# International Journal of Agricultural Research

ISSN 1816-4897

Academic Journals Inc.

www.academicjournals.com

International Journal of Agricultural Research 7 (10): 482-493, 2012
ISSN 1816-4897 / DOI: 10.3923/ijar.2012.482.493


# Complementarity Between Agriculture and Tourism Towards Sustainability

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## ABSTRACT

The economic valuation of oases has focused almost entirely on marketable agricultural outputs. The role of oases as a provider of positive amenities has not been recognized. In this study, the contingent valuation method was used to estimate visitors' willingness to pay to visit Misfat Al-Abreen mountain oasis for recreation. A Tobit model was used considering a range of socioeconomic and preference variables. Sixty four percent of the visitors indicated their willingness to pay an entrance fee. The average willingness to pay is $ 8.6/visit/group. Oases in Oman are managed by farmers' associations whose responsibilities could be expanded to encompass the collection of entrance fees in Misfat Al-Abreen as the oasis has one single entrance. The collected fees will be used to improve the maintenance of the irrigation infrastructure and provide services to visitors as well as to distribute among farmers based on land/water property. This will encourage landowners to sustain the agricultural activity and enhance the production of environmental services.

**Key words:** Agrotourism, Tobit model, environmental services, positive externality, contingent valuation method

## INTRODUCTION

The role of the agricultural sector as a provider of environmental services was recognized since the 1980's by the major developed countries, mainly the US and EU. The introduction of payments to farmers to increase the provision of positive externalities and to reduce the negative externalities started in the 1990's (Baylis *et al*., 2008). Farmers' compensation for the provision of the environmental services is justified whenever (1) the environmental service is a public good with impossibility of exclusion of beneficiaries, (2) the flow of service is not measurable or (3) the transaction cost of a market implementation is higher than the environmental benefit *per se* (Kroeger and Casey, 2007). In the absence of compensation the result is an over production of negative externalities and/or under production of positive externalities. The payments to farmers are thus aimed at increasing the level of production of positive externalities. Payments to farmers included among other programs, compensations to reduce nutrient run-off and soil erosion and an increase in positive externalities, such as scenic views or the cultural value of preserving a farming heritage (Bernstein *et al*., 2004; Mullarkey *et al*., 2001). Compensation requires the estimation of costs (some monetary and some psychic) that are often difficult if not impossible to estimate (Rothbard, 1979). Despite the information problem confronting a government agency to determine

the right level of compensation (Pasour, 1983). Europe still favors government payments instead of environmental users' payments. Users' payments are only possible when property rights are enforceable. Several studies showed that private users pay for public environmental services such as forests or natural parks whenever exclusion is possible (Anderson and Leal, 2001; Lee and Han, 2002; Espey, 2006). Sugg and Kreuter (1994) discussed various compensation possibilities to conserve depleting resources. Furthermore, they cite examples in Texas and South Africa where private landowners earn more from wildlife hunting than from cattle ranching or cropping. In desert environments greenery and beautiful scenery are exclusively tied to irrigation and farming. Thus, landowners in desert environments are almost the sole providers of environmental services in the form of greenery and scenery for recreationists. These services are currently provided for free and hence the need to consider recreationists' payments to private farmers. This would allow farmers to earn more from their lands and visitors to get a quality experience by finding better scenery and landscape in the middle of the desert.

There are two methods of valuation of environmental goods and services, the stated preference methods and the revealed preference methods. The Travel Cost Method (TCM) and hedonic pricing method are revealed preference methods. Revealed preference methods require that actual behavior be observed across periods with sufficient variation in all regulations which are used in the analysis (Boyle, 2003). This represents a weakness for situations where regular data time series are difficult or costly to obtain (Oh *et al*., 2005). The stated preference methods where individuals are asked, through a survey, to make a choice based on a hypothetical market (McMaconnell and Walls, 2005; Brown *et al*., 2003; Loomis *et al*., 2006). The Contingent Valuation Method (CVM) is able to evaluate not only an individual's WTP of the present conditions of the natural site but it also values individual's WTP with hypothetical changes to the natural site. Besides, the CVM is able to value trips with multi-destinations by asking hypothetical questions for each specified destination (Lee and Han, 2002). The TCM and CVM differ on the statistical and surveying approaches and have been used to value the same recreation service (Fix and Loomis, 1998). Carson *et al*. (1996) found CVM estimates to be smaller than the revealed preference counterparts using TCM but the benefit estimates from the two methods were significantly correlated. Even though CVM has been criticized (Fox, 1992; Diamond and Hausman, 1994), it is currently widely accepted as a standard non-market valuation technique (Carson *et al*., 2001; Veisten, 2007).

