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Estimating the Recreational Benefits of Dibeen National Park in Jordan Using Contingent Valuation and Travel Cost Methods

[1]Amer S. Jabarin and [2]Said A. Damhoureyeh
[1]Department of Agricultural Economics and Agribusiness,
Faculty of Agriculture, University of Jordan, Amman, Jordan
[2]Department of Biological Sciences, Faculty of Science,
University of Jordan, Amman, Jordan

Abstract: The objective of the study is to examine the recreational pattern of Dibeen National Park (DNP) in Jerash, Jordan and to estimate the use value that would be used to demonstrate the potential magnitude of this environmental amenity that cannot be ignored in policy making in Jordan. Two non-market evaluation techniques namely the contingent valuation method and travel cost model are used to estimate the economic value that Jordanians, place on improving DNP. A survey of 300 questionnaires was used to elicit the recreational value of DNP. Several models have been developed using the Travel Cost Method (TCM) and the open-ended contingent valuation method (OEWTP). Poisson regression analysis was used to estimate the travel cost model while the Tobit regression analysis was used to estimate the willingness to pay models. Using the TCM estimates, the average value of recreation in DNP is JD 71.55 (US$ 100) per person per recreation day. The mean of willingness to pay for conserving and improving the services on DNP from the OEWTP approach was JD 5.53 (US$ 7.8). The value of DNP to its users is can be estimated at approximately JD 13.6 million (US$ 19.2 million) a year using the TCM. This figure would vary from year to year depending on number of visitors. These findings suggest that the recreation values should be integrated in multiple use decision making process. According to the recently launched biodiversity strategy and action plan, the Government of Jordan is intending to implement a conservation projects in Dibeen and Ajloun regions, the two most important forest in Jordan. The results of this study could be used by researchers and policy analysts at the Ministry of Environment to justify the implementation of conservation of the two forests. Nevertheless, public goods should be managed to maximize the public benefits and recreation is indeed a public benefit of the forest resource.

Key words: Jordan, jerash, travel cost method, Tobit, Poisson, contingent valuation method, National park management, recreational benefits, allepo Pine *(Pinus halepensis)*

INTRODUCTION

Jordan is one of the popular countries in the Middle East region to tourists. It is well known for its great historical significance and nature, which attracts tourists from many parts of the world. However, most of those tourists come from the Arab countries and certain European countries. In 1991, earnings from tourism composed 8.4% of the country's GNP (Royal Scientific Society, 1994). The government role in developing the tourism sector is minimal. The private sector play the important role in establishing the infrastructure needed for new developments such as hotels, restaurants, transportation, souvenir and antique shops and other related services in the main tourist spots within Jordan. Some of the more famous historical sites are Petra, the Roman city of Jerash, Madaba, Um Qayes and the Dead Sea.

Domestic or internal tourism is another important sector of the national economy. Many Jordanians travel during the weekends and holidays to the numerous tourist spots, national parks, spas (thermal springs) and to the shores of the Red Sea and the Dead Sea. The beauty of Jordan is further enhanced by the variation in its climatic conditions. In summer, people enjoy traveling to the high mountains that are partially covered with pine trees. These mountains are located in Dibeen, Ajloun and Shobak. In winter, they can enjoy the warm weather in the Jordan Rift Valley and on the shores of the Dead Sea and Red Sea in the south.

Corresponding Author: Amer S. Jabarin, Department of Agricultural Economics and Agribusiness, Faculty of Agriculture, University of Jordan, Amman, Jordan Tel: +962-6-535-5000/2547/2555 Fax: 962-6-523-1503

Dibeen forest is considered the best remaining area of mature, natural population of Allepo Pine -*Pinus halepensis* (Al-Eisawi, 1982, 1997). Pine trees grow at elevations between 600 and 1000 m asl on the limestone slopes in northern Jordan. Under story is of *Arbutus andrachne*, *Qquercus calliprinos* and *Pistacia palaestina*. There is a much-used recreational area in the center of the site, with parking spaces, barbecue sites, restaurant and playgrounds. The site is harbors rare and threatened flora and fauna such as the Persian squirrel and several orchid species, respectively. In recent surveys the forest has been considered as an important Bird Area in Jordan (Evans, 1994).

