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Economic Value of an Environmental Management Plan: Case of Uluabat Lake

Serkan GÜRLÜK*
Uludag University Agricultural Faculty Agricultural Economics Department 16059 Bursa

ABSTRACT

Wetlands provide many important use and non-use services for humans. They have been threatened by the high population density and rapid economical development especially in developing world. There is a similar situation in Uluabat Wetland, which is an important Ramsar site of Turkey. It has been threatened by industrial activities, agricultural chemical use, excessive fishing-hunting and a dam project, which will be built on the main inflow to wetland. In this context, World Wildlife Fund-Turkey (WWF-Turkey) initiated a joint project to realize an "Integrated Management Plan" with all stakeholders for Uluabat Wetland. The aim of this plan was to ensure the integration between conservation and development around the wetland. In this study, Contingent Valuation Method (CVM) has been used to estimate a total economic value or benefit from such a management plan as an indicator for local authorities and all stakeholders. A sample of 126 residents was interviewed to elicit their maximum willingness to pay based on single-bounded dichotomous choice survey. The estimated values of that program are 4,848,000.00 and 8,100,000.00 USD/year based on the mean and median values respectively.

Key Words: Wetlands; Contingent valuation; Wetland management plan; Ecosystem services

INTRODUCTION

Wetlands are multi-functional natural resources that provide environmental services such as water purification and regulation of water flows, fishery and other resources for human and non-human use, habitats for plants, animals and micro-organisms, and opportunities for recreational use and tourism (Adamus and Stockwell 1983, Adger and Luttrell 2000; Silvius et al. 2000).

While wetlands continue infinitely to present vital services for humans, they have been threatened by the high population density and rapid economical development especially in the developing world. After the industrial revolution, intensive agricultural methods, rapid industrial activities and increasing human needs started to degrade wetlands like other natural resources. However, since 1971 (the emergence of Ramsar Convension) the functions and values of wetlands have been increasingly recognized at local, regional and international level (Silvius et al. 2000). In addition, taking economic values of natural resources into account in political decision process has gained importance in both policy-making and environmental researches (Hanley and Spash 1993, Turner et al. 1994, Hanemann 1995, Turner et al. 2000). Under Ramsar Convention, management plans are required which are systematically designed, appropriate for wise-use principles and easy-applied for protection of these natural resources. In this framework an integrated wetland management plan for Uluabat Wetland was prepared in Turkey. Uluabat is one of the most important wetlands because of not only its regional and local usage but also for its global merits such as being a wintering and feeding area for some endangered species. This plan is important for Turkey for being a pioneer study. It can be seen as a framework rather than a comprehensive one. However, it needs not only some revision in its content but also some additional activities such as monitoring and evaluation. It also has not any economic evaluation and economic figure that shows the importance of the plan.

Main aim of this paper is to estimate an economic value for this plan through assessing the residents' willingness to pay (WTP) to conserve the Lake of Uluabat. The study also intends to test the feasibility of CVM in a developing country which has other priorities rather important than environmental problems. The paper is organized as follows. Firstly, a brief explanation has been given about Uluabat Wetland and Uluabat Integrated Wetland Management Plan (UIWMP). Secondly, survey procedure, data collection and methodology are presented while the next section investigates the empirical model and its results. Finally, a brief conclusion has been given.

FEATURES OF ULUABAT WETLAND

Uluabat Wetland is located in the northwestern part of Turkey. It is a large but shallow (max. 3m deep) freshwater lake, which covers an area of between 135 and 160 km^2 depending on lake level. The main human-wetland relations at the lake are fishing, farming and industrial activities based on agri-industry. The area is one of the most productive agricultural regions in Turkey due to its suitable climatic conditions, high

* Corresponding author: serkan@uludag.edu.tr

quality soil, and developed irrigation facilitates. The fish stocks of Uluabat Wetland constitute the most important source of income for the people of Golyazi (*Apollonia*), which is one of Uluabat Wetland's settlements. Uluabat Wetland is one of the nine Ramsar sites in Turkey in terms of rich biodiversity and valuable freshwater sources. It is located on the migratory bird route and is very close (35 km) to Manyas Lake which is another important Ramsar site. Moreover, it is an important feeding and wintering area for globally endangered species such as *Pelecanus cris pus* and *Pygmy cormorant* (Özesmi 2001).

