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An Assessment of Urban and Per-Urban Household's Willingness to Participate in Urban Forest Conservation Practice in Assosa District, Western Ethiopia

Teha Romanu Benti[1, *], Shafe Zelalam Gasisa[2]

[1]Natural Resource Economics and Management, Assosa Agricultural Technical and Vocational Education Training College, Assosa, Ethiopia

[2]Agricultural Economics, Assosa University, Assosa, Ethiopia

Email address:

teharomano12@gmail.com (Teha Romanu Benti), shafex2023@gmail.com (Shafe Zelalam Gasisa)

[*]Corresponding author

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Abstract: Urban forests is networks or systems comprising all woodlands, street trees, trees in parks, trees in derelict corners and gardens group of trees, and individual trees found in urban and per-urban areas. In developing country particularly in Ethiopia urban forests provides environmental, social, and economic benefits to urban resident. Despite all this importance to the livelihood of the urban communities, urban forests in Assosa Woreda are facing artificial and natural challenges. Therefore; This study was intended for the assessment of urban and per- urban households' willingness to donate money for conservation of urban forest ecosystem; in Assosa woreda, Western Ethiopia with the specific objectives of exploring the amount of money urban and per-urban household's would be willing to donate for urban forest conservation and identifying those factors affecting urban and per-urban households willingness to donate money for urban forest conservation. Data for the study were composed from primary and secondary sources through semi structured questioner via face to face interview. Besides, data were collected using household surveys, focus group discussions, and key informant interviews. Multistage random-sampling procedures were used in selecting 392 respondent followed by a probability proportion to size. The value-elicitation used was double bounded dichotomous elicitation format followed by open ended questions. The data were analyzed by descriptive statistics and econometric model. The result of seemingly unrelated bivariate probit model displays the mean willingness to donate money for the conservation of urban forest was found to be 60 birr per year per household. The result from tobit model indicated that household's literacy status, total annual income, land size, access to credit had positive significant effects on willing to donate money for urban forest conservation and the age of the respondent had a negative and significant effect on willingness to donate money for urban forest conservation. The study shows that the urban and per-urban households has willingness of donating money toward urban forestry conservation programs and they have important information that can help local decision makers to increase the efficiency of urban forest growing, maintenance, and promotion. As policy implications, an effort would be needed to strengthen literacy which increase urban household's knowledge about the importance of conservation practices and credit facilities expansion are important.

Keywords: Urban Forest, Conservation, Seemingly Unrelated Bivariate Probit Model, Tobit Model, Willingness to Pay, Willingness to Donate

1. Introduction

1.1. Background of the Study

Urbanization and development of cities are rapidly increasing across the world and urban forests constitute important tools that maintain the basic environmental and ecological functions of cities on which plant, animal and human existence depend [21]. Building a green economy and effectively implementing ongoing environmental laws are

among the strategic goals to be pursued in the growth plan of both developed and developing countries [28]. The forestry sector is receiving strategic attention in GTP II as a key sector that can contribute to Ethiopia's industrialization goals, especially through expansion and the sustainable management of the forest resource base to feed the growing wood-based industries. Ethiopia's economic growth requires an increasing amount of forest resources, including wood products for construction, furniture, electrification, and the pulp and paper industry [33]. Further, forests also provide non-timber forest products that are important sources of livelihood for urban and local forest-dependent communities. Urban forest is the sum of all woody and associated vegetation in and around dense human settlements, ranging from small communities in rural settings to metropolitan regions [37]. Sustainable urban forest planning and management contributes to a pleasant and healthy environment. As a valuable natural resource, urban forest may provide a number of direct and indirect benefits, including climate regulation, noise reduction, watershed protection, recreational opportunities, outdoor education, wood and fruit production and habitat resource for wildlife [11].

Improving the standard of urban green infrastructure in Ethiopian cities is a national priority [25]. Economic development will continue to bring with urbanization, greater population density in urban settlements, and correspondingly, increased demand for green infrastructure. To maximize the need of urban society, the Ministry of Urban Development and Housing (MoUDH) prepared the Climate Change-Resilient Urban Green Development Strategy as a road map to fulfill the urban population need in the area of urban green infrastructure service provisions. The MoUDH has developed the Ethiopia National Urban Green Infrastructure standard which aims at setting the basic minimum standard requirements for Urban Green Infrastructure (UGI) development and management. Therefore, this urban green infrastructure standard provides the basic minimum requirements to be achieved in the design, implementation and operation of urban green infrastructure.

Forests in and around cities has been facing many pressures, such as unregulated urban development and investment. Although it has been confirmed that coherent investment in the establishment, guard and restoration of urban forests can produce a healthy environment, such forests are frequently appreciated more for their aesthetic value than for their ecosystem roles [41].

Large urban green parts are rapidly being lost, leave-taking cities with fewer trees but becoming a concrete jungle [19]. For instance [23] on a study on management of agro forestry practices in Assosa district, Ethiopia reported a significant decreases in green areas in the district compared to is its coverage of previous year. The reason is that town designers, government and policy creators are not giving acceptable attention to trees and its attachment in infrastructure and other land allocation priorities. This is because more attention was given to the tangible market product, primary timber, fuel wood, and discounting its non-market environmental service values [4].

Payment for environmental service is defined in terms of payments to undertake actions that increase the levels of desired environmental services, and defined within market-based approaches [36]. It provides some key opportunities to link up those involved in 'supplying' environmental services more closely to those benefiting from the same environmental services. In doing so, it provides cost-effective ways of developing new streams of financing by considerable innovation as for many environmental services, both 'suppliers' and 'beneficiaries' may not currently be aware of their roles.

