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Economic Valuation of Borena-Sayint National Park, Ethiopia: An Application of Contingent Valuation Method

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Abstract
When a market for a certain good is suitably competitive, economic behavior can be studied all the way through the market-pricing instruments. In view of the reality that this is usually not viable in the case of natural resource and environmental goods and services, particular methods of economic valuation of such goods have to be used. This study presents the economic valuation of Borena-Sayint national park in north-central part of Ethiopia. Contingent valuation method was used to carry out the analysis of data collected from 236 local resident households of the park. To do so probit model was used in the contingent valuation methodology. The result from probit model shows log-transformed income, age of the household head, gender of the household head, training on forest conservation, and numbers of family members were among the significant and positive variables that affect local resident's willingness to pay for conservation. On the other hand, a randomly offered initial bid, marital status, and illiteracy had a negative sign and were significant variables. Finally, the mean willingness to pay of households for the conservation of the forestry park was also estimated to expand in to aggregate willingness to pay. The mean WTP from probit model is birr 38.15. This suggests that there is a strong economic case for the conservation of the forestry park.
Keywords: Borena-Sayint national park, Contingent valuation method, Economic valuation

1. INTRODUCTION

One of the basic principles of economic analysis is that people live in a world of scarcity where resources tend to be insufficient to produce the products and services that satisfy all the human needs. One of the scarce resources is environment which is valuable for the society. The set of needs and wants satisfied environment is extensive, ranging from most basic like breathing pure air to much more complex ones recreation and short breaks. In addition, as society become richer, industrialized and urbanized, demand for environmental goods tend to increase resulting great pressure on natural resources (Barata et al, 2014).

National parks are the most extensive form of protected areas in all parts of Africa and globe. National parks comprise the highest percentage (23%) of total protected areas in the world. In Africa, more than 1,812 national parks were built before 2013. Only in sub-Saharan Africa, national parks constituted around 4% of total land area (Muhumuza and Balkwill, 2013).

National parks with other protected areas and public goods have a lot of advantages in different activity of the society. The major benefits are biodiversity conservation, ecotourism development and as a source of income for the community living around the vicinity of the areas. Throughout the process national parks can improve the performance of national economic growth (Yibrie, 2011).

The values of environmental services are not usually revealed in market transactions because many of them are non-tradable. The Total Economic Value (TEV) of ecological goods include marketable and non-markatable values, their present and future values, and goods provided can be material and non-material. Accordingly, non-market valuation techniques must be used to assess their economic values and promote efficiency. These most commonly used techniques are stated preference methods (SPM) and revealed preference methods (RPM) (Barata et al, 2014).

2. Statement of the Problem

If sustainable environmental protection is integrated in the development project of countries, it may foster sustainable economic development of the world. High population growth, expansion and development of cities, industrialization, raising production and consumption, intensification of farming and desertification has been affecting the environment. However, the magnitude of the problem is still different depending on the level of development, and the nature of environmental policy implemented in different countries (Vondolia, 2009).

In many parts of both developed and developing countries, like conventional marketable goods national parks are susceptible to a number of market failures as a result of varying degree of non-rivalry and non-excludability

properties. Moreover, the areas are vulnerable to negative environmental impacts due to change of ecological system, mismanagement, and lack of preservation plans which often occurs in most of the developing countries (Yibrie, 2011).

In developing countries, there is a tight spot with regard to protection of biodiversity. Not only there are justifiable factors for the establishment of national parks, there are also some arguments which bear the idea of authorizing the consumptive use of environmental services. Thus, even if the investment in the provision of alternative income generating activity in the encouragement of ecotourism and delegation of conservation decision making, the rate of environmental degradation remains a challenge of conservation. Conflict between management of protected areas and local communities are the widespread features of biodiversity conservation in national parks and other protected areas (Vondolia, 2009).

Borena-Sayint national Park, one of largest biodiversity area in Ethiopia is challenged by a number of factors as too demanding grazing land, cutting of trees for the purpose of agricultural expansion, livestock and for fuel wood. Thus, conflict of management of BSNP and local community is also a common problem. Income generated from ecotourism is almost nil which implies there is low tourist flow in the country in general and BSNP in particular. This is primarily due to the lack of proper planning, monitoring and valuation of the existing natural resources associated with tourism in the area. If the external and internal pressures continued in a similar manner, the future sustainability of the park is questionable (Eshetu, 2014).

The financial return from entry price in national parks which is understated in the existing situation can be improved if national parks and other recreational sites are valued in the appropriate manner. Thus, resource and environmental economists have to come up with different approaches of measurement of environmental benefits (Bandara and Tisdell, 2014). Contingent valuation, travel cost, choice experiment and hedonic pricing are the most widely used environmental valuation techniques even if they are underdeveloped in most developing countries like Ethiopia (Etensa, 2014).

Different researchers have done on the economic valuation of national parks in different parts of the world and Ethiopia (Yibrie, 2011); Thapa, 2016; Sebastian and Tobias, 2007; Satyanaryana and Tadesse, 2014); Sergio and Sherry, 2008; Sharahi et al, 2015, Eticha, 2016). These researchers have been mainly focused on the valuation of recreational use value of national parks and other protected areas particularly on visitors. However, a major challenge of environmental conservation programmes especially in developing countries like Ethiopia depends on the preference of local residents and resource users. The failure to include both local residents and visitors in future protected area management and conservation policies contributes to limited conservation benefits and further conflict between people and protected areas. The major objective of the paper is to measure the economic value of Borena-Sayint national park through the application of contingent valuation method.

The study provides a recommendation for sustainable conservation of BSNP and financial resource for management of the park. The area of study is highly practiced in developed countries after the first attempt of Clawson and Cnetsch of 1966 (Horland, n.d[1]). However, environmental valuation is found at an infant stage of development with some progress in the past few years. Although national parks play significant role in developing countries, estimation of economic value is not sufficiently explored. Thus this study contributes to the existing limited literature in the area of environmental valuation through future resource and environmental researchers.

The rest of the paper is organized as follow. The second section presents the methodological issues like data collection, sampling and econometric estimation. In the third section, descriptive statistics and analysis of results was presented. Finally in fourth section, conclusion and summary of results was discussed.

3. Material and Methods

3.1. Description of the Study Area

Borena woreda is one of the administration provinces in northern central part of Ethiopia found in South Wollo zone which was known by the name called Debresina woreda in the earlier periods up to 2007. It is situated between 10^{o} 50’ 45.4”- 10^{O} 53’ 58.3” N latitude and 38^{O} 40’ 28.4” – 38^{O} 54’ 49” E longitude. The woreda is categorized under 36 administrative kebeles[2] with four administration provinces as a boundary. The boundary woredas are Wegede woreda in the south and southeast direction, Amhara Sayint woreda in the north, Legambo woreda in the northeast, and Mertole Mariam woreda in the west direction. The first three borders of the woreda are from South Wollo zone and the fourth is from east Gojjam zone through Abay River. The total area of woreda is 1000.78 km^2 (Eshetu, 2010).