The lake also has historical values since the settlement around the Uluabat Lake began in ancient times. The ancient city *Apollonia ad Rhyndacum*, which provides the current name of this region, was on the trade route between Europe and Asia. The region was very important for thousands of years due to silkworm production and silk trade.

In 1998, World Wildlife Fund (WWF)-Turkey initiated a joint project with the Turkish Ministry of the Environment to prepare an Integrated Management Plan for Uluabat Lake (UIWMP). The aim of this plan was to ensure the integration of conservation efforts with the development around the lake according to the wise-use principles of the Ramsar Convention with the participation of all stakeholders.

This management plan can be seen as a framework rather than a comprehensive one. It consists of three main chapters with a short reference list. A general information about the lake and its environment were presented in chapter one while related environmental problems have been summarized in chapter two. In the last chapter fifty-five action plans were given. All actions were started to be realized in 2004 through organized Integrated Management Plan Committee, while most of them had been scheduled to start earlier in the management plan.

SURVEY AND DATA COLLECTION PROCEDURES

For the field survey a draft questionnaire, similar to those of Pate and Loomis (1997) and White et al. (1997), was prepared. The draft questionnaire was tested and scrutinized by a focus group. Result of this test survey suggested some changes to make questions more understandable for all respondents.

The five neighboring settlements were chosen along the lake; Akcalar, Eskikaraagac, Fadilli, Golyazi (*Apollonia*), and Uluabat. A sample of 126 residents which is about two percent of whole population living around the wetland was interviewed in 2004. FAO (2000) reveals that most of CVM studies in developing countries have relied on interview approach. Hadker et al. (1997) describes the value of this method compared with the mailed questionnaire and telephone surveys in developing countries (Whitehead 2002, Bandara and Tisdell 2004). Survey was conducted by personal visit to all villages and interviews with the randomly selected respondents who were informed by management plan's working group about the importance of wetlands to the rural communities.

The questionnaire consists (i) Demographical information, (ii) The respondent's knowledge, attitudes, and behavior about wetlands and recreation, and (iii) Dichotomous *Yes/No* WTP questions. Demographical information included age, gender, education level, and household total income. The sample demographical characteristics were compared with the same characteristics of the whole population (1997 Census of Population) by a chi-squared (x^2) analysis. None of the sample characteristics was significantly different from the census data at the P<0,01 level. The second chapter investigates the respondents' relations with the wetland, and recreational behavior along Uluabat Wetland. The final set of questions deals with annual household WTP for conservation and preservation program of the wetland.

The required financial sources which are used for action plans' purposes can be assumed to be provided in several ways (Bateman et al. 1995). Especially in developing countries such as Turkey, using local tax increase as a payment mechanism has some problems in survey interviews, because of the opinion about the tax evasion and inequity, and lack of confidence to government policies. Generally, annual donation to non-governmental organizations related to environmental problems may also not be a successful method because of less confidence to such organizations. Therefore, in this study a special fund was proposed which was created and used under the control of local authorities and all stakeholders. Hence, all respondent were asked for to express the amount of WTP for such a fund which would be used to conserve and improve the environmental quality of the lake against all threats.

EMPIRICAL MODELS AND RESULTS

Contingent valuation method (CVM) which was used in this study has some advantages over revealed methods (Kriström 1990, Perman et al. 1999, Kotchen 2000, Bandara and Tisdell 2004). In implementing single bounded CVM, there are a number of estimation procedures which are, both parametric and non-parametric converting data on "yes" or "no" responses to a dichotomous question into a monetary measure (Jakobsson and Dragun 1996, Garrod and Willis 1999). We applied the parametric model of Hanemann (1984), which is consistent with the utility theory. If respondents are assumed to have utility functions *u(z, y, s)* where "z" is a dummy variable (z = 1 if the conservation and preservation program is dealt with and z = 0 otherwise), "y" is income and "s" is a vector of individual characteristics. Then, the utility function can be written as follows:

$$u(z, y; s)=v(z, y; s)+\varepsilon_i \quad z= 0, 1 \tag{1}$$

where $v(z, y; s)$ is the observable component and "ε_i" is the random unobserved component of utility. The ε_i is the random effects associated with the respondent which arise because of the fact that we are not able to consider all factors influencing the respondent's answer. If "z_1"states with nature and "z_0" without nature then ΔU will be the change in utility. It is rewritten:

$$u(z_1, y; s) - u(z_0, y; s) = (v(z_1, y; s)+ \varepsilon_1) - (v(z_0, y; s) + \varepsilon_0) \tag{2}$$