Payment for environmental Services is becoming increasingly popular as a way to manage ecosystems using economic incentives [47]. It is a flexible incentive-based mechanism that has the potential to deliver in both application of policies and incentives to promote the conservation and sustainable use of biodiversity and environmental services, and secondly, a more efficient use of available finances in existing biodiversity programs.

The contribution of forest ecosystems to national income is seen as a necessary element of the case for forest conservation in Ethiopia [29]. Hence before establishing conservation strategies, urban authorities have to investigate house hold's' willingness to pay (WTP/WTCL). The willingness to pay is the maximum amount a person would be willing to pay, sacrifice or exchange in order to receive a good or to avoid something undesired. This is answer from market or public to conservation and well management of natural resources and urban forests. It measures whether an individual is willing to forego their income in birr or their labor in man days in order to obtain more urban forest service and is typically used for non-market goods. The contingent valuation method (CVM) is an example of stated preference methods, which are most commonly used to gauge environmental value of urban forests. CVM relies on using a questionnaire that taps the willingness to pay (WTP) for non-market functions, which is based on a survey of respondents using hypothetical questions [39].

States that monetary valuation of urban forest broadly reported in the literatures while non-market environmental benefit remains unexplored [3]. Failure to calculate non-market ES in appropriate term often results in an implicit value of zero placed on them [17]. It is essential to connect the functional values of forest in response to the pressures of urbanization and development issues in and around cities. It is mainly urgent and important to consider the sustainable growth and transformation plan which entails to make cities and human settlements safe, resilient and sustainable [40].

Urban extension intensifies the extent and importance of tree resources to provide serious ecosystem services to sustain social safety and environmental quality in and around the cities [9]. Hence financing in conservation of urban forest in the Assosa city and including them in the future planning activities is vital. This can be accomplished if suitable and current information on the environmental services of the

urban forest are properly assessed.

Despite all this importance of urban forest, in recent years, urban forests in the Assosa towns are not given the required attention. As a result, the city's urban forest has significantly deteriorated due to the high rate of deforestation, largely attributed to increasing population growth combined with rapid urbanization. Cognizant of this, the study aimed to assess urban and per-urban household's willingness to pay for the urban forest conservation in the Assosa Woreda, Western Ethiopia to explore the amount of money, urban and pre-urban household's would be willing to donate for urban forest conservation and to identify factors affecting urban and pre-urban households' willingness to donate money for urban forest conservation.

1.2. Statement of the Problem

Urban forest conservation has attracted considerable global interest in recent years. It is accepted as a veritable means of achieving poverty reduction goals because of its role in livelihood, food security and environmental objectives. In many parts of the world urban forests hold significant value to all of its inhabitants as well as the overall health of the planet. It serve as natural defenses against climate change, removing greenhouse gas (C02) generating oxygen, controlling erosion, recharging underground water, maintaining hydrological cycle [43].

Carbon capture and storage are proven, technically viable and environmentally safe means of reducing greenhouse gases [38]. Urban Forests have the Potential for $C0_2$ mitigation option and are critical greenhouse gas reduction strategy. Hence with rapid transformation of economy from agriculture to industry paying attention for urban forest achieve the perpetuation of ongoing development path in Ethiopian economic development [14]. With the development of civilization, large areas have been cleared to make ways for construction, investment, towns and roads [7]. People and forests are connected and have been since ancient times. "This relationship is based on survival. But humans have been and being disrupts this balance.

Climate change impacts on per-urban landscapes include impacts on the per-urban agriculture systems. Impacts of flooding, groundwater Stalinization, sea level rise, heat stress, drought, and changes in resources availability are likely to intensify with climate change and especially in Africa and Asia [45]. Therefore, the existence of per-urban agriculture can be threatened by the convergence of urban development and climate change pressures. While climate change is certainly the biggest challenge that humanity currently faces, it however, brings opportunities as well. Reduced Emission from deforestation and desertification (REDD) with its significance in capturing carbon will help us and other developing countries protect the remaining forests, encourage more reforestation and afforestation programs [44].

Ethiopian urban forest resources are vanishing at an alarming rate. The loss of urban forest and vegetation cover results in high rate of soil erosion, degradation of water resources, depletion of biodiversity and declining cities beauty. These factors, in turn, adversely affect per-urban agricultural production and productivity. The cumulative effect of this chain of events is reflected in the prevailing land degradation, poor economic performance and accelerated poverty.

Looking at the area of interest, namely Assosa District, there is natural and manmade forest around and within urban areas that were planted by different government and non-government organization. However, forests in and around Assosa town has been and being facing by many threats such as free-for-all urban development, lack of an investment and management, illegal settlements, recurrent fire, agricultural expansion and illegal construction. Still the resource are rapidly diminishing at alarming rate due to construction, medicinal use, human food, ornamental, built fence, fuel wood shading and live fence. Although it has been established that coherent investment in the creation, protection and restoration of an urban forests can create healthy environment, due attention were not given to conserve urban and per-urban forest resources. Beside this there is no source of fund for conservation and rehabilitation of urban and per-urban forest in and around the town. This will create a problem of climate change and increase vulnerability of the community to food insecurity. Hence, in order search source of fund from the community for urban forest conservation and rehabilitation practice attaching monitory value and setting its payment vehicle should be enhanced. To do so, urban forest conservation and rehabilitation is a prerequisite to reserve climate change which enables urban and per-urban resident to get conducive climate for their healthy and quality life [6].