The total population of the woreda is estimated to be 200,399 in 2016/2017. The gender composition shows 99,598 (49.7%) are males and 100,801 (50.3%) are females. 188,375 (94%) of population is rural area depending on subsistence smallholder farming. The population density of woreda is 200.2 peoples /km^2 (BSNP, 2016).

The landscape of Borena woreda is characterized by mountain (10%), plain (20%), valley (30%), and ups and

[1] n.d. refers to not defined
[2] a collection of small villages (category of woredas)

downs (40%). Its altitude ranges between 1100-3700 meters above sea level. This makes possible the woreda to have diversified agro ecological zones ranging from Kola (Warm to hot climate (20°-30°c)) (32%), Woina dega (Warm to cool climate (16-20°c)) (47%), Dega (Cool to cold climate (10°c-16°c)) (20%) and Wurch Zone (Alpine climate (<10°c)) (1%). The yearly mean temperature and rainfall are 18°c and 1200 mm respectively (Eshetu, 2010; Bisrat, 2015).

The first declared area of the park was 4375 hectare (ANRS, 2009). In 2011/12, additional 10,887 hectare of land was demarcated from Amhara-Sayint, Legambo, Mekdela and Tenta woredas. As a result, the newly demarcated total size of Borena-Sayint national park will be 15,262 hectare (Assefa, 2012). There are 13 kebeles surrounding the park from three woredas. Only one kebele from Amhara-Sayint woreda called Beja Chilaga, three kebeles from Mehal Sayint woreda namely, Kotet, Wejed and Samayie, and nine kebeles from Borena woreda namely, Anferfera, Chero Cherkos, Jelisa Libanos, Abu Aderie, Fati Jenberu, Miskabie, Chiro Kadis, Dega Dibi, and Hawey Betaso are the surrounding kebeles of BSNP (Eshetu, 2010).

The forest conservation history of the area backs to the 15th century during the period of Zere-Yaekob. During this time, the forest coverage was too large encompassing areas comprehensive as outlying as the edge of Blue Nile. The area has been recognized as one of an interesting biodiversity and tourist destination natural forest areas of the country in 1952, and demarcated in 1973. Even though the forest area was protected as a state forest in the Derg regime (1974-1991), it faces destruction in 1991 during the government change of the country (Eshetu, 2010). Later in 2009, Amhara national regional state declared the aforementioned natural forest conservation area to be one of the national parks in the country by the Negarit Gazeta proclamation number 68/2009 as Borena-Saynt national park (Assefa, 2012).

3.2. Source and Method of Data Collection

Both primary and secondary source of data were used in the study. Primary data was collected from the surrounding sample households through structured questionnaire to elicit their willingness to pay for the conservation of the park.

Secondary data was collected from Borena-Sayint national park and Borena woreda administration office. Direct (face-to-face) interview method of data collection was used to conduct the survey. The method was selected for the purpose of higher response rate than other data collection tools. Self-designed questionnaire was used to conduct the survey of households. In addition to the survey method, Focus Group Discussion (FGD) was also organized with 20 randomly selected households to determine initial bid value hence to avoid starting point bias in contingent valuation methodology section. 5 data enumerators were hired and trained from Walelign Mekonnen secondary school grade 12 social science and Technical Vocational Training (TVT) students to conduct in-person interview.

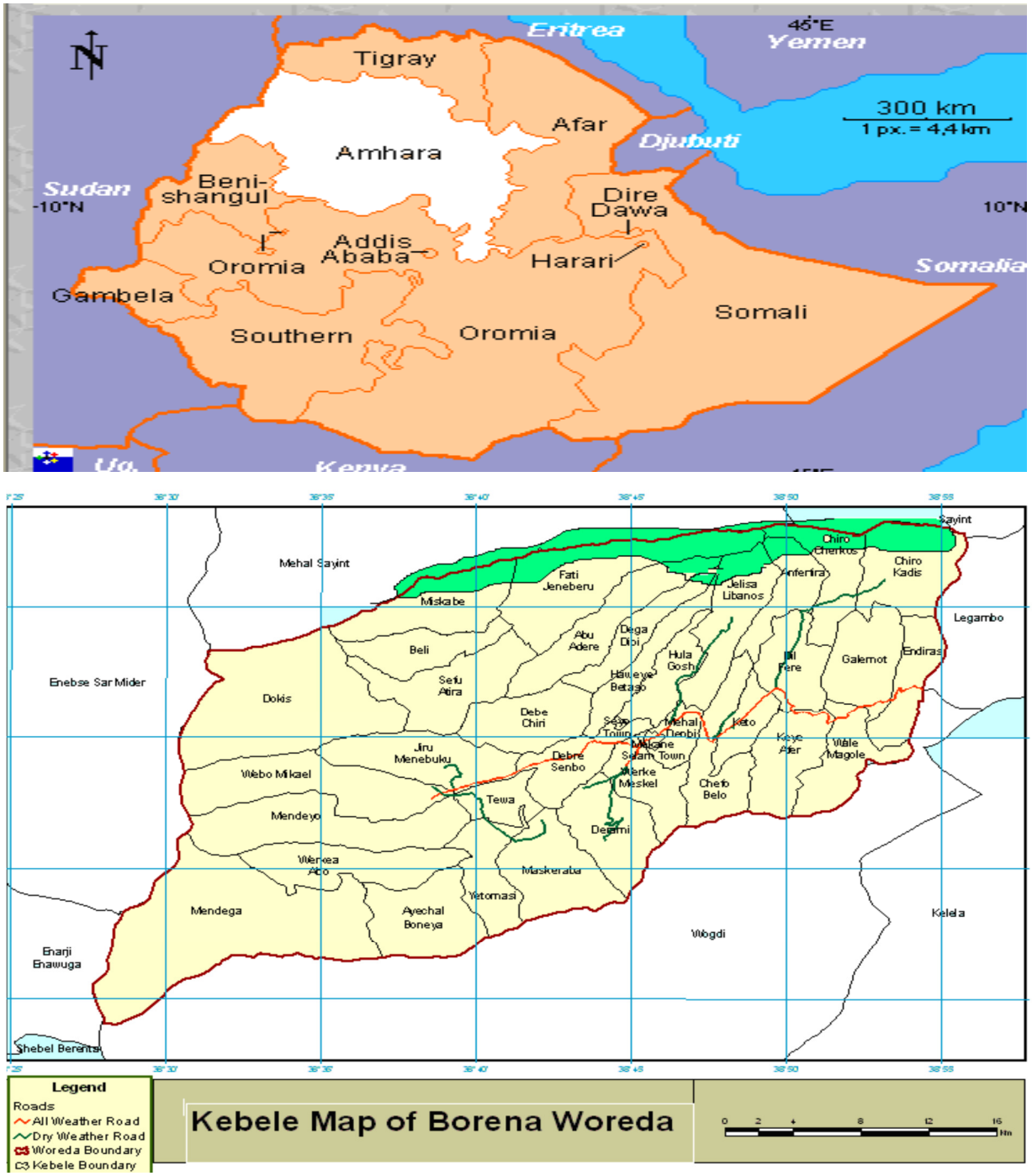
3.3. Questionnaire Format and Elicitation Methods

