An Application of Travel Cost and Choice Experiment Methods on Awash National Park, Ethiopia

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Abstract

Awash National Park is one of nature-based recreational sites in Ethiopia for its impressive landscape and diversity of fauna. However, the park has been in danger due to heavy settlement by farmers, declining numbers of wildlife population, widespread deforestation and continuous reduction in recreational qualities of the site. Due to this, the park has been unable to improve the qualities of ecotourism experience and expand the types and variety of its recreational services for a long time because of lack of sustainable income from internal sources. Moreover, the value of the park in terms of its recreational service to the society is not known. Thus, there is a need for valuation of the park to know how much value the people attach to the park so as to demonstrate how the park managers can extract revenue by improving the qualities of the national park and by expanding the types and variety of the services. These can in turn enable to establish a sustainable and efficient level of operations for the maintenance of the park. Thus, to attach quantitative estimates to the on-site recreational benefit of the park, the study applied two standard procedures of Environmental Economics, i.e. travel cost and choice experiment methods, using primary data collected from a survey of 195 on-site visitors at the park. By applying the Travel Cost Method, the aggregate annual recreational economic benefit gained from visitors of the park was estimated to be ETB 4,987,965.14 out of which the site authority captured only about 12.1% of the true economic recreational benefit of the park. On the other hand, by applying the Choice Experiment Method, the finding indicated that all the attributes (namely; wildlife population, afforestation and additional service to visitors and one monetary attribute, gate fee) were significant factors in affecting the probability of choosing an improvement scenario. Generally, while the results of this study indicates the conservative estimate of the economic value of recreation benefit from the site is very big, it has also indicated that the domestic recreation demand to the park is high.

Therefore, it can be suggested that alleviating the major problems that reduce the quality of the park and supporting improvement and expansion projects by extracting revenue out of the excess benefit are essential.

Key words: Travel cost method, Choice experiment method, Marginal willingness to pay, Environmental valuation, Awash National Park, Ethiopia.

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Introduction

According to the World Economic Forum report 2017, in its 'The Travel & Tourism Competitiveness Index 2017 Ranking' Ethiopia's all over performance in Travel and tourism was 116th in rank from 136 world countries. When compared with neighboring and nearby countries with fewer tourism resources, Ethiopia's tourism performance is very low. In this case, while having less diversified tourism resource when compared with Ethiopia, such countries like Kenya and even Rwanda, which respectively stood at 80th, and 97th in their rank, were and still are in a better position than Ethiopia.

By establishing more than 55 protected areas, out of which 21 are parks, Ethiopia is making a good effort to protect and conserve its natural ecosystems and wildlife heritage. However, the country is not effectively using its rich and endemic wildlife species for ecotourism. Nature-based sustainable ecotourism is confined only in few natural parks (Alemneh 2015). The direct contribution of Travel & Tourism to GDP in 2013 was only 2.2% of GDP. The contribution of Ethiopian wildlife tourism as a source of foreign earnings and employment is also insignificant (WTTC 2013).

The Awash National Park (ANP) represents one of the most outstanding nature. Because of its rich biodiversity, high number of endemic species and paramount biophysical features the ANP is being a recreational resource for everyone who visits this park. It has economic impacts on society around the area of the park and it used as ecotourism site which can enhance national income and international significance.

Despite its ecological, social and economic importance, the Park is not under proper management. Besides, the precious wild mammal species diversity of the park is declining at an alarming rate. Continued land use/land cover changes coupled with increasing demand for resources have heavily affected the fauna and flora of the park. This change cannot be ignored altogether because it has unquestionable negative consequences on both the livelihood of communities surrounding the park and on the ecotourism benefit of the country. Despite its tremendous economic significance, the park has been unable to improve the qualities of ecotourism experience and expand the types and variety of its recreational

services for a long time. Instead, the center is deteriorating mainly because of widespread deforestation resulting from road construction, residents of people, grass burning, agriculture, hunting, firewood collecting and domestic livestock grazing (Belay 2015).

Furthermore, according to the finding of Habtamu (2014), population growth, free grazing, charcoal production and new development projects were the major drivers of deforestation and forest degradation in the park. He also added that with the current rate of deforestation it will take only 71.5 years for the remaining woodland to be completely lost.

Thus, visitors might be forced to spend their recreation time on other substitute sites and the site be used for some other alternative activities, which in turn may result in irreversible damage to the different environmental resources of the site. This is due to the fact that, the current price for different services are assigned arbitrary rather than through valuation techniques which result in the park authority to be constrained by lack of money.

