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Research Article

Willingness to Pay for the Ecosystem Conservation: The Case of Lake Hora, Bishoftu, Ethiopia

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Article Info

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Abstract

Lakes provide considerable social, economic, and ecological benefits to society. However, they are shrinking and declining due to anthropogenic factors and land use changes, particularly in developing countries. Despite this, information regarding the socio-economic and ecological impacts of the lake level reduction and communities' willingness to pay for its conservation programs is lacking. This study employed a contingent valuation method to estimate willingness to pay for the conservation of Lake Hora, Bishoftu, Ethiopia. The primary data were collected from 203 randomly selected sampled households through face-to-face interviews. A double bounded dichotomous choice format was used to elicit the household's willingness to pay. Descriptive statistics such as mean, standard deviation, and percentages were used to describe sample respondents in terms of some desirable variables. Bivariate probit and probit models were also applied to estimate the mean willingness to pay and to determine factors affecting willingness to pay, respectively. Results of the study showed that most respondents (74.5%) were WTP for the conservation of the ecosystem of the lake. The bivariate probit model result shows that the total willingness to pay was computed at 2,180,706 ETB $(47,811.13)$ per annum. Furthermore, the results of the probit model revealed that age awareness on ecosystem service, occupation, education, marital status, age, and income have positive and significant effects on WTP while the amount of initial bid and satisfaction have a negative and significant effect. Hence, researchers and government should target those socio-economic variables in conserving and restoring lake's ecosystem services at the household level.

Keywords: Bishoftu; Contingent Valuation Method; Double Bounded Dichotomous Choice; Ecosystem services, Willingness to Pay.

1 Introduction

Environment is composed of assets that deliver a variety of services which provide the life support systems to sustain our very existence such as inputs for the production process, waste assimilation, amenity values, and global life support (Folmer and Tietenberg 2003). Principally, environmental resources are the basis of human life playing a crucial role in the survival of people and nations, both for subsistence and economic mainstay, for individuals' welfare and continuing existence entirely depends upon the various attribute of the environment (MEA 2005).

Lake ecosystems have enormous economic and aesthetic values and are largely responsible for positive contributions toward maintaining and supporting overall environmental health. They can serve as a source of food, medicines, and materials as well as for recreational and commercial purposes (Halkos and Matsiori 2014; MEA 2005; Saliba et al. 1987). Though they have such a great role in the welfare of human beings, many ecosystems, and their services are currently under increasing pressure; explicitly, more than 60% of the world's ecosystems are not being used in a sustainable way (MEA 2005). Not only that, the diversity of users who claim rights to obtain different benefits from the lake ecosystems makes it challenging to manage in a sustainable way (Tumer 2020). Many lakes in Ethiopia are located in the Rift Valley and central part of the country where siltation and environmental pollution are common problems (Bamlaku Ayenew et al. 2015; Dagnachew Legesse et al. 2004).

The problem is more serious on the lakes which are in the vicinity of urban areas. In a developing country like Ethiopia, where there are no appropriate urban forest management policies and urban waste management facilities, lakes found in urban centers can be easily polluted by waste (Fasil Kenea et al. 2017). Despite the growing recognition and long-lasting benefits obtained from sustainable lake management, users and decision-makers inappropriately discount when choosing between ecosystem conversion and conservation (Gebrehiwot Mesfin 2020). This is what happens to the lake Hora, which is found in Bishoftu town, Eastern Shewa. Lake Hora is one of the seven lakes found in Bishoftu town (Hora, Babogaya, Cheleleka,Kuriftu, Bishoftu, Kilole, and Green), which took the largest place in the society and is more preferable of its multifunction.