Increasing population, industrialization and per capita consumption are considered as the major causal factors to environmental degradation such as deforestation, desertification and loss of biodiversity (Krupa and Kickert 1989; Turner *et al*., 1990; Folke *et al*., 1996; Gowdy, 1997). Jordan and many of the Southern Mediterranean countries are facing serious threats of desertification due mainly to the unsustainable use of limited environmental resources and human activities such as illegal harvest of forest resources. Continues loss of forestland in an arid country like Jordan has raised numerous environmental concerns. The loss of the forestland started since the Ottoman occupation (The Ottoman Empire is the Turkish Empire was an imperial power that existed from 1299 to 1923 that ruled the borders of the Mediterranean Sea for more that five centuries) back in the early years of the last century. The few remaining forests in Jordan are still open-access amenities, which are considered as the main threat of losing these forests. The economic impacts of losing forestland will be the focus of this paper and specifically the value that people put on this resource. The current and future impacts of deforestation on the ecosystems and communities are somewhat uncertain. It is important, however, to determine if Jordanians place a value on the current and future impacts of deforestation in the Dibeen National Park (DNP).

The objective of this study is to examine the recreational pattern of DNP and to estimate the use value that would be used to demonstrate the potential magnitude of this environmental amenity that cannot be ignored in policy making in Jordan.

In order to place a value on recreational benefits of DNP, the authors designed a survey, following the literature on the Travel Cost Method (TCM) and the Contingent Valuation Method (CVM). The collected data were used to estimate the consumers' willingness to pay (WTP) for improved quality of services at DNP and to determine the entrance fee for visiting the Park. Both methods are nonmarket valuation tools. As a revealed preference method, TCM is based on calculating the Marshallian consumer surplus (Bateman, 1993). CVM is a standardized and widely used method for estimating maximum Willingness To Pay (WTP) or willingness to accept compensation (WTA) for use, existence and bequest values for resources (Loomis, 1996). Both methods have become the principal means of valuing environmental goods. The derived values by CVM are now used in Cost Benefit Analysis (CBA) and in the damage assessment in the US under the 1980 Comprehensive Environmental Response, WTA Compensation and Liability Act (Smith, 1993; Arrow *et al*., 1995).

MATERIALS AND METHODS

Many economists and environmentalists have debated the issue of placing monetary values on environmental goods (Ward and Loomis, 1986; Schreiner and Cannock, 1989). The most popular classification for the methods of the pricing and valuation of environmental goods and services include Demand Curve approaches and Non-demand Curve approaches (pricing through market priced goods). Bateman (1993) stated that the demand curve approaches might include the expressed preference methods and the revealed preference methods. The revealed preference methods are based on calculating the Marshallian consumer surplus through the travel-cost method or the hedonic pricing methods. Other references refer to the travel-cost method and land value method as indirect valuation methods or Implicit Price methods. Many researchers in the area of environmental economics have concluded that the appropriate measure of the value of the outdoor recreation to an individual is consumer's surplus (Rosenthal *et al*., 1986; Stoll *et al*., 1987).

In this study two methods are employed to estimate the recreational value of DNP: Travel Cost Method and the Contingent Valuation Method. To avoid complexity, the essential criteria for selecting a demand model proposed by Wang *et al*. (1996) were followed which include: relative illustrative power, consistency with economic theory and simplicity of estimation.

Travel Cost Method (TCM): In this study the travel-cost method is used to put a value on the recreational benefits for visitors to DNP in Jerash-Jordan. This same method has also previously been used to value the recreational benefits of many sites in England (Willis and Benson, 1989). The technique was again used to help resolve a recreational conflict in the Colo Shire, located Northwest of Sydney in the early 1970s, which arose from the

combination of the attractive natural environment and the large adjacent population (Sinden and Worrell, 1979). The benefits of the site were estimated by the Travel-Cost Method for each of the recreational activities provided at the site such as water-skiing, water picnicking, picnicking on land, driving for pleasure and visiting the butterfly farm.

