International Journal of Multidisciplinary Research and Development
Online ISSN: 2349-4182, Print ISSN: 2349-5979, Impact Factor: RJIF 5.72
www.allsubjectjournal.com
Volume 4; Issue 7; July 2017; Page No. 01-05

Economic valuation of recreational benefits from government botanical garden, the Nilgiris: An individual travel cost approach

[1] V Rajkumar, [2] S Boopathi

[1] Ph.D Research Scholar, Department of Economics, Bharathiar University, Tamil Nadu, India
[2] Professor, Department of Economics, Bharathiar University, Tamil Nadu, India

Abstract
Recreation is an activity of leisure and an essential part of human life, the demand for this activity has been increasing with the increase in population, income and mobility. There is, however, limited scarce natural and financial resource involved in improved provision of recreation. Hence, there is a need to estimate the economic benefit of recreation sites (Botanical Garden) so as to properly and efficiently allocate scarce resources for improvements. In this backdrop, the present paper addresses the issue like determination and quantitative estimation of the recreational use value generated by Government Botanic Garden (GBG), The Nilgiris by using the Individual Travel Cost Method (ITCM). A purposive sampling technique was used to choose 150 visitors and a linear regression method was employed to investigate determinants of recreational use value at GBG. The number of visits (per year) was taken as the dependent variable in this model. Travel cost, location, age of the respondent, family size, family income and garden quality were evaluated as independent variables and were found as major determinants of visits to the garden. Our estimated results indicate that, individual consumer surplus was determined at Rs.4000 (US$ 59.64) and total consumer surplus is determined as Rs.11.757 billion (US$ 175.293 million). This value corresponds to an annual recreational use value of the garden. The activities such as exhibitions (Flower show), picnics and natural beauty offered to visitors played an important recreational role in increasing the degree of satisfaction.

Keywords: botanical garden, travel cost method, linear regression, recreational value, consumer surplus

1. Introduction
Botanic gardens are an important part of society as they provide a variety of benefits to the human community in different ways like, source of community pride, enhance children education through school programs and field trips, act as a vacation destination and attract tourists, a venue for community meetings and cultural events and provide information for everyone from amateur gardeners to university scholars (Smith, 1989) [13] As a place of leisure and connection with nature, botanic gardens help visitors cope with stress (Kohlleppel, Bradley, & Jacob, 2002) [9]. Botanic gardens have social, economical, cultural and environmental values of the plants in their collections. When considered from the environmental aspect, resources have a significant economical value in terms of recreation in particular (Stephen Forbes, 2008).
Recreation is a human activity that increases a visitor's utility. The demand for recreation has been increasing in many developing countries due to rise in population, income and mobility (Clawson *et. al.,* 1966) [3]. Many types of natural resources are used for numerous recreational activities. In Economic perspective, these services have two significant features. Firstly, the economic value of these services depends upon the characteristics of the natural resource system. Knowledge of the value of these services is therefore important for a variety of resource management decisions. Secondly, to access the natural resource for recreation is typically not allocated through markets (Freeman, 1993; Khan, 2004) [7].
One major problem that confronts environmental economists is that it is very difficult in valuing environmental resources and other public goods such as recreational sites because either there are no markets or the existing markets are imperfect in regions where they exist (Twerefou and Adjei Ababio, 2012) [15]. Clearly, botanic garden services are not bought and sold in a competitive market setting. A central problem in estimating the natural resource value is that many of their services are not traded in competitive markets (Downing and Roberts, 1991) [6]. Botanic gardens are collections of plants, a great number of which are priceless, but worth of immense value (Oldfield, 2010) [12].
Based on the aforementioned problems, this study raises three crucial research questions such as: What is the recreational use value of the GBG? What are the factors that determine the recreational use value of the Garden? What is the visitor's consumer surplus of the GBG? This study seeks to address these questions by adopting the Individual Travel Cost Method (ITCM) to derive the recreational use value (monetary value) of GBG as well as the factors that determine the recreational use value (Visitation to the garden). There is very little knowledge on the recreational use value in botanical gardens in Tamilnadu. Analysis of these issues is important because it will help the government to gather some knowledge of the imputed economic value of the GBGs and help in better planning and management of other recreational sites.