In this study, self-developed questionnaire was used to carry out the survey of households. The questionnaire for contingent valuation has three sections. These are attitude and perception of local residents about Borana-Sayint national park, willingness to pay questions, and demographic and socioeconomic characteristics of residents. According to (Rohlig, 2012), the success of CVM in yielding valid and reliable results is highly dependent on well-structured survey instruments. Thus, the CV questionnaire contains the following major concepts.

Determination of a payment vehicle: in a valuation process, the objective of researchers is estimation of a monetary value. In essence, the choice of a payment vehicle like tax and refund must be defined as certain payment method might result protest bids. In this study, households were also requested to state the way of their payment vehicles. Three choices were offered for this purpose. These are payment with rural land use fee, payment as annual donation and other way of payment vehicles.

Valuation questions: elicitation technique and the choice of WTP or WTA are the major issues in valuation questions. WTP method of valuation is selected over WTA particularly to avoid measure biases of contingent valuation method. The four commonly known elicitation methods are open-ended question, biding game, payment card and dichotomous format. This study applied dichotomous choice format.

Auxiliary questions: this section of questionnaire includes attitude and perception of local residents, and demographic and socioeconomic questions of local residents. For example, this comprises questions related to income, education, or age including their perception about conservational issue that enable to determine factors for WTP and to provide more refined recommendations.



Source: (Eshetu, 2010)

Figure **3.**1: Map of the study area

3.4. Hypothetical Market Scenario

A clear depiction of hypothetical market scenario is the principal body of every contingent valuation study. It starts by describing the status quo i.e. the present situation and corresponding characteristics or environmental goods and services in question. The practical difficulty of researchers is to describe and communicate the environmental change to be valued. The problem is severe for environmental goods and services, as respondents are less experienced in dealing with these types of goods and services. Consequently, the scenario has to be clearly demonstrated.

The first step in questionnaire design for CVM analysis is development of hypothetical market scenario. The conventional market has no obvious price of environmental amenities. In the present study, the scenario was established to determine the farmers' willingness to pay for the conservation of Boren-Sayint national park. Development of this scenario requires different assumptions. The first assumption is the existing conservation

system of government through scout and patrolling is not effective. The second is settlement of agricultural population around the park resulted conflict of interest in biodiversity of the park. Thirdly, loss of biodiversity of the park affects both flora and fauna.

Relevant conservation programmes were presented to local residents with information sheet about the current status of the national park with different opportunities and threats. The scenario was presented as follow for respondents. "Consider Borena-Sayint national park management office initiated a conservation plan for efficient biodiversity protection and reverse underutilization problem of ecotourism service for the coming five years. The plan has the following major contents. 1) Further strong protection of the national park, 2) establishment of entertainment center inside the park, 3) standard road and other infrastructural construction for tourists, and 4) wide area promotion for sustainable tourist attraction". Beyond this, respondents were also informed about the potential opportunities as a result of the designed program and sustainable conservation of biodiversity of the park. The possible benefits will be raising the number of visits of the park, sustainable protection of flora and fauna species of the park, sustainable generation of income by the park itself.

3.6. Target Population, Method and Size of Sampling

The target populations of the study were major stakeholder of Borena-Sayint national park i.e. local residents. Villages surrounding the park which can access and exert direct and indirect benefit and cost (Miskabe, Fati Janeberu, Abu, Jelisa Libanos, Anferfra, Chiro Cherkos, Chiro Kadis, Dega Dibi, Beja-Chilaga and Hawey Betaso kebeles from Borena woreda, Kotet, Wejed and Samayie from Mehal Sayint woreda, and Beja Chilaga kebeles from Amhara Sayint woreda) were surveyed to elicit their willingness to pay for the conservation of the park by cash. Multi-stage random sampling method was used in the study to obtain representative sample of the population (farmers). This is because it distributes sample uniformly over the entire population and provide more information about the required data from the population (Eshetu, 2010).

Steps involved multi-stage random sampling were the following: firstly, 26 villages were selected randomly from 13 surrounding kebeles of Borena-Sayint national park. Secondly, lottery numbers for each village was assigned from 01 to 26. Thirdly, 13 or 50% villages were selected using lottery method. Lastly, All households of 13 villages (236 household heads) were surveyed.

3.8. Econometric Method of Analysis

The fundamental model for analyzing dichotomous CV questions is the random utility model. The intention of estimating parametric model is to determine WTP for the service described. Moreover, parametric models allow for inclusion of respondent characteristics in to willingness to pay function. Understanding how WTP responds to individual characteristics allow the researcher to gain information on the validity and reliability of the CV method, and to extrapolate sample responses to a more general population. The study applied the model developed by (Haab and McConnell, 2002).

In the CV case, there are two choices; as a result, indirect utility for respondent r can be formulated as follow:

$$UT_{ir} = UT_i(m_r, S_r, V_{ir}) \quad (3.1)$$

Where, i=1 for final state and i=0 is for status qu. In this case, utility determined by m_r (r^{th} respondents income), S_r (vector of socio-economic indicators), and V_{ir} (a component of individual preference known to individual but not observed by the researcher).