The concept of the Travel-Cost Method (TCM) is based on that a rational individual will weigh up the costs of a recreational visit against the benefits of the visit and then display the result in actual behavior. In this way, the willingness to pay for the use of an environment is inferred from the travel expenditures of those who visit it. TCM is considered to be one of the officially sanctioned methods for use in evaluating federal water projects in the United States. The individual approach of TCM has been used extensively in literature by Creel and Loomis (1990) and Wilman and Pauls (1987).

The individual recreation approach includes five sequential steps: 1) trip preparation, 2) travel to the site, 3) the on-site experience, 4) the travel back from the site and 5) the recollection of the experience (Schreiner *et al*., 1984). Ward and Loomis (1986) argue that four components of benefits could be derived from recreational sites which include: 1) direct on-site recreational benefits, 2) benefits to off-site users such as option or existence values, 3) revenues to the operating agency from entrance fees and 4) net gain in regional income derived from on-site expenditures.

The TCM is based on transportation and other costs of travel. It is assumed that the cost of travel and time taken to visit a recreational site is an indicator for the price of any on-site activities. Users of the TCM expect that the frequency of use of that site will decrease with the increases in travel costs, travel time and entrance fee. Data on actual travel costs (including food costs, accommodation costs and any forgone income) can be collected by a survey. The benefits for any given individual are the cost savings relative to the other individuals who visit the same recreational environment.

The uncompensated, Marshallian demand function from which consumer surplus can be calculated is derived from the use of traveled distance, expenses incurred by those consumers using the amenity in concern, along with the socio-economic characteristics such as income, education, family size, site characteristics and substitute characteristics. The quantity of the dependent variable in the estimated demand function is the number of the trips to the site or the number of days spent recreating at the site. Price is the most important independent variable since it is what consumer surplus estimated is dependent upon. Price in this demand equation represents the cost per trip to the studied site. Other independent variable also play crucial role in forming the demand curve for the recreational benefits of the studied site such as the income, education and the characteristics of the site. The two widely used estimation techniques to estimate the demand function are Ordinary Least Squares (OLS) method and the Maximum Likelihood Estimation (MLE) method. However, since the dependent variable in this research (the number of visit by the individual to DNP) is an integer number, count data models are typically used to estimate the demand function based on either the Poisson or negative binomial distributions.

TCM has been widely used in the past to establish net economic value of existing site like DNP, to determine the net economic value of modifying the site, to determine net economic losses from loss of or damage to a site, to predict receptionists' behavior and forecast changes in the use of a recreation site resulting from charging or changing fees (Loewen and Kulshreshtha, 1995a, b).

Contingent Valuation Method (CVM): Contingent valuation method is used to directly value the use and the non-use value of a natural resource. It is a standardized survey method for estimating maximum Willingness To Pay (WTP) or willingness to accept compensation (WTA) for use, existence and bequest values for resources (Loomis, 1996). A hypothetical market or referendum scenario is constructed in a survey and response to this market is then elicited. Available literature shows that there are few types of CVM that have been employed in many of the recent studies. Some of the employed CVM techniques that have been used to determine the maximum WTP or WTA compensations for changes in the availability of nonmarket goods are the open-ended approach, dichotomous choice, double bounded dichotomous choice and dichotomous choice. In this paper the CVM technique was employed in which the Open-ended (OE) method in two scenarios: the WTP for an entrance fee to the park and the WTP to improve the quality of services. Referendum models or dichotomous choice models seem to be the most preferred contingency valuation models. However, dichotomous choice models require large number of observations.

In the open-ended technique the responded is simply asked to make the maximum WTP or WTA. This is an easy technique to implement but has low incentive compatibility and is therefore prone to strategic behavior (Bateman *et al*., 2000). The open-ended technique could be followed by a second direct hypothetical questing format in a sort of Iterative Bidding (IB), where the interviewer states an initial amount of monetary unit (say dollar) and the respondent answers whether or not they would pay.