Oman is undergoing a process of urbanization and diversification of its economy. Currently more than 50% of the population lives in cities. The tourism sector is growing fast. All these facts are contributing to the increase of agrotourism and eco-tourism activities. On the other hand the agricultural activity is losing momentum because of the lack of competitiveness, migration of the labor force, increased competition for groundwater and aging of the farmers' population. The economic valuation of oases, as agricultural area, has focused almost entirely on marketable agricultural outputs and agricultural water value (Al-Said *et al*., 2007; Zekri *et al*., 2006). It is increasingly accepted, however, that oases' economic benefits extend beyond these direct values. The omission of amenities' values such as the aesthetically pleasing scenes, outdoor recreation and rural cultural heritage underestimates the economic value of those oases. Using the travel cost method, Zekri *et al*. (2011) estimated the total social benefit from Misfat Al-Abreen oasis' visits at $366,590 per year. These results underscore the importance of the role played by farmers in the provision of amenity services for agrotourism in a desert environment.

This study estimated the visitors' willingness to pay an entrance fee to an oasis in Oman using the CVM. The main purpose of payment of an entrance fee was to compensate farmers for the provision of amenities.

## MATERIALS AND METHODS

**Study area:** "Misfat Al-Abreen" is a mountain oasis covering 17.5 hectares divided in small private not fenced farms varying from ¼ ha to 1 ha managed individually. The water delivery system is commonly owned and operated by the farmers' association. Farms are accessible for pedestrians by paved alleys, walk ways and stairs. One important characteristic of this oasis is that it has one single entrance that might be used in the future to impose an entrance fee. Currently the oasis' entrance is free since farmers have no right to exclude visitors from using the alleys which have the status of a public good like all roads in Oman. A crowding effect is observed during holidays due to the free access. The oasis is equipped with a parking at the entrance. Inside the oasis the visitors get the perception of being in a dense forest of palm trees and other trees species such as citrus, papaya, banana, pomegranates as well as wild plants. Water circulates in open channels adding to the beauty of the place. Visitors usually walk following the water channels which run from top to down and some of them come for picnic (Ministry of Tourism, 2006).

**Data collection:** In this study, a payment card format was used to obtain recreationists' WTP for Misfat Al-Abreen site. Visitors were asked the following question: Suppose that there was an entry fee to access Misfat Al-Abreen oasis, this entrance fee will be used to help farmers better maintain and sustain the productivity of their farms and to improve the site. What is the maximum amount, you as a group, are willing to pay to enter the site? A range of bid amounts, were suggested to the respondents (US$ 0, 3,5,8,10,13, 18, 23, 28 and 39). The bids were presented in Omani Rials (the country currency) but reported here in dollars. These bids were presented to facilitate the choice of the WTP amount. The bid amounts were determined after a pilot study carried prior to the survey. The majority of oases' visitors have no reference to declare a WTP magnitude. If any presented bid fits with the respondent's WTP, then the visitor has the possibility to indicate his maximum WTP amount. The same method has been used by Cho *et al.* (2005) where they proposed to respondents a payment card to indicate their willingness to pay by checking the appropriate box for the amount or fill in another amount.

