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Demand Determinants and Use Value of Gudumale Recreational Area, in Hawassa City, Ethiopia

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Abstract

This paper presents the estimate of economic value of Gudumale recreational area. Recreation is an activity that increases visitors' satisfaction. The demand for recreation has been growing with the increase in standard of living and/or income. The objective of this study is to measure the economic use value of Gudumale recreational site in order to show how the site authorities can extract revenue and improves the qualities of the recreation services and develops the types and varieties of the services. The research encompasses the analysis of data collected from 180 randomly selected visitors in the Gudumale recreational area in Hawassa. To measure the recreational economic benefits from Gudumale recreation site Individual travel cost method was employed Individual Travel Cost Method (ITCM) is preferred to Zonal TCM in this study because of its statistical efficiency.

In the selection of a model the number of visits has been taken into account, which is truncated at one. In this study, travel costs, visitors' income, level of education, and visit to WondoGenet and Sodere substitute recreation site were positively related and major determinants of visits to the site, were as family size, visits to Langano and AbjataShalla substitute recreation site and being the head of the family were negatively related and found to be major determinants of visits to the site. To estimate the annual recreational value the truncated Poisson model was employed and found Birr 8,383,605.This implies that the site authorities collected 10.61% of this sum. Therefore, this quantitative valuation may help authorities to make informed decisions on the area for better planning and management of the environmental resources.

Key words: Gudumale; Recreation; Travel; Truncated; Valuation.

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Introduction

Economics is about making choices. Making choices about the environment is more complex than making choices in the context of purely 'private' goods and services (Pearce *et al*, 1998). Private goods tend to be bought and sold in markets. Public goods have the feature that consumption tends to be 'joint' between individuals. Nowadays, the main environmental economy subject, which is almost publicly accepted, is the fact that the environment is inseparable from the economy and any changes in one may affect directly the other one **(**Morteza*et al*, 2009**)**. Economic valuation can contribute positively to the formulation and evaluation of environmental policies (Lant, 1994). Environmental systems provide material and experiential benefits that contribute directly to human well-being, and it is meaningful and important to quantify these benefits in understandable terms.

Recreation is a human activity, which increases visitor's utility. Hence, resource managers are facing decisions that balance society's different needs and values, while trying to ensure ecosystem *sustainable* integrity. This commonly leads to *conflict* and *litigation*, as individuals and stakeholder's opinions of resources are commonly markedly different (FAO, 2000). Therefore, managers need information that provides quantifiable measures of individual preferences and values associated with different recreational services, to make effective, efficient, and equity planning and policy decisions. Money metrics of recreational service is thought as an important and desired tool in resource management.

In order to measure the economic value of environmental goods and services, economists developed several techniques that help to value the service and goods gained from the ecosystem. Travel cost method is one of the techniques that is used to value the environmental services and goods. Travel cost method is mostly used to measure the value of recreational benefit of environmental services and goods. The travel cost method can then be interpreted as a special case of the production function approach (Dosi, 2000).

Recreational service of natural resources is one of the services among many others that provide satisfaction for household or recreationist. The recreational services can be appropriately valued by using travel cost method. The basic approach that drives this method is, if a consumer wants to use the recreational services of a site he/she has to visit it (Mendes, 2005). The travel cost to reach the site is considered as the implicit or the proxy price of the visit, and changes in the travel cost will cause a variation in the number of visits. Study of these visitations across individuals will allow the estimation of demand functions and the derivation of the welfare measure. A travel cost is calculated on per person per visit or recreation day basis (Blackwell, 2007).

Statement of the Problem

Economic presumption put forward that resources be allocated such that marginal value product or benefits are equated across uses to maximize total returns or social benefits (Gibbons, 1987). Unlike other private marketable goods, values of recreation sites cannot easily be determined through the interaction of supply and demand. Thus, there is a need to have some ways to put an economic estimate to recreation sites whose values are not easily determined in conventional market situations. Theoretically, Clawson(1959) explained that putting an accurate and acceptable value on recreation site would be valuable in resource management in different ways. First, it would provide a means for comparing the importance of recreation with that of other uses of the same resources. Secondly, the value of the recreation to be provided by a proposed recreation site would provide one measure of the desirability of making the necessary investment in the project. Thus, we need to attribute values that reflect the true social costs and benefits of recreational activities using some techniques of valuation of environmental resources.