There has been an extensive debate on which, the open-ended (continues valuation question) or closed ended (discrete valuation question) valuation techniques produce more reliable estimates. However, there is no decisive evidence indicating which method is best (Kealy and Turner, 1993; Bateman *et al*., 2000). Advantages and disadvantages of these techniques are discussed in Loewen and Kulshreshtha (1995b) and Bateman *et al*. (1995). Biases are difficult to avoid in CVM due to its hypothetical nature. Different types of biases are encountered in applying the different types of CVM techniques including vehicle of payment, free riding, strategic overbidding, scope bias, embedding bias, information effects and aggregation problems (Carson and Mitchell, 1995; Bateman *et al*., 2000; Goldar and Misra, 2001).

Model specification and estimation of recreational benefits: The choice of the functional form and its effects on the estimation of respondents' welfare has been debated in literature related to both TCM and the various techniques of CV (Chotikapanich and Griffiths, 1998; Mansfield, 1998; Fix and Loomis, 1998).

TCM model specification: A comprehensive review of the theoretical refinements and empirical applications of the TCM of the approach was provided by Ward and Loomis (1986). Kramer (1993) used a modified travel cost approach to estimate the importance of different attractions at an international travel destination to international tourists to the Mantadia National Park in Madagascar. Through his modified approach, Kramer estimated the addition in consumer's surplus as a result of diversifying and enhancing the facilities on the site.

Several functional forms have been used in estimating the demand function for recreational benefits using TCM. However, the choice of selecting a specific functional form in a TCM is somewhat of an arbitrary process as argued by Kealy and Bishop (1986). The linear, semi-log, double log and quadratic model have been used in past research to value nonmarket goods (Luzar *et al*., 1992). Ordinary Least Squares (OLS) and Maximum Likelihood Estimation methods are wildly used to estimate the demand functions. Balkan and Khan (1988) found a little difference in estimating consumer surplus using the two methods.

The TCM is employed in this study to estimate the demand function for recreational benefits from DNP. The demand at DNP is a relationship between the number of visits taken by an individual, trip price (i.e., travel cost) and other socioeconomic factors. Since the model's dependent variable is an integer valued variable then a count data estimator is proper. The count data travel-cost model has been widely used to estimate demand for recreational amenities (Loomis *et al*., 2000; Chakraborty and Keith, 2000). Count data models are typically estimated based on either the Poisson or negative binomial distributions,

The data collected from the interviewed 300 recreationists were utilized to derive the demand function for site. The dependent variable was the number of trips to the site during 2002. The dependent variable is regressed on price and other socioeconomic characteristics of the respondents and the site using the Poisson regression model as demonstrated in Eq. 1.

$$\Psi_i = f(P_i, V_i) \quad (1)$$

Where: Ψ_i is the number of trips to the site, P_i is the expenses incurred per person per trip which includes the cost of gas, food, entrance fees and other expenses incurred due to taking the trip to DNP , V_i is a vector of socioeconomic variables such as income, substitute sites to DNP (binary variable 1 = yes there is a substitute, 0 = otherwise), educational level of respondent, traveled distance, age and satisfaction (binary variable 1 = satisfied, 0 = otherwise).

The consumer surplus is then calculated for the best fitted equation under the assumption of omitted variables as follows (Fletcher and Graham-Tomasi, 1989):

$$CS = Q^2/(-2B) \quad (2)$$

Where: CS is estimated consumer surplus, Q is the number of trips to DNP and B is the price coefficient obtained from the elicited travel cost demand function. Equation 3 shows the Poisson distribution:

$$Pr(Q_i = n) = \frac{e^{-\lambda_i}\lambda_i^n}{n!} \quad (3)$$

Where the mean is λ_i and it is usually modeled as:

$$\lambda_i = \exp(\sum_k \beta_k x_{ki}) \quad (4)$$

The Poisson model implies that the number of trips a person decides to take is a random variable drawn from a distribution that only allows non-negative integers. To obtain the welfare measures in the Poisson model, which is the stated objective in this study, the expected number of trips for an individual is the mean of the Poisson distribution for that individual. The mean is λ_i in Eq. 4 above and is usually specified as a semi-log function of the explanatory variables as indicated in Eq. 5.