2. Material and Methods
Government botanical garden was selected for this study. The Garden is located in the Nilgiris (Ooty) district, Tamil Nadu

state, India. It was established in 1847 and maintained by the Tamil Nadu Horticulture Department. The Garden, divided into several sections, covers an area of around 22 hectares, and lies on the lower slopes of Doddabetta peak. The botanical garden is home to many rare species of trees. Chief among them are the cork tree, the only one of its kind in India, the paper bark tree, the monkey puzzle tree and an old fossilized tree (estimated as 20 million years old) round out the other rare species. A flower show along with an exhibition of rare plant species is held every year in the month of May in this garden.

The data for this paper were derived from a primary survey. The survey was conducted in the summer of (April-May) 2016 and purposive sampling techniques were used for sample selection of 150 visitors with the help of interview schedule containing all relevant information incorporating important variables. The interview schedule consisted of two parts. The first part contained general information about the visitors including gender, location, marital status, family type, age, income, etc. The second part of the questionnaire is concerned about the visitor's recreational behaviour like the number of visits to the garden, travel cost, purpose of the visit and knowledge of substitute sites.

Model specification for Travel cost method:

In environmental economics there are a number of valuation methods used to estimate the economic benefits of a natural or man-made recreational site. Among them, one important method is travel cost method (TCM) that is frequently used in recreational benefits purpose (Sajib Hossain and Nazrul Islam, 2016) [10]. This method has been applied to estimate the recreational use value and consumer surplus at recreational site. The TCM model is usually estimated as a trip generating function such as the following (Bateman, 1993) [1]:

$$V = f(C, X)$$

Where; V: number of visits to a recreation site; C: visit costs; X: other socio- economic variables, which significantly explain V.

The travel cost method is divided into three types: Zonal travel cost method, Individual TCM and Random Utility Method. For the ZTCM, the visitors are grouped into zones based on some certain similar characteristics such as geographical origin and this is the oldest form of the travel cost method (Timah, 2011). The second one is ITCM, the number of visits of the site made by each visitor over a specific period. This method uses survey data from individual visitors in the statistical analysis, rather than data from each zone. However, in recent times the ZTCM has been under serious criticism for its vagueness as a non-market valuation tool. Hence, the majority of the economists and researchers have now turned to use the ITCM as a better option for estimating the recreational benefits (Bell and Leeworthy, 1990; Mohammed El-Bekkay *et al*, 2013) [2, 11]. In this study, the ITCM was applied to estimate the recreational use value of the Government botanical garden, The Nilgiris. The Equation written as:

$$Vij = f(Cij, Xi)$$

Where; Vij: Number of visits made per year by the individual i to recreation site j; Cij: visit cost per individual i to recreation site j; Xi: other socio-economic variables determining individuals visit.

The ITCM relates to produced demand curve by the individual's annual visits to the costs of these visits. Integrating under this demand curve gives us the consumer surplus for per individual (ICS). Individual consumer surplus can be calculated by using the following formula (Willis, 1991; Damigos and Kaliampakos, 2001) [16, 4].

$$CS = -1/\beta ij$$

Where, CS is the Consumer Surplus per person per trip and βij is the Coefficient of travel cost. The total annual consumer surplus obtained from the recreation site can be calculated by multiplying the ICS with the number of visits made in a year. (Mohammed El-Bekkay *et al*, 2013) [11]

3. Analysis and Discussion

As mentioned earlier, structured questionnaire was designed to collect the necessary data of this study. This section presents the descriptive statistics that was collected from the 150 visitors from their interview. Among the most important variables, gender, location, religion, community, marital status, family type, age, the number of visits to the garden, income of the respondents and quality of the garden are included for the descriptive analysis. Based on the survey, socio-demographic characteristics of the respondents are presented in the table below.