If the respondent accepts the offered bide value, his/her income is reduced by the amount of bid value (BV).

$$UT_1(m_r, S_r - BV_r, V_{ir}) > UT_0(m_r, S_r, V_{0r}) \quad (3.2)$$

The probability of an accept response will be specified as follow:

$$prob(accept_r) = prob[UT_1(m_r - BV_r, S_r, V_{1r}) > UT_0(m_r, S_r, V_{0r})] \quad (3.3)$$

It can be rewritten as follow:

$$UT_r(m_r, S_r, V_{ir}) = UT_i(m_r, S_r) + V_{ir} \quad (3.4)$$

$$prob(accept_r) = prob[(UT_1(m_r - BV_r, S_r) + V_{1r}) > UT_0(m_r, S_r) + V_{0r}] \quad (3.5)$$

$$= prob[UT_1(m_r - BV_r, S_r) - UT_0(m_r, S_r) > V_{0r} - V_{1r}]$$

$$= \mu_\eta(\Delta UT) \quad (3.6)$$

Where η is $V_{0r} - V_{1r}$

$\Delta UT = UT_1 - UT_0$

, and $\mu_\eta(\Delta UT)$ is the cumulative distribution function. If the utility function is linear, then the deterministic part of the preference function is linear in income and covariates.

$$UT_{ir}(m_r) = \theta_i S_r + \beta_1(m_r) \quad (3.7)$$

The deterministic utility for the proposed CV scenario is

$$UT_{1r}(m_r - BV_r) = \theta_i S_r + \beta_1(m_r - BV_r) \quad (3.8)$$

The utility at the status quo is;

$$UT_{0r}(m_r) = \theta_i S_r + \beta_0(m_r) \quad (3.9)$$

The change in deterministic utility with constant marginal utility of income is;

$$UT_{1r} - UT_{or} = \theta_i S_r + \beta(BV_r) \quad (3.10)$$

$\theta = \theta_1 - \theta_0$ *and* $\beta_1 = \beta_0$

Thus, the probability of "accept" for respondent r can be estimated as;

$$prob(\theta S_r - \beta BV_r + V_{ir} > 0) = prob(V_{ir} < \theta S_r - \beta BV_r)$$

$$= \emptyset\left[\frac{\delta S_r}{\tau} - \frac{\beta BV_r}{\tau}\right] \quad (3.11)$$

Where, φ is the cumulative normal distribution. Thus, the study employed a probit model, and it was used to determine factors of household's willingness to pay for the conservation of BSNP. The model can be formulated based on (Haab and McConnell, 2002).

$$WTP_r^* = \beta X_i + V_i$$

Where WTP_r^* is unobservable latent variable which is a household WTP for the conservation of the park. However, we can observe the dummy variable WTPBID, which is defined as; WTPBID=1 if WTP_r^*>BV[1] and WTPBID$_I$=0 if WTP_r^*<BV[1].

X_i is the vector of explanatory variables, β is the vector of coefficients, and U_i is the coefficient of error term. Thus, the model can be specified as follow.

The determinants of local resident willingness to pay for conservation of national park and other protected areas were determined depending on previous researchers such as: (Etensa, 2014; Bandara and Tisdell, 2002; Asmamaw et al 20l6; Nigus, 2014; Bantie, 2011). Accordingly, the most important determinants were yearly or monthly income, dependency ratio of the household, age of household head, landholding size of the farmer, sex of household head, training on forest conservation, marital status, and amount of bid offered to respondents.

These determinants includes socio-economic, demographic and attitude indicators of respondents as explanatory variables. It can be specified as follow:

$$WTPBID = \theta + \beta_1 BID + \beta_2 lnIN + \beta_3 AGHH + \beta_4 DR + \beta_5 LHS + \beta_6 NFM + \beta_7 SEHH + \beta_8 MRS + \beta_9 TFC + \beta_{10} ILL + U_i$$

Where WTPBID is willingness to pay for the offered bid; lnIN is the logarithm of monthly income of farmers, DR is the dependency ratio of the household, NFM is number of family members, AGHH is the age of household head, LHS is landholding size of the farmer in hectare, SEHH is the sex of household head, TFC is training on forest conservation, MRs variable is the marital status of household, BID is the offered amount of bid, ILL is level of illiteracy and U_i is an error term.

3.9. Definition of Variables and Expected Signs

3.9.1. The Nature of Dependent Variable

Willingness to pay for the offered bid (WTPBID): refers to the willingness to pay of local residents for the conservation of Borena-Sayint national park. This is the dependent variable used in the probit model (single-bounded dichotomous method). This variable is a dummy variable which takes the value one if the respondent is willing to accept the first randomly offered bid value and zero otherwise.

3.9.2. Definition and Hypothesis of Independent Variables

Income of the farmer (lnIN): is the amount of money in which the farmer earned from crop production, livestock, and other source of income. It is expected that income has a positive effect on farmer's willingness to pay for the conservation of national park. This is because from economic theory, the demand for goods and service purchased depend on the level of income earned by the individual.

Dependency ratio (DR): is the ratio of economically unproductive age population (between age 0-14 and above 65) to economically active age population which is between age (15-64). In this study, it is the ratio of number of children and old to the number of adult in a particular household. It has a negative effect on the productivity potential, purchasing power and willingness to pay for the environmental conservation. Thus, it is expected to have a negative sign variable.

Number of family members (NFM): is the size of households' family members living under one roof. It is discrete variable expressed in quantitative number. On one hand, large family size reduces the purchasing power of the farmer which implies it will have a negative impact on willingness to pay for environmental conservation. On the other hand, large family size implies diverse income source for the household as well as there is a bequest motive among households. Thus, family size is expected to have an either of signs.

Age of the household head (AGHH): is quantitative variable which represent the number of years after the birth date up to the time of interview by a particular household head. In this study, age is expected to have a positive of

effect on WTP of household.

Landholding size of the household (LHS): this variable represents the area of arable land possessed by a particular family unit. It is expected to be positively related with the probability of WTP.

Sex of household head (SEHH): refers to the biological gender of household head as a dummy variable which is equal to one if the head of the household is male and zero if the head is female. It is hypothesized to be positive which imply male household heads have a greater willingness to pay for environmental conservation than their female counterparts in Ethiopia.

Training on forest conservation (TFC): is a dummy variable that shows the effect of investment on awareness creation about environmental conservation. If the respondent followed trainings on environmental conservation, it takes one and zero if not. TFC is expected to have a positive sign.

Marital status (MRS): is status of farmer whether he/she is married, single, divorced or widowed. It is expected to be negative with WTP in which married individuals have lower willingness to pay than other categories with a lot of burdens.

Amount of bid (BID): is the predetermined amount of bid value offered to respondents. Bid amount is expected to have a negative effect on households WTP. The higher amount of bid offered to respondents the lower will be their willingness to pay.

Illiteracy (ILL): is a dummy variable which is equal to one for individual who have no formal education, and zero for individuals with formal education. Illiteracy is expected to have a negative effect on households WTP.

4. Empirical Results and Discussions

4.1. Descriptive Analysis

In this subsection, the socio-economic and demographic characteristics of local residents were analyzed using mean, percentages, frequency distributions and others.

4.1.1. Socio-economic Characteristics of Households

Table 4.1: Summary statistics of continuous variables; all results based on no missing observations (no. obs. = 229)

Socio-economic characteristics	Mean	Std. Err.	Min.	Max.
Age	40.89	.73	18	80
Landholding size	.574	.026	0	5
Dependency ratio	.64	.018	0	1
Income	902.12	145.27	450	13450
Number of family members	4.4	2.2	1	12

Source: Own survey, 2017

As presented in table 4.1 above, a total of 229 households from Borena, Amhara Sayint and Mehal Sayint woreda were surveyed and had a complete response. The mean age of sampled households is 41 years with minimum of 18 years and maximum of 80 years old household heads. The average family size of household is 4 persons living under one roof. The mean landholding size of households is 0.57 hectare with minimum of zero and maximum of five hectares of arable land. The average income[1] of households is 902.12 birr ($45[2]). The dependency ratio is around 0.64 with minimum of 0 and maximum ratio of 1. This means that for every 100 persons in the working age group, there are about 64 dependants. In other words, every two person in the working age group has more than one dependent.

