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Estimation of Recreational Use Value of Forest Resources by Using Individual Travel Cost and Contingent Valuation Methods (Kayabaşı Forest Recreation Site Sample)*

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Abstract: In this study, the recreational use value of forest has been estimates by using the Individual Travel Cost and Contingen Valuation Methods with the case study of Kayabaşı Forest Recreation site located in Trabzon City of the East Black Sea Region of Turkey. As a result of the study, the value of Kayabaşı Forest Recreation Site (Consumer Suplus) was estimated by using ITCM as 27.640 million Turkish Lira per person per visit. On the other hand, according to contingent valuation method, total willingness to pay per year was calculated as 12.362 billion Turkish Lira for the current situation, 21.581 billion Turkish Lira for the developed situation 1 and lastly 25.287 billion Turkish Lira for the developed situation 2 of Kayabaşı Forest Recreation Site.

Key words: Forest resource, Turkish forestry, recreational use, service production, travel cost method, contingent valuation

INTRODUCTION

The main objective of forestry was to provide the potential benefits of the forest resources to society. These can be classified into two main groups as national and global benefits^[1]. The main benefit at the national level is wood based products. In Turkey, as well as in all developing countries, such use of the forest resources is the primary objective. However, forest resources have other functions, which should be considered in the estimation of national benefits, such as non-wood forest products, hunting and wildlife, watershed protection services and recreational use.

The value of wood-based products and some non-wood products supplied by forest resources can be stated in monetary terms, but the economic values of other forest goods and services cannot be observed through market prices. Consequently, although forest area cover about more than quarter of the land area, the share of forestry sector in the GDP is just 0.5%^[2].

Some methods have been developed to put value on non-market forest goods and services such as recreational use. Travel Cost Method (TCM) and Contingent

Valuation Method (CVM) are the most widely used methodologies in the determination of recreational use value of forests around the world. However, these methods are not well known and applied in Turkey despite their potentially vital role in Turkish forestry.

In this study, the recreational use value of forests will be determined by using TCM and CVM with the case study of Kayabaşı Forest Recreation Site (FRS) managed by Trabzon National Park and Hunting-Wildlife Head Office.

MATERIALS AND METHODS

Travel cost method: TCM is the oldest approach to environmental valuation. The method has been widely used for valuing the non-market benefits of outdoor recreation, especially recreation associated with national parks and public forests^[3].

The TCM is a survey technique. A questionnaire is prepared and administered to a sample of visitors at a recreation site in order to ascertain their place of residence; necessary demographic and attitudinal information; frequency of visit to this and other sites and

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trip information such as purposefulness, length, associated costs, etc. From these data, visit costs can be calculated and related, with other relevant factors, to visit frequency so that a demand relationship may be established^[4].

In essence, the TCM evaluates the recreational use benefit for a specific recreation site by relating demand for that site (measured as quantity of site visits) to its price (measured as the costs of a visit). A simple TCM model can be defined by a trip-generation function (tgf) as follows^[4]:

$$V = f(C, X) \quad (1)$$

Where:

- V : Number of visits to a recreation site,
- C : Costs per visit,
- X : Other socio-economic variables, which significantly explain V.

The method is applied in two ways according to the definition of the dependent variable V. These are the Individual Travel Cost Method (ITCM) and the Zonal Travel Cost Method (ZTCM). The ITCM simply defines the dependent variable as the number of site visits made by each visitor over a specific period, for example, one year. On the other hand, the ZTCM divides the entire area from which visitors originate into a set of visitor zones and then defines the dependent variable as the visitor rate per zone^[4]. In this study, the ITCM was applied to estimate the value of the recreational use of the forest site allocated for the recreational purposes.

As seen, the fundamental difference between the ZTCM and ITCM is that the latter defines the dependent variable as V_{ij} , the number of visits made per period (annum) by individual i to site j. Now, the simple tgf of Eq. 1 can be rewritten as its ITCM equivalent:

$$V_{ij} = f(C_{ij}, X_i) \quad (2)$$

Where:

- V_{ij} : Number of visits made per year by individual i to recreation site j,
- C_{ij} : Visit cost faced by individual i to recreation site j,
- X : All other socio-economic variables determining individual i's visits.