To this effect, measures should be done in leadership commitment to understanding the current economic value of the park. This is because estimating the actual economic value of the Park will enable to preserve the site and generate maximum possible income from the site.

With the best knowledge of the researcher, no one tried to determine the Economic value of ANP. The park has its unique features of accommodating various natural and cultural assets, like the volcanic fissures at Mt. Fentale, Awash River falls (the second biggest falls in Ethiopia, next to the Blue Nile), the natural hot springs with doum palm forest, the Fentale Hyena Community Hyena Park, its rare wildlife (Beisa Oryx), it is also the leading park in bird diversity. Therefore, because of all these unique features, it's important to conduct a separate study for the park.

The question is that what is the current economic value of ANP? How can it really be measured? Which attributes are significantly reducing the recreational quality of the site? These questions can be answered by the application of appropriate economic valuation methods. Thus, this study was conducted to estimate the park benefits and the value that the people

attach to multiple services of the park by using Travel Cost Method (TCM) and Choice Experiment Method (CEM).

The general objective of the study was to estimate the annual economic value of ANP and to determine the visitors' preferences for different attributes using travel cost and choice experiment estimation methods. More specifically, the study tries to identify the major attributes that are responsible for influencing the visitors' willingness to pay for the recreational services of ANP, to estimate the visitors' marginal willingness to pay and welfare impacts of improvements of each attribute of the park and to identify the significant determinants of visitations of the park. In the remaining parts of the paper, methodology, results and discussions and conclusion were presented.

RESEARCH METHODOLOGY

Sources of Data

Data were collected from 195 onsite visitors. The sample size of the study was determined to be 97 and 98 individuals for local and foreign visitors, respectively. In this case, since there were two group's i.e, foreigners and local visitors, stratified sampling technique was applied. Accordingly, the interviewer randomly chose and picked respondents from each group.

Individual Travel Cost Method

Since all observed visitors have taken at least the current trip, non-visitors were not observed, so the sample is truncated at zero. Because of this, truncated data model was used to estimate the demand curve for trips using data from an on-site survey of visitors to ANP. The truncated model is adopted from the general presentation on Greene (2008), with some modification to recreation sites.

$V_{ij} = \beta' X_t + \varepsilon_i$---------- (1)

Where V_{ij} is individual i's visit to site j, X_t is vector of explanatory variables, β is a parameter vector to be estimated, and ε_i is an error term. Assuming that $\frac{V_{ij}}{X_t} \approx N(\mu, \sigma^2);\ \mu = \beta' X_t$

Because, the residual is correlated with the explanatory variable X_i in truncated model we get inconsistent estimates of the parameters, β, if we

use OLS Method. The conditional mean is therefore non-linear function of *X* and *β,* and so is the variance. Therefore, ML estimation is preferred to OLS for this type of data set.

In empirical estimation of recreation demand models, log-log functional forms have been used. Of course, Kealy and Bishop (1986) argued that no one of functional forms are better than others. McConnell (2003) deduce that semi log and log-log functional forms are preferred to other types of model specifications since they reduce heteroscedasticity and multicollinearity problems, and gives efficient and consistent estimates.

Calculating the right cost is the basic work in TCM valuation. Failure to do so will further over or underestimate visitor's consumer surplus. In this study, the cost components include transportation cost and time cost. To incorporate appropriate cost of time, one-fourth of individual wage rate was used as an opportunity cost of trip and on-site time cost. However, on-site pocket moneyed cost was omitted. Food cost was also excluded.

In this method, a demand function was estimated using the number of visits to a site as the dependent variable and the travel cost associated with the trip and household socioeconomic characteristics as independent variables.

$$\begin{aligned}\ln(NOV)_t = \beta_0 &+ \beta_1 ln(TC)_t + \beta_2 ln(STC)_t + \beta_3 ln(AGE)_t + \beta_4 ln(EDU)_t \\ &+ \beta_5 ln(FSIZE)_t + \beta_6 ln(INCOM)_t + \beta_7 ln(KNOW)_t \\ &+ \beta_8 (DGEN)_t + \beta_9 (DMARS)_t + \beta_{10} (DMOT)_t + \beta_{11} (DGRP)_t \\ &+ \beta_{12} (DEMP)_t + \varepsilon_i\end{aligned}$$