Table 4.2: Tabulation statistics of dummy and categorical variables

Variables	Description	Freq.	Percentage	Cum.
Gender	Female	39	17.03	17.03
	Male	190	82.97	100
Marital status	Married	171	72.77	72.77
	Single	34	14.47	87.23
	Divorced	19	8.09	95.32
	Widowed	11	4.68	100
Training on forest conservation	Trained	150	63.56	63.56
	Not trained	86	36.44	100.00
Illiteracy	Illiterate	192	83.84	83.84
	Literate	37	16.16	100
Total		**229**	**100**	

Source: Own survey, 2017

From the total surveyed households, 190 (83%) of households were found to be male headed, while the rest 39(17%) were female headed. Households regular participation in forest conservation shows almost 150 (64%) of

[1] Average income is calculated as yearly income from all economic activities of the household is divided into 12 months.
[2] 1 USD is equal to 22 Ethiopian birr

households were regularly trained and the rest 86 (36%) were not. From the total households surveyed, 171 (73%) are married and the rest 58 (27%) are in the other marital status categories. From the total survey households 192(84%) are illiterate.

4.1.2. Households Willingness to Pay given an offered Bid Values

Table 4.3: Households willingness to pay given an offered bid prices (birr 10, 15, 20, 30 and 40)

WTP responses	Number of households	percentage
No	70	31
Yes	159	69
Total	229	100.00

Source: Own survey, 2017

As we can observe from table 4.3 above, in order to determine local residents willingness to pay, five initial bid values (birr 10, 15, 20, 30 and 40) were established and offered to respondents. Consequently, given the randomly assigned initial bid values, out of 229 households, 159 (69%) households were willing and and the rest 70(31%) were not willing to pay for conservation given the first randomly offered bid values.

As presented in figure below, households were also requested to state their payment vehicles.

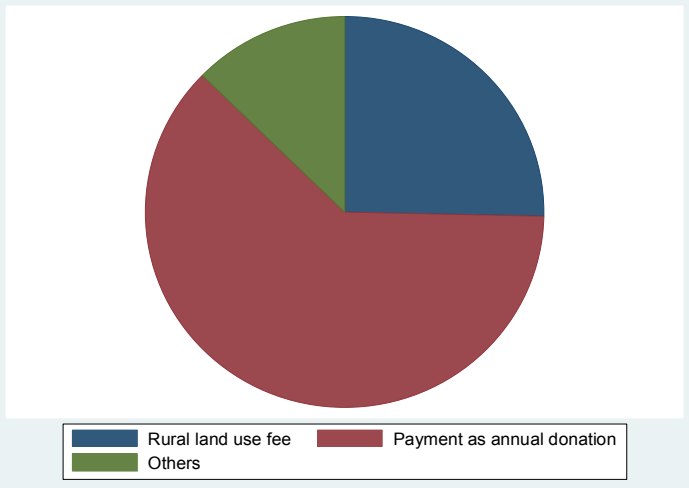


Figure 4.1: household's payment vehicle
Source: Own survey, 2017

As presented in the figure 4.1 above, three choices were offered for this purpose. These are payment with rural land use fee, payment as annual donation and other way of payment vehicles. Majority of the respondents replied that they can pay as annual donation. Thus, it is recommended to select annual donation as a payment vehicle in household's willingness to pay collection.

4.2. Attitude and Perception of Local Residents

Table 4.4: Household's perception about vegetation cover of BSNP

Vegetation covers	Freq.	Percent	Cum.
Declining	140	61.13	61.13
Constant	76	33.19	94.32
Increasing	13	5.68	100.00
Total	229	100.00	

Source: Own survey, 2017

As depicted in table 4.4 above, the observation of local residents about the vegetation of cover of the park shows that about 61% of respondents replied that the vegetation cover of the park declined as a result of 3 year round grass collection by the neighboring households, and the rest 33% and 6% of respondents perceived no change and increasing in the vegetation cover of the park respectively. The response shows that there is degradation in the park hence a conservation program is required.

Table 4.5: Major problems of Borena-Sayint national park

Major problems	Freq.	Percent	Cum.
Agricultural land expansion	66	28.82	28.82
Collection of grasses for cattle's and for home purposes	144	62.88	91.70
Cutting of trees for fuel wood	19	8.30	100.00
Total	229	100.00	

Source: Own survey, 2017

As presented in table 4.5, the key problems challenged the sustainable development of protected area as perceived by local inhabitants is collection of grasses for cattles and home purposes (63%). The rest of respondents (37%) considered the problem of cutting of trees for fuel wood and land degradation as a result of increasing demand for agricultural land expansion.The data has an insight that there is illegal logging hence the the protection through scout is not effecetive. Other conservation measure is required like provisition of training for local residents.

Table 4.6: Responsibility of preserving the park

Responsibility of preservation	Freq.	Percent	Cum.
Park management office	20	8.73	8.73
Community	124	54.15	62.88
Federal government	44	19.21	82.10
Kebele administration	41	17.90	100.00
Total	229	100.00	

Source: Own survey, 2017

The attitude and perception of local residents regarding to the responsibility of preservation of the protected area as depicted in table 4.6 showed that 124 (54%) of households considered as the responsibility of protection as community, while 44 (19%) considered for the gevernment and the rest of respondents 61(27%) replied that the responsibility of protection is for park management office and kebele administration. This implies even if majority of local residents considered the park as their own resource, there are still residents who considered the responsibility of preservation for the gevernment. This is one of the reasons of conlict of interest in biodiversity conservation (Belete and Assefa, 2007; Vondolia, 2009).

Table 4.7: Purpose of the protected area

Purpose of protected area	Freq.	Percent	Cum.
Tourism	58	25.33	25.33
Biodiversity conservation	119	51.97	77.29
Don't know	7	3.06	80.35
Other	45	19.65	100.00
Total	229	100.00	

Source: Own survey, 2017

Respondents were also asked an insight question "what do you believe is the main purpose of Borena-Sayint national park?". 52% of respondents believe that the major aim of the protected area is biodiversity conservation, 25% replied as tourism development and the rest 23% are in either "other" as controlling land dgradation or "I don't know" category. The major attitude of local residents regarding the objective of protection area is biodiversity conservation which imply the there is low ecotourism development in the area.