The demand curve produced by this model relates individuals' annual visits to the costs of those visits (i.e. there is no need to convert from zonal visitor rate to actual visits as in the ZTCM). The demand curve for the site will be defined by the $\partial V_{ij} / \partial C_{ij}$ relationship

Integrating under this curve gives us the ITCM estimate of consumer surplus per individual. The estimate of consumer surplus for the recreation site is then obtained by multiplying by the number of individuals visiting the site annually, i.e.,

$$\text{Total consumer surplus} = N_j \int f(C_{ij}, X_i) dC_{ij} \quad (3)$$

Where, N_j is the number of individual visits to recreation site j, year, C_{ij} and X_i are defined as in Eq. 2^[4].

In another way to calculate individual consumer surplus is to use the following formula for the semi-log function^[5,6].

$$CS = -\frac{1}{\beta_{TC}} \quad (4)$$

Where, CS is the consumer surplus per person per trip and β_{TC} is the coefficient of travel cost (C_{ij}).

The total annual consumer surplus obtained from the recreation site can be calculated by multiplying the individual consumer surplus with the number of visits made in a year and lastly, the total consumer surplus value per ha area can be obtained by dividing the total annual consumer surplus by the area of recreation site.

Contingent valuation method: Contingent valuation, which was firstly used by Davis^[7], seeks to place a value on the benefits people derive from consuming a good by directly questioning a sample of consumers in order to obtain their maximum willingness to pay (WTP) to have the good, or minimum compensation sum (Willingness to accept, WTA) to go without it. WTP and WTA may also be estimated for any welfare decreasing action^[8]. The CVM requires that individuals express their preferences for some environmental resources, or change in resource status, by answering questions about hypothetical choices^[9]. A bid curve may be estimated in order to investigate the determinants of, WTP^[8]. For example, for individual i:

$$WTP_i = F(Q_i, Y_i, T_i, S_i) \quad (5)$$

Where:

- Q_i : The quantity or quality of environmental good,
- Y_i : Income,
- T_i : Preferences,
- S_i : Other socio-economic variables thought relevant.

THE CASE STUDY

Research area: In this study, Kayabaşı Forest Recreation Site (FRS), that is under the control of Trabzon National Park and Hunting-Wildlife Head Office (NPHO), was

Table 4: The results of regression analysis related to Kayabaşı FR

Model summary						
Model	R	R ²	Adjusted R ²	SD of the estimate		
Semi-Log	0.400	0.160	0.124	0.4271		
Analysis of variance						
Model type	Model	Sum of squares	df	Mean square	F	Sig.
Semi-Log	Regression	2.433	3	0.811	4.446	0.006
	Residual	12.768	70	0.182		
	Total	15.201	73			
Coefficients						
Dependent variable	Model variables	Coefficients	SD	t	Sig.	
Ln (AVN)	Constant (-)	1,542	0,287	5,373	0,000	
	Total Travel Cost [TTC]	-3.62E-05	0,000	-1,674	0,041	
	Type of Settlement [TOS]	0,128	0,056	2,295	0,025	
	Distance of Settlement [DOS]	-1,141E-02	0,005	-2,215	0,030	

AVN: Annual Visit Number

Travel cost method application: In order to estimate, the recreational use value of Kayabaşı FRS by means of the consumer surplus set up its demand model and determine the effective factors which drive the number of visits made by individuals in a year, a multiple regression analysis and stepwise model was undertaken. The dependent variable was the number of visits made by individuals in a year and the independent variables were total travel cost and other socio-economic variables related to individuals and recreation site such as household income, education, age, car ownership, distance of settlement, type of settlement. In the first stage of ITCM, according to F, t and also adjusted R² values, semi-logarithmic function was found significantly at the 99% level.

According to the regression results, the three independent variables were included in the regression model (Table 4). These are total travel costs, type of settlement and distance of settlement. In the model, all variables were significant at the 95% level. Considering the variables in the regression model, the demand function for Kayabaşı FRS was developed as follows:

$$\text{Ln}(\text{AVN}) = 1,542 - 3,618\text{E-}08 \times \text{TTC} + 0,128 \text{ TOS} - 1,141\text{E-}02 \text{ DOS} \quad (6)$$

The demand model, the sign of total travel costs is negative, so there is a negative relationship between the number of visits made by individuals in a year and the cost of a visit per person (Table 4).