Therefore, a respondent will agree to pay a price X to avoid a change in $z(z_1-z_0)$ if:

$$v(z_1, y-X; s)+ \varepsilon_1 \geq v(z_0, y; s) + \varepsilon_0 \tag{3}$$

If "X" is the bid amount and respond is "yes" then probability statement will be:

$$Pr(yes_j) = \Pr [v_1(y_j-X_j, z_j)+\varepsilon_{1j} > v_0(y_j, z_j) + \varepsilon_{0j}] \tag{4}$$

When we apply log-linear utility function to equation (4), we can get;

$$V_{1j}(y_j-X_j) = \alpha_1 z_j +\beta_1 ln(y_j - X_j) \tag{5}$$

Where, X_j is the price offered to the j^{th} respondent. If the respondent doesn't accept the offered amount, her utility will be:

$$V_{0j}(y_j) = \alpha_0 z_j+\beta_0 ln(y_j) \tag{6}$$

Utility difference in deterministic utility can be stated as follows:

$$V_{1j} - V_{0j} = \alpha_1 z_j + \beta ln(y_j-WTP_j) + \varepsilon_{1j} = \alpha_0 z_j+\beta ln(y_j)+\varepsilon_{0j} \tag{7}$$

We specified a functional form for the observable component of utility and assumed a specific probability law (e.g logistic or probit) for the random component to estimate the parameters of the utility difference in Equation (7) (See also Batemann et al. 2002 and Haab and McConnell 2002 for a discussion of the various distributions in the context of discrete choice). For the log-linear random utility model defined in equation (7), WTP will be:

$$E_{\varepsilon}(WTP_j \mid \alpha, \beta, z_j, y_j) = y_j - y_j \exp\left(-\left(\frac{\alpha}{\beta} z_j + \frac{\varepsilon_j}{\beta} \right) \right) \tag{8}$$

Binary logit regression analysis was estimated by using LIMDEP 7.0 to determine factors associated with responses for the principal WTP elicitation question at the $P<0.05$ significance level. Variables used in the analyses have been described in Table 1, while descriptive statistics and the estimated model parameters are given in Table 2 and 3 respectively.

Table 1. Variable definitions and sample statistics

AGE	Age groups. 1=18-24; 2=25-34; 3=35-44; 4=45-59; 5=60+
CHEM_USE	Wetland Management Plan's effects on chemical use (1= I did not change or increase the chemical use level 0=I reduced chemical use)
DAM_PROJECT	1=Cinarcik Dam Project is not beneficial for local residents, 0=Otherwise
EDU	Education level (1=Primary, 2=Secondary, 3=High School, 4=University)
GENDER	1=Male, 0=Female
INCOME	Monthly household income
INDUSTRY	1=Industrial activities should be decreased around Uluabat Wetland, 0=Industrial activities should be increased around Uluabat Wetland
KNOWLEDGE	Knowledge of wetlands' benefits before wetland management plan (1=Yes, 0= No)
SPECIES	Knowledge level about Uluabat Wetland's Area's species (1=Yes, all of them, 0=No or little knowledge about species)
TIME	Time duration spent in wetland as hours/day.