Apart from this, Gudumale recreation site is widely used as a natural recreation area for many people in Ethiopia. It is prominent in its amenity of the pleasantness of the beautiful environment, boating, swimming, the wildlife and bird like (Hippopotamus and monkey watching), camping, striking view of Lake Hawassa and other recreational activities. If the site authorities are not aware of the approximate economic value of the site, they are not able to make informed decision about the potential environmental benefit of the site. Consequently, the quality of the site may deteriorate over time, which could force visitors of the site to shift to other substitute sites. This phenomenon may, over time, result in an irreversible damage to the different environmental resources on the site as well as to the state of business.

Hence, there is a need to estimate the value of the site that could help to compare the economic value of the site in its present recreational use versus some other land use (development) option that private developers or government authorities may come up with. Such economic value estimates are lacking and this research was initiated to fill that gap.

The specific objectives of the study

• To identify the determinants of visit to the Gudumale recreation site.
• To estimate a demand function for the recreation site and approximate the sitebenefits.

Research Questions

The research was conducted in the form of a survey that addressed the following questions:

a) What are the determinants of individual's visits to Gudumale recreational area?
b) What is the demand function for Gudumale recreational site?
c) What is the annual recreational benefit of the Gudumale recreation site?

Here the researcher discusses a brief on Valuation of (Environmental Goods) Recreational Site Using TCM: Theoretical Framework

Here theoretical framework is presented to valuate environmental benefit of recreational area. The TCM is a non-market technique, which seeks to place a value on recreational sites by using consumption behavior (Fang *et al*, 2010). Specifically, the costs of consuming the recreational amenity of a particular site are used as proxies for prices. These costs include travel costs, entrance fee, on-site expenditure and outlay on important equipment.

This basic theory is presented as developed by Brookshire *et al* (1982), Bateman and Turner (1993) and recently summarized by Freeman (2003). A given household will have a utility function which comprises a vector of the quantities of market goods (X), a vector of environmental goods, e.g., recreational activity (Q) whose quantities or qualities are fixed for individuals, and a vector of time spent in various activities (T) that yield utility to the individual. Specifically:

U = U(X, Q, T) ……… (1)Here, a household's utility is also composed of visits to a recreation site that yield utility to the individual. In addition, traveling to a recreational site could be significant in a household's utility function. Let's denote V_j= visits to recreation site j and d_{ij}= total distance traveled by an individual i to site j. Both V_j and d_{ij} are explained as a vector. Thus, a household's utility function can be specified as follows:
$U=U(X, V_j, V_j d_{ij}, Q_j)$ ………(2)

Each rational household maximizes this utility function subject to the budget constraints; the income constraint is represented by the equation:

$Y - \sum FV_j - \sum TCVjdij - X = 0$ ……3)
Where: -F = entrance fee (which is non-existent). Hence: equation (3) becomes:
$Y - \sum TCV_j d_{ij} - X = 0$

The time constraint is represented by the equation:
$T - \sum St_j V_j - \sum tt_{ij} V_j d_{ij} = 0$……… (4)
Where: -

Y = Disposable income of a visitor
C = Travel cost per km (money expenditure on travel)
T = Total time spent for recreation
St_j = Time spent on site j per visit
$t_j V_j$=Total time spent on site j for the number of visits at site j.
tt_{ij}= Travel time per km for a single visit of individual i to site j.
$tt_{ij} V_j d_{ij}$= Total travel time for a number of visits of individual i to site j.

In equation(2) above, the utility function is assumed to be increasing in X, $V_j$and Q_j. However, the utility obtained from $V_j d_{ij}$ (total travel) cannot be known a priori.

$$\frac{\partial U}{\partial X} = U_x \geq 0, \frac{\partial U}{\partial v_j} = U_v \geq 0 \text{ and } \frac{\partial U}{\partial Q_j} = U_Q \geq 0$$

But $\frac{\partial U}{\partial V_j d_{ij}}$ is indeterminate a priori.

By forming the Lagrangean function and considering first order conditions with some rearrangements, we obtain:

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$$\frac{U_v}{U_x} = -\sum Cd_{ij} + \lambda \sum tt_{ij}\, d_{ij} \;\ldots\ldots\textbf{(5)}$$

$$\frac{\partial U}{V_j} = -\mu \sum Cd_{ij} + \lambda \sum tt_{ij} + \lambda \sum tt_{ij}\, d_{ij}$$

$\frac{\partial U}{\partial v_j}$ = Marginal utility of a visit to site j

$\mu \sum Cd_{ij}$ = Opportunity cost of travel to site j

$\lambda \sum tt_{ij}$ = Opportunity cost of time spent on site j

$\lambda \sum tt_{ij}\, d_{ij}$ = Opportunity cost of time spent on travel to site j

The above equations demonstrate that marginal rate of substitution between recreational activities and consumption of goods with the TC associated with a visit is taken into account in equilibrium for a rational economic agent.