Calculation of consumer surplus: It is necessary to calculate individual consumer surplus per person per visit for determining the total annual consumer surplus. Individual consumer surplus can be calculated by using formula 4.

$$\text{CS} = -\frac{1}{0,0000000487} = 27.640 \text{ m TL } (\$US 22.11)$$

The total annual consumer surplus obtained by visitors from the Kayabaşı FRS can be calculated by multiplying the individual consumer surplus with the number of visits made in a year, estimated as 20.000 people for Kayabaşı FRS. At the last stage, the total consumer surplus value per ha area can be obtained by dividing the total annual consumer surplus by the area of Kayabaşı FRS which is 120 ha.

According to the ITCM for Kayabaşı FRS, the values of consumer surplus is about 27.640 million TL (\$US 22.11) for per person per visit, 552.79 billion TL (\$US 442.233) for the total annual consumer surplus and lastly 4.6 billion TL (\$US 3.685) for the total annual consumer surplus per ha.

The demand curve for kayabaşı forest recreation site: In the second stage of ITCM, the demand curve for Kayabaşı FRS was hypothetically developed by using the demand function (Eq. 4) and is shown in Fig. 1. As expected, there is an inverse relationship between the number of annual visitors and the cost of traveling to the site.

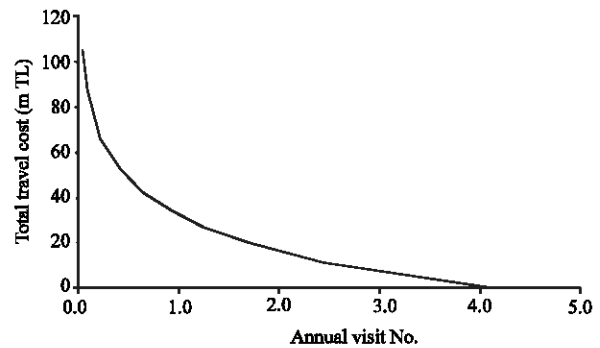


Fig. 1: Kayabaşı FRS demand curve

RESULTS AND DISCUSSION

Natural resources such as forests supply many social benefits as well as economic benefits. The recreational use of forests are kind of benefit obtained from forests. The monetary value of these benefits has been estimated by using methods such as TCM and CVM for decades in many countries. The results of this research have been used by decision makers and managers in the allocation of natural resources.

The main purpose of this research was to estimate the recreational benefits derived by users of the Kayabaşı FRS. For this purpose, two methodologies, which are ITCM and CVM, were employed in the study. In the ITCM, individual consumer surplus and annual total consumer surplus were estimated by using demand function. In CVM, three individual WTP values and three total WTP values were estimated for the three situations of Kayabaşı FRS.

In this study, the value of Kayabaşı FRS located in the East Black Sea Region of Turkey was estimated by means of total consumer surplus by using ITCM as 552.79 billion TL (\$US 442.233) per year. On the other hand, according to CVM, total WTP was annually calculated as 12.362 billion TL (\$US 9.888) for the current situation, 21.581 billion TL (\$US 17.264) for the developed situation 1 and 25.287 billion TL (\$US 20.232) for the developed situation 2 dependently on the entry fee WTP of the respondents for the Kayabaşı FRS.

Kayabaşı FRS was managed by private sector paying 3,428 billion TL (\$US 2 742.4) to the NPHO in 2001^[10]. This figure was considered as annual income for the NPHO from Kayabaşı FRS and it can be accepted very low regarding above figures calculated by using ITCM and CVM. But, considering the environmental clearance tax, workers and management costs paid by the manager in addition to rental cost, it would be over the total annual WTP calculated by CVM.

On the other hand, comparing the results of ITCM and CVM, it will be seen the results of CVM based on the WTP of respondents is lower than the result of ITCM. Namely, average WTP for the current situation of Kayabaşı FRS was calculated as 0.618 m TL (\$US 0.49) and total WTP for year 2001 was about 12.362 billion TL (\$US 9.888). The economic crises continuing and affecting the society in Turkey may be considered as the most important reason of low WTP calculated by CVM for Kayabaşı FRS. Because, in CVM, the WTP of individuals

for a services provided by forest resource is determined and of course, the WTP of Kayabaşı FRS users would be related to their economic situations. Likewise, average household income of respondents was 478.850 million TL (\$US 383.08) per month. The household income of Kayabaşı FRS users is low, so were the WTP values.

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