The data were collected on-site from December 15, 2008 to February 19, 2009. The survey was administrated in Arabic and English to accommodate the preferences of visitors. The survey was distributed to the local and foreign visitors of the Misfat Al-Abreen by intercepting them at the entrance of the oasis. A total of 230 questionnaires were distributed during week-ends, of which 226 were returned and 222 were usable giving a response rate of 97%. One hundred forty three respondents (64%) are Omanis or residents in Oman and 79 (36%) are foreign visitors. For foreigners, 62% of the group size is less than 5 persons. However 45% of Omanis and residents' groups have a size varying between 6 and 10 persons. Fifty four percent of all recreationists sample indicated that they are completely satisfied by their visit to Misfat Al-Abreen. Table 1 shows that

Table 1: Socio-economic and trip sample characteristics according to the Willingness to pay

| | Willingness to pay | | |
|---|---|---|---|
| Average | No | Yes | Total sample |
| Onsite time (min) | 57 | 55 | 55 |
| Group size (No. of persons) | 7 | 5 | 5.9 |
| Number of visits/2008 | 18 | 13 | 15 |
| Annual income (US$) | 34,450 | 60,616 | 51,186 |
| Age of respondent (years) | 32 | 38 | 36 |

on average visitors spent 55 min inside the oasis and that the average group size is 6 people. The average age of the respondent or group leader, is 36 years. The average income of the respondent is 51,186 US$ per year. Table 1 shows that the income of visitors willing to pay is almost double the income of those not willing to pay an entrance fee to the oasis.

**Model description:** Let $WTP_i$ be the amount of bid chosen by the respondent and $X_i$ the (k×1) vector of right hand side explanatory variables and $\beta$ is a (k×1) vector of regression coefficients.

The fundamental Tobit model may be expressed by the flowing relationship:

$$y_i = \begin{cases} X_i\beta + \varepsilon_i & \text{if } X_i\beta + \varepsilon_i > 0 \\ 0 & \text{if } X_i\beta + \varepsilon_i \le 0 \end{cases} \quad \forall i = 1, 2, ..., N \tag{1}$$

Where:

N = No. of observations
$y_i$ = Dependent variable or $WTP_i$
$X_i$ = Vector of independent variables, in this case represents a range of socioeconomic and preference variables
$\beta$ = Coefficients vector
$\varepsilon_i$ = Error term

The model assumes a fundamental stochastic index equal to $(X_i\beta+\varepsilon_i)$ which is observed only when it is positive and consequently qualifies as an unobserved latent variable (McDonald and Moffitt, 1980).

According to Tobin (1958), the expected value of y in the model is presented as follows:

$$E(y) = X\beta F(z)+\sigma f(z) \tag{2}$$

where, $z = X\beta/\sigma$, f(z) is the unit normal density and F(z) is the cumulative normal distribution function.

The expected value of F(z) for observations above the limit, called y*, is $X\beta$ plus, the expected value of the truncated normal error term. According to McDonald and Moffitt (1980), the simplified Tobit model feature are as follows:

$$E(y^*) = X\beta F(z)+\sigma f(z) \tag{3}$$

$$E(y^*|y^*>0) = X\beta+\sigma F(z)/f(z) \tag{4}$$

$$P(y^*>0) = F(z) \tag{5}$$

Then:

$$E(y^*) = P(y^*>0)E(y^*|y^*>0) \tag{6}$$

The effect of change in the ith continuous variable of X on E(y*), after the McDonald and Moffitt decomposition, can be expressed as:

$$\frac{\partial E(y^*)}{\partial X_i} = P(y^* > 0)\left[\frac{\partial E(y^* | y^* > 0)}{\partial X_i}\right] + \partial E(y^* | y^* > 0)\left[\frac{\partial P(y^* > 0)}{\partial X_i}\right] \quad (7)$$

The marginal effects for continuous variable $X_i$ i.e., the marginal effects at the means of the independent variables allows specifying points where marginal effects are to be evaluated. There are three main forms of marginal effects, which can be used to elicit independent variables effects:

$$\text{Unconditional expected value} \frac{\partial E(y^*)}{\partial X_i} = F(z)\beta_i \quad (8)$$

$$\text{Conditional expected value: } \frac{\partial E(y^* | y^* > 0)}{\partial X_i} = \beta_i\left[\frac{1 - z f(z)}{F(z)} - \frac{f(z)^2}{F(z)^2}\right] \quad (9)$$

$$\text{Probability uncensored: } \frac{\partial P(y^* > 0)}{\partial X_i} = \frac{f(z)\beta_i}{\sigma} \quad (10)$$

According to the utility theory and the Tobin model each consumer's WTP for the oasis Misfat Al-Abreen recreation can be represented as advanced by Shrestha *et al.* (2002):

$$WTP_i = f(q, Y, T) = \left[e_i(p^0, q^0, U^0) = Y^0\right] - \left[e_i(p^0, q^1, U) = Y^1\right] \quad (11)$$

where, $WTP_i$ the willingness to pay for the recreationist i, q is the quantity or quality of recreation goods, Y is the minimum income to maintain utility given constant prices and quantities of other goods, T is a vector of socioeconomic and preference factors that influence the recreationist preferences, $U^0$ is the initial utility of recreationist, $e_i$ is the recreationists expenditure function.