Table 2. Descriptive statistics of variables included in the logit analysis

Variables	Mean	Median	Standard Deviation	Maximum	Minimum
Dependent					
Dummy WTP	0.596	1.000	0.491	1.000	0.000
Independents					
AGE	3.8800	4.0000	0.9440	5.0000	2.0000
CHEM_USE	0.5060	1.0000	0.5010	1.0000	0.0000
DAM_PROJECT	0.2480	0.0000	0.4330	1.0000	0.0000
EDU	1.7150	2.0000	0.7250	4.0000	1.0000
GENDER	0.8800	1.0000	0.3250	1.0000	0.0000
LNINCOME	0,947	0,975	0,642	0,999	0,666
INDUSTRY	0.8570	1.0000	0.3500	1.0000	0.0000
KNOWLEDGE	0.6620	1.0000	0.4740	1.0000	0.0000
SPECIES	0.4710	0.0000	0.5000	1.0000	0.0000
TIME	4.2930	4.0000	2.1920	10.0000	0.0000

Table 3. Logit regression model

Variables	Coefficient	Std. Errors	b/Std.Error	P-value
Constant	-140,095	25,586	-5,475*	0,000
AGE	0,846	0,411	2,055**	0,039
CHEM_USE	-0,131	0,587	-0,224*	0,822
DAM_PROJECT	0,728	0,808	0,901*	0,367
EDU	0,710	0,455	1,558*	0,119
GENDER	0,725	0,648	1,118*	0,263
LNINCOME	135,099	24,861	5,434**	0,000
INDUSTRY	1,574	0,937	1,680**	0,093
KNOWLEDGE	1,047	0,641	1,633*	0,102
SPECIES	0,672	0,599	1,123*	0,261
TIME	$-0{,}184 \times 10^{-2}$	0,102	-0,018*	0,985

Log Likelihood function	-75,682
Restricted log likelihood	-151,823
Chi-squared	152,283
Degrees of freedom	11
Significance level	0,000

* Significant at the P<0.05 level

** Significant at the P<0.01 level

The coefficients of the variables included in the model are all have the expected sign except the time variable. Although the variables are not, mostly, insignificance at the conventional statistical levels individually, overall significance of the model fit the conventional statistical levels according to Chi-squared value. The probability of a yes response decreases as the WTP amount the respondents are asked to pay increases. The variables of Age, Edu and Lnincome positively influenced the probability of yes. Males are more inclined to accept the offer. Education and gender variables are statistically insignificant at the conventional statistical levels. Duration spent in wetland as hours/day (Time variable) was not statistically significant at the conventional statistical levels.

On the other hand, Chemical Use variable is related negatively while Industry, Knowledge and Species variables are related positively. While chemical use increases, willingness to pay probability decreases. In other words, the respondents who decreased chemical use in agribusiness activities around the lake had more willingness to pay on conservation of the wetland. Industry variable is one of the most effective one among independent variables. The respondents who want to have decreased industrial activities around the lake supported the wetland management and conservation plan. The knowledge level about Uluabat Wetland's specific species affected the probability of yes response positively.

Expected values of WTP were estimated from equation (8). It was obtained from Table 3 by calculating the alpha (α), which is composed of the constant, plus the coefficients of other variables multiplied by the

mean or median value of the appropriate variable. Beta (β) is the coefficient on the dollar amount variable (Jakobsson and Dragun 1996). The estimated mean WTP value was 80.8 USD per capita for a year. Also estimated median WTP value was 135.0 USD per capita for a year.

CONCLUSION

Uluabat is one of the most important wetlands because of not only its regional and local usages but also for its global merits such as being wintering and feeding areas for some endangered species. In 1998 an integrated management plan was prepared to conserve and restore of the wetland merits.

In this study, a survey study was conducted in the region to elicit WTP of the residents of for preservation and conservation of the wetland. Age, income and industry are significant determinants of the interviewed residents' responses to the WTP. These results show the importance of education about the environmental issues, and also the necessity of income generating activities which are not directly related with the wetland. Therefore, it can be advised to integrate some of the activities of the action plan in a regional rural development project. The estimated mean WTP value was 80.8 USD while the median was 135 USD per capita for a year. According to 1997 National Census results, Uluabat Wetland population was about 60,000. Multiplying the number of population by the mean and median values of WTP for the program, we can get total amounts 4,848,000.00 USD/year and 8,100,000.00 USD/year based on the mean and median respectively. Indeed, the value of the program might be underestimated, because of the fact that these amounts reflect only the benefit expectation of the residents around the lake excluding the other present and potential users.

It can be concluded that Uluabat residents are aware of the threats and ready to pay to avoid. Moreover, this study shows clearly that stated preference studies can give reasonable results if it is combined with particular environmental management plans because of lower education level and environmental sensitivity especially in developing countries.

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