In addition to the recreational services obtained from this lake, it also serves as a host for the great "Irrecha" ceremony celebration of Oromo peoples for a long period. These increase the socio-cultural, economic, and ecological importance of the town too. However, different pressures that arise from liquid waste leakages or discharge from resorts, hotels, and lodges surrounding the lakes, soil erosion from lake side constructions, solid wastes, degradation of forests surrounding the lake, and high pumping of water from the lakes

by different private and governmental institutes speed up its degradation. The information regarding the ecological and economic impacts of Lake Ecosystem degradation on local farmers has not been clearly defined. Hence, due consideration from both the government and community sides is required to keep sustain the ecological as well as the economic value of the lake. The contingent valuation method (CVM) is an important economic technique for the valuation of such anon-marketed goods and services in developing countries (David et al. 2006), which helps to address the environmental issues by eliciting the respondent's willingness to pay through the hypothetical market. Thus, this study was initiated to evaluate the communities' demand for the Lakes' ecosystem conservation by estimating their willingness to pay and examining factors affecting their decision to pay for the ecosystem services.

Payment for Environmental Services (PES) has recently received a great deal of attention as a new, innovative, and promising approach to natural resources management. The approach is considered a paradigm shift from the predominant use of command-and-control mechanisms and conventional approaches to more flexible and efficient ecosystem protection (De Grott et al. 2002). Unlike the conventional approach, PES offers conditional payments to motivate private landowners to invest in land-use practices that lead to conservation or production of ecosystem services (Ferraro and Kiss 2002; Wunder 2005). Payments are usually made in cash, in kind, or, in a mix of both. Accordingly, in this study, PES is defined as a contractual agreement between at least an environmental service (ES) beneficiary and an ES producer, by which the former transfers resources to the latter, providing the ES producer adopts specific practices on the land or resource he controls or possesses, to enhance the production of a specific ES.

2 Materials and methods

2.1 Description of the study area

Bishoftu town was established in 1925 following the Ethio-Djibouti railway line. Geographically the town is located between 8º 43 and 8º 45 North Latitude; 38º 56 and 39º 01 East Longitude, (Genet Abera and Engdawork Assefa 2021), and 47km southeast of Addis Ababa, Ethiopia (Figure.1).

2.2 Sampling design and sample size

This study employs multistage sampling techniques. In the first stage, Bishoftu Lakes werepurposively selected due to having seven natural lakes that need attention for the conservation of the ecosystem in the town. Out of the seven lakes, Hora lake was purposively selected due to the presence of a large area of forest coverage conservation and its multifunctional purpose for the local community. In the third stage, three surrounding kebeles (Cheleleka, Filtu, and Birbirsa foka) were selected randomly from the nine urban kebeles found near the lake. Finally, the required

numbers of respondents (203 households) were sampled by using simple random sampling techniques. The sample size was determined following the method explained by Yamane (1967).

$$n = \frac{N}{1 + N(e^2)} \tag{1}$$

n=N/1+N (e) ^{2} Equation 1

Where n is the sample size, N is the population size, and e is the level of precision (with 7%).

Thus, according to this formula, the sample size of 203 households was randomly sampled and distributed to the three kebeles proportional to their population size.