Table 4.8: Economic benefit of the park to local residents

Existence of economic benefit	Freq.	Percent	Cum.
No	15	6.55	6.55
Yes	214	93.45	100.00
Total	229	100.00	

Source: Own survey, 2017

From the above table 4.8, the response on the use of local commuinty from the park shows about 93% replied that as they benefited and the rest 7% replied as they had not got any economic benefit from the protected area. The local communities from 13 kebeles got a grass benefit for their cattles once every three years. This implies the protected area has diverse use beyond biodiverstiy conservation and as a source of recreation.

In relation to this, households were asked to rate the benefit of the park for their livelihoods. The response on likert scale is presented in the table 4.9 below.

Table 4.9: The magnitude of benefits of local residents from the protected area

Uses of the park	Percentage of households				
	Least benefit	some benefit	No benefit	Good benefit	most benefit
Farmland protection	5.24	6.995	9.17	12.66	65.94
Livestock benefits	2.62	6.99	20.52	16.16	53.28
General infrastructure development	0.44	3.06	10.92	17.47	68.12
Income from tourist activities	37.99	8.3	45.85	3.06	4.8

Source:Own survey, 2017

The above likert sclae table 4.9 shows that farmland protection from wind and water degradation rated by 65% households as most benefit. The benefit for livestock is also remarkable that 54% respondents rated it as most benefit in the programm of once every thee year grass collection currently with two years. The infrastructure development of the area is also remarkable that 68% of respondents perceived as most benefit and the economic benefit from tourism is low that 84% considered as a least beneft. This implies again the protected area has a diverse uses in the production behaivor of households living around the park.

4.3. Econometric Analysis of Contingent Valuation Method

This section focuses on the outcome from the econometric analysis of the CVM method. Econometric method of analysis was used to find out mean WTP hence aggregate WTP and determine coefficients of socio-economic variables that affect local resident's willingness to pay for the improved conservation of Borena-Sayint national park.

4.3.1. Result of the Probit Model

As we have discussed in the third section, probit model was employed to estimate coefficients of independent variables for a single-bounded dichotomous question. Before estimating the effect of explanatory variables on households WTP decision to improve the existing conservation of biodiversity and recreation area, assumption test was made for the prevalence of multicollinearity and hetroscedasticity problems. From the correlation matrix result (appendix C), it is observed that there is no series multicollinearity problem among independent variables. As a rule of thumb, multicollinearity is a series problem when a correlation coefficient between independent variables is greater than or equal to 0.8 (Gujarati, 2004). Therefore, from the correlation matrix generated, it is observed that there is no multicollinearity problem. VIF is also low (<10) which imply again there is no series multicollinearity problem.

When we use cross-sectional data, we may encounter the problem of hetroscedasticity (appendix C). To avoid the problem, we can estimate robust standard error rather than normal standard error (Woodridge, 2002). Thus, the econometric models which are estimated in this study were corrected for hetroscedasticity problem using robust command in stata 12 statistical software.

The model passed the assumption test of overall significance of explanatory variables by using Wald test. The Wald test takes a chi –squared ($\chi 2$) distribution with 10 degree of freedom is about 87.14 with a p-value (prob> chi^2) 0.0000 tell us the probit model as a whole is statistically significant. The likelihood ratio test of overall significance also approves similar result that the null hypothesis of zero coefficients was rejected at 5 percent level of significance (appendix C). Pseudo R-sq is found to be 0.86 in the probit model. This implies, the model totally explains 86.6 percent of the variation in willingness to pay. The interpretation and implications of bid coefficient and other covariates is described below.

Table 4.10: Estimated coefficients of probit model: determinants of willingness to pay for the offered bid values

WTPBID1	Coef.	Robust Std. Err.	P>|z|	dy/dx
BID	-.1234197	. 0255647	0.000***	-.0047861
SEHH	2.674651	.7482653	0.000***	.5194571
TFC	3.558717	.4460338	0.000***	.5495493
LnIN	4.41399	.7486719	0.000***	.1711689
ILL	-2.070806	.5587257	0.000***	-.0490934
MRS	-.3019976	.1743025	0.083**	-.0117111
LHS	1.743317	.617628	0.005***	.0676036
AGHH	.0103546	.0199443	0.604	.0004015
DR	-.5726246	.778767	0.462	-.0222056
NFM	.1847279	.0938905	0.049**	.0071635
_cons	-34.95404	5.823819	0.000	N/A

Log pseudo likelihood = -18.758612 No. of observation = 229 N/A: Not Available
Wald chi2(10) = 87.14 Prob > chi2 = 0.0000

Source: Own survey, 2017
***, ** and *refers to variables are statistically significant at 1, 5 and 10 level of significance.

As reported in table 4.10 of the probit model, out of 10 explanatory variables, eight were statistically significant in determining local resident's willingness to pay for improved conservation of the park. These are the offered bid amount, sex of household heads, marital status, landholding size of the household, training on forest conservation, income, number of family members, and illiteracy.

The estimated coefficient of bid value, which is the most fundamental explanatory variable of probability of WTP, was found to be statistically significant at 1 percent level of significance with an expected negative sign. This indicates that the probability of WTP to support the improvement of park conservation decreases (increases) as the bid price increases (decreases) under the hypothetical market scenario. The marginal effect estimates shows that when the initial bid increases by one Birr, the probability of accommodating the initial bid decreases by approximately 0.47 percent, holding other factors constant. This implies larger bid affect the expenditure pattern of the household and makes it unwilling to pay for conservation since it covers considerable part of their expenditure. The result is similar with the study of (Satyanaryana and Tadesse, 2014; Etensa, 2014; Anteneh, 2015; Nigus, 2014).

The log-transformed amount of income is also a significant variable at 1 percent level of significance and has an expected positive sign. As the income of respondent's increases, their willingness to pay will also increase. Marginal effect shows when the log-transformed income (a one percentage change in income) raises, the probability of accepting the initial bid rises by 17 percent, other factors remain constant. The implication is that as the income the respondent increase, the purchasing power hence willingness to pay increase. The result is consistent with (Tadesse, 2014; Etensa, 2014; Satyanaryana and Tadese, 2014).

Training on forest conservation was found to be a significant determinant at 1 percent level of significance and was positively related with local resident's willingness to pay. This has a justification of trained households have more willingness to pay for conservation than their counterparts. The marginal effect result implies that well trained respondents probability of willingness to pay is 54 percent greater than not trained respondents. Which also has an implication of investing on training (creating environmental protection awareness) of households is important mechanism of conservation of biodiversity and recreational protected areas. The result is similar with (Etensa, 2014; Haroyu, 2016; Belete and Assefa, 2007).