All else equal, if $Y^1 < Y^0$, $q^1$ is preferred to $q^0$ and the visitor would be willing to pay more in terms of compensating surplus (variation) for the recreation opportunity up to the point that the utility is unchanged.

If $Y^1 < Y^0$, $q^1$ is not preferred to $q^0$, which implies non positive compensating surplus and thus zero WTP.

Using a Tobit model, the respondents WTP for oasis recreation is regressed against a range of socioeconomic and preference variables. The payment vehicle used in the CVM survey scenario was a direct payment per visitors group in local currency. Selected socioeconomic variables are income (INCOME), travel cost during the current day trip (TRAVELCOST), household size (HLDSIZE), education level of respondent (EDUCATION) and a dummy variable for resident visitors (RESIDENT). Preference variables are recreationist' satisfaction with the site Misfat Al-Abreen visit (SITESATIS), a dummy variable according to the improvement of site Misfat Al-Abreen alleys and roads (ROADIM) and a dummy variable which reflects the respondent agreement of arranging spaces inside the oasis (ARRSPACE). The descriptive statistics of the regression variables is summarized in Table 2.

The estimated version of Eq. 12 is explicitly specified as:

$$\begin{aligned} WTP_i = {} & \beta_0 + \beta_1 INCOME + \beta_2 HLDSIZE + \beta_3 EDUCATION + \beta_4 TRAVELCOST \\ & + \beta_5 RESIDENT + \beta_6 SITESATIS + \beta_7 ROADIM + \beta_8 ARRSPACE \end{aligned} \quad (12)$$

Table 2: Descriptive statistics of regression variables

| Variable | Observations | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|
| Dependent: WTP | 222 | 8.6 | 7.599 | 0 | 39 |
| INCOME | 222 | 51,186 | 58,931 | 375 | 452,887 |
| HLDSIZE | 222 | 5.9 | 4.760 | 1 | 36 |
| EDUCATION | 222 | 3.7 | 0.612 | 1 | 4 |
| TRAVELCOST | 222 | 104 | 150 | 1 | 769 |
| RESIDENT | 222 | 0.6 | 0.480 | 0 | 1 |
| SITESATIS | 222 | 1.3 | 0.842 | -2 | 2 |
| ROADIM | 222 | 0.1 | 0.274 | 0 | 1 |
| ARRSPACE | 222 | 0.3 | 0.474 | 0 | 1 |

## RESULTS AND DISCUSSION

Traditionally the economic values of Oases have been assessed entirely based on the amount of agricultural output produced in these oases. Amenities, such as recreation, have always been overlooked and totally ignored in assessing the economic values of oases. This paper attempts to do just that by soliciting visitors' (both foreigners and residents) willingness to pay to visit an oasis for recreation purpose. In general, result shows that sixty four percent of the visitors are willing to pay a fee. The average willingness to pay is approximately $8.6 per visit per group of visitors.

Specifically, Table 3 shows the differences of willingness to pay among category of visitors. Foreign visitors are more willing to pay since 76% of them indicated their WTP for an entrance fee, compared to 57% of residents. Foreign visitors' income is more than triple the residents' income. The average income of the respondents was US$ 91, 454 and US$ 28,941 respectively for foreign visitors and residents.