Where, *ln* is to express variables in logarithm form. *NOV* is the total number of visits individual *i*take to ANP during the past one year. *TC* is the total travel cost associated with a round trip to and from ANP. This includes fuel cost or transport cost, and travel and on-site time costs in ETB. *STC* is the respondent's cost of accessing the substitute recreation site. *AGE* is the age of visitors in years. *EDU* is visitor's formal educational level in years of education. *FSIZE* is family size that was measured as the total number of people in the visitor's household. *INCOM* is disposable monthly income (In ETB) of visitor *i*. *KNOWS* is the number of years that visitors have known the site. *DGEN* is the sex of visitor *i* (1 = male and 0 = female). *DMARS* represents the marital status of the visitor (1 = married and 0 = otherwise).*DGRP* represents whether recreational trips

are made in groups or alone. (1 = group trips and 0 = otherwise). *DMOT*is variable that represents the mode of transport that is used during trip to ANP (1 = own car and 0 = otherwise).*DEMP*is whether the visitor is a full-time employee or not. (1 = full-time employee and 0 = otherwise). β_i is the constant term, $\in_i$ is the residual term which has a normal distribution with mean zero and variance δ^2.

The Choice Experiment Model (CEM)

In a choice experiment analysis, respondents are offered with a series of choices, which are different attributes and attributes levels, and asked to choose their best choice. A baselines or status quo is usually included in each choice set. This is because one of the choices must always be included in the respondent's currently feasible choice set to interpret the results in the standard welfare economic terms (Hanley*et al*. 2001).

The CEM technique depends on two fundamental theories: Lancaster's characteristics theory of value (Lancaster 1966) and random utility theory (Adamowicz*et al*. 1998). Lancaster's theory states that choice can be modeled as a function of characteristics, or attributes of the alternative relevant to a given choice problem. The random utility theory assumes that the alternative with the greatest total utility is selected. According to random utility theory the utility function for a representative consumer can be separated into a systematic or observable portion and a random or unobservable portion by the analysts. Hence, the random utility function takes the following form (Jainjun*et al*. 2013):

$$U_{in} = V_{in} + \varepsilon_{in} \quad (2)$$

Where $U_{in}$is the total utility of offering i for individual n; $V_{in}$is the systematic or stochastic component of utility, and ε_{in} is the random or unobservable component.

The random parameter logit (RPL) model should be used to take in to account the preference heterogeneity in pure public goods like national parks though it is statistically complex (Birol*et al*. 2006). Preferences are in fact heterogeneous and accounting for this heterogeneity enables estimation of unbiased estimates of individual preferences and enhances the accuracy

and reliability of estimates of demand, participation, marginal and total welfare (Greene 1997).

The random utility functions for the RPL models take the following form (Birol*et al*. 2006):

$$U_{it} = V_{it} + \varepsilon_{it} = Z_i(\beta + \eta_t) + \boldsymbol{\varepsilon_{it}} \text{---------- (3)}$$

Where U_{it} is the total utility for respondent *t* from choosing alternative *i* in the choice set. It is assumed that the utility function consists of both systematic components (V_{it}) and stochastic component ($\boldsymbol{\varepsilon_{it}}$). The indirect utility is assumed to be a function of the choice attributes *Z* with parameters β (and socioeconomic and environmental attitudinal variables, if included in the model), which due to preference heterogeneity may vary across respondents by a random component η_t.

The choice experiment is designed with the assumption that observable utility function would follow a strict additive form. Accordingly, in this study, the indirect utility was specified as function of selected four attributes of ANP and ASCs as follow.

$$V_i = ASC + \beta_1 AFFOR + \beta_2 WILDLP + \beta_3 ADSERVICE + \beta_4 ENTFEE \text{ --- (4)}$$

Where i = 1, 2, 3, and the value of ASC is 0 for status quo (plan 3) and 1 for proposed improvements (plan 1 and plan 2).The β values (β_1, β_2, β_3 and β_4) are the coefficients associated with each of the attributes, namely *AFFOR(Afforestation), WILDLP(Wildlife life Population), ADSERVICE(Additional Service) and* ENTFEE(Entrance fee), respectively.

Notice: The *ASCs* used for V_1 and V_2 are assumed to be the same. This shows that the model under specification is generic (unlabeled). If the choice sets used were not generic one (labeled), an alternative specific from the model under specification would be needed. This leads to using ASC_1 and ASC_2 respectively for each improvement equations as well as differing coefficients of potential attributes (Bennet 1999).