Solving all the equations from the first-order conditions, we can obtain the Marshallian demand function: number of visits as a function of basic variables such as entrance fee (if any), money expenditure on travel, disposable income of visitors, environmental good (in this case is recreational visits) and distance traveled to the recreation site. Then, the total area under this demand curve is the total recreational benefit associated with a given trip. It is in this way that the TC estimation technique is used to estimate the environmental benefit of the site

Methodology

Sample unit

Gudumale Recreational Area, in Hawassa City, Ethiopia is taken as a sample unit for the research purpose

Data Collection Method

The survey was carried out through on site face-to-face interviews of the recreationists of the site using structured questionnaire. The questionnaire was designed to capture all the necessary variables that are used to establish the demand equation of the site. Accordingly, the questionnaire for primary data survey included detailed socio-economic characteristics of visitors and main features of visits. Secondary data was collected from the Association about the last year’s total number of visits and other information about the site.

Data Analysis

Data Coding and Diagnosis

Truncated negative binomial or Truncated Poisson regression is appropriate for truncated dependent variable with count data/integer (Greene, 2003). Nevertheless, the significance of the coefficients in a Poisson regression can be greatly overstated if the variance of the dependent variable is not equal to its mean (over dispersion). Test of over dispersion was done and found that the data has no over dispersion problem (see appendix 3). Therefore, the Poisson regression can be used in this study.

Descriptive Analysis

The socio-economic data was presented by using descriptive statistics. The frequency, mean, variance and other distribution is being presented or tabulated by using table and their respective distribution or percentage.

Econometric Analysis

Gudumale recreation demand study was carried out based on information obtained from actual visitors of the site during the survey period. Since potential visitors were excluded from the sample, the dependent variable is truncated. i.e. only number of visits greater than or equal to one is considered in this recreation demand model. Foreign visitors were excluded from the sample because of multipurpose trip and difficulty to isolate the particular cost to the site. Hence, Ordinary Least Squares (OLS) might give biased estimates of the parameters. Since the dependent variable (number of visits) is truncated at a certain point, maximum likelihood estimation is taken as an appropriate technique in selecting recreation demand model, Greene (2003).

The Truncated Model

The truncated model for the recreation demand function is adopted from Greene (2003) as follows:

$V_{ij} = \beta X_i + \varepsilon_i$..............7)

Assuming $V_{ij}/X_i \sim N(\mu, \delta^2)$ and $\mu = \beta X_i$

Where: V_{ij} = Individual i's visit to site j
X_i = Vector of explanatory variables for individual i
β = Parameters
ε_i = Error term

In this truncated model, we observe V_{ij} only if $V_{ij} \geq 1$.

Now, taking the density function of V_{ij} (truncated variable) with probability density function of $f(V_{ij})$, mean $\mu = \beta X_i$ and standard error δ.

$$f\left(V_{ij}/V_{ij} \geq 1\right) = \frac{f(V_{ij})}{prob\,(V_{ij})\geq 1} = \frac{(\frac{1}{\delta})\phi[V_{ij} - \beta x_i]/\sigma}{1-\Phi(\alpha_i)} \text{.........} \quad (8)$$

Where: $\phi(.)$ = Standard normal probability distribution function
$\Phi(.)$= Standard normal cumulative distribution function
$\alpha_i = (1- \beta X_i)/\sigma$

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Hence: $E\left(V_{ij}/V_{ij} \geq 1\right) = \beta x_i + \sigma \frac{\phi[1-\beta x_i]/\sigma}{1-\Phi[1-\beta x_i]/\sigma}$......(9)

$Var\left(V_{ij}/V_{ij} \geq 1\right) = \sigma^2 [1 - \delta(\alpha_i)]$...... (10)

Clearly, the conditional mean and variance are non-linear functions. Thus, ML estimation is preferred to OLS due to the fact that in a truncated model, the partial derivative of Equation (9) with respect to X_i is equal to β $[1-\delta(\alpha_i)]$ which is different fromβ. In the estimation of the truncated model maximum likelihood (ML) estimation is used.

SPSSVersion 17 &NLOGIT Version3is used to obtain the parameter estimates of the ML estimator.