Table 4 shows that eighty one visitors visited both "Misfat Al-Abreen" and "Al Hota Cave" during the same day which represents 36% of the total sample. Among those who visited "Al Hota Cave" and paid an entrance fee, only 62% of them are willing to pay another entrance fee for "Misfat Al-Abreen". The entrance fee to the cave varies from $5 to $13 according to the age of visitor. Thirty eight percent of the visitors estimate thus that they have already paid a considerable amount visiting the cave and are not willing to pay more to visit the oasis due to budget constraints. The number of visitors willing to pay an entrance fee to visit the oasis among visitors who have not visited the cave is higher than those who already visited the cave. However, the percentage of WTP for both groups who visited the cave or not are almost identical. These figures show coherence in the responses obtained for the WTP to enter the oasis.

Table 5 shows that 36% of respondents have a zero WTP bid response implying that the Tobit model is the most appropriate to regress the WTP bids with a range of explanatory variables. According to Shrestha *et al*. (2002), the open-ended CVM provides reasonable estimates of benefit values, though the WTP values obtained using this method should be considered as lower bound estimates. The Tobit model was formulated by Tobin (1958) to deal with the specific data sets cases in which the dependent variable has a number of its values clustered at a limiting value (censored), frequently zero, as in this study where 36% of the respondents have a zero WTP bid response. The average WTP is $ 8.6/visit/group including those who refused to pay. The median WTP is estimated at $ 13/visit/group. The figures also show that 58.5% of total visitors are willing to pay $ 8/visit or more.

Table 3: Residents and foreign visitors according to willingness to pay (WTP)

| WTP | Foreign visitors | Resident | Total sample |
|---|---|---|---|
| No (%) | 24 | 43 | 36 |
| Yes (%) | 76 | 57 | 64 |
| Average income (US$) | 91,454 | 28,941 | 51,186 |
| Total sample (%) | 100 | 100 | 100 |

Table 4: Visits to the nearest substitute site with entrance fee (Al Hota Cave)

| | Did you visit "Al Hota Cave?" | | | | | |
|---|---|---|---|---|---|---|
| | Yes | | No | | Total sample | |
| | No. | % | No. | % | No. | % |
| **Are you willing to pay an entrance fee to visit the oasis?** | | | | | | |
| Yes | 50 | 62 | 92 | 65 | 142 | 64 |
| No | 31 | 38 | 49 | 35 | 80 | 36 |
| Total sample | 81 | | 141 | | 222 | |

Table 5: Sample distribution according to WTP bids

| WTP bids ($) | Observations | Percentage |
|---|---|---|
| 0 | 80 | 36 |
| 3 | 7 | 3 |
| 5 | 7 | 3 |
| 8 | 4 | 2 |
| 10 | 2 | 1 |
| 13 | 99 | 45 |
| 18 | 12 | 5 |
| 23 | 8 | 4 |
| 29 | 2 | 1 |
| 39 | 1 | 0.5 |
| Total | 222 | 100 |
| Mean WTP bids (US$) | 8.6 | |
| Median WTP bids (US$) | 13 | |

Table 6 summarizes the definition of the explanatory variables and their expected coefficient signs according to the economic theory. The results of the Tobit model regression are presented in Table 7. The objective of this study was to identify factors that influence the visitors' WTP. STATA 9.1 software was used for the Tobit regression to correct for heteroskedasticity. After correction for heteroskedasticity there were non-significant changes in most right hand side variables.

The Likelihood Ratio (LR) test show significance because the calculated chi-square ($\chi^2$) is 27.75 with 8 degrees of freedom is significant at 1% level. The Log-likelihood of the Tobit regression is equal to-600.86967.

The variable (INCOME) is significantly positive at 5% level. The household size variable (HLDSIZE) is negatively significant at the 10% level, i.e., the respondents with larger families have a lower WTP. However, the respondents with a higher education level (EDUCATION) are more WTP and the variable has a positive significant effect at the level of 10%. This result implies that highly educated visitors are more informed about natural resources degradation, therefore, are more concerned with natural sites conservation.