$$E(Q_i) = \lambda_i = \exp(\beta_{0i} + \beta_1 c_i) \quad (5)$$

The consumer surplus as a measure of welfare using Poisson model is the area under a semi-log demand function which can be obtained by Eq. 6.

$$CS = \int_{c_i^0}^{\infty} \exp(\beta_{0i} + \beta_1 c_i) dc_i \quad (6)$$

CVM model specification: The Open-ended (OE) willingness to pay method was employed this research. In estimating the (OE) WTP function to preserve DNP, the Tobit model was used instead of the Ordinary Least Squares (OLS) method. Preceding research has shown that for data sets with a substantial number of zero bids, OLS estimates will be biased downward (Halstead *et al*., 1991). Tobit regression analysis was conducted by using the maximum likelihood estimation technique (Greene, 1998).

Of the 300 observations, 18 were excluded due to missing information and outrageous response to willingness to pay values. Responses to the OE WTP question were analyzed and the following bid function estimated (Eq. 7):

$$WTP^{OE} = (INC, EDU, SAT, AGE) \quad (7)$$

Where:

WTP^{OE} is the open-ended WTP, INC is the household income, EDU is the education level of the respondent and SAT is the satisfaction (1 = satisfied, 0 = otherwise).

Data: Two kinds of data were used in this study: Primary and Secondary. The primary data were collected by face-to-face interviews at DNP. A questionnaire was designed focusing on DNP, soliciting information on characteristics of the park: park users and their visits, attitudes regarding travelling time, expenditure, park substitutability, park fee change system and straight forward question on the maximum willingness to pay to conserve the park.

Jordanians usually head to recreational parks on the mountainous areas on weekends during warm summer days. The weekend in Jordan is Friday and Saturday. A trained team of enumerators collected the data by interviewing the park users during the weekends of summer 2002. The survey covered only the visitors who come from other places purposively to visit the site and not the residents of DNP or those who are passing by. The survey was conducted on two stages: in the first stage 64 questionnaires were completed as a pre-test and in the second stage a sum of 236 were completed. Questionnaires in the two stages were used in the analysis since there was no modification made after the pre-testing process. Of the total 300 questionnaires, 283 were usable for estimating the consumer surplus and the willingness to pay. Details on responses are summarized in Table 1. Respondents, on average, earned JD 439.6 (JD 1.0 = US$ 0.71) and had an educational level of 3.4 (12 years of education). Mean household size is 6.5, which is close to the average reported household by Department of Statistics. The visitors traveled 92.4 km, they visit DNP 3.7 times a year and other recreational sites 7.8 times and they accepted to pay an entrance fee of JD 1.0 per visit.

Table 1: General characteristic of DNP visitors in 2002

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Age	283	17	76	39.0	13.00
Family size	283	1	34	6.5	3.70
Education level	283	0	5	3.4	1.15
Household monthly income (JD)	283	80	4000	441.7	450.70
Traveled distance	283	5	400	92.4	53.40
Annual visits to DNP site	283	1	100	3.7	8.30
Annual trips to other sites	283	0	80	7.8	10.50
Accepted entrance fee per visit	283	0	5	1.0	0.90
OE-WTP	283	0	100	5.5	10.50
Total costs of the trip to DNP	283	2	120	24.5	17.50

The Royal Scientific Society report was the only available secondary data on the number of visitors to touristic sites in Jordan. According to this report, DNP received in 1994 as many as 43,412 visitors especially during summer came for recreation and its closeness to major cities such as Amman, Irbid and Zarka. Given the annual growth rate of population in Jordan, which is 2.6%, the extrapolated number of visitors in 2002 was 53,307. The visitors complained from the lack of services on the site as a result 255 out of the 300 questioned visitors were willing to pay to improve the services and preserve the place. In this research, the entrance fee was not the payment vehicle in the contingent valuation scenario. However, the questionnaire included a direct question about the entrance fee to the Park. Although, there is no entrance fee currently charged, the 255 visitors welcomed the idea of establishing an entrance fee at an average rate of JD 1.0 (US$ 1.4) per household per visit to use the collected funds to improve the level of services provided and to conserve the biodiversity at the site.