In this study, the data for the dependent variable (visits per year) are typical of count data (integer). Truncated Poisson Regression (TPR) is, therefore, used to study such count data (Greene, 2003).Because the data for the dependent variable is integers, truncated below one visit per year, equation estimation by OLS regression is inappropriate. Maddala (1992) showed that the estimated regression line by OLS will be biased estimate of true slope when the dependent variable is truncated. The result is that the least squares method understates price elasticity and overstates consumers' surplus. Price elasticity is defined as (in this case) the percentage change in quantity demanded (trips) caused by a one percent change in money trip price (travel cost). The regression results were obtained for this study, therefore, estimated using maximum likelihood (ML) estimators. Since Poisson and negative binomial regression functional forms are equivalent to a logarithmic transformation of the dependent variable, truncated Poisson or truncated negative binomial regression is appropriate for dependent variables with count data (integer). Thus, truncated Poisson model was used to represent a simple count data model. As stated in Parsons (2003), the Poisson regression model specifies that each V_i (number of trip) is drawn from a Poisson distribution with parameterλ, which is related to the regressors X_i.

The primary equation of the model is:

$prob(V_i = v_i) = \frac{\exp(-\lambda)\lambda_i^{v}}{v_i}$ ....(11)

Where: V = 0, 1, 2, 3…; and λ is the expected number of trips = E(V), which is taken as equal to the variance of the random variable = Var(V).

The most popular functional forms are linear, quadratic, semi-log and log-log. There is no consensus in the literature reviewed on the preferred choice. Because the dependent variable consists mostly of low values (i.e. skewed to the left), this study uses the semi–log form. The logarithm of the dependent variable helps to adjust its skewness to normal distribution (Nam and Son, 2001).

TABLE 1 Descriptions and hypothesis of variables

Variable description	**Description**	**Hypothesized effect**
Travel Cost	Continuous	–

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Age of visitors	Continuous	–
Monthly Income of visitors	Continuous	+
Family Size	Continuous	–
Education Level	Dummy	+
Sex of visitors	Dummy	Indeterminate a priori
Marital Status of Visitors	Dummy	Indeterminate a priori
Mode of Transportation	Dummy	Indeterminate a priori
Group Size of visitors	Continuous	–
Head of family	Dummy	Indeterminate a priori
Occupation of Visitors	Dummy	Indeterminate a priori
Wondogenetrecreation Site	Dummy	Indeterminate a priori
Langano recreation site	Dummy	Indeterminate a priori
Sodere Recreation Site	Dummy	Indeterminate a priori
AbjataShalla recreation Site	Dummy	Indeterminate a priori

The general semi-log function for the individual travel cost model is:

$\ln(\lambda) = \sum_{i=1}^{n} \beta_i X_i$............(12)

Equation (12) is a Poisson form of a recreation demand. Substituting equation (12) into (11) gives an expression for the probability of observing an individual take Vtrips as a function of trip cost and individual characteristics. The parameters in equation (12) are estimated by maximum likelihood. For each person in the sample the analyst knows the independent variables. Using these data and equations (11) and (12) the probability of observing the number of trips actually taken is constructed for each person in the sample. The likelihood of observing the actual pattern of visits then is the product of these probabilities.

$L=\prod_{i=1}^{n} \frac{\exp(-\lambda_i).\lambda_i^{v_i}}{V_i!}$. ....(13)

An individual is denoted by $i = 1\ldots,n$, so $V_i$is the number of trips taken by person i. In estimation, the parameters β_i, on which λ depends according to equation (12)are chosen to maximum L.

Consumer surplus, or access value, for each person in the sample has an explicit form in the Poisson model. For individual I the surplus is:

$Cs = / \frac{1}{-\beta_i} /$ ....(14)

Where: λ_i is the expected number of trips from equation (12). Once the parameters of the model are estimated, equation (14) is used to calculate the surplus value for each individual in the sample and then aggregated over the population of users to arrive at a total access value.

The corrected probability for an on-site sample is a slight variation on the basic Poisson probability in equation (11). It takes the form:

$pr(v_i/v_i > 0) = \frac{\exp(-\lambda_i)\lambda_i^{v_i-1}}{(V_i-1)!}$......(15)

This corrects for truncation at one trip and differs from the basic Poisson regression only by $v_i - 1$replacing v_i. With on-site sampling then equation (15), instead of (11), enters the likelihood function for each individual. Consumer surplus is still measured as shown in equation (14). Finally accordingly the interpretation was undertaken.

Calculation of Travel Cost

Opportunity cost of time

In this research the opportunity cost of time is measured by asking individual how much they would be willing to accept if they are requested to cancel their visit.