Monetary valuation of environmentally friendly services can help to provide an incentive needed for its urban forest conservations in developing countries, mainly in major town of Ethiopia [1]. This was because the current economic situation supports pressure on government budgets and on funds allocated to maintain standing urban forest and tree resources. This system tells in economic terms, the level of peoples' concern for their environment as professed from their willingness-to-pay for ES [42]. If the values are adequately large enough, it offers supportive argument for the vital roles forests play in sustaining environmental quality. This is obvious, since everybody involved in policy, with management and uses of forest resource are most likely familiar with gains and losses when stated in monetary terms [35]. Most significantly, economic value of ES can offer substantial evidence to support the allocation of capitals (environmental protection/ecological funds) for the conservation of forest resource in Ethiopia.

Some studies have estimated the monetary value of non-market benefits derived from urban forests. Economic valuation of ecosystem services helps in identifying and resolving the trade-offs among different stakeholders engaged in management of ecosystems, help decision-making process and incorporates consideration of equity and sustainability and services helps link conservation strategy with mainstreamed policies at national and regional levels

[30]. Each choice or option (that is, to leave a resource in its natural state, to allow it to degrade or convert it into another use) has implications in terms of values gained and lost [10]. Hence, all the values that are gained and lost under each resource use option are carefully considered. Highlight of growing tendency, in young generations, towards a more sustainable awareness, should believe to nurture through adequate policy instruments, so to enhance the quality of urban life [12]. City managers who are interested in understanding the public value of urban greening programs and developing strategies or policies to expand urban forests as part of a climate change strategy. Increased urbanization coupled with increased reliance of urban communities on rural areas for ecosystem service provision is a challenge faced by many nation and ability of urban households to directly support restoration efforts in surrounding rural regions is underappreciated funding stream for ecological restoration [13].

Study done by [46] on assessment of farm house holds willingness to contribute labor for bamboo forest conservation also excludes urban households who may contribute for bamboo forest conservation practice. In the study the researcher used bivariate probit model for estimating mean willingness to contribute labor. But mean willingness to contribute labor has lower and upper limit. Hence to avoid such biasness in willingness to contribute labor for forest conservation seemingly unrelated bivariate probit model was applied for the research.

To the knowledge of the researcher no research were carried out in the specific study area. Hence, this study was launched in Assosa Woreda of Western Ethiopia to address the above-mentioned problems by addressing the following objectives.

1.3. Objectives of the Study

1.3.1. The General and Specific Objective of the Study

The general objective of the study was to assess urban and per-urban household's willingness to pay for the urban forest conservation in the Assosa Woreda, Western Ethiopia.

1.3.2. The Specific Objectives of the Study

1) To explore the amount of money urban and per-urban households would be willing to donate for urban forest conservation.
2) To identify factors affecting urban and per-urban households' willingness to donate money for urban forest conservation.

2. Research Methodology

2.1. Description of the Study Area

The study was conducted in Assosa district which is one of the 22 Woreda's in the Benishangul-Gumuz Region of Ethiopia. Assosa district is found around 678 km away from Addis Ababa and bordered by Kurmuk and Homesha in the north, by Menge in the northeast, by Oda Buldigilu in the east, by Bambasi in the southeast, by Mao-Komo special woreda in the south and by Sudan in the west. According to CSA (2020) Report the woreda has total population of 104,147, of whom 52,968 were men and 51,179 were women. Geographically, it is located at 10^0 20′ latitude in the N and 34^0 58′ longitudes in the E. (ADARDO, 2019). Total of 20829 households were counted in this woreda, from these amount 4842 urban households.

Assosa Woreda has a less urban forest coverage compared to its areal coverage. According to [5], about 92023 ha which is about 47.73% of the total area of the Woreda is covered by natural forests including the dense and privately planted forests. Out of this, the urban and per urban forest forests take only about 23005.75 ha [5].

2.2. Data Collection Method

2.2.1. Sample Size and Sampling Procedures

Multi-stage random sampling procedures were implemented to select sample from population. In the first stage, Assosa town purposively selected due to availability of street trees, green area, and urban parking. In the second stage, the selected town were stratified in to urban and peri urban based on their geographical and distance from the center of Assosa town. In the third stage four kebele from urban strata and 10 kebele from peri-urban strata were purposively selected. Finally 392 sampled households were selected through systematic random sampling techniques through Yamane formula, at 95% confidence level, 0.5 degree of variability and 5% level of Precision.

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

Where n is the sample size, N is the population size (Total household of the Assosa district), and e is the level of precision. *Equal to:* $n=\frac{20823}{1+20823(0.05)2}=392.$