The payment vehicle in the contingent valuation scenario was the open-ended question on the willingness to pay to conserve the park. The enumerators explained to recreationists the threats facing the park and the need for funds to improve the services.

Respondent's mean expenditure was about JD 24.5 per household (i.e., JD 3.8 per individual) of which 19% are spent on gas, 58% on food and 23% on other items.

RESULTS

The benefits of recreation (equivalent to the economic value of recreation) at DNP are measured as consumer surplus. This was estimated through identifying the consumer's WTP. Two approaches were followed in this paper: the TCM and CVM were used to estimate the consumer willingness to pay based on consumer surplus attributable to DNP site.

TCM models: Of the 300 observations, 17 were excluded due to missing information and outrageous travel cost. Table 2 presents the parameter estimates for the specified model. Several alternative specifications of the demand equations were estimated. The explanatory variables used in the demand equation are the travel cost, visitor's age, level of education and satisfaction. It was hypothesized that the demand for recreation (the number of trips) would be negatively correlated with the cost of the trip and positively correlated with age, level of education and satisfaction. The standard Poisson regression mode was the one that best fits the data. Statistical results for the estimated models 1, 2, 3 and 4 are presented in Table 2. The results were satisfactory by the usual measures of level of significance and confirming of signs to the theoretical expectations except for the age variable. The estimated behavioral equations with their t-statistic (number beneath the regression coefficients in parenthesis) and the Log likelihood function for each model are given in Table 2. The results of all models indicate that there is a significant relationship between the number of visits of the households to the site and the travel cost (price) and the other explanatory socioeconomic variables. The used model confirms that the number of visits to Dibeen by the household is a decreasing function of travel cost (price) that actually complies with the basic assumptions of demand theory. The last two lines in the table indicate the estimated consumer surplus for the household and per individual visitor to the site. The consumer surplus for the four models was calculated using Eq. 2. The consumer surplus per visit ranged between JD 66.5 to JD 76.6 representing about 5% of the 2002 per capita GDP at current prices (CBJ, 2003). Assuming that DNP attracted as many visitor-days as predicated in 2002 (53,307 X 3.6 = 189,773 visitor-day) the value of the park can be estimated using the most conservative models (model 1 and 4) at JD 12, 619, 905. While the estimated value of the park using models 2 and 4 resulted in a higher total consumer surplus at 14, 536, 612. Consequently, this paper confirms that the value of recreation at a particular site is sensitive to specification of the selected variables (Loewen and Kulshreshtha, 1995a, b).

Table 2: Model estimation results with number of trips to DNP in 2002 as the dependent variable

Independent variables	Regression coefficients			
	Model 1	Model 2	Model 3	Model 4
Price	-0.016	-0.014	-0.014	-0.016
	(-6.70)**	(-5.88)**	(-5.83)*	(-6.89)**
Age		-0.022	-0.022	-0.028
		(-8.61)**	(-8.62)**	(-10.31)**
Education			0.074	-0.051
			(2.85)**	(-1.89)*
Satisfaction				1.82
				(18.58)**
Constant	1.676	2.452	2.300	1.238
	(28.48)**	(23.51)**	(19.45)**	(8.48)**
Log likelihood function	-1241.349	-1202.547	-1198.602	-935.0691
Mean of the Dep. variable	3.72	3.72	3.72	3.72
Sample size	283	283	283	283
Consumer surplus per household	432.5	497.7	497.7	432.5
Consumer surplus per individual	66.5	76.6	76.6	66.5

t-statistics are in parenthesis; one asterisk indicates 5% level of significance; two asterisks indicate significance at 1% level

The OE-WTP model: The same interviewed sample was also used to elicit the OE-WTP model. A bid curve traces out the impact of people's characteristics on their willingness to pay for environmental goods or services. Some visitors to DNP refused to pay any amount of money for the improving the conditions of the Park. The Tobit regression model was employed in this case. Of the 283 respondents, 74 respondents were not willing to pay towards the quality improvement in the Park. Responses to the OEWTP question were analyzed and the following bid function estimated:

$$WTP^{OE} = \underset{(0.092)}{0.194} + \underset{(10.599)^{**}}{0.013}\,INC - \underset{(-0.992)}{0.485}EDU + \underset{(2.681)^{**}}{3.035}SAT - \underset{(-1.255)}{0.0545}AGE \quad (9)$$