There are four stages followed in the design of a choice experiment: (i) definition of attributes, leveling attributes and customization, (ii) experimental design, (iii) questionnaire development and (iv) choice of sample and sampling strategy. These stages should be seen as an integrated process with feedback (Alpizar*et al*. 2001).

Table 1: Description of the Attributes and TheirLevels

Attributes	Description	Levels
Afforestation	This program will focus on Planting new native trees on the degraded areas to improve the park's ecosystem services	Planting 1,000,000 new trees(Low) Planting 2,000,000 new trees(Medium) Planting 3,000,000 new trees(High) No new plantation of trees*
Wildlife	This will focus on increasing the number of both endemic and common wildlife. Management zones will be developed within the park; creation of core protection area of wild animals and buffer zone in which pastoralists and agro-pastoralists carry out their respective livelihood.	50% increase in the number(Low) 100% increase in the number (Medium) 150% increase in the number(High) No change*
Additional services	The plan will have improved and well organized additional services for visitors, such as camping equipment, on-site resting places (hotels and lodges), transportation facilities within the park and the other mentioned facilities.	Provision of after visiting the park service[2] Provision of on-site and after visiting the park service[3] Provision of to reach the site, on-site and after visiting the park service[4] No improvement*
Entrance fee	Making entrance fee greater than present level paid by tourists to finance any types of facilities at the park. Using it as a source of fund to support enhanced and improved recreational facilities at the park.	50% increase in the gate fee 100% increase in the gate fee 150% increase in the gate fee No change (current level)*

[2]*which includes library/museum, construction of additional lodges, hotels and camping equipment like tents, cabin, sleeping bags, mattresses, cooking gears.*

[3] *which includes health and medical treatment, trained tour guides and scouts, protected tourist zone, shops, showers, swimming pool and traditional transportations, and library/museum, construction of additional lodges, hotels and camping equipment respectively.*

[4] *which includes information desk, improved infrastructure and map, and health and medical treatment, trained tour guides and scouts, protected tourist zone, recreation benches, shops, showers, swimming pool and traditional transportations, and library/museum, construction of additional lodges, hotels and camping equipment respectively.*

An asterisk (*) indicates that it is the status quo.

As shown in the above table, four attributes have been identified for experimental designation. The attributes considered were afforestation, wildlife population, additional services and entrance fee with their respective levels. All attributes have three levels and results in a full factorial with eighty one possible combinations could be formed (34 =81). From this eighty one possible combinations, five optimal choice sets was created using SAS in orthogonal design method using the OPTEX procedure. Each respondent was asked to complete five consecutive choice sets with three alternatives (plans). One of the choice sets provided to respondents is given in Table 3.2 as an example:

Table 2: Sample Choice Set

Choice set: Which plan would you choose for Awash National Park?

Attributes	Option 1	Option 2	Option 3 (status quo)
Afforestation	Planting 2,000,000newtrees	Planting 2,000, 000 new trees	No change
Wildlife	150% increase in theirnumber	50% increase in their number	No change
Additional services	Provision of on-site and after visiting the park service	Provision of after visiting the park service	No change
Entrance fee	50% increase	150% increase	No change
I prefer (please tick in the box)	☐	☐	☐

Results and Discussion

Descriptive Analysis Visitors' Characteristics and Park Attributes

Measuring the respondent's attitude toward the characteristics of ANP in making a trip decision to it explains the level of the attractiveness of the site. The attractiveness level is measured based on individual visitors believe. Based on this, 'extremely bad', 'very bad' and 'bad' options were not rated at all. Only 2pc of total sample visitors rated the site as 'adequate'. 54pc of sample visitors rated the site as 'very good'. Which

make it the most rated attitude measurement option. This implies that the park has good tourism potential.

Table 3: Visitors' Attitude towards the Park

NO.	Attitude Measurement Options	Local Visitors		Foreign Visitors		Total	
		freq	Percent	freq	Percent	freq	Percent
1	Extremely Bad	0	0%	0	0%	0	0%
2	Very Bad	0	0%	0	0%	0	0%
3	Bad	0	0%	0	0%	0	0%
4	Average(Adequate)	2	2%	1	1%	3	2%
5	Good	31	32%	22	22%	53	27%
6	Very Good	52	54%	54	55%	106	54%
7	Excellent	12	12%	21	21%	33	17%
Total		**97**	**100%**	**98**	**100%**	**195**	**100%**

Respondents were also asked to rank major problem of the site. Majority of the respondents ranked the forest and landscape degradation of the area as the first problem in reducing the recreational quality of the site. This is due to the fact that the Park's quality is deteriorating mainly because of road construction, widespread deforestation and grass burning, agriculture, firewood collection, hunting and domestic livestock grazing. Difficulties of access roads within the Park and Severely hot temperature ranked second and third, respectively, by sample respondents in reducing recreational quality of the park.