Table 1: Socio-demographic characteristics of the respondents

Particular		Frequency	Percentage
Gender	Male	115	76.7
	Female	35	23.3
	Total	150	100.0
Location	Rural	47	31.3
	Urban	103	68.7
	Total	150	100.0
Religion	Hindu	121	80.7
	Christian	13	8.7
	Muslim	16	10.6
	Total	150	100.0
Marital status	Single	50	33.3
	Married	98	65.3
	Separated/Divorced	2	1.3
	Total	150	100.0

Gender is an important social variable which acts as basic information about recreational activities. Out of the 150 respondents, 115 representing 77% were males and 35 (23%) were females. Since the study is carried out with visitors most of the respondents were male compared to females. The rate of frequency of visits of an individual to a recreation site varies with respect to the location the individual belongs to. The study captured 31.3% visitors from rural areas and 68.7% from urban areas. Religion has its own influence in deciding the recreational activities and attitudes of the visitors. Regarding the religion, altogether 121 (80.7%) of the respondents belong to Hindu remaining 29 (19.3%) of them are equally Muslims and Christians. This result clearly depicts that Hindu religion respondents are visiting this garden more when compared to Muslims and Christians.

The marital status of the respondents has been classified into married, unmarried and separated / divorced. Regarding to marital status, 65.3% of respondents were married whereas 33.3% of respondents were unmarried (single) and the rest (1.3%) of Separated/ Divorced.

Table 2: Distribution of the respondents by age group and Income group (per month)

Particular		Frequency	Percentage
Age group	21-30	53	35.3
	31-40	37	24.7
	41-50	39	26.0
	Above 50	21	14.0
	Total	150	100.0
Income groups	5000-10000	15	10.0
	10001-20000	65	43.3
	20001-30000	35	23.3
	30001-50000	25	16.7
	Above 50000	10	6.7
	Total	150	100.0

Table 2 reveals the distribution of the respondents by age group and income group (per month). Age is one of the important demographic variable which determines the recreational activities at the garden. With regard to the age variable, between the ages of 21 – 30 (35.3%) 53 of the respondents, 37 (24.7%) of the respondents were between the ages of 31-40. 26% (39) of the respondents were between 41-50 years, 14% being between above 50 years. Overall, about 90 (60%) out of the 150 visitors were less than the 41 years old. Results clearly mention that percentage of young people visiting this garden is high and this is because of our intuitive expectation that young people travel to long distances to spend leisure time in recreation sites.

Another important variable which has its bearings on the economic status is respondent's income. It is observed that 43.3 percent of respondents fall in the income group of Rs.10000-20000 per month and 10 percent of the respondents have a monthly income in the range of Rs.5000-10000. Some 23.3 percent of respondents have income of Rs. 20001-30000. Taken together, 76% of the households fall in the income range of 5000 – 30000.

Table 3: Distribution of the respondents with respect to the number of recreational trips

Particular		Frequency	Percentage
Previous visit to the garden	Yes	96	64.0
	No	54	36.0
	Total	150	100.0
Number of trips	1	32	33.3
	2	39	40.6
	3	18	18.8
	above 3	7	7.3
	Total	96	100.0

The number of annual visits is a crucial element used to estimate the recreational activities at the garden. Out of the total surveyed respondents, majority of the respondents (64%) reported that they already visited this garden and 36% of them are visiting the garden for the first time. Regarding the number of annual visits, 33.3% of visitors have visited the garden 1 time whereas 40.6% of the visitors have visited the garden 2 times and rest of one fourth of visitors have visited the garden 3 and more than 3 times in the last 12 months. Overall, about 74 % of visitors have visited this garden 1 or 2 times.

The respondents were asked to express their opinion about the quality of garden at GBG. For this purpose five points scale was employed. These points are very poor, poor, fair, good and excellent. The detailed opinion of the respondents on recreational benefits is shown in the following table 4.