Where:

WTP^{OE} is the open ended WTP response, INC the respondent's income (continuous variable), EDU level of education of the respondent (discrete variable 1 if high graduate through 5 illiterate), SAT is 1 if respondent is satisfied with the offered services at the site (= 0 otherwise) and AGE is the respondent's age. Figures in brackets are t-statistics, one asterisk indicates that the variable is significant at 10% and the two asterisks indicated that the variable is significant at the 1% confidence level.

Table 3: Truncation effects-open-ended WTP analysis[1]

% of upper tail omitted	No. of observations	Mean WTP[3]	SD	[2]Min WTP	Median WTP	Max Bid[4]
0	283	5.53	10.49	0	2	100
5	270	3.72	4.77	0	1	20
10	256	2.95	3.48	0	1	15
15	242	2.49	2.97	0	1	10
20	227	2.00	2.33	0	1	10
25	213	1.69	1.91	0	1	5

[1] All columns, except the first three, are measured in JD/household/year, [2]Min WTP Includes, as zeros, those who refused to pay anything at all

The bid function shows that respondents with higher incomes and higher-level of satisfaction, who often visit the park to relax and enjoy the scenery, have higher WTP to conserve the area. This agrees with results of other studies and prior expectations. The results from the OE analysis are given in Table 3 (which also illustrates the impact of truncating higher bids). The truncated mean of WTP decreases as more observation of the upper tail omitted. The median also falls from 2 to 1 when the first upper 5% are omitted and remains at 1 until 25% of observations are omitted. Using the estimated equation 9 to predict the maximum open-ended willingness to pay at the means of income, education, level of satisfaction and age, the estimated WTP mean is JD 9.80 (US$ 14.05).

DISCUSSION

In this study the researchers applied two non market valuation techniques to assess the economic value of DNP. Using face-to-face interviews, several models have been developed using the Travel Cost Method (TCM) and the Open-ended Contingent Valuation Method (OEWTP). The two methods were employed to estimate the use value of DNP that cannot be ignored in policy making process related to environmental amenities in Jordan. Due to the increasing popularity of recreational activities, these estimates of benefits may be useful in addressing the importance of conserving recreational sites like DNP and other famous parks like Ajloun and Gamadan.

Using the TCM estimates, the average value of recreation in DNP is JD 71.55 (US$ 100) per person per recreation day. The without truncation mean of willingness to pay for conserving and improving the services on DNP from the OEWTP approach was JD 5.56 (US$ 7.9). The value of DNP to its users is can be estimated at approximately JD 13.6 million a year using the TCM. This figure would vary from year to year depending on number of visitors.

The significance of DNP features was elicited from recreationists who wanted to enjoy visiting the site more. The most important features of the site as indicated by the respondents are the scenery, forest, fresh air and the quietness. The absence of similar studies conducted in Jordan or in the neighboring countries for estimating recreational values makes it hard to compare the estimated values for DNP in this study with values of other places. However, similar studies conducted in the US and Canada by Sorg and Loomis (1984) and Shafer *et al.* (1993) estimated consumer surplus using TCM in the range of US$ 16-90 per recreation day for wilderness related recreation and from US$ 4-28 using the CVM. Although it is not fair to compare the estimated values of DNP to those reported values in the US and Canada due to many cultural, economic and social differences, it is evident that the estimated values using TCM and CVM in this research are reasonable.

The estimated non-market values of Dibeen National Park, such as the recreation values, should be integrated in multiple use decision making process. According to the recently launched biodiversity strategy and action plan, the Government of Jordan is intending to implement a conservation projects in Dibeen and Ajloun, the two most important forests in Jordan. The results of this study could be used by researchers and policy analysts at the Ministry of Environment to justify the implementation of conservation of the two forests. In spite of everything, public goods should be managed to maximize the public benefits and recreation is indeed a public benefit of the forest resource.

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