Table 6: Definition and expected signs of the variables used in Tobit regression

| Variable | Definition | Expected sign |
|---|---|---|
| WTP | Dependent variable of the model representing the maximum willingness to pay per visit per group (US$) | NA |
| **Socioeconomic variables** | | |
| INCOME | Total annual household income in US $ | + |
| HLDSIZE | Respondent household size | - |
| EDUCATION | Education level of respondent (1: illiterate, 2: primary school, 3: secondary school and 4: University) | + |
| TRAVELCOST | Travel cost during the current day trip visit to the site "Misfat Al-Abreen" (US$) | - |
| RESIDENT | Dummy variable, which equal 1 if the recreationist is resident and 0 otherwise | +/- |
| **Site preference variables** | | |
| SITESATIS | Recreationist satisfaction during the current visit to the site "Misfat Al-Abreen", the variable was presented according to a Likert scale (1-5) | + |
| ROADIM | Dummy variable, which equal 1 if the recreationist agrees that alleys and road improvements may increase his individual satisfaction | + |
| ARRSPACE | Dummy variable, which equal 1 if the recreationist agrees that arranged spaces inside the site may increase his individual satisfaction | + |

Table 7: Tobit regression and marginal effects results

| | Coefficient $\beta = \partial E(y_i)$ | Unconditional expected value $\partial E(y_i^*)/\partial X_i$ | Conditional on being uncensored $\partial E(y_i^*/y_i^*>0)/\partial X_i$ | Probability uncensored $\partial P(y_i^*>0)/\partial X_i$ |
|---|---|---|---|---|
| INCOME | 0.0319511 (0.0152)** | 0.022859 | 0.015865 | 0.001026 |
| HLDSIZE | -0.3604153 (0.1994)** | -0.257852 | -0.178959 | -0.011577 |
| EDUCATION | 2.25053 (1.3441)** | 1.610096 | 1.117470 | 0.072290 |
| TRAVELCOST | -0.0462212 (0.0807)** | -0.022951 | -0.033068 | -0.001485 |
| RESIDENT | -2.7406 (2.6696) | -1.993426 | -1.387090 | -0.085808 |
| SITESATIS | 2.203361 (0.9128)** | 1.576350 | 1.094049 | 0.070775 |
| ROADIM | 2.610748 (2.8404)** | 1.954988 | 1.365446 | 0.078128 |
| ARRSPACE | 1.901477 (1.7052)** | 1.378489 | 0.958368 | 0.059915 |
| Constant | -3.318199 (5.9003)** | | | |
| N | 222 | | | |
| Log-likelihood | -600.86967 | | | |
| $\sigma$ | 10.46216 | | | |
| LR-$\chi^2$ (8) | 27.75 | | | |
| Pr>$\chi^2$ | 0.0005 | | | |

Values between brackets are standard errors of coefficients *t-statistic significant at 10% level, **t-statistics significant at 5% level

The WTP is positively affected by the respondent visit satisfaction; the variable (SITESATIS) reflects the enjoyment of the recreationist with the site, hence the implication to avoid the site degradation through the proposed WTP amount. The variables representing travel cost (TRAVELCOST), resident visitors (RESIDENT), roads and alleys improvement (ROADIM) and acceptance of arranged space inside the site (ARRSPACE) have the right sign but are statistically insignificant.

The marginal effects of household income variable (INCOME) is interpreted as follows: a $ 1,000 increase in annual visitor's income would result in a 0.103% increase in the probability of a positive WTP, the monetary increase of WTP equals to $ 0.0158 for visitor with a positive WTP and $ 0.0228 for all visitors sample. Despite the non-significance of the travel cost variable (TRAVELCOST) and referring only to the sign, the marginal effects can be interpreted as follows;

a $ 10 increase in individual travel cost yields a 0.149% decrease in the probability of a positive WTP bid, a $ 0.0229 decrease in the WTP for recreationists with positive WTP bid and a $ 0.331 decrease in WTP for all recreationists.

With dummy variables, we are typically interested in the net effect on a form of the dependent variable when the indicator changes from 0 to 1; the marginal effect of a discrete change in the indicator variable. Marginal effect of the dummy variable attributed to the residence of recreationist (RESIDENT), despite non significance, can be interpreted as follow; a resident recreationist, with mean of model quantitative variables, would have a $ 1.993 decrease in the unconditional expected WTP (WTP for all recreationists) and a $ 1.387 decrease in conditional expected WTP (WTP for recreationists with positive WTP bid). Moreover, foreign tourist have 8.58% higher probability of being uncensored (positive WTP bid) than residents.