2.2.2. Types, Sources and Methods of Data Collection

Quantitative primary data were gathered by a face to face interview. Focus group discussion and key informant interview were also made as part of data collection method for qualitative primary data. Moreover, secondary data were collected from journals, books and agriculture office of the Assosa Woreda. Similarly, quantitative data were collected by employing semi-structured questionnaire. The questionnaires were controlled in to two sections. The first section includes demographic, socioeconomic and institutional variables. The second section has CV scenario and household's WTP for conservation of urban forests. The questionnaires were translated into local language (Amharic Language) to simplicity the data collection process. Then, well-trained enumerators having good experience in the survey were employed to collect the data required for this study. Dichotomous choice format CVM studies were preceded by a pretest survey of small sample population. The discussion by [20] showed that pretest survey with an open ended question can help to provide certain information on the bounds of respondents' WTP. As a result, the pretest surveys

were conducted before the actual survey. For this purpose, 14 households were randomly selected for the pretest before the actual survey. In addition to the pretest survey, household survey, focus group discussion and key informant interviews were held to determine initial bid in terms of cash using an open-ended contingent valuation format. As a result, 2O, 30, and 50 per annum followed by open-ended questions were used as a starting bid for the actual survey. After the bids were designed, the respondents were asked a yes/no question to elicit their willingness to pay. If his/her answer was yes, the next higher amount was asked to state their answers. Finally, the respondents were asked their maximum willingness to pay in birr both for the bounded and unbounded values using open-ended questions to state the maximum amount they are willing to pay. If his/her answer was no, the next minimum amount followed by open-ended question was also employed to implore his/her maximum amount.

Table 1. *Bids designed and number of randomly assigned sample household.*

First round bid	Second bid round if YES in the first round	Second round bid if NO in the first round	Sample size
20	40	10	131
30	60	15	131
50	100	25	130

Source: Own survey, 2021

2.3. Methods of Data Analysis

2.3.1. Descriptive Analysis

Descriptive statistics (arithmetic mean, percentage, standard deviation and frequency distribution) were used, to have clear understanding of socio economic, institutional and demographic characteristics of the respondent and their WTP. Chi-square test and independent sample t-test were employed to recognize the statistical relationship of explanatory variables on willing and non-willing urban households. The chi-square test were conducted to compare qualitative characteristics of willing and non-willing conservation of urban forests; and t-test was run to get statistical difference between the two groups 'as mean of the willing and non-willing' groups with respect to Continuous explanatory variables.

2.3.2. Econometric Analysis

In order to quantify the amount that urban and pre-urban household's willingness to pay and the factor that affect urban and pre-urban house hold willingness to pay, seemingly unrelated bivariate probit and tobit models were employed respectively for the study.

(i). Seemingly Unrelated Bivariate Probit Regression Model

In this study Seemingly Unrelated Bivariate Probit model was employed to estimate household's mean WTP from double bounded elicitation method. The general expression of the model is expressed following [15] two related equations as:

$$Y_1 = \alpha_1 + \beta_1 B_1 + \sum_{i=1}^{n} \beta_i x_i + \varepsilon_1$$

$$Y_2 = \alpha_2 + \beta_2 B_2 + \sum_{j=2}^{m} \beta_j x_j + \varepsilon_2 \quad (1)$$

$$\text{Corr}[\varepsilon_1, \varepsilon_2] = \rho$$

Where: Y_1 and Y_2 are binary responses to WTP questions; B_1 and B_2 are bids in first and second bid questions; x_i represent explanatory variables and α's and β's are coefficients to be estimated. The explanatory variables of model 1 could be different from the explanatory variables of model 2. But for the study explanatory variables of both models are the same ($x_i = x_j$).

Following [16], the econometric modeling for formulation of double-bounded data is given as:

$$\text{WTP}_{ij} = \mu_i + \varepsilon_{ij} \quad (2)$$

WTP_{ij} =Is the j^{th} respondent's WTP and i=1, 2 represents the first and second answers;

μ_1, μ_2 = mean value for the first and second response;

ε_{ij} = unobservable random component.

Setting $\mu_{ij} = X_{ij}\beta_i$ allows the mean to be dependent upon characteristics of respondents (demographic and socio-economic variables).

To construct likelihood function, probability of observing each of the possible two bid Response sequences (yes-yes, yes-no, no-yes, no-no) are given as follows. The Probability that respondent i answers to the first bid and to second bid is given by [16]:

$$\text{pr(yes, no)} = \text{pr}\left(\text{WTP}_{1j} \geq t^1, \text{WTP}_{2j} < t^2\right) \quad (3)$$

$$= pr(\mu_1 + \varepsilon_{1j} \geq t^1, \mu_2 + \varepsilon_{2j} < t^2)$$

$$\text{pr(yes, yes)} = \text{pr}(\text{WTP}_{1j} > t^1, \text{WTP}_{2j} \geq t^2)$$

$$= pr(\mu_1 + \varepsilon_{1j} > t^1, \mu_2 + \varepsilon_{2j} \geq t^2)$$

$$\text{pr(no, no)} = \text{pr}(\text{WTP}_{1j} < t^1, \text{WTP}_{2j} < t^2)$$

$$= \text{pr}(\mu_1 + \varepsilon_{1j} < t^1, \mu_2 + \varepsilon_{2j} < t^2)$$

$$\text{pr(no, yes)} = \text{pr}(\text{WTP}_{1j} < t^1, \text{WTP}_{2j} \geq t^2)$$

$$pr(\mu_1 + \varepsilon_{1j} < t^1, \mu_2 + \varepsilon_{2j} \geq t^2)$$

After running regression of the dependent variable (yes/no indicator), on constant and on independent variables consisting of bid levels, the mean WTP value is determined. Therefore, mean WTP value of urban forest conservation could be calculated as follows.

$$\text{Mean WTP} = x\,\beta/\beta o \quad (4)$$

Where X= Row vector of the sample mean including 1 for the constant term,

$\beta(k-1x1)$= Column vector of estimated coefficients,

βo =Coefficient on bid variable, and in constant-only models x=1 βis the Coefficient of the constant term.