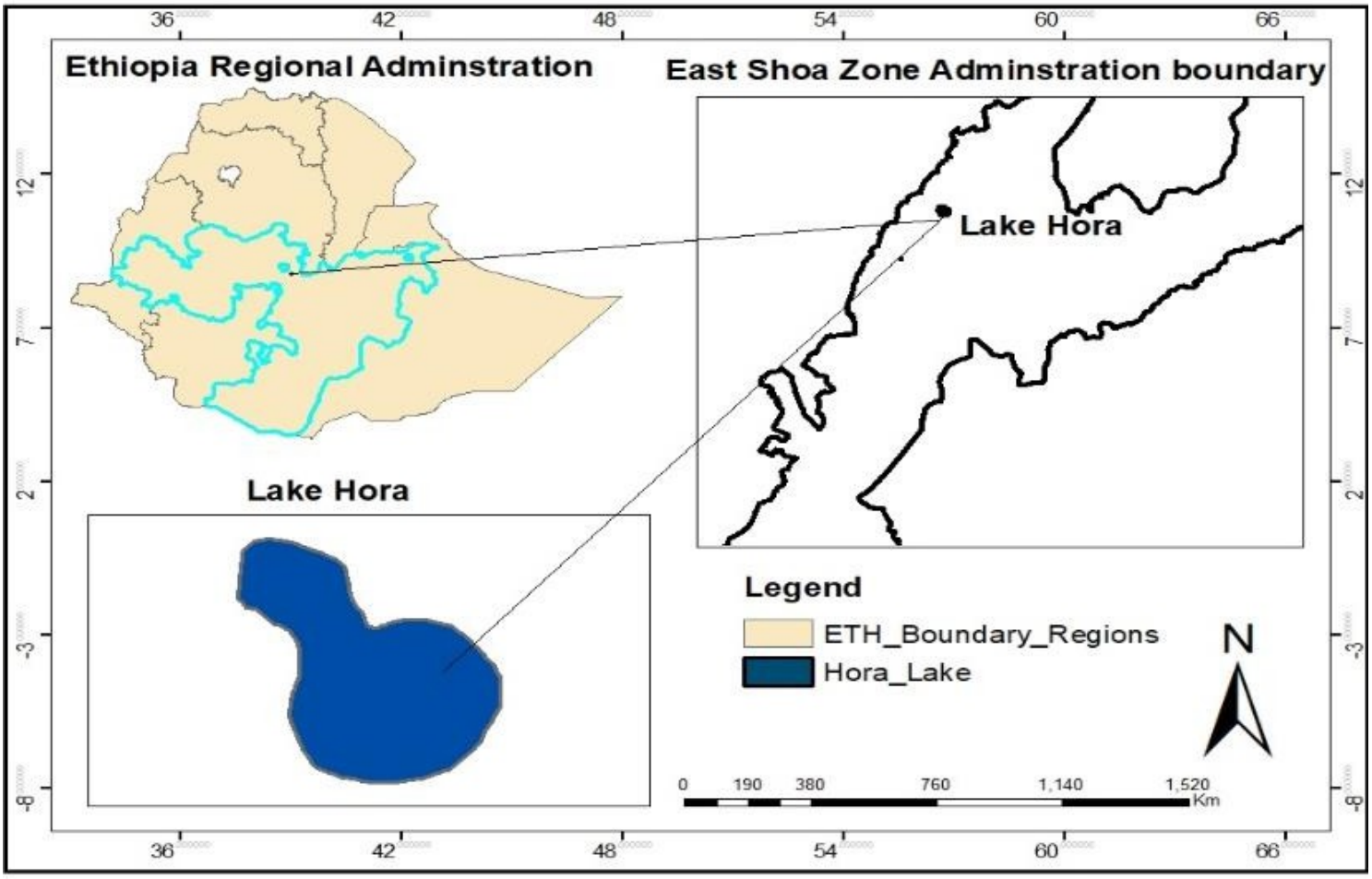

Figure 1: Map of the research area

2.3 Data type, source, and collection techniques

Both primary and secondary data were used for the study. Secondary data was obtained from published and unpublished documents and reports. The primary data were collected from sample respondents through household surveys, key informant interviews (KII), and focus group discussions (FGD) using a structured questionnaire via face-to-face interviews with the heads of the households. The developed questionnaire was pre-tested before conducting the final survey and was translated into the local language (Afaan Oromo), to increase the enumerators' as well as respondents' understanding of the questionnaires. Before conducting the household survey, FGDs and KIIs were done to gather complementary data about the study. The FGD comprises men, women, elders, and youth who are native to the area. Contingent valuation method (CVM) in the form of a double-bounded dichotomous choice elicitation method with an open-ended follow-up question was also employed to elicit households' WTP for the improvements of the lakes' ecosystem. The double-bounded dichotomous choice format (yes-no, no-yes responses) makes clear bounds on unobservable true WTP, and the yes-yes; no-no response sharpens the true WTP (Haab and McConnell 2002). The double-bounded dichotomous choice format also helps to elicit more information about respondent's WTP than single bounded format Arrow et al. 1993; Hanemann et al. 1991)