Monetary cost related to travel

Monetary cost of visit includes fuel costs and other special costs that people may incur associated with trip such as entrance fee, car spare part costs, money spent on food, drinks, etc. in connection with trip when people travel to get into the site. This was measured by asking the visitors how much total cost they spent for accommodation including entrance fee and for transportation: if they use public bus the tariff is considered and own care fuel cost and maintenance cost was considered.

Results and Discussion

The empirical findings of households' characteristics and visitations as well as the regression results and the aggregate value estimation are presented and discussed.

Descriptive Analysis

Socio-Economic Characteristics of Household

The survey data was collected from a sample of 200 visitors of the site. However,20 questionnaires were discarded due to incompleteness. Hence, the responses of 180 visitors were used for this study. During the survey period, it was found that visitors came from different region of the country. The respondents were government employees, NGO workers, businessmen and some students who came to the site with their relatives.

Table: 2 Socio-Economic Characteristics of Household (**N=180**)

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Variables	Frequency(rate)	Percent
Age group		
≤20	4	2.2
21-30	139	77.2
31-40	33	18.3
41-50	2	1.1
51-60	1	0.6
≥70	1	0.6
House Hold size		
1-3	137	76.2
4-6	24	13.3
>6	19	10.5
Educational level		
Below college and university	36	20.0
Attended college & university and above	144	80.0
Occupation		
Government employee	42	23.33
Non-government employee	17	9.44
Own business	121	67.23
Income range(ETB)		
200 – 1000	32	17.78
1001 – 1600	24	13.33
1601 – 2500	37	20.56
2501 – 3600	27	15
3601 – 4500	23	12.78
4501 – 6000	16	8.88
6001 – 8000	9	5
> 8000	12	6.67
Type of Recreation activity		
Enjoying from striking view of lake Hawassa and beautiful Environment	59(1)	49.17
Bird watching and to have photograph	33(2)	27.5
Boating	15(3)	12.5
Swimming	4(4)	3.33
Number of visitors in a group		
1.0	42	23.3
2.0	57	31.7
3.0	25	13.9
> 4.0	56	31.3
Number of annual visit		
1.0	94	52.2
2.0	21	11.7
3.0	20	11.1
>3.0	45	25.0
Travel cost per round Trip (ETB)		
130 – 300	59	32.78
301 – 500	30	16.67

501 - 1000	25	13.89
1001 – 1600	24	13.33

In this sample, it was observed that 74.4% of respondents were male. Of the total respondents, 26.1% were married of which 6.7% were married women while 19.4% were married men. The rest (73.9%) of the respondents were single. It was also observed that 27.2% of the respondents were heads of their household.

As indicated in Table 2, 96.6% of visitors were between 21 and50 years old. Visitors that were less than 21 accounted for 2.2% of sampled visitors, while 1.2% of the respondents were greater than 50 years old. The mean age of the respondents was 27.85years. If we look at the number of visitors in different age groups, we observe that it is increasing up to 20-30 age groups and decreases subsequently.

As can be seen from Table 2,60.6% of sample visitors had no other members in their family. 15.6% of them had no more than 3 members in their family. It was found that as the number of members in a family increases, the number of visitors to the site decreased. This suggests that people who had larger family size are less likely to take more visits to the recreation site. The average household size of sample visitors is 2.5.

A good proportion of visitors had education at college or university level. As indicated in the Table 4.3,80% of sample visitors had completed their college or university education. And the remaining (20%) was illiterate and attending elementary & high school.

As can be seen in Table 2, 23.33% of visitors were government employees while 9.44% were non-government employees and 67.22% ran their own business. It was also observed that about 75.6% of sample visitors came to the site using public bus.

As shown in the Table 2, 70.55% of sample visitors did earn monthly income ranging between birr 1000 and 6000. The average monthly income of respondents was birr 3,969.71. The fact that 82.2% of the sample visitors' monthly income was greater than Birr 1000 demonstrates that relatively high-income groups went to the recreation site.

Responses of Households to Visitation

The basic assumption of Travel cost method is that people reflect their willingness to pay for a site by the amount of money and time they spent in traveling to the site. Thus, total number of annual visits and travel costs per trip are the two crucial elements used to construct the demand curve for recreational area.