Following to [16], mean WTP from the open ended contingent valuation responses can be estimated as:

$$\text{Mean WTP}=\sum_{i=0}^{n}\frac{yi}{n}$$

Where n is sample size and y_i is maximum amount of willingness to pay stated by Households.

(ii). Tobit Model

Tobit model was used in this study for evaluating the determinants of WTP and maximum amount of money respondents would be willing to pay for urban forest conservation practice. This model has benefit over other discrete models in that, it tells both the probability of WTP and its maximum WTP for the households, at the same time. The model is specified following random utility model [2].

$$MWTP_i^* = Bo+b1x1+b2x2+b3x3+b4x4+b5x5+b6x6\ldots.. +eij \quad (5)$$

$MWTP = MWTP_i^*$, if $MWTPi^* > 0$

$MWTP = 0$, if $MWTP_i^* \leq 0$

Where, $MWTP_i$ = the observed dependent variable, in this case maximum willingness to

Pay of each household (i^{th} household).

$MWTP_i^*$= is a latent variable which is not observed when it is less than or equal to 0, but is

Observed if it is greater than 0.

X = Vector of factors affecting WTP

B_O= Vector of unknown parameters

ε = Error terms that are independently and normally distributed with mean zero and

Common variance σ^2

The model parameters are estimated by maximizing the Tobit likelihood function

$$L^{\cdot}=\text{II}_{MWTPi}{}^{*} > 0\,\frac{1}{\partial}\left(\frac{MWPi-\beta x)}{\alpha}\right)\text{II}_{MWTPi}{}^{*} < 0F\left(\frac{-\beta Xi}{\partial}\right)$$

Where: *f* and *F* are the density function and cumulative distribution function of Y_i^*, respectively. $^{\text{II}}{}_{MWTPi}{}^{*} < 0$Means the product over those i for which $^{\text{II}}{}_{MWTPi}{}^{*} \leq 0$

$\text{II}_{MWTPi}{}^{*} > 0$Means the product over those i for which $\text{II}_{MWTPi}{}^{*} > 0$

It may not be sensible to interpret coefficient of a Tobit in the same way as one interprets Coefficients in a non-censored linear model. Hence, one has to calculate the derivative of estimated Tobit model to predict the effect of changes in the exogenous variables

$$\frac{\partial(MWTPi}{\partial xi} = f(t)\beta \quad (6)$$

Where $\frac{\dot{\beta x}}{\partial}$ is denoted by t.

Following [27], change in the probability of WTP as independent variable. Changes are:

$$\frac{\partial F(t)}{\partial xi}=\text{f (t)}\frac{\beta}{\partial} \quad (7)$$

The change in the amount of WTP with respect to a change in explanatory variable among

Individuals who are willing to pay are:

$$\partial E = \left(\frac{\grave{M}WTP\iota}{MWTP\iota*} \neq 0\right) = \beta\left(1 - \acute{t}\,\frac{f(t)}{F(t)} - \left(\frac{f(t)}{F(t)}\right)2\right) \quad (8)$$

Where, F (t) is the cumulative normal distribution of, f (t) is the value of derivative of the

Normal curve at a given point (i.e., unit normal density), t is the score for the area under

Normal curve, β′ is the vector of Tobit maximum likelihood estimate and $\hat{\partial}$ is the standard

Error of the error term

3. Results and Discussion

3.1. Demographic and Socio-Economic Characteristics of the Sample Households

As shown in the table 2 below from the total sampled households the majority of the respondent was male (72.43%) and female (27.57), 82.22% were in marriage, and 8.15% has never been married while divorced persons were account for about 9.63% of the respondents. With regard to religious affiliation, 17.78% were Orthodox Christians, 25.92% Protestant Christians and 56.30% of the respondents were Muslims. The education figures revealed that 371 (94.64) had received formal education with average years of schooling 7 while 21 (5.36 percent) were illiterate. Out of the total literate household heads, (48.21%) received primary education (from grades 1-8). However, (46.43 percent) had received secondary education (grades 9-12).

Table 2. *Distribution of sample households based on their marital status, Religion and Participation in urban forest conservation.*

Socio economic characteristics	Categories of households	Frequency	%	Mean	Std, DEEV.	Min	Max
Sex	Male headed	280	72.43				
	Female headed	112	27.57				
Marital status	Single	32	8.15				
	Married	322	82.22				
	Divorced	38	9.63				
Religion	Orthodox	70	17.78				
	Protestant	102	25.92				
	Muslim	220	56.30				
Educational status	Illiterate	21	5.36	7.0459	4.007402	0	12

Socio economic characteristics	Categories of households	Frequency	%	Mean	Std, DEEV.	Min	Max
	Grade 9-12	182	46.43				
	Grade 1-8	189	48.21				
Source of income	non-farm income	123	31.38%				
	Farm income	269	68.62%				
Age				35.6454	12.89756	18	65
Total land size				.250721	.04325	.008	1
Total annual income				159014.	155474.7	10450	829650
Distance from urban forest in minute				43.392	36.7231	3	150
Urban forest expert advice (Extension contact)	No	103	26.28				
	Yes	289	73.72				
Experience in urban forest conservation	Has experience	297	75.77				
	No experience	95	24.23				
Access to credit	Not Access to credit service	108	27.55				
	access to credit service	284	72.45				
Membership in the environmental protection club.	No	167	42.22				
	Yes	225	57.78				
Participation in urban forest conservation	Yes	340	86.7				
	No	52	13.26				
Residential location of the households	Live in the center of the city	285	72.70				
	Live outside of the city	107	27.30				

Source; own survey (2021)

Land size of households:-From table 2 above, the minimum and maximum land size owned was 0.008 ha and 1 ha respectively, the average size of land size for the total sample farmers was about 0.25 ha. The survey result also indicated that none of the sample respondents have their own demarcated urban forest land which may show the importance of urban forest for this purpose. As presented in table 3 below, there were statistically significant differences among willing and non-willing respondents in both initial and second bids in terms of land ownership.