2.4 Preliminary Survey and Bids

Before implementing the survey, pre-testing was conducted in each of the three kebelesto determine the potential bid level. Random samples of 15 households were participated from each kebele and a total of 45 household heads were interviewed under the pilot survey those did not appear in the final survey. Finally, the starting price was identified for WTP as 10, 20, 40, and 60 Birr. Using these initial bids, sets of bids were determined for follow-up questions based on whether the response is "no" or "yes" for the initial bid. The actual survey was undertaken by dividing the total sampled households randomly into four groups and there would be 51 randomly assigned households per bid level. The survey was completed with a relatively small number of protest zeros (about 5%). The protest zero bidders checked for sample selection bias and they were excluded from the data set.

2.5 Data Analysis

The survey data were analyzed using descriptive statistics and econometric models. The descriptive statistics include mean, standard deviation, percentages, and frequency distribution

2.5.1 Econometric Model Specification

When the dependent variable in the regression model is continuous, the analysis can be conducted using a linear regression model. However, when the dependent variable in a regression model is binary, the analysis could be conducted using linear probability, logit, or probit models (Pindyck,1981). The results of the linear probability model may generate predicted values less than zero or greater than one, which violates the basic principles of probability (Gujarati,2004). On the other hand, logit or probit models generate predicted values between 0 and 1, and they fit well with the non-linear relationship between the probabilities and the explanatory variables (Pindyck,1981; Gujarati,2004). Besides, the probit model works better for bivariate models than the logit model. Therefore, in this study, the probit model was used to determine the factors that affect a household's willingness to pay (WTP) for the conservation of the lake ecosystem services. Following (Cameron,1994), the probit model was specified as:

$$Y^* = \boldsymbol{\beta}'\mathbf{x} + \varepsilon \tag{2}$$

$$Y_i = \begin{cases} 1 & \text{if } Y^* > I_i^*, \\ 0 & \text{if } Y^* < I_i^*, \end{cases} \tag{3}$$

where:

- $\boldsymbol{\beta}'$ = vector of unknown parameters of the model,
- $\mathbf{x}_i$ = vector of explanatory variables,
- Y_i^* = unobservable household's actual WTP for conservation of the lake ecosystem services,
- Y_i = discrete response of the respondents for the WTP,
- I_i^* = the offered initial bids assigned arbitrarily to the i^{th} respondent,
- ε_i = unobservable random component distributed $N(0, \sigma)$.

Bivariate Probit Model

Bivariate normal probability density functions are among the familiar bivariate distributions employed commonly by statisticians. Crucially, they allow for a non-zero correlation, whereas the standard logistic distribution does not Cameron,1994). Hence, the bivariate probit model is used in this study to estimate the mean WTP from the double-bounded dichotomous choice model. The j^{th} contribution to the likelihood function is given as:

$$L_j(\boldsymbol{\mu}/\mathbf{t}) = \Phi_{\varepsilon_1\varepsilon_2}\left(d_{1j}\left(\frac{t_1-\mu_1}{\sigma_1}\right), d_{2j}\left(\frac{t_2-\mu_2}{\sigma_2}\right), d_{1j}d_{2j}\rho\right) \tag{5}$$

where:

- $\Phi_{\varepsilon_1\varepsilon_2}$ = standardized bivariate normal distribution function with zero means,
- $Y_{1j} = 1$ 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,
- $d_{1j} = 2Y_{1j} - 1$, and $d_{2j} = 2Y_{2j} - 1$,
- ρ = correlation coefficient,
- σ = standard deviation of the errors.