Table 4: Major Problems at the Site in Reducing Recreational Qualities

	Forest and landscape degradation of the area		Lack of protected tourist zone		Lack of appropriate resting facilities		Difficulties of access roads within the Park		Lack of modern swimming pools and toilet facilities		Lack of services i.e, info provision, fast foods, rented transportation		Severely hot temperature	
degree	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
1st	**64**	**32.8**	13	6.7	4	2.1	28	14.4	16	8.2	24	12.3	46	23.6
2nd	41	21.0	12	6.2	6	3.1	**76**	**39.0**	5	2.6	24	12.3	31	15.9
3rd	33	16.9	13	6.7	6	3.1	32	16.4	12	6.2	40	20.5	**59**	**30.3**
4th	29	14.9	15	7.7	30	15.4	12	6.2	0	-	**70**	**35.9**	39	20.0
5th	9	4.6	36	18.5	40	20.5	13	6.7	68	34.9	16	8.2	13	6.7
6th	3	1.5	**54**	**27.7**	42	21.5	34	17.4	49	25.1	9	4.6	4	2.1
7th	16	8.2	52	26.7	**67**	**34.4**	0	-	45	23.1	12	6.2	3	1.5
Total	195	100	195	100	195	100	195	100	195	100	195	100	195	100

Respondents were asked the statement that best described the reason why they made their choices in answering the choice set questions. All of the respondents have answered the follow up questions presented after the choice experiment exercises.

From sample visitors, more than 42 percent replied that they understood wildlife population attribute is important and that they gave priority to choose the highest level of this attribute. About 24 percent of them made their choices they understood that afforestation attribute is important and that they gave priority to choose the highest level of this attribute. Only 2 percent of them chose the status quo option because of an objection to the amount of entrance fee. The results are presented in the following table.

Table 5: Park's Attribute Affecting Visitor's Decision

	Follow up Questions	Local visitors		Foreign visitors		Total	
		Freq.	%	Freq.	%	Freq.	%
1	I chose the status quo option because of an objection to the amount of entrance fee	**3**	**3%**	**0**	**0%**	**3**	**2%**
2	I understood that afforestation attribute is important and that I gave priority to choose the highest level of this attribute	**20**	**21%**	**26**	**27%**	**46**	**24%**
3	I chose the cheapest option whatever its level is.	**5**	**5%**	**3**	**3%**	**8**	**4%**
4	I understood that wildlife population attribute is important and that I gave priority to choose the highest level of this attribute	**34**	**35%**	**47**	**48%**	**81**	**42%**
5	I understood that additional services attribute is important and that I gave priority to choose the highest level of this attribute	**19**	**20%**	**15**	**15%**	**34**	**17%**
6	I agree to pay because the payment is a reflection of the value of recreational quality.	**16**	**16%**	**7**	**7%**	**23**	**12%**

Travel Cost Method Results

The econometric model presented in thissection attempts to make some analysis and makeinferences based on the information obtained fromthe

sampled visitors. The regression resultfrom truncated model is presented in tablebelow.

Table 6: Estimation Results of the Truncated Model for Travel Cost Method

Explanatory variable	Expected coefficient Sign	Truncated coefficient	p-value	Marginal Effect	Mean Value
lnTC	-	-0.061 (.024)	0.010**	-0.061	555.42
lnSTC	+	0.065 (.026)	0.012**	0.00035	678.56
lnAGE	-	0.196 (.065)	0.003***	0.195	41.57
lnEDU	+	0.284 (.061)	0.000***	0.282	14.01
lnFSIZE	-	-0.077 (.031)	0.012**	-0.076	2.47
lnINCOM	+	0.055 (.025)	0.028**	0.055	49,400.3
LnKNOW	+	0.076 (.024)	0.002***	0.076	15.27
DGEN		0.01 (.31)	0.731	0.01	.6205
DMARS		0.041 (.034)	0.228	0.041	0.441
DGRP		0.011 (.038)	0.768	0.012	0.749
DMOT		0.140 (.047)	0.003***	0.142	0.128
DEMP		-0.066 (.040)	0.100*	-0.067	0.810
Cons		-1.341 (.497)	0.007	-1.341	
Summary Statistics	Log likelihood = 32.28644 Wald chi2(11) = 149.15 Prob>chi2 = 0.0000 Number of observation = 192				