Total annual income of households:-As shown in table 2 above, the surveyed households on the average earn birr 159014 annually income. The main sources of income are crop production, livestock selling, laboring and off farm activities. The income level ranges from a minimum of birr 10450 to a maximum of birr 829650 per year. As shown in the table 3 below, the mean difference of annual gross income from the two sources was significant for follow up bids.

Age of households:-From table 2 above data on age revealed a wide range of responses starting from 18 to 65 years where the average was found to be 35.6454. As indicated in table 3 below, t-value result indicated that there was a statistically significance difference in the mean age between the willing and non-willing respondents which was 30.42908 and 49.01818 years for the first bid and 31.44248 and 41.36747 for the second bid respectively.

Residential location of the household:-As shown in table 2 above, from the total surveyed respondent's 72.7% are normal resident of the city within the center of the city and round the city and 27.3% of the respondents was not normal resident of the city. As shown in table 4 below, the chi-square value indicates that there was a significance difference between willing and non-willing respondents between respondent live within the city and those live outside the city in both bids at 1% significant level.

Source of income for respondents:-From the table 2 above, 31.38% of the respondent source of income were non-farm income and the left 68.62% their annual income from farm economic activity. As shown in table 4 below, the mean difference of source of income from the two sources was significant for both initial and follow up bids.

Table 3. *Distribution of sample households based on their Land size, Total annual income, Distance from urban forest, Education and Age.*

Item	WTP the Initial B8d			WTP the Next Bid		
	Willing	Non willing	t-value	Willing	Non willing	T value
	Mean	Mean		Mean	Mean	
Land size	.620195	0.286651	0.9805***	0.109981	.395006	-1.1574***
Total annual income	207838.9	33844.95	-11.5073	212551.1	86126.23	-8.6780***
Distance from urban forest	26.41844	86.90909	21.794	33.43363	56.95181	6.5970
Education	8.886525	2.327273	-21.492	8.40708	5.192771	-8.5377
Age	30.42908	49.01818	16.8196 ***	31.44248	41.36747	8.1308***

Table 4. *Distribution of sample households by Sex, Residential location, Experience in urban forest conservation, Income source and Access to credit.*

Item	WTP the Initial Bid					WTP the Next Bid				
	Willing		Non willing		χ^2	Willing		Non-willing		χ^2
	N	%	N	%		N	%	N	%	
Sex										
Male	215	54.8	65	16.58	11.4	170	43.36	110	28.06	3.7616

Item	WTP the Initial Bid					WTP the Next Bid				
	Willing		Non willing		χ^2	Willing		Non-willing		χ^2
	N	%	N	%		N	%	N	%	
Female	67	17.09	45	11.48		56	14.28	56	14.28	
Residential location										
in city	260	66.3	25	6.4	192.4 ***	40	10.2	67	19.09	24.7***
Outside city	22	5.6	85	21.7		186	47.4	99	25.2	
Experience in urban forest conservation										
Has experience	22	5.6	73	18.6	147.802	191	48.7	106	27	22.24
Has no experience	260	66.3	37	9.4		35	8.9	60	15.3	
Income source										
Farm income	245	62.5	24	6.2	155.566***	177	45.1	92	23.46	23.302***
Non-farm income.	37	9.4	86	21.9		49	12.5	74	18.9	
Access to credit.										
User	266	68.87	18	4.6	240.96	91	23.2	193	49.2	44.8
Non user	92	23.46	16	4.08		33	8.4	75	19.13	

***, **,* Statistically significant at 1, 5%, 10%, respectively
Source: own survey, 2021.

3.2. Household's Willingness to Donate for Urban Forest Conservation

3.2.1. The Contingent Valuation Survey Results

From the sampled households 28.06% percent were unable willing to pay for the initial bids and 42.35 of the respondent were unable to pay for follow up offered bid. The specific reason for the unwillingness was lack of awareness on the direct and indirect benefit of urban forest conservation. Three sets of bid prices which were identified from the pilot survey were used for the study. These are (20, 40 10), (30, 60, 15) and (50, 100,25) cash in birr per year which were proportionally dispersed to survey questionnaires sated as starting point bid over focal group discussion. Out of total respondents, about 71.94 percent responded "Yes" for the first bids and 57.65% responded yes for second bid in in birr. When we look at the "Yes" and "No" distribution for first and second bids across initial bids, as the initial bid gets higher the frequency of "Yes" responses for cash bids decreases.