This general model is estimated using the standard bivariate probit algorithms. Finally, the mean willingness to pay (MWTP) from the bivariate probit model was calculated using the formula specified by (Haab,2002):

$$\text{MWTP}(\boldsymbol{\mu}) = -\frac{\alpha}{\beta} \tag{6}$$

where:

- α = coefficient for the constant term,
- β = coefficient of the offered bids to the respondent.

Description of Explanatory Variables

Table 1 summarizes the explanatory variables used in the model to analyze households' WTP for the conservation of the lake ecosystem services.

The data were analyzed using STATA version 11.0 and SPSS version 16.0.

$$L_j(\boldsymbol{\mu}/\mathbf{t}) = \Pr(\mu_1+\varepsilon_{1j} > t_1, \mu_2+\varepsilon_{2j} < t_2)^{YN} \times \Pr(\mu_1+\varepsilon_{1j} > t_1, \mu_2+\varepsilon_{2j} > t_2)^{YY} \times \Pr(\mu_1+\varepsilon_{1j} < t_1, \mu_2+\varepsilon_{2j} < t_2)^{NN} \times \Pr(\mu_1+\varepsilon_{1j} < t_1, \mu_2+$$

Table 1: Variables name, expected signs, definitions, and coding

List of variables	Defining and coding	Expected sign
WTP1/WTP2	Willingness to pay decision for proposed initial bid coded, (0-no, 1-yes)	
Age	Age of the respondents (in years)	-
Sex	Sex of the respondents coded, (1-male, 0-female)	+
Family Size	Number of family members in the household	+
Income	Monthly income of the households (in birr)	+
Educational Level	The educational level of the respondents (in years of schooling)	+
Occupation	Occupation of the households (1 if employed, 0 otherwise)	+/-
Marital Status	The marital status of the respondents coded, 1-married, 0-unmarried	+
Awareness	Awareness, coded, 1-aware household, 0-otherwise	+
Years stay in the area	The number of years in residence in the area	+
Satisfaction	Level of satisfaction with the existing ecological service (0-satisfied, 1-unsatisfied)	-
Initial bid	Initial bid offered to the respondents	

Table 2: Descriptive statistics of some socio-economic characteristics for willing and non-willing to pay respondents.

Variable	Responses	No willing		Willing		Total	
		No.	%	No.	%	No.	%
Sex	Female	21	10.3	45	22.2	66	32.5
	Male	31	15.3	106	52.2	137	67.5
	Total	52	25.6	151	74.4	203	100
e Occupation	Employed	31	15.3	77	38	108	53.3
	Unemployed	21	10.3	74	36.4	95	46.7
	Total	52	25.6	151	74.4	203	100
Marital status	Single	21	10.3	16	7.9	37	18.2
	Married	31	15.3	135	66.5	166	81.8
	Total	52	25.6	151	74.4	203	100
Awareness of Lake	No	12	5.9	62	30.5	74	36.45
Conservation	Yes	40	19.7	89	43.8	129	63.55
	Total	52	25.6	151	74.4	203	100
Respondents	Yes	38	18.7	26	12.8	64	31.5
satisfaction with the	No	14	6.8	125	61.6	139	68.5
existing service	Total	52	25.9	151	74.4	203	100

3 Results and discussion

3.1 Socioeconomic characteristics of the respondents

The socio-economic characteristics of respondents were presented by response category of willing and non-willing to pay respondents and summarized in table 2.

The probability of households responding “yes” to offer bid decreases as the amount of bid increases. This could indicate the presence of the first response effect on the response for the follow-up question, which is consistent with studies done by Cameron and Quiggin (1994) and Bamlaku et al (2015). 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 a seemingly unrelated bivariate probit model (Table 4). The result revealed that the correlation coefficient of the error term is less than one implies that the random component of WTP for the first question is not perfect correlation with the random component from the follow-up question.

