J. Appl. Environ. Biol. Sci., 4(1)28-35, 2014

ISSN: 2090-4274
Journal of Applied Environmental and Biological Sciences
www.textroad.com

Economic Value of Conservation Pastureland in Southern Iran

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Received: November 11 2013
Accepted: December 6 2013

ABSTRACT

The present study aims to estimate the conservation value of pastureland in Fars Province, southern Iran. For this purpose, the CVM method was applied to data collected from a sample of 200 pasture users randomly selected in the region and individuals' willingness to pay for using pastureland and conservation areas was calculated. The average willingness to pay by individuals and families were 6357.7 rial and 609.6 rial, respectively. Although Iran is a developing country and people have low to moderate annual income, the result of the study shows that 80.5% of the respondents are willing to pay for conservation the pastureland. Also the result shows that local farmers and ranchers are willing to pay more. The result of the study shows that local people are aware of the importance of this area and willing to do enough to protect it.

JEL classification: Q25,Q51
KEYWORDS: pastureland, conservation value, willingness to pay, CVM method, Fars, Iran

INTRODUCTION

Pasturelands are semi-natural ecosystems that are the main characteristics of the native vegetation. Rangeland includes Natural Grasslands and Shrubbery, Plant Communities of Arid Deserts, Savan, Tundra, Alpine Mountains, Coastal Swamps and Meadows of the Valleys Floor (Mesdaghi 1995).

According to existing statistics, the vast majority of the earth's surface (43%) is covered by pastures to and the rest is devoted to forest (18%), agricultural lands (20%), residential-industrial areas (4%) and useless areas, such asglaciers and peaks cover 15 percent of earth's surface (Mesdaghi, 1995).

Sources of rangeland are for grazing livestock and native animals and products of wood, water supply and wildlife (Verkman1995). Pasturegrassis are new able resource and a vital input to feed livestock and to convert them into food sources. On time grazing during one season does not have any negative effect on amount of grass production on future years and many of these pasturelands can be exploited in a way that the output remains constant (Verkman1995).

In the case of the history of animal husbandry and pasture utilization, there is no sufficient written information available. However we can say that after formation of rancher's community, optimization of pastureland in Iran began and gradually increased. The peak of ranching activity and economic progress can be known relate to late 13th or early 20th centuries, as that time, the knowledge of traditional optimization from pasturelands has got its peak and population of animal in country was equivalent with pastureland production (Mesdaghi, 1995).

Pasturelands in Iran, with area of 90 million hectares annually produce 10 million tons of forage (Mesdaghi, 1995). Available reports indicate that pasture in Iran are over the range of regress. This is primarily due to the large number of animals and the lack of proper grazing management on rangeland country. The pasture-