for conservation of Gibe Sheleko National park: Table 1 shows the effects of the bid prices and different demographic and socio-economic factors of respondents on willingness to pay in cash to conserve the park.

Age of the household head (Ag): Age of the household head had negative effect on the willingness to pay of households for conservation gibe sheleko national park. It had negative and significant effect on households WTP in cash at less than 1% level of significant. The negative and significant correlation between age and willingness to pay for conservation of the park might be perhaps because of two reasons. Older age may shorten planning time horizon and reduce willingness to pay. Thus, older are less likely willing to pay for conservation of the park as they expect they have no awareness of the environment compared to new generations even though they understand the use of those resources through experience. Another reason is smaller control over family's budget, reliance on children after their retirements. The negative relationship between age and investment for environmental protection is consistent with the findings of Tegegne [7]. The marginal effects signify that, for every one year rise in the age of the households, the probability of saying "yes" to a given bid declines by 0.47%, ceteris paribus.

Sex of Household head (SH): As dummy variable sex of the households has a positive sign though it is not expected a priori. It shows that male respondents are willing to pay more than females. However, the result is not statistically significant and therefore the variable is not statistically important.

Marital status of the household's head (MS): The dummy variables MS coefficient registered positive sign, indicating that married household's likelihood of accepting offered bids is higher than willingness to pay than those singles, this might be because of married people are considered better managers of household affairs and they want to conserve the park biodiversity for future generation and statistically significant at 10% [8]. Marital status produces a

Log pseudo likelihood=-184.40407			Number of obs=201 Walid chi² (28)=81.78 Prob> chi²=0.0000		Marginal effect	
	Equation 1		Equation 2			
Variable	Coef.	P>z	Coef.	P>z	dy/dx	P>z
T1	-0.2376711*** (0.0445428)	0.000			-0.073597	0.000
T2			-0.0600098* (0.0349719)	0.086	-0.0179801	0.054
Ag	-0.0319718*** (0.0106092)	0.003	0.0173581* (0.009933)	0.081	-0.0046995	0.218
SH*	-0.127942 (0.2415138)	0.596	0.3091017 (0.2245419)	0.169	0.0568676	0.456
MS*	0.4845736* (0.2496324)	0.052	-0.0695553 (0.2460572)	0.777	0.1332991	0.105
FS	0.2186933*** (0.0814878)	0.007	-0.0176957 (0.0818563)	0.829	0.0624184	0.039
EL	-0.0218977 (0.045749)	0.632	0.0172446 (0.0372617)	0.644	-0.001614	0.924
HI	0.0000626*** (0.0000127)	0.000	0.0000256** (0.0000121)	0.034	0.000027	0.000
DR	-0.2118468 (0.3015001)	0.482	-0.024108 (0.269742)	0.929	-0.0728235	0.408
OCH*	0.2864551 (0.4957825)	0.563	0.2377082 (0.3943882)	0.547	0.1574891	0.347
TLU	0.0775243* (0.046765)	0.097	-0.0031618 (0.0484506)	0.948	0.0230588	0.198
DP	-0.4602732*** (0.1133962)	0.000	-0.0592069 (0.0991241)	0.550	-0.1602674	0.000
IR	-0.0011963*** (0.0003699)	0.001	0.0003442 (0.0002972)	0.247	-0.0002673	0.010
TWC*	-0.4440138* (0.2272212)	0.051	-0.1652989 (0.2054475)	0.421	-0.1848672	0.010
FPC	0.2779231** (0.1412293)	0.049	-0.1005393 (0.1297231)	0.438	0.0559379	0.237
_cons	1.825392 (0.761325)	0.017	-0.3170362 (0.7451171)	0.670		
/athrho	-0.07929354			0.017		
rho	-0.6600687					
Wald test of rho=0:chi²(1)=7.24336 Prob>chi²=0.0071						

***, **, *in coefficient indicates significance level at 1%, 5% and 10% respectively, *in the variable dy/dx is for discrete change of dummy variable from 0 to 1. Numbers in parenthesis are standard errors.

Source: Own survey 2017.

Table 1: Results for seemingly unrelated bivariate probit model with robust in cash and marginal effect.

marginal effect of 0.1332, meaning that for a discrete change of the dummy variable, marital status, from zero to one, the probability that an individual will be interested to pay in cash to conservation will also increase by 13.32% from the mean keeping other thing remain constant.

Family size of the household (FS): The coefficient of this variable supports the proposed program and it was found to be significant at 1% probability level. Households with higher family size are expected to pay more than those who have less family size. Looking at the marginal effect, keeping other factors constant, as the family size of the household increased by one person, the amount of price that the household head is willing to pay for conservation of the park will increase by about 6.2%.