As a result, the mean WTP value of the conservation of Lake Hora ranged from 47 to 56 ETB per year for the initial bid and the follow-up bid, respectively according to the formula of Habb and McConnell (2002) (See Equation 4). Therefore the annual mean WTP was computed at 51.7 Birr per year per

In a contingent valuation (CV) study, the aggregation of WTP for the environmental resource is very important. But before aggregation, protest zero bidders were excluded to minimize the biases. Based on the double bounded dichotomous questionnaires, the aggregate WTP for conservation of Lake Hora was computed at 2,180,706 ETB ($47,811.13) per year as shown in table 5. It was calculated by multiplying the mean willingness to pay from dichotomous choice responses result by the total number of valid responses which is 42,180.

Table 3: Distribution of initial bids and their willingness responses

Bid values	Frequency	Percent	Willingness responses	
			No (%)	Yes (%)
10	51	25.37	0.00	100.00
20	51	25.37	9.00	91.00
40	51	25.37	36.00	64.00
60	50	24.89	57.00	43.00
Total	203	100.00	25.5	74.5

Table 4: Parameter estimates of bivariate probit for conservation of Lake Hora household.

Dependent variables	Explanatory variables	Coefficients	St. Error	Z-value	P-value
Response 1	Bid1	-0.0364	0.0059	-7.03	0.000
	Cons	2.0400	0.2111	8.83	0.000
Response 2	Bid2	-0.0183	0.0065	-2.84	0.005
	Cons	0.8677	0.2249	3.86	0.000
rho = 0					
chi2 (1) = 5.26222					
prob ¿ chi2 = 0.0218					

3.2 Determinants of WTP for Conservation of Lake Hora

The estimated result on factors affecting the households' WTP for the conservation of the lake Hora ecosystem is presented in Table 6 below. The sign of most of the explanatory variables was as expected. Eleven explanatory variables were included in the model to predict the maximum willingness to pay of the respondents in monetary value. A chi-squared test was used to measure the overall significance of the model and the result of the model shows thatthe probability of chi-squared distribution is 0.000, which is significant at less than 1%. Thisimplies that the variables used in explaining the WTP for Lake Hora conservation fit the probit model at less than a 1% probability level. As it has been indicated in Table 6 below, out of eleven (11) variables used in the model, eight (8) variables were affecting the willingness of the local community. Variables like age, occupation, education, marital status, Income and households' awareness of ecosystem conservation positively and significantly influence willingness to pay at p-value less than 1%, whereas, initial bid and satisfaction with the current status of the lake negatively and significantly influence WTP at p-value lessthan 10%.

Age of the household head: had a positive effect on the willingness to pay households for the conservation of Lake Hora. The positive and significant correlation between age and WTP might be perhaps respondents of older ages were expected to pay more for the conservation of natural resources as they have awareness of the environment., This result is consistent with the findings of Calderon et al. (2006) and Gebremariam Gebrelibanos (2012).

The result of the marginal effect shows that keeping the influences of other factors constant, a one-year increase in the age of the respondents increases the probability of WTP by 0.56%. This may be due to the multifunctional purpose of Lake Hora, especially for its cultural ("*Irreecha*") value that they had been experiencing for a long period.

Households' income: has a positive relationship with the households' WTP and is statically significant at 10%. This effect indicated that respondents with higher income pay more for the conservation of the lake than households with lower income. The marginal factor shows that keeping the influence of other variables constant, for a one birr increment of a household's net monthly income, the probability of his/her willingness to pay for the conservation of Lake Hora will increase by 0.0019 %. This result was also consistent with the findings of (Bamlaku Ayenew et al 2015; Calderon et al. 2006; Gebremariam Gebrelibanos 2012).

Educational Level of respondents: The education level of the respondents is positively and significantly at 1 % significant level. The marginal effect result shows that for each additional increment of education, the probability of willingness of a household to pay for the lake conservation practices will increase by 2.04 %, ceteris paribus. One possible reason could be that more educated individuals are concerned about environmental goods including lake conservation in our case. This result is also supported by the findings of (Bamlaku Ayenew et al. 2015; Calderon et al. 2013; Gebremariam Gebrelibanos 2012).