Table 4: Distribution of Visitors' perceptions regarding to the quality of the garden

Quality of garden	Frequency	Percentage
Very poor	7	4.7
Poor	10	6.7
Fair	42	28.0

Good	78	52.0
Excellent	13	8.7
Total	150	100.0

It is found from the above table that majority (60.7%) of the respondents expressed their opinion about quality of garden as excellent and good, one third (28.0 %) of the respondents opined as Fair. Only a meager percentage (11.4%) of respondents said as poor and very poor. From the analysis it is inferred that substantial per cent of the visitors said that the quality of garden is 'good' and 'excellent'.

Regression Results for Estimation of Recreational use value on ITCM

In order to estimate the consumer surplus, which means the recreational use value of GBG, and determine the effective factors on the number of visits made by individuals in a year, a multiple regression analysis was employed by selecting the number of visits made by an individual to the garden as dependent variable and the travel costs associated with the trip and other socio-economic characteristics as independent variables. Correlation matrices were applied to understand and shortlist the number of variables, which influence the number of visits. Of the fifteen variables travel cost, location, age of the respondent, family size, family income and garden quality were considered for running the regression analysis. As such, these variables exhibit a high percentage of correlation.

Table 5: Result of regression analysis

Variables	Coefficients of Regression (β)	Std. Error	Standardized Coefficients	't' value
(Constant)	1.295	.869		5.478
Travel cost	-0.00025	.000	-.258	-3.929***
Family Income	.170	.054	.225	3.168***
Family size	-.219	.075	-.189	-2.911***
Location	.225	.089	.173	2.536**
Age of the Respondent	-.017	.007	-.153	-2.317**
Garden Quality	.393	.090	.300	4.389***
R^2	0.43			

Note: ** and *** indicates coefficient significant at 5% and 1% level respectively.

According to the regression results summarized in Table 5, the six independent variables were included in the regression model. These are travel cost, location, age of the respondent, family size, family income and garden quality. The R square value turns out to be 0.43. This shows that 43 percentage of the relationship in the dependent variable is being explained by the independent variables. Considering the variables in the regression model, the demand function for GBG was developed as follows:

$$V = 1.295 - 0.00025_{(TC)} + 0.170_{(FI)} - 0.219_{(FS)} - 0.225_{(LOC)} + 0.017_{(AGE)} - 0.393_{(GARQ)} + Ɛ$$

Where, V = Annual Number of Visits (last one year)
TC = Travel cost
FY = Family Income (per month)
FS = Family size
LOC = Location (1.Rural 2.Urban)
AGE = Age of the respondent
GARQ = Garden quality
Ɛ = Residual Term

To understand the implications of the results, a detailed discussion is necessary. Firstly, travel costs incurred by individuals are inversely related to annual number of visits to the garden. The negative sign implies that higher the total travel cost spent by visitors to reach GBG, the less frequently they visit. This means that people living closer to the garden made many trips while those living far from the garden made fewer trips. Another crucial variable, which is positively related to annual visitation rates, was family income (per month). This implies that if the visitor's family income level increases the garden visitation rates and recreational activities also increases. Similarly, the variable of family size has a negative value; it is shows that there is an opposite relationship between the annual number of visits and family size. In other words, as the family size increases, the number of annual visits decreases. Another independent variable, location (dummy variable) of the visitors was found to be 5% level of significance and positive. The positive sign implies that people from urban areas tend to visit more than the people from rural areas.

On the other hand, the coefficient the respondent age and the number of visits to GBG are inversely related at 5% level of significance. This result implies that old aged people tend to visit less to recreational activities of GBG. Coefficient of the dummy variable for perception about the garden quality is another crucial independent variable, which turned out to be positive in relationship with number of visits and statistically significant at 1% level. This implies that if the quality of recreation services of the GBG was improved, visitor would like to make more visits to the garden.

Calculation of consumer surplus

It is primarily necessary to calculate the individual consumer surplus (per person) and subsequently the total consumer surplus.

$$CS = -1 / (- 0.00025) = Rs.4000 (US\$ 59.64)$$

The total annual consumer surplus can be calculated by multiplying the individual consumer surplus by the number of visitors to the garden. According to the data from the year of 2015, the annual number of visits to GBG was 29, 39,341visitors (The tourism department, The Nilgiris, 2015).