Source: Computed from the survey data

*Significant at p<0.1; **Significant at p<0.05and *** Significant at p<0.01

→Numbers in parenthesis are standard deviation

The truncated model is selected as an appropriate model that fits our data because of the absence of over dispersion problem. Over dispersion occurs when the variance is larger than the mean for the data. This may be due to few respondents making a large number of trips while most respondents making only a few. The mean of the visitation which is 1.43 is higher than the variance of the visitation0.847, an indication of absence of the over dispersion problem.

The overall significance of the model was tested using the log likelihood ratio test since the log-likelihood ratio (LR) test is formally more preferred

to test the significance of the model (Andualem 2011). The log-likelihood ratio test estimated as follows:

$LR = -2(Restrictedlog - Unrestrictedlog)$

Where the restricted log is the log-likelihood only with constant and the unrestricted log is the log-likelihood of the full model. The calculated LR chi ^{2}(11) is 149.15 and the critical value of the test with 11 degrees of freedom ($\chi 2_{11}$) at one percent significant level is 24.72. The calculated value is higher than the tabulated value at one percent significant level. Therefore, the likelihood ratio statistic test models goodness-of –fit under the null hypothesis that all parameters are zero can be rejected.

To arrive at the final welfare of the visitor, the first step is estimating the demand relationship for the recreational benefit.

$lnV_{ij} = \alpha_0 + \alpha_1 lnTC_i + \varepsilon_i$---------- (5)

Where lnV_{ij}represents logarithm of individual i's annual visit to site j, and $lnTC_i$is logarithm of individual i's travel costs per trip. Where $\varepsilon_i$is residual and which has a normal distribution with mean zero and variance δ^2. The value of the constant term (α_0) is the sum of the values of all other significant variables (assuming all the other variables are at their mean values) and the constant term in the original model.$\alpha_1$is the coefficient on the TC variable in the table. By using the coefficients and the mean values of variables on table 6, the demand function is estimated as:

$lnV_{ij} = 6.3216 - 0.061\ lnTC$---------- (6)

To estimate the annual recreational benefit of ANP per person and then in aggregate, it is important first of all to transform the above demand function in to its inverse form. When the above demand function is transformed, it takes an exponential functional form (see equation 7). Then the area under the demand curve is the recreational benefit of the site.

$$V_{ij} = \frac{e^{6.3216}}{TC^{0.061}}\ \{TC > 0\}$$---------- (7)

Now, integrating the inverse demand function (equation 7) between zero and mean trip of 1.43, it is possible to estimate the recreational benefit obtained from the park. Thus, the estimated recreational benefit for the

average number of visits is ETB 829.146. The recreational benefit of Awash Park per visit per person is, therefore, estimated at ETB579.822.

For an obvious reason, all of this recreational benefit cannot be attributed to the on-site experience. Hence we need to find a technique to evaluate how much of this benefit can justifiably be said to have been purely related to the on-site experience. The usual method is asking visitors to allocate percentage points to the on-site and off-site experience to evaluate how much of the utility of the whole recreational experience is due to the on-site experience (Willis and Garrod 1997; Mesfin 2010). In this study a similar procedure was followed, i.e. visitors were asked to allocate their total enjoyment in to travel and on-site experience. The mean value for the on-site experience was calculated to be 86 percent, and hence per visit per person benefit for the on-site experience was estimated as ETB498.647.

The aggregate annual on-site recreation value of the park is the multiple effect of number of visitors registered within a year and recreation benefit per person per visit. Considering an average annual visits for last six consecutive years of 10,003, according to data obtained from the site, the annual estimates for per person recreational benefit can be translated in to expected total on-site recreational benefit of ETB4,987,965.141 per annum.

In a previous six consecutive fiscal year the average revenue generated from visitors of the park is ETB 605,300. As compared to the total annual benefit estimation result obtained from recreation activities, the figure shows that the revenue collected from total aggregate benefit of the park is only around 12.135%.

Once the demand function has been estimated, the consumer surplus provides an approximation of the welfare associated with visiting the site. Formally, based on the demand function equation, a consumer surplus from the recreation is the area below the visit demand curve and above the average travel cost (Nakatani and Sato 2010). Estimation of the demand function and consumer surplus for the actual visitors is done using the count data model.