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Table 5: Average and aggregate willingness to pay of households for conservation of Lake Hora

Total HHs in Bishoftu	Number of sample HHs	samples with protest zero	Expected protest	HHs with valid responses	Mean WTP (birr)	Total WTP (birr)
44,403	203	10	2,220	42,180	51.7	2,180,706

Table 6: The probit model estimation results of households' WTP

Variables	Coef.	Std. Err.	Z	P¿—z—	Marginal Effects
Length of stay in town	-0.0013	0.0019	-0.70	0.486	-0.0013
Sex	-0.0303	0.0213	-1.43	0.153	-0.0303
Age	0.0056***	0.0013	4.44	0.000	0.0057
Occupation	0.2900***	0.0420	6.91	0.000	0.2900
Education	0.0205***	0.0055	3.70	0.000	0.0205
Net monthly income	0.0001*	0.0001	1.76	0.079	0.00002
Family size	-0.0024	0.0059	-0.41	0.683	-0.0024
Marital status	0.3780	0.0508	7.44	0.110	0.3780
Awareness	0.1372***	0.0393	3.49	0.000	0.1372
Satisfaction	-0.0465*	0.0268	-1.74	0.082	-0.0465
bid 1	-0.0020***	0.0006	-3.35	0.001	-0.0020
cons	-0.2247	0.0914	-2.46	0.015	
Number of ob = 203	Prob ¿ chi2 = 0.0000	LR chi2(1) = 52.66	Log likelihood = -88.57	Pseudo R2 = 0.2292	

*, **, & *** significant at less than 10%, 5%, & 1% respectively.

that respondents with higher income pay more for the conservation of the lake than households with lower income. The marginal factor shows that keeping the influence of other variables constant, for a one birr increment of a household's net monthly income, the probability of his/her willingness to pay for the conservation of Lake Hora will increase by 0.0019 %. This result was also consistent with the findings of (Bamlaku Ayenew et al 2015; Calderon et al. 2006; Gebremariam Gebrelibanos 2012).

Educational Level of respondents: The education level of the respondents is positively and significantly at 1 % significant level. The marginal effect result shows that for each additional increment of education, the probability of willingness of a household to pay for the lake conservation practices will increase by 2.04 %, ceteris paribus. One possible reason could be that more educated individuals are

concerned about environmental goods including lake conservation in our case. This result is also supported by the findings of (Bamlaku Ayenew et al. 2015; Calderon et al. 2013; Gebremariam Gebrelibanos 2012).

Occupation of respondent: has a positive relationship with the households' WTP and statically significant at 1 % significant level. The households who are working in the government and non-government organization and paid regular salary has more willingness to pay for the conservation of Lake Hora than those who were not employed.

Awareness of Lake Conservation: is positive and significant at a 10 % level. This conforms with a priori expectation; meaning that, if the respondent is aware of the benefits of lake conservation then his/her WTP will be high. Those respondents who are aware of lake conservation benefits are willing to pay 4.65 % more for improved lake conservation than those who are not aware of lake conservation benefits, ceteris paribus.

Respondents' satisfaction with the current status of Lake Ecosystem: The variable satisfaction level of the respondent with the existing lake ecosystem service was found to have significant at 10 % with a negative parameter estimate on the probability of WTP decision for lake conservation. This means that as respondents feel the existing lake ecosystem service is unreliable and/or poor quality; he/she become more likely to pay for conservation programs which possibly ensures the improvement of the existing lake ecosystem service. The marginal effect of this variable shows, that those respondents having dissatisfaction with the existing lake ecosystem service will have 4.65 % more probability of paying for lake conservation than those who are satisfied.