Only 42 visitors (23.3%) were observed traveling alone during the survey period. All 76.7% of sample visitors were traveling in-group. As shown in Table 4.6 many of the visitors (68.4%) came to the site in-group of 2-6 people. The average number of persons in a group was 3.29. From Table 4.6, the number of visits decreased as the number of people

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As indicated in Table 2, 52.2% of sample visitors have visited the site only once during the last 12 months. About22.8% of them visited the site 2 or 3 times during this period. The average number of annual visits to the site per individual was estimated at 2.78.

As shown in Table 2, about 76.67% of sample visitors spent Birr 130 - 1600 to recreate on the site. Travel cost per round trip consists of both mileage and time costs. Mileage costs include fuel costs and other special costs that people may incur associated with trip (e.g., car spare part costs, money spent on food, drinks, etc. in connection with trip when people travel to get into the site). Time costs are measured by the opportunity cost of time spent on site and travelling to site, which, in this study, is obtained by asking visitors how much they would be willing to be paid by any economic agent if they were requested to cancel their visitations. The minimum round trip travel cost was Birr 130 and the maximum was Birr 8,818.20. The average round trip travel cost was Birr 1,127.20.

The response rate may be a good indicator of recreationist's interest in different types of recreation activities. The activity with the highest rating was enjoyment from striking view of Lake Hawassa, beautiful Environment, scenery of the lake and bird watching and photographing, more than 76.67% of the visitors preferred these recreation activities

Econometric Analysis

As noted earlier, the recreation demand function is approximated using the number of visits to the site as dependent variable and the travel cost associated with the trip and other socio-economic characteristics as independent variables.

The truncated Poisson model is used to estimate the demand function since the dependent variable has only integral values and the values are greater than or equal to one (truncation)(Hesselnet *al*., 2003; Hagerty&Moeltner, 2005).

Model Specification

$$LnV = \beta_0 - \beta_1 TC + \beta_2 AG + \beta_3 Y - \beta_4 FZ + \beta_5 ED + \beta_6 G + \beta_7 MS - \beta_8 TS + \beta_9 GZ - \beta_{10} HF + \beta_{11} OC + \beta_{12} WGRS - \beta_{13} LRS + \beta_{14} SRS - \beta_{15} AJSRS + \varepsilon_i \qquad (16)$$

Where:

V= Individuals' number of visits.

TC = visitors' travel cost.

AG = visitors' years of age

Y= visitors' monthly income.

FZ = visitors' family size.

ED= visitors' level of education as dummy variable (1 for above college and university, and 0 otherwise)

G= visitors' Sex as dummy variable. (1 for male, 0 for female)

MS = visitors' marital status as dummy variable. (1 for married, 0 otherwise)

TS = visitors' mode of transportas dummy variable (1forpublic bus, 0 otherwise).

GZ = number of visitors in a group

HF = visitors' head of the familyas dummy variable (1 for head of the family, 0 otherwise)

OC = visitors' occupation as dummy variable. (1 for government employee, 0 otherwise)

WGRS =Wondogenet Recreation Substitute site as dummy variable (1 for visits to WGRS, 0 otherwise)

LRS = Langano Recreation Substitute site as dummy variable (1 for visits to LRS, 0otherwise)

SRS = Soderie Recreation Substitute site as dummy variable (1 for visits to SRS, 0 otherwise)

AJSRS=AbijataShalla Recreation Substitute site as dummy variable (1 for visits to AJSRS, 0 otherwise)

The visitors who made a multipurpose trip were excluded from the sample to avoid the possible occurrence of over estimation of Gudumale recreation site. The regression results obtained from this model are estimated using ML estimator. The robust regression results of the truncated Poisson model are displayed inTable3 below.

TABLE 3 Maximum likelihood regression results

Variables	Truncated Poisson Coefficients	Mean Values
Travel Cost	-0.00227**	
	(-5. 963)	1127.20444
Age	0.441292	
	(7.96573)	27.8500000
Income	0.0490*	
	(1.957)	3969.71111
Family Size	-0.038853***	
	(-1.50111)	2.50000000
Education	0.473111***	
	(3.18276)	0.80000000
Sex	0.0361615	
	(0.26188)	0.74444444
Marital Status	0.337009	
	(2.06653)	0.26111111

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Mode of Transportation	-0.154828 (-0.941632)	0.24444444
Group Size	0.0446105 (5.2463)	3.28888889
Head of family	-0.910372** (-5.07732)	0.27222222
Occupation	0.195195 (1.43735)	0.23333333
Wondogenetrecreation Site	1.13218*** (9.39158)	0.32222222
Langano recreation site	-0.274128*** (-2.18434)	0.31666667
Sodere Recreation Site	0.562132** (4.61942)	0.28333333
AbjataShalla recreation Site	-0.51389** (-2.20956)	0.07222222
Constant	2.082006 (8.13)	N/A