This study investigated a positive and significant relationship between household's willingness to pay and number of family members for a particular household. This implies that other things remain constant, as the number of family members increase, the probability of willingness to pay will increase for conservation. The marginal effect result shows that as the number of family size increase by one person, the probability of willingness to pay increase by 0.7 percent, other factors remains constant. This can be justified as households with high number of family are responsible for their children's (bequest value) hence are willing to pay more for conservation of environment. The result is consistent with the study of (Nigus, 2014; Tadesse, 2014).

The coefficient of dummy variable sex of household head was founded as expected a positive and significant effect on household's willingness to pay. It is highly significant at 1% level of significance with expected positive sign, indicating male household heads are more willing to pay than female household heads. From marginal effect result, male household heads willingness to pay is 51.9 percent greater than female households other factors remain constant. This implies male household heads have more exposure to such environmental activities, because females are most of the time workers inside home hence no way getting training about conservation. This is particularly

true in the majority of rural parts of Ethiopia. The result is in line with (Vondolia, 2009, Asmamaw et al, 2016; Bantie, 2011).

The dummy variable illiteracy coefficient was also found to be an expected negative sign. The coefficient of illiteracy in this study is negative which implies illiteracy and WTP are negatively related with households WTP. The marginal effect of illiteracy implies that the probability of willingness to pay of illiterate respondents is 4.9 percent less than the literate respondents. This is obvious that uneducated households are less aware of environmental conservation than those who have formal education and have lower willingness to pay. The result is consistent with (Vondolia, 2009; Etensa, 2014).

Landholding size of households was found to be significant variable with an expected positive sign. The inference is that as the landholding size of households increase, willingness to pay also increase, other things remains constant. The marginal effect of landholding size implies that as other factors held constant, the respondent landholding size increase by one hectare, their probability of willingness to pay also increase by 6.7 percent. This is because of land which is the basis for agricultural activity in the area is the major means of income hence their willingness to pay is also significantly altered by their landholding size. The result is in line with (Belete and Assefa, 2007; Nigus, 2014).

The dummy variable, marital status of the household coefficient registered a negative sign, and is a significant variable at 1 percent level of significance. This is indicating that married household's probability of accepting the initial bid is lower than those who are in divorced, widowed and single marital status categories. The marginal effect result implies that, other factors being equal, the probability of willingness to pay of single, divorced and widowed marital status categories is higher than married respondents by 1.2 percent. This might be because of unmarried respondents has lower expenditure than married households with many children's. Moreover, thus categories are more of in the productive age population hence higher willingness to pay than married households. The result is similar with (Nigus, 2014).

4.4. Estimation of Mean Willingness to Pay and Aggregate Economic Benefit

As we have discussed in the third chapter of this thesis, one of the main objectives of contingent valuation method was to estimate aggregate WTP of households, following the determination of mean willingness to pay of sampled households for improved conservation of Borena-Sayint national park.

The mean WTP was estimated using the one bid price answers. It was conducted in two steps. The first step was estimation of probit model; then finding mean by using wtpcikr[1] command in stata12. Krinsky Robb procedure was implemented to estimate mean WTP. The Krinsky Robb method uses random draw from assumed multivariate normal distribution to generate new parameter vectors. It also draws a number of times from the asymptotic normal distribution of the parameter estimates and calculates the welfare measures for each draws. The estimated mean/median WTP and the confidence intervals are presented in the table below.

Table 4.11: Estimated result of mean WTP from probit model: Krinsky and Robb (95 %) Confidence Interval for WTP measures (Nb of reps: 5000)

MEASURE	WTP	LB	UB	ASL*	CI/MEAN
MEAN/MEDIAN	38.15	33.90	45.52	.0000	0.30

Source: Own survey, 2017

*: Achieved Significance Level for testing H0: WTP<=0 vs. H1: WTP>0

LB: Lower bound; UB: Upper bound

The above table 4.11 result indicates that the point estimates of mean WTP for improved conservation of Borena-Sayint national park from probit model is birr 38.15. Thus, birr 38.15 estimated from the first equation was used in this study to estimate the mean WTP, if the scenario of improving conservation of Borena-Sayint national park is implemented. The result is consistent with (Anteneh, 2015; Bantie, 2011; Nigus, 2014). From a total of targeted 13,250 households, the aggregate willingness to pay is calculated to be birr 505,487.5 ($22,976.7[2]) from the probit model.

4.5. Validity Tests of Contingent Valuation Method Results

According to (Hanley and Barbier, 2009), one of the most important things from policy perspective on the use of contingent valuation method is how consistent and good contingent valuation estimate are in estimation.

Protest rate: is another pointer of contingent valuation survey. The threshold protest rate is 40% (Nigus, 2014).

[1]Wtpcikr calculates mean and/or median willingness to pay (WTP), confidence intervals based on Krinsky and Robb procedure, achieved significance levels (ASL) for testing the null hypothesis that WTP<=0, and relative frequency measures. The command supports both linear and exponential contingent valuation models estimated with or without covariates using the Stata commands probit, logit, and biprobit (Haab and McConnell, 2002).

[2] 1 USD is equal to 22 Ethiopian birr.

However, a protest rate above 40% indicates there is a problem of contingent valuation survey. In this study, the survey was conducted in face to face interview and the hypothetical market scenario was carefully developed to avoid protest bid responses, as a result the response rate was very high. In this study, the protest rate is 1.44 percent which is substantially less than the threshold level.

Construct validity test: test whether the effect (sign and significance) of factors to hypothetical willingness to pay is consistent with prior hypothesis and theoretical expectations. Therefore, in line with prior expectations and economic theory of demand, income of respondent's willingness to pay was positive and significant variable. The first randomly offered bid and follow-up bids were also negative and significant variable in the probit and bivariate model. The result is also consistent with the theory of demand since the law of demand tells us, other things remain constant, and there is a negative relationship between the price of the product and its corresponding quantity demand. Hence, construct validity test is also satisfied in this study.

CHAPTER FIVE
CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

The subject of this study was to give a quantitative estimate for conservational value of Borena-Sayint national park so as to help planners and decision makers expanding in the input from economic valuation by presenting a sound valuation technique and process to accept the best possible approach towards a sustainable improved conservation. The study identified the determinants of WTP from household's point of view. In doing so, contingent valuation method was applied to estimate households' willingness to pay for improved conservation and to identify its determinants based on probit model.

The result from probit model shows log-transformed income, age of the household head, gender of the household head, training on forest conservation, and numbers of family members were among the significant and positive variables that affect local resident's willingness to pay for conservation. On the other hand, a randomly offered initial bid, marital status, and illiteracy rate had a negative sign and were significant variables. The point estimates of mean WTP for improved conservation of Borena-Sayint national park from probit model was found to be birr 38.15. These results support the argument for using economic instruments to promote the conservation of protected areas.