Using the exponential demand function in equation (7), consumer surplus (CS) for the average number of visits is calculated as the area below the demand curve and above the average travel cost of ETB 555.42. Thus,

individual consumer surplus (CS) per visit was approximated to ETB330.12. This consumer surplus per visit can be translated into aggregate consumer surplus for the total number of 10,003 visits for the average number of visit for six consecutive fiscal period before the survey, which was approximated to ETB3,302,190.36.

As compared to findings of other study, the estimated aggregate recreational benefit of Awash Park is below those of other sites. This may be because, research assumptions and procedure followed and site characteristics in these sites to some extent differing to one another. Another possible reason for small recreation value in this study may be due to very low annual tourist flow to the site.

Choice Experiment Results

Table 7: Estimation Results of the RPL Model for Choice Experiment Method

Variables	Coeff. (P-value)	Std.err.
ASC	**13.56539** (0.8631)	0.1.20921
AFFOR	**4.78e-06** (0.0003)***	0.9843e-07
WILDLP	**3.21093** (0.0042)***	0.30097
ADSERVICE	**0.8168971** (0.0199)**	0.23802
ENTFEE	**-0.09890300** (0.0473)**	0.02580
Summary Statistics	Log-likelihood = -36.266994 Pseudo R2 = .8749 Number of obs. = 975	

Source: Computed from the survey data

* Significant at p<0.1; ** Significant at p<0.05 and *** Significant at p<0.01

The overall explanatory power can be assessed using the McFadden‘s (pseudo R2) which allows us to compare the fit of different models. The larger the value of pseudo-R2, the better is the fit of the model to the observed data (Birol*et al*. 2006). Accordingly, in this study the reported R2 statistic is adequate compared to what is considered to be the standard.

All the attributes are significant in the RPL. These implies that those three attributes are important determinants in the choice of the park‘s resource management.

Estimation of the Marginal Willingness to Pay

Right after the estimation of the parameters, the objective of using the discrete choice models is to calculate amount of money respondents are willing to give up to get some benefit from doing certain action such as visiting the natural recreational area. Such monetary measures are known as willingness to pay (WTP) or implicit price. Implicit price refers to marginal willingness to pay for each improvement program. If at least one attribute is measured in monetary value, the ratio of the two parameters would give a financial indicator of WTP (Bennett 1999).

$$Implicitprice(WTP) = -(\frac{\beta_{Parkattribute}}{\beta_{monetaryattribute}})\text{----------} \quad (8)$$

In this case β is the coefficient of the attribute after the estimation of the model, implicit price or *WTP* formula shows the marginal rate of substitution between payment and the environmental attribute; the marginal willingness to pay for improvement in environmental attribute (Birol*et al*. 2006).

Table 8: Estimates of Marginal WTP (in ETB) for Each Attribute

Variables	Coeff.(P-value)	St.err.
Afforestation	0.0178106 (0.017)**	1.34e-08
Wildlife population	0.040008 (0.003)***	.0074896
Additional Service	0.0138137 (0.0811)*	.0104898

Source: Computed from the survey data

* Significant at p<0.1; ** Significant at p<0.05 and *** Significant at p<0.01

Each attributes is statistically significant at different level of significance. This shows that the visitors have positive willingness to pay for each improvement levels of the attributes in quality and quantity. WTP of afforestation and additional services attributes are significant at 5% and 10%, respectively whereas wildlife population attribute is significant at 1%.

As it is reported on table 8 above, the marginal willingness to pay for afforestation is .0178106 ETB per visit per individual, keeping other things constant. This much payment is for each extra increment of one plant coverage of the degraded area of the park from the status quo level. The marginal willingness to pay for every additional increment of wildlife population and additional services levels are valued to be 0.040008 ETB and 0.0138137 ETB per visit per individual respectively, keeping other factors unchanged. From these values, visitors' MWTP for wildlife population is higher than that of afforestation and every additional service, and in turn MWTP of afforestation is higher than that of additional services, ceteris paribus. Hence, these visitors valued wildlife population first, afforestation second and additional services third, respectively. This bears coherent result with the result of follow up questions.