ML Results
Unrestricted Log Likelihood = - 325.5624
Restricted Log Likelihood (β_0= 0) = - 472.6460
R^2 = 0.6492
Number of observations = 180

***,**,and * are significance at 1 %, 5% and 10 %, respectively. Numbers in parenthesis are t-values.N/A=Not available

The log-likelihood ratio (LR) can be used to test the significance of the model (Greene,

2003).LR = -2(Restricted Log L - Unrestricted Log L) In this case, the unrestricted log likelihood is–325.5624 and the restricted log likelihoodis–472.6460. Thus, LR is equal to 294.1672

However, at 1% significance level, the table value of the test with 15degrees of freedom(χ^2, 15) is 30.58.Since the computed value is greater than the critical (tabled)value; we can reject the null hypothesis that says all independent variables are irrelevant at 1% significance level. Thus, the model used in this study is significant at 1%significance level.

R^2 was 64.92 percent, and the adjusted R^2 was 61.71 percent, indicating that the model explains nearly two-thirds of the total variation in the data. In their survey of the TCM Loomis and Walsh (1997) and Green (2003), observed that R^2 values exceeding 50 percent are considered acceptable in empirical demand estimation.

Demand Estimation

The regression results are presented in Table 4.9. The results indicate that travel cost (TC) has a negative and significant impact at 5% significance level on the demand for visits to Gudumale recreation site, as expected. In particular, the results show that, ceterisparibus, the demand for visits to Gudumale recreation site would increases by 1 trip if visitor's travel cost decreased by Birr 220.20. Similarly, visitors' income (Y) has a positive and significant influence on the demand for visits to the site. In particular, the number of visit would decrease by 1 trip when visitor’s income decreases by Birr 1,204.10, ceteris paribus. The conditional mean estimate (λ) of the trips taken to the Gudumale recreational site is 2.76390. This does not vary much with the actual mean of 2.77778 trips observed in the sample.

Furthermore, the coefficient of the dummy variable for Wondogenet Recreation Site is positive and significant at 1% significant level, suggesting that those who visit Wondogenet Recreation site are more likely to visit Gudumale recreation site, other things remaining the same. Family size (FZ) and being head of the family(HD) are found to have a negative and significant effect at 1% and 5% level of significant respectively, suggest that as the number of the family increases the number of visit to Gudumale recreation site would decreased and being head of the family visitors are less likely to visit the site. Similarly, Langano recreation site is found to have a negative and significant effect. The negative sign of the coefficient of the dummy variable for Langano recreation site suggests that those who had visited Langano recreation site are less likely to visit Gudumale recreation site, other things remaining the same.

The positive sign of the coefficient of education variable suggests that more educated people (college and university) visit the site more frequently than less educated ones(elementary and high school).

Other explanatory variables such as occupation of visitors, sex, and mode of transportation, group size and marital status are found to be insignificant determinants of visits to Gudumale recreation site. Though the extent of significance of these variables differs from one study to the other, many of these variables are found in several TCM studies as principal factors affecting the demand for visits to a recreation site. The results obtained in this research are also consistent with other studies in similar areas e.g., see Shammin(1999), Jeong andHaab(2004).

Demand Function and Recreational Benefit Estimation

The demand function for visits to Gudumale recreation site is constructed by relating visitors' number of visits (V) to Gudumale recreation site with their travel costs (TC). The exponential function is selected in this study as the benefit estimates from the power function are not defined.

The typical Log-linear travel cost model hypothesis is explained in eq. (17)*(*Pak, M. and M. F., Tüker, 2006)

$LnV_{ij}=\beta_0-\beta_1 TC_i+\varepsilon_i$……(17)

Where:

V_{ij}= individual i's annual visits to site j.

TC_i= individual i's travel cost

β_0 =the sum of the values of all other significant variables (assuming allthe other variables are at their mean values) and the constant termin the original model.

ε_i= residual assumed to be normally distributed with mean = 0, and variance =σ^2, i.e.,$(0,\sigma^2)$.

The demand function estimated for visitation to Gudumale recreation site is stated as follows:

Ln V_{ij}= 10.553– 0.00227TC--$_{i}$ (18)

By considering sample visitors only, the annual recreational benefit of Gudumale Recreation site is estimated by calculating the area under the demand curve. This area is calculated by transforming equation (18) into an exponential function and integrating the inverse demand function between 0 and the average number of visits which was estimated at Birr 106,047 for the average number of visits. The recreational benefit of the site per visit per person was, therefore, estimated at Birr 589.