5.2. Recommendations

Depending on the results of this thesis, the following more refined recommendations can be delivered:

The result of the study implied that local residents are largely concerned and are willing to pay for the conservation of the national park. Therefore, any program designed to conserve the national park, should consider a joint-community involvement for its successful implementation. By making the local residents the participant and direct beneficiary from the park, it is possible to preserve the park.

Awareness creation and training is recommended to give to the neighborhood households on efficient conservation of biodiversity and recreational area through shared efforts of all stakeholders.

For efficient implementation of different improvement scenarios should consider important variables like initial bid, income, education, marital status, training and landholding size in designing improved conservation service.

Programmes which are presented in the hypothetical market scenario are recommended to be implemented with the collaboration of the park office and community to sustainably conserve the park, and to attract both domestic and international visitors.

REFERENCES

Anteneh, A. (2015). Economic Valuation of Irrigation Water in Bahir Dar Zuria Woreda, Ethiopia: The Case of Chilal Abay, Negida and Upper Andassa Irrigation Schemes. Master Thesis, Addis Abeba University.

Asmamaw, B., Beyene, B., Tessema, M., Kara, A., & Goshu, B. (2016). Estimating Willingness to Pay for Labeobarbus Fish Species Conservation in Lake Tana, Ethiopia: A Contingent Valuation Study. *International Jouranal on Natural Resource Ecology and Management, 155-161.*

Assefa, A. B. (2012). Status and Sustainability of Conservation and Threats of Borena-Sayint National Park. Journal of Academics.

Bandara, R., & Tisdell, C. (2002). Willingness to Pay for Conservation of the Asian Elephant in Sri Lanka: A Contingent Valuation Study. A Working Paper in Economics, Ecology and Environment.

Bantie, Y. (2011). The value of Improved Water Supply in Mota Town, East Gojjam, Ethiopia, Application of Contingent Valuation Method (CVM). Master thesis, Addis Abeba University.

Barata, E., Simoes, P., & Cruz, L. (2014). Non-Market Valuation of Environmental Goods in Portugal.

Belete, Z., & Assefa, Y. (2007). Willingness to Pay for Endangered Environment, the case of Nechsar National Park.

Bisrat, E. (2015). Guide to Ethiopia. The Definitive Guide for Ethiopian History, Attractions, Hotels, Restaurants, Service Providers and Tour Operators in a Unique Format with Unique Features (Second edition ed.). Addis Abeba, Ethiopia: Weave Promotion & Marketing P.L.C.

BSNP. (2016). Socio-economic Data of Borena Woreda.

Eshetu, A. A. (2010). Community Based Ecotourism Development as a Viable Strategy for Sustainable Natural Resource Management: Opportunities and Challenges. The Case of Borena-Sayint National Park. Master Thesis, Mekelle University.

Eshetu, A. A. (2014). Forest Management System in Ethiopia: a Historical Review. *International Journal of Biodiversity and Consernvation.*

Etensa, T. (2014). Economic Valuation of Conservational Benefits of Natural Wetland Ecosystem Values. LAP LAMBERT Academic Publishing.

Eticha, A. (2016). Economic Valuation of Nechisar National Park Ecosystem: Choice Experiment Approach. Master Thesis, Addis Abeba University.

Gujarati, D.N.(2004).Basic Econometrics, Fourth Edition Front Matter Preface. The

McGraw−Hill Companies.

Haab, T., & McConnell, K. (2002). Valuing Environmental and Natural Resources:

Hanley, N., & Barbier, E. B. (2009). Pricing Nature Cost-Benefit Analysis and Environmental Policy. Cheltenham, USA: Edward Elgar Publishing Limited.

Hanley, N., & Spash, C. (1993). Cost-benefit Analysis and the Environment. UK: Edward Elgar Publishing Ltd.

Haroyu, Y., Bayeh, M., & Wolle, H. (2016). Valuation of Environmental Goods and Services: The case of Bale Mountain National Park, Ethiopia. *African Journal of Economics and Management* , 4(3) (2375-0707), 266-277.

Hayos, D., & Mariel, P. (2010). Contingent Valuation: Past, Present and Future.

Horland, T. (n.d.). Contingnent valuation Methods:Possibilities and Problems.

Morey, E. R. (1994). What is Consumer Surplus Per Day of Use, When Is It a Constant Independent of the Number of Days of the Number of Days of Use, and What Does It Tell Us About Consumer Surplus? *Journal of Environmental Economics and Management* , 6 (3), 215-303.

Muhumuza, M., & Balkwill, K. (2013). Factors Affecting the Success of Conserving Biodiversity in National Parks: A Review of Case Studies from Africa. *International Journal of Biodiversity* , 2013 (798101), 20.

Nigus, H. Y. (2014). Households Willingness to Pay for Camel Milk in Aba'ala Woreda, Afar Regional State. Master Thesis, Mekelle University.

Rohlig, A. M. (2012). Economic Evaluation of Tropical Rainforests – An Application of the Contingent Valuation Method. Master Thesis.

Satyanaryana, K., & Tadesse, B. (2014). An Analysis of Economic Valuation through Contingent Valuation Method in Semien Mountains National park (SMNP),Ethiopia. *Inernational Journal of Innovative Research and Development* , 3 (13).

Sebastiam, B., & Tobias, L. (2007). An Economic Valuation of Periyar National Park in India: A Travel Cost Approach.

Sergio, A., & Sherry, L. (2008). Economic Valuation of Periyar National Park in India: A Travel Cost Approach. Selected Paper Prepared for Presentation at the Southern Agricultural Economics Association Annual Meetings. Dallas.

Sharahi, M. K., Mohamedi, M. H., & Abedini, A. (2015). Estimating Outdoor Recreational Value of Chizgar Forestrial Park of Tehran with the Use of Contingent Valuation Method. *Journal of Economics, Environment and People* , 4 (4).

Tadesse, M. (2014). Analysis of Visitors Willingness to Pay for Recreational Use Value of " Mengesha Suba" Forest Park: Application of Contingent Valuation Method. Master Thesis, Addis Abeba University.

Thapa, K. (2016). Estimating Recreational Economic Value of Lantang National Park, Nepal. *Bhutan Journal of Natural Resources and Development* , 3(1), 25-31.

Vondolia, G. K. (2009). Do Ghanaian have Preference for National Biodiversity Strategy? A Case Study of Farmers Living Around Kakum National Park in the central region. *Ghana Policy Journal* , 3.

Wooldridge, J. M. (2002). Econometric Analysis of Cross Section and Panel Data. The MIT Press Cambridge, Massachusetts London, England

Yibrie, A. (2011). Valuing the Economic Benefit of Ecotourism Areas with Travel Cost and Choice Experiment Methods: A Case Study of Semen Mountain National Park, Ethiopia. Masters Thesis, Addis Abeba University.