Total Consumer Surplus = Rs.4000 X 2939341 = Rs. 11757364000

According the ITCM for GBG, the value of individual consumer surplus per visit is about Rs.4000 and the value of total consumer surplus is estimated at Rs.11.757 billion (US$ 175.293 million). This value corresponds to an annual recreational use value of GBG, The Nilgiris.

4. Conclusion

Economic valuation studies are useful for managers of recreation areas and policy makers. In this study, to provide an economic valuation of the recreational use values of GBG and the determinants of visits to the garden the ITCM was employed with a sample of 150 visitors. Regression analysis established that travel cost, location, Age of the respondent, family size, family income and garden quality are the most important factors that determine the visits to the GBG. Our estimates in the research indicate that the Individual consumer's surplus is calculated at Rs.4000 (US$ 59.64), which translated into an annual aggregate value of Rs.11.757 billion (US$ 175.293 million) in 2015. This result has implications in the public policy if the government is making a cost-benefit analysis of using the garden for any other alternative uses since it provides information on the annual value that visitors put on the GBG.

5. References

1. Bateman I. Valuation of the Environment: A Survey of Revealed Preference Methods, CSERGE GEC Working Paper, University of East Anglia, Norwich, and University College, London; 1993.
2. Bell FK, Leeworthy VR. Recreational demand by tourists for Salt Water Beach Days, Journal of Environmental Economic Management, 1990; 18:189-205.
3. Clawson M, Knetsch J. Economics of Outdoor Recreation, Washington, DC. Resource of the Future; 1966.
4. Damigos D, Kaliampakos D. Economic Valuation of Mined Land Reclamation: An Application of Individual Travel Cost Method in Greece, International Conference of Mine Producing, Geology and Environment Protection, Varna-Bulgaria; 2001.
5. Demir A. Determination of the recreational value of botanic gardens: a case study royal botanic gardens, Kew, London. Expert Projects Publishing House, 2014; 44:160-180.
6. Downing M, Roberts KR. Estimating Visitor Use-Value of Arboreta: The Case of the University of Tennessee Arboretum. Journal of Environmental Horticulture. 1991; 9(4):207-210.
7. Freeman AM. The Measurement of Environmental and Resource Values: Theory and Methods, Washington, D.C: Resources for the Future; 1993.
8. Khan H. Willingness to Pay for Margalla Hills National Park: Evidence from the Travel Cost Method, The Lahore Journal of Economics. 2006; 11(2):43-70.
9. Kohlleppel TJC, Bradley S, Jacob A. walk through the garden: Can a visit to a botanic garden reduce stress? HortTechnology, 2002; 12:489-492.
10. Md. Sajib Hossain, Nazrul Islam AKM. Estimating Recreational Benefits of the Kuakata Sea Beach: A Travel Cost Analysis. Daffodil International University Journal of Business and Economics.2016; 10(2):26-40.
11. Mohammed El-Bekkay, Abedellatif Moukrim, Faical Benchakroun. An economic assessment of the Ramsar site of Massa with travel cost and contingent valuation methods. African Journal of Environmental Science and Technology. 2013; 7(6):441-447.
12. Oldfield S. Botanic Gardens Modern-Day Arks, London, UK: New Holland Publishers; 2010.
13. Smith S. Why a botanical garden? The Public Garden, 1989; 4(1):14-15.
14. Timah P. Non Market Valuation of Beach Recreation Using the Travel Cost Method in the Context of Developing World: An Application to Visitors of the Naoe Beach in Kribi. Cameroon. Swedish University of Agricultural Sciences, 88; 2011.
15. Twerefou DK, Adjei Ababio DK. An Economic Valuation of the Kakum National Park: an Individual Travel Cost Approach. African Journal of Environmental Science Technology. 2012; 6(4):199-207
16. Willis KG, Garrod GD. An Individual Travel Cost Method of Evaluating Forest Recreation, Journal of Agricultural Economics, 1991; 42:33-42.