Considering the annual sales record of Gudumale recreation site, the total number of visits to the site for the last 12-months period before the survey was 14,230.

Then, the estimated individual recreational benefit per visit per person can be translated into total annual recreational benefit as follows:

Birr 589 x 14,230= Birr 8,383,605

Therefore, the total annual recreational benefit of the site was estimated to be Birr 8,383,605.Using the exponential demand function, consumer surplus (CS) for the average number of visits is calculated as the area below the demand curve and above the average travel cost. Thus, individual consumer surplus (CS) per visit was approximated to Birr 440. This consumer surplus per visit can be translated into aggregate consumer surplus for the total number of 14,230 visits for the 12-month period before the survey, which was approximated to Birr 6,263,192.

Summary, Conclusions and Recommendations

Economic value of most of recreation areas, national parks and other natural resources were not known well in Ethiopian. The quality of these resources is therefore decreasing from time to time due to lack of proper management of the resources.

The major objective of this study is to estimate the economic use value of Gudumale recreation site. Though there are problems of getting accurate and reliable data in the process of estimation of the value of natural resources, it is practically manageable to put monetary values on such recreation site. For this purpose, an environmental technique of valuation for recreational area viz. travel cost method (TCM) was employed.

Since the data for the dependent variables are integers, count data models were used. The dependent variable is truncated at a point where number of visits is greater than or equal to one. Furthermore the statistical test showed that the data has no over dispersion problem. Thus, the truncated Poisson model was used in the empirical analysis instead of the negative binomial model.

The regression results obtained from this study showed that travel costs, visitor's income, family size, level of education, being a head of the family, availability of Wondogenet, Sodere, Abjata-Shalla and Langaano substitute recreation sites were important determinants of the recreation demand of the site.

The coefficient of travel cost is negative and significant at 5% significant level, implying that an increase in travel cost reduces the number of visits of the site. Similarly, the coefficient of income variable is positive and significant at 10% significant level, implying that the demand for recreation increases as visitor's income increases and vice-versa. The relationship between education variable and recreation demand was Positive and significant implying that the more educated people make more frequent visit than less educated ones.

Furthermore the recreational benefit computed from the regression analysis indicated that the recreational benefits per person amounted to Birr 589. The expected total annual benefit of the site was, therefore, estimated at Birr 8,383,605. Use of a travel cost model to estimate the willingness of users to pay for visits to Gudumale recreation sites has demonstrated that these sites provide substantial values to users.

The result of this study indicates that the benefit of visitors from the site is larger than the annual income that the site authority earned from visitors of the site, as expected. Based on these results of the study, it is therefore legitimate to draw the following recommendations.

The site management was able to capture only about 10.61% of the true economic recreational benefit of the site for the 12-month period before the survey. 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.

If we compare the true economic recreational benefit of the site and the actual revenue collected by the site authorities, it may be possible to further augment the actual revenue collected from the site, which could again possibly be reinvested to improve the quality and the conservation benefit of the site.

Consequently, site authorities and other concerned bodies need to be aware that there may be a possible danger of underestimation of the conservation benefit of the site if future economic decision of managing this resource fails to properly consider the true recreational benefit of the site. Failure to properly internalize as much of the true benefit of the site for conservation and improvement of the quality of the site may lead to possible occurrence of an irreversible damage on the natural resources of the site. The site management should give great emphasis to improve the existing services and hence increases their revenue. The current payment or entrance fee should be increased at least twice to capture 20% of the total economic benefits, which goes for recreationists annually.

This research attempted to measure the recreational benefit of Gudumale recreation site. It is only one component of the total economic benefit of the site. The total economic value of the site also includes other use values of the site (such as option value) and non-use values of the site (such as bequest value and existence value).The total economic value of the site requires an effort of attaching a monetary value to all these values of the site. Therefore, it is advisable if site authorities or other concerned bodies encourage research to estimate the total economic value of the site. Decision makers need to have adequate scientific information about economic values of environmental resources before they plan to launch similar projects. By any measure, decision on allocation of environmental resources would be appropriate if it is based on an economic estimate obtained through accepted estimation techniques than valuing resources on the basis of peoples' traditional value judgment. It would, therefore, be of great importance if conservation/ recreational authorities like Environmental protection agency (EPA) and Tourism commission base their future management decisions on the economic value of these resources estimated using environmental valuation techniques.

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