Table 5. *Distribution of responses to double bounded question across the bid sets for birr.*

Set of Bids	Households' response for DB questions across bid sets in Birr									
	Yes-Yes		Yes- No		No-Yes		No-No		Total	
	N	%	N	%	N	%	N	%	N	%
(20, 40, 10)	67	17%	34	8.7%	16	4	14	3.6	131	100
(30, 60, 15)	62	47.05	19	14.7	8	5.8	42	32.06	131	100
(50, 100, 25)	38	29.41	4	15	23	17.64	65	50	130	100

Source: own Survey 2021

As indicated in Table 5 above, out of 131 respondents offered twenty birr initial bid, about 17% accepted both the first and second bid, 8.7% accepted the first bid and rejected the follow up higher bid, 4% reject initial bid and accept the follow up lower bid and 3.6% of the respondents were found non-willing and rejected both the first and the second bid.

From the respondents of the thirty birr initial bid, about 47.05% accepted both first and second bid, 14.7% of the respondent accept the initial bid and reject the follow up higher bid, 5.8% of the respondent reject the initial bid and accept the follow up lower bid and the last 32.06 percent of the respondent both initial and follow up bid.

The last bid offered for the respondent was fifty birr. The out of the 130 last respondent offered fifty initial bid 29.41% accepted the first and follow up bid, 15% of the respondent accept the initial bid and reject to accept the follow up higher bid, 17.64 of the respondent were reject initial bid and accept the follow up lower bid and the remaining 50% rejected both initial and follow the initial bid Generally, one can notice that as the initial bid gets higher, the number of "Yes" response decreases.

Table 6. *Joint frequency of discrete response for money in birr.*

Joint Response	Frequency	Percentage
Yes- Yes	167	42.6
Yes-No	57	14.5
No-Yes	47	11.9
No-No	121	31

Source: own survey 2021

As indicated in Table 6 above, one can understand from the joint frequencies of discrete responses, 42.6% responded "Yes-Yes" for both the first and second bids, 14.5% responded "Yes-No" for both bids, 11.9% responded "No-Yes" and remaining 31% responded "No-No" The survey result also indicated that 42.6% of the respondent who accepted the first bid gave similar response to the second bid and 31% of the respondents who rejected the first bid also rejected the follow up bid. This may indicate the presence of the first response effect on response for the second question.

3.2.2. Aggregate Mean WTP

The mean WTP of respondents for conservation of urban forests were calculated using the formula specified by [16]. The coefficients α and β were estimated by running seemingly unrelated bivariate probit model using first bids and second bids as explanatory variables. Accordingly, mean WTP estimated from initial bid and follow up bid values ranged 60 birr to 80 birr per year per household, and WTP from the open-ended question was 105 birr per year per household which is equivalent to half working hour labor in man days per year per households at current labor market of Beneshangul Gumuz regional state. According to [16], researcher must decide which approximations from the double bounded questions to use so as to calculate mean WTP. They explained that parameter approximations from the first equation are usually used in the computing mean WTP. The reason behind is the fact that second equation parameter are likely to comprise more noise in terms of fixing bias as the respondent is assumed to take the hint from the first bid while forming his WTP for second question. Hence 60 birr per year per household were projected from first equation from seemingly unrelated bivariate probit model.

The annual aggregate WTP of Urban and per- urban household for urban forest conservation were valued by multiplying the number of households (9912) by the mean WTP per year per households. Therefore, annual aggregate WTP was estimated to be 594720 birr per year.

3.3. Factors Affecting WTP for Conservation of Urban Forest

Before running the econometric model, the presence of outlying, multicolinearity and heteroscedasticity problems were tested. The result showed that there was no serious multicollinearity problem between the variables. Similarly, to correct the heteroscedasticity problem, the robust standard errors were used. Thus, from Tobit model result the explanatory variables which affected WTP were discussed as follows.

Table 7. *Tobit model.*

	Coef.	Robust Std. Error	p>/z/	Marginal effect result			
				Coef	Std. Error	Z	P>|z|
Age	-.7319355	.3469458	0.036	-.7319355	.34695	-2.11	0.035
Sex	.6242596	8.117019	0.939	.6242596	8.1170	0.08	0.939
Experience in urban forest conservation	4.588327	9.961439	0.645	4.588327	9.9614	0.46	0.645
Land size	.2895428	.1093139	0.008	.2895428	.10931	2.65	0.008
Distance from home to urban forest	-.123946	.1411189	0.380	-.123946	.14112	-0.88	0.380
Contact with extension agent	-7.173021	13.44403	0.594	-7.173021	13.444	-0.53	0.594
Income source	-4.711256	12.15231	0.698	-4.711256	12.152	-0.39	0.698
Total annual income	.0002251	.0000357	0.000	.0002251	.00004	6.30	0.000
Level of education	3.235037	1.860063	0.083	3.235037	1.8600	1.74	0.082
Access to credit	37.25005	14.39395	0.010	37.25005	14.394	2.59	0.010
Residential location	9.58607	12.22	0.433	9.58607	12.22	0.78	0.433
Cons	58.87857	21.99018	0.008				
Number of obs =392							
LR chi2(11) =246.23							
Pseudo R2 =0.0498							
Log likelihood = -2239.0916 > Prob > chi2 =0.0000 P***							

Source: Own Survey, 2021

Age of the household head:-Age of the household head had negative and significant effect on households WTP at 5% significant level. This might be older age might shorten planning time horizon and reduce WTP. On the other hand, young farmers might have a longer planning horizon and, hence, might be more likely to be willing for the conservation. Besides, an older aged household heads are more likely to have a money deficiency and reduce willingness to recompense for urban forest conservation. That is holding other things constant, one year increase in household head age decrease the probability of willing to pay by 0.73. The result was consistent with studies done by [22].