Estimation of the Compensating Surplus/ Welfare Measures

Using the results from the regression, the CS can be estimated by employing the following equation (Adamowicz*et al*. 1998).

$$CS = -\frac{1}{\beta_M}\{\ln(\Sigma exp V_0) - \ln(\Sigma exp V_1)\} \quad (9)$$

Where β_M is the coefficient of the monetary attribute and is assumed to be the marginal utility of income. This study considers only one site.Therefore, following Adamowicz and Boxall (1998) equation 9 was reduced to:

$$CS = \left\{-\frac{1}{|\beta_M|}\right\}(V_0 - V_1) \quad (10)$$

Where, V_0 and V_1 represent the initial and subsequent utility states, respectively (see equation 4). The model also enables the estimation of welfare changes (compensating surplus) associated with an array of changes in recreational quality of the site away from the "status quo" scenario.

In order to compute the visitors' CS for improvement in the Park's alternative management scenarios over the status quo option; Hence, three possible options were formed as follow.

At the Status quo levels (Current situation) no any additional improvement in attributes

At the scenario 1 (low impact improvement scenario) there will be 50 percent increment in the number of wild life population, 1 million new trees to be planted and Provision of after visiting the park services

At scenario 2 (Medium impact improvement scenario) there will be 100 percent increase in the number of wild life population, 2 million new trees to be planted and provision of on-site and after visiting the park services

At scenario 3 (High impact improvement scenario) there will be 150 percent increase in the number of wild life population, 3 million new trees to be planted and provision of to reach the site, on-site and after visiting the park services

Table 9 Compensating Surplus for Visitors

Alternative improvement Scenarios	Mean WTP per visit in ETB
Scenario 1	226.21
Scenario 2	315.27
Scenario 3	404.32

Source: Computed from the survey data

These are the marginal estimates, showing willingness to pay for a change from the current situation. It can be seen from the estimates that, the CS for the change from the status quo to the scenarios considered increases as we move towards improved recreational conditions of the site. Based on the RPL model, mean WTP for scenario 1 is ETB 226 per visit, whereas greater improvements in recreational services of the site under the medium impact improvement scenario increases WTP to ETB 315 per visit, and under the high impact improvement to as high as ETB 404 per visit. The benefit derived from various improvement scenarios can be compared to the cost of these improvement projects so that a benefit-cost analysis can be made. However, this is beyond the scope of this study.

Conclusion and Recommendations

Measures should be done in leadership commitment to understanding the current economic value of ANP. This is because estimating the actual economic value of the Park will enable to preserve the site and generate maximum possible income from the site. In doing so, the study applied two standard procedures in environmental economics, i.e. Travel Cost and

Choice Experiment Methods, using primary data collected from a survey of 195 onsite visitors.

The regression results of the travel cost method showed that travel costs, cost of accessing a substitute site, age, income, education, family size and acquaintance with the site are important determinants of the recreation demand of the site. According to this study, the site management was able to capture only about 12.14% of the true economic recreational benefit of the site comparing it with the average annual income of the last six consecutive financial period (2011/12-2016/17). This implies that the amount of revenue that the site authorities collected from the service is far from the true economic recreational benefit of the site.

The Choice Experiment Method, on the other hand, was employed to measure visitor's valuation of the site's quality improvements and to examine the general attitudes towards the recreation site's resource, in particular to analyze how visitors value different recreational attributes associated with the site. The researcher employed three different attributes (wildlife conservation, Afforestation and service quality) as indicators of the recreation site's quality. In addition, a monetary attribute-gate fee was included in the choice experiment. Random parameter log it models were used for estimation. According to the estimation result, all the attributes were significant and they have the expected sign. The analysis showed that the wildlife conservation attribute proved to be generating a higher impact on the utility for the visitors than did the additional service and forest attributes. As the visitors showed in their marginal willingness to pay, visitors are willing to pay to support the plan for the park improvement either through different attributes which is given consecutively as the increase in the number wildlife, afforestation, and improvement in the different services

The average consumer surplus per person that is estimated in this study could be used as a guide on the fee structure. Concerned authority should give due attention and design appropriate management plans consecutively for the increase in the number wildlife population, afforestation, and improvement in the different services or improvement in the alternative hypothetical scenarios after they do the cost-benefit analysis and

depending of their capacity. All these increase the recreational demand and quality of the park.

In many cases, decision makers have no idea as to the economic values of environmental resources such as a recreational site. They base their decision on their value judgment. Therefore, they should make their decisions based on estimates obtained through valuation techniques such as travel cost, choice experiment and other estimation methods.

Finally, this study has provided an estimate of Awash National Park taking both local and international visitors in to account, in a particular time period. Future studies could benefit from estimating the potential calculated value of the park for local and international visitors separately which can be very helpful in informing park quality conservation decisions.

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Notes of Contributors

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