Initial bid: The result revealed that the initial bid value significantly and negatively affects households' decisions on WTP. The coefficient of starting bid price has a negative sign and is significant at a p-value less than at a 1% level of significance. The negative sign and the significance of this coefficient indicated that, as the initial bid value increases by one unit, the probability of a household's willingness to pay will be reduced by 0.2%. The finding is in line with (Carlson et al. 2004; Mousavi and Akbari 2011; Deginet Berhanu et al. 2022).

4 Conclusion

Hora Lake is essential for the local communities' livelihoods. However, the lake ecosystem resource is shrinking from time to time due to different factors. The main cause of this incidence is the absence of a clear demarcate boundary of the lake, illegal settlements and improper use of indigenous and exotic tree species, lack

of environmental education, and socio-political factors Local community perception towards the use and conservation of natural resources is important for policymakers and sustainable conservation of the ecosystem. This study quantified the potential contributions of the community to the conservation of Lake Hora in terms of monetary value. Our findings revealed that about 74.5% of households were willing to pay for ecosystem conservation, while 25.5% were not willingto take the offered initial bids. The mean willingness topay from the double bounded dichotomous responses and aggregate willingness to pay for the conservation of Lake Hora was 51.7 ETB and 2,180,706 ETB ($47,811.13) per year respectively. The findings indicated that age, occupation, education, marital status, income, level of satisfaction, awareness about conservation activities, and initial bid are key factors influencing the WTP Therefore, actions to be made towards these socio-economic aspects that significantly influenced household's WTP is a first step towards conserving Lake Hora to sustain quality and quantity ecosystem services.

Acknowledgments

We are very much grateful to Oromia Environment, Forest and Climate Change Bureau and Bishoftu town communities for their time, kindness, and willingness to share their accumulated knowledge.

Competing interests

The authors declare that they have no competing interests.

Ethical Consent

The rights and well-being of participants were respected and they were informed about the research before collecting primary data. Not only that, the research was conducted on the area based on the information from the local community during problem identification. Participants were fully informed about the purpose of the research and were willing to participate in the study. Local enumerators were used to collect data and the researchers also engaged in recording their voices during focus group discussions. So the recorded voices were used as supplementary information, while collected data were used as input directly for the analysis. For this participation, they reflect their willingness even though they couldn't provide written consent to the researchers. Thus, we'd like to declare that the participation was voluntary and free from coercion, and participants had the right to withdraw at any time.

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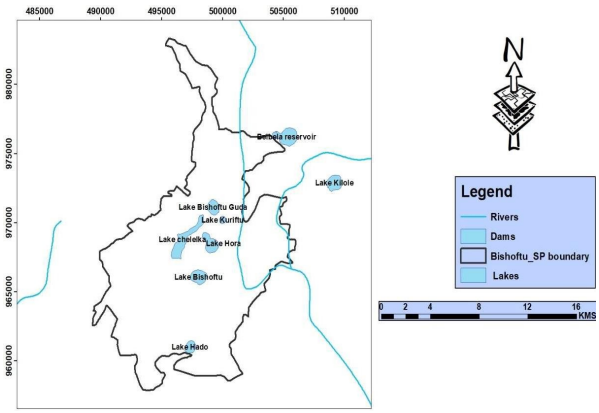
Appendices

Table 7: Annex I Summary of ecosystem services and function of Lake Hora

Ecosystem services	Frequency of respondents (out of 203)	Percentage (%)
Provisioning services		
Fish	105	52
Fodder	133	66
Medicinal plants	109	54
Water supply	122	61
Others (specify if any)	73	36
Regulating services		
Climate regulation	143	71
Erosion control	147	73
Supporting services		
Habitat	178	89
Cultural services		
Recreational and tourism	189	94
Spiritual		



Appendix 2 Lakes in Bishoftu

Source: Bishoftu city Administration (Bishoftu Structural Plan, 2019).

Ecosystem services of Lake Hora (Recreation)