Level of education coefficients on WTP was found to be in line with established theory and evidences which suggest that education is positively linked with people's WTP for both equation, implies that people who are higher educated can be aware of the need for conserving and managing environmental resources better than other who are not higher educated. However, not significant, this is consistent with study of Zewdu and Yemesrach [9]. It is not surprising to found that education is not an important variable in the model since most of the households are illiterate thus wherever additional years of schooling rise up to certain level may not have any effect on WTP.

Household income (HI): Income of households is expected to have a positive relation with willingness to pay answer. As monthly income of households increase their willingness to pay will also increase. As expected the result from our study showed the expected sign in equations one highly significant at 1% significant level and also statistically significant in equation two at 5%. A one unit increase in the income of the respondents increases the probability of positive response for offered bid from the mean by 0.0027% on average. In line with other studies we can be further seen that income is the most important variable which determines the WTP of the household. This aspect has been substantiated by evidence by other studies as well by Binilkumar and Ramanathan [10].

Total Livestock unit owned by households (TLU): Livestock ownership in TLU was found to positively affect the willingness of the households to pay for the conservation of the park at 10% significance level. TLU could be a proxy for household's wealth and as the wealth of the household increases; the household's WTP is expected to increase. Another reason could be that households would expect sustainable feed source to their animals from park grass and leaves as a result of the conservation of the park. The marginal effect of this variable indicates that for each additional increment of TLU, the probability of being willing to pay for the conservation of the park will increase by about 2.3%, keeping other variables constant at their means. This result is in line with the studies conducted by Tefera [11].

Distance from the park (DP): The coefficient for distance from household home to the park was found to be expected sign, negative and it is highly significant at 1% level of significance, implies that the farther the households to the park, the less they are willing to pay to conserve otherwise vice versa. This may be showed by the amount of dependency of the individuals on the park and its biodiversity. A one kilometer increase in distance (far off) of the respondents from the site decreases the probability of positive response for offered bid from the mean by 16.02%, keeping other factors being equal. These results support the findings of earlier research carried out by Binilkumar and Ramanathan.

Income related to park Resource (IR): The yearly income households obtained from the park resource was found to influence the willingness to pay negatively, it show that statistically significance at 5%, the result of marginal effect shows that a one birr increase in the annual income got from the park resource decrease the probability of willingness of the household to pay for the conservation of the park by 0.02% on average.

Training or workshop on the conservation of the park resource (TWC): This variable showed a significant negative relation with the willingness of the household to pay at 10% significance level. Since most of the household head illiterate it does not increase the willingness to pay. Its marginal effect result shows that training on the conservation on the park resource will decrease the probability of WTP of households by 18.48% ceteris paribus.

***Frequency of household head contact with park officer (FPC)*:** This variable was found to have positive effect as expected and significant at 5%. This could be because those households who have contact with park officer or scout are expected to have better information and awareness about the general status of the resource and the conservation the park which may increase the willingness of the household head to pay for the conservation. The marginal effect value shows that the probability of being willing to pay that have contact with park officer or scout agents increases by 5.59%, ceteris paribus.

Initial Bid (T1): The coefficient of initial bid was negative as expected and statistically significant at 1% for the first question. The second bid which depends on the response of the first bid is also significant at 10% and has a negative coefficient in the second question. As the bid amount increases, the households would be less willing to accept the hypothesized scenario and that is consistent with the law of demand.

Determinants of willingness to contribute labor force for conservation of Gibe Sheleko national park: As Table 2 below show that Age (Ag) of the household head had negative effect on the willingness to pay of households for conservation gibe sheleko national park. It had negative and significant effect on household's willingness to contribute labor force per month at 5% level of significant. The descriptive statistics also shows there is a significant difference between the two mean. The negative and significant correlation between age and willingness to contribute labor force for conservation the park, might be perhaps because of two reasons. Older age may shorten planning time horizon and reduce the WTP. Thus, older are less likely willing to contribute labor force for conservation of the park as they expect they have no awareness of the environment compared to new generations even though they understand the use of those resources through experience, young households may have a longer planning horizon and, hence, may be more likely to be willing for conservation. The negative relationship between age and investment for environmental protection is consistent with the findings of Solomon [12]. The marginal effects signify that, for every one year rise in the age of the households, the probability of saying "yes" to a given bid declines by 0.007%, other thing remain constant.