Our results are broadly consistent with scholar publications employing the CVM (Bergstrom and Ready, 2009). Previous studies arriving at similar conclusions include: Loomis (1987) in a survey of California households regarding WTP for increased water flows into Mono Lake. The average willingness to pay per household was estimated at $156 per year. Drake (1992) estimated the Swedes' WTP to preserve the agricultural landscape at 541 Swedish Kroner per person per year or 975 Swedish Kroner per hectare per year. Barrens *et al.* (1996) estimated the economic value for preserving critical fish habitat at $195 per household. Loomis (1996) found the WTP per households in the Olympic Peninsula in Washington to remove dams and restore the Elwha River to be $73. Tameko *et al.* (2011) applied the CVM to estimate the visitors' WTP for improved urban park. Results revealed that 78% of the respondents were WTP an entrance fee higher than the one implemented at the time. Furthermore, the WTP was found to be 370 CFA/person. Banga *et al.* (2011) employed the double-bounded CVM to investigate households' WTP for improvement in solid waste-collection services. The study found the mean WTP to be approximately US$ 1 per month. Grala *et al.* (2012) used the CVM to estimate the WTP to support planting of field windbreaks for aesthetic purposes on agricultural lands. Results showed that the mean WTP ranged from US$4.77 to US$8.50. However, the CVM approach has somewhat been criticized and most of the criticisms revolve around the methodology. The methodological disputes rest upon standard criticisms of surveys, e.g., respondents' reports of their behaviors may not match their real behaviors. Other criticisms rest upon respondents' consistent tendency to answer willingness-to-pay questions with excessive zeroes and infinite numbers.

## CONCLUSION AND RECOMMENDATIONS

This study estimated the WTP of an entrance fee to visit the oasis Misfat Al-Abreen using a payment card. The study showed that 64% of the interviewed visitors are willing to pay an entrance fee of $ 8.6/visit/group. Consequently, the implementation of an entrance fee would likely reduce the number of visitors, thus reducing the total social benefit. Besides, the existence of a number of oases in proximity to the “Misfat Al-Abreen” might divert part of the visitors willing to pay, even though the beauty of the substitute sites is lower. Nevertheless, the implementation of an entrance fee will improve the quality of the site which in turn might increase the potential demand if part of the fees is used for a proper advertising and to reduce the crowding phenomena observed during holidays. Oases in Oman are managed by farmers' associations responsible for water supply, distribution and maintenance of the infrastructure. Such institutions' responsibilities could be expanded to encompass the collection of entrance fees. This is specifically feasible for "Misfat Al-Abreen" as the oasis has one single entrance allowing for exclusion. The manager of

the oasis's water association can receive up to 7% of the entrance fees as is the practice regarding the income from water auctions (Zekri *et al*., 2006). The net revenue will be distributed among farmers based on land/water property and to provide services to visitors. The end result is to encourage landowners to sustain the agricultural activity and enhance the environmental services.

The results also showed that on average 70 visitors entered the oasis daily during the week-end. Most visits to the site are undertaken in winter and spring as summer is too hot for outdoor recreation. The total number of visits is at 3,500 per year. Given an entrance fee of $8.6/group and given the average group size of 6 persons the entrance fee per visitor is estimated at $1.43. The implementation of an entrance fee would result in a gross profit to farmers of $5,016 per year. Farmers' profit from agriculture in the oasis is estimated at $90,545 per year (Zekri *et al*., 2011). Thus, farmers' profit from tourism would represent 6 percent of the profit from the farming. On the other hand, The WTP of an entrance fee to the oasis is far below the $13 per visitor paid to access the Hota Cave, a substitute/complementary site near "Misfat Al-Abreen". Besides, Zekri *et al*. (2011) found that the average travel cost is $63.6/visitor, thus the WTP estimated represents only 2.3% of the travel cost. The results obtained show that although tourism might increase farmers' revenue it is far from becoming an attractive activity that will encourage farmers to stay in business or ensure sustainability.

## ACKNOWLEDGMENTS

The authors are thankful for the financial support obtained from Sultan Qaboos University under grant No. IG/AGR/ECON/08/01. The authors are also grateful to the complementary financial and logistic support offered by the Ministry of Regional Municipalities and Water Resources.

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