Access to credit (CU):- The variable access to credit has a positive sign as expected and significant at 10%. This indicates that access to credit has a positive influence on the price urban and per-urban households' are willing to pay for the for urban forest conservation. The result indicates that, keeping other factors constant, being access to credit increase the probability of the households' willingness to pay for urban forest conservation by 37.25% similarly, when the house holds access to credit the amount of cash household could pay for urban forest conservation also increases by birr 37.25, holding the effect of other factors constant. The better they access to credit the more urban and per-urban households willing to pay for conservation program. Access to credit enables households to invest in non-farm economic activity to increase their daily or monthly revenue. This result is supported by the findings of [8].

Total annual income:-Households' total annual income has a positive sign and it is significant at 1% level of significance. The marginal effect displays that an increase in the total yearly income of the household by one Birr increases the probability of households' WTP for urban forest conservation by 0.0223%, keeping other factors constant. In

similar way, when an income of a household increases by one birr, the amount of cash a household might pay for urban forest conservation increases by 0.0002251 birr, holding other factors constant. Higher income raises the ability of household to pay for urban forest conservation program. Besides, those households with higher income are willing to pay more for urban forest conservation than their counterparts with lower income. This value is in line with the work of [32].

Education level of the respondents (EDUC):-Educational level, as expected was positively associated to WTP and significant at 5% probability level. Keeping other factors constant, the marginal effect of the variable specifies that a class year increase in education level of the household increases the likelihood of WTP for urban forest conservation program by 323.5037%. In the similar way, as the education level of household improved by a class year, the amount of cash a household is willing to pay for urban forest conservation program might increase by 3.235037 birr, ceteris paribus. That is, households with more class years are more willing to pay for urban forest conservation practice. One possible reason might be that more literate individuals are more worried about urban forest as education delivers knowledge and makes the household get information, and the information creates awareness about the benefits obtained from urban forest conservation than less educated or illiterate ones. The finding was similar to findings by [32].

Land size:-The result from the Tobit model showed that total land size owned was found to positively affect the willingness of respondents to donate time and money for conservation and rehabilitation of urban forests at 1% significance level. One hector increase in the land size of the households increase the probability of urban households WTP for urban forest conservation program by 28.95% and one hector increase in the land size of the household increase WTP of the household for urban forest conservation program by 0.2895 birr. The reason for this is that households having more land size may have more for plantation and rehabilitation than households with les land. This result is inline the finding of [1].

4. Conclusion and Recommendations

This study assessed urban and per urban households' willingness to pay for urban forest conservation of Assosa Woreda, Western Ethiopia.

The finding shows that, on average, each household was willing to pay 60 birr per year through water billing for urban forest conservation programs and WTP from the open-ended question was 105 birr per year per household. Thus, mean willingness to donate money from dichotomous choice questions is less than open-ended questions. The aggregate welfare gain from conserved urban and per-urban forest in the study area from the double bounded dichotomous choice format and open ended format was estimated to be 23520 and 41160 birr per year respectively.

The important variables identified in this study to determine urban and per-urban households' WTP for urban forest conservation was related to their level of education, total annual income, land size, age and access to credit. Our findings suggest that improving households' total annual income, educational level, credit service expansion and land size improve urban households willingness to pay for urban forest conservation program. The positive relationship between total annual income of the household and WTP indicates that increment of the total annual income of the respondents increases their willingness to donate money towards conservation practices of urban forest conservation practice. So, the forest policy of Ethiopia, particularly Beneshangul Gumuz regional state should design strategies to diversify income sources of the households so as to realize the conservation of urban forests. Age of the household head and level of education have negative and positive influence on the households' willingness to donate money (WTDM) for the conservation of urban forests respectively, Thus, it is vital to teach conservation practice to increase the awareness of the old aged households by teaching them about the use and non-use value of urban forests for their own consumption and for the future generation which may increase their willing to donate money for the conservation and rehabilitation of urban forests. Hence, all educational institution particularly Assosa University should focus on launching environmental protection targeting department, expanding and providing adult education targeting on younger household heads is necessary to enhance their level of understanding about the resource degradation and environmental problems and sustain their willingness to participate in the conservation and rehabilitation programs. The study indicated that urban forest resources are important to supplement of livelihoods of the people living around the urban forest, so that the local administration should take in to consideration this livelihood issue before changing the forested area in to other development tradeoffs. The significance of credit utilization shows that in order to have an effective urban conservation pricing system incentive the households in utilization of credit is an important for urban and per-urban of the study area. Thus, any urban forest conservation program should link urban and per-urban households with credit facilities to induce sufficient investment on their urban forest through expanding bank; establishment of micro-credit institutions where urban and per-urban can access and utilizes credit at more reasonable rates. Urban and per-urban households in the study area had good willing to donate money toward urban forestry programs and activities of the urban forest. Hence the regional government in teamwork with the federal government should use this chance to mobilize the community to fight the problem through implementing the draft strategy and revenue collection for urban and per-urban environment protection. The investment and settlement programs of the government particularly Assosa city settlement program should be implemented by giving a due attention to the urban forest resource as these programs are considerably damaging urban forests. This study assessed the amount of money in birr urban and per-urban households

willing to donate for the conservation of urban forest and the determinants of urban and per-urban household's willingness donate money for urban forest conservation. Assessing the determinants of urban and per-urban household's willingness donate time and amount of time urban and pre-urban household's willingness to donate for urban forest conservation could be an interesting field of study for future studies to put an economic value on different attributes of urban forest.

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