Sex (SH): As dummy variable sex of the respondent has a negative sign though it is not expected a priori. It shows that female household are willing to pay more than males, the result is highly statistically significant at 1% and male household head has 6.99% lower probability of negative response as compared to female households. Marital states (MS) family size (FS) and dependency ratio (DR) all the dummy variables are coefficient registered positive sign, but statistically not

Log pseudo likelihood=-184.40407			Number of obs=201 Walid chi²(28)=81.78 Prob>chi²=0.0000		Marginal effect	
	Equation 1		Equation 2			
Variable	Coef.	P>z	Coef.	P>z	Dy/dx	P>|z|
TL1	-0.5092475*** (0.0445428)	0.000			-0.1104547	0.000
TL2			-0.0600098* (0.0349719)	0.000	-0.0880942	0.000
Ag	-0.0250822** (0.0106092)	0.022	0.0173581* (0.009933)	0.098	-0.000075	0.983
SH	-1.462662*** (0.2415138)	0.000	0.30910179** (0.2245419)	0.049	-0.0699222	0.398
MS	0.2608048 (0.2496324)	0.345	-0.0695553 (0.2460572)	0.568	0.0993626	0.175
FS	0.02646 (0814878)	0.757	-0.0176957 (0.0818563)	0.449	-0.0133077	0.632
EL	-0.1261162*** (0.045749)	0.010	0.0172446 (0.0372617)	0.725	-0.0226564	0.085
HI	0.0000557*** (0.0000127)	0.000	0.0000256 (0.0000121)	0.157	0.0000173	0.000
DR	0.1657335 (0.3015001)	0.546	-0.024108 (0.269742)	0.949	0.0304283	0.765
OCH	0.9189648* (0.4957825)	0.095	0.2377082 (0.3943882)	0.535	0.2329827	0.048
TLU	0.1002599* (0.046765)	0.099	-0.0031618 (0.0484506)	0.373	0.0354352	0.052
DP	-0.200386* (0.1133962)	0.082	-0.0592069 (0.0991241)	0.987	-0.043961	0.180
IR	-0.0005472* (0.0003699)	0.085	0.0003442 (0.0002972)	0.452	-0.0001875	0.051
TWC	-0.4449255* (0.2272212)	0.059	-0.1652989 (0.2054475)	0.437	-0.0458623	0.538
FPC	-0.0178847 (0.1412293)	0.901	-0.1005393 (0.1297231)	0.984	-0.0030335	0.949
_cons	3.049659 (0.761325)	0.000	-0.3170362 (0.7451171)	0.435		
/athrho	-0.4608392		0.017			
rho	-0.6600687					
Wald test of rho=0: chi²(1)=5.65131 Prob>chi²=0.0174						

***, **, * indicates significance level at 1%, 5% and 10% respectively.
Numbers in parenthesis are standard errors.
Source: Own survey result 2017.

Table 2: Results for Seemingly Unrelated Bivariate Probit Model with robust, labor force contribution.

significant, this might be because of married household family size and dependency ration all are no impact on willingness to contribute labor force to conserve the park.

Level of education coefficients on WTP was found to be in line with established theory and evidences which suggest that education is positively linked with people's willingness to contribute labor force for conservation, this implies that people who are higher educated can be aware of the need for conserving and managing environmental resources better than other who are not higher educated. However, negatively significant at 1%, this is consistent with study of Zewdu and Yemesrach. It is not amazing to found that education is negatively affect willingness to contribute labor force, since most of the households are illiterate thus wherever additional years of schooling rise up to certain level have negative effect on willingness to contribute labor force. The marginal effect result also indicates that being literate will decrease the probability of accepting the first labor force contribution for the conservation of the park by about 2.26%, ceteris paribus.

Income of households (HI) is expected to have a positive relation with willingness to contribute labor force answer. As monthly income of respondents increase their willingness to contribute will also increase. As expected the result from our study showed the expected sign highly significant at 1% significant level. A one unit increase in the income of the households increases the probability of positive response for offered bid from the mean by 0.0017%, other things being equal. In line with other studies we can be further seen that income is the most important variable which determines the WTP

Estimation of Mean (Median) willingness to pay and aggregate benefit

One of the main objectives of the double bounded dichotomous choice format as we discussed in the methodology part, was to estimate total WTP of the households, after finding the mean WTP of the

MEASURE	WTP	LB	UB	ASL*	CI/MEAN
MEAN/MEDIAN	8.23	7.25	9.82	0.0000	0.31

*Achieved Significance Level for testing H0: WTP<=0 vs. H1: WTP>0 LB: Lower bound; UB: Upper bound

Source: Own computation (2017).

Table 3: The mean or median for model with Krinsky and Robb estimation result of (95%) Confidence Interval for WTP measures reps: 5000) for WTP in cash.

MEASURE	WTP	LB	UB	ASL*	CI/MEAN
MEAN/MEDIAN	3.65	3.13	4.54	0.0000	0.39

*Achieved Significance Level for testing H0: WTP<=0 vs. H1: WTP>0 LB: Lower bound; UB: Upper bound

Source: Own computation (2017).

Table 4: The mean or median for model with Krinsky and Robb estimation result of (95%) Confidence Interval for WTP measures reps: 5000) for WTP in labor force contribution.

sampled households for conservation of Gibe sheleko national park. The mean or median for model with which was found to be robust, particularly for small to medium sample sizes, mean willingness to pay estimation method using 'STATA13.0' wtpcikr [13].

WTP is calculated for each of these parameter estimates and they are used to construct the WTP distribution for the complete set of replications. The estimated mean/median WTP in cash and the confidence intervals are presented in Tables 3 and 4.

Accordingly, the mean WTP in cash and WTC labor force estimated from the initial bid and the follow up bid values ranged from 7.25 Birr to 9.82 birr for cash and 3.13 and 4.54 labor force per month per household, respectively. Whereas, the mean WTP and WTC labor force was 8.23 birr for cash and 3.65 labor force day per month per household, respectively.

According to Haab and McConnell, the researcher must decide

which estimates from the double bounded question to use so as to calculate the mean WTP. They explained that parameter estimates from the first equation are generally used in the computing mean WTP. The reason behind is the fact that the second equation parameters are likely to contain more noise in terms of anchoring bias as the respondent is assumed to take the clue from the first bid while forming his WTP for the second question.

Hence, the average household's WTP is estimated to be ETB 98.72 in cash and 43.8 labor per household per year if the scenario of conserving gibe sheleko national park. The annual aggregate WTP of households for conservation of Gibe sheleko national park was estimated by multiplying the number of total households in the six villages or kebeles (4003) by the mean WTP or WTC labor force per year per household. Therefore, the annual aggregate WTP was estimated to be 395¸336.28 ETB in cash and 175,331.4 labor forces.

When we convert the labor force contribution in to local labor wage price on average one person daily laborer wage is 60 ETB then the aggregation labor force contribution is 10,519,890 ETB per annum.

Conclusions and Recommendations

Conclusions

The livelihood of most of the communities in the study area largely depends on the park resources specially those household which found inside the park. They use the resource as firewood, for construction, as source of income and food to mention some. However, the park forests in the area have been and are facing different man-made and natural challenges. Conservation measures, therefore, are necessary to enable the resource regenerate and save it from being permanently vanished. To be effective and sustainable, the participation of the community in each step of the conservation process of the conservation of the park is important. This study was, therefore, conducted so as to know the willingness of the households in the study area to participate in the conservation program.

The bivariate probit model revealed that the mean WTP for the respondents was ETB 8.23 per month per household which is estimated to be about 98.72 ETB per annum per household. The mean willingness of households to contribute labor was estimated to be about 3.65 labor force days per month per household which is equivalent to about 43.8 labor force days per year per household.

The mean WTP of households both in cash and labor could be an indicator to the importance of conservation of gibe sheleko national park in the household's livelihood and the significance of conservation of park resource to the community in the study area. The result from the model indicated that out of fourteen explanatory variables which were hypothesized to explain the household's WTP, ten of them were found to be significant in affecting the probability of WTP for the conservation of the park.

Consequently, marital states of the household head, family size household income tropical livestock unit and frequent contact of household head with mark officer or scout of the park were all found to positively and significantly relate to the probability of WTP. Whereas initial bid, age of the household head income related to park resource, distance of household home to the park and the training and workshop were found to negatively and significantly influence the probability of WTP for the conservation Gibe Sheleko national park. The result of the study revealed that the households have already recognized the existing problem which the park faced and degradation of park forests due to mass flowering and are willing to participate and contribute for the conservation of the park resource.

Recommendations

- The livestock owned by a household in TLU have positive impact on household's WTP for the conservation of the site. The policy implication is that improving the productivity of livestock by introducing a modern livestock husbandry practices that can safely use the grass and leaves of trees as forage can provide household's incentive to conserve this is why to minimize the overgrazing.
- Based on the findings from the survey, it can be concluded that the households are willing to participate in the conservation of park through the contribution of cash and labor. Thus, the participation of the community should be ensured in every decision making and formulation of policies and strategies which are related to the conservation of the site.
- Due to the reason that, relatively labor force is cheap, the strategy should be designed to participate in the community in terms of labor hour contribution than cash payment to conserve the park.
- Modern irrigation system should be introduced to reduce the problem which the community faced, since the park is endowed by rivers, springs and ground water. By this mechanism it will be possible to minimize the number of people who cut trees and trapping animals for the purpose of income and foods.
- Not only staffs members of the park office need to be committed but also community centered conservation as well as environmental conservation authorities need to implement the necessary principles and policies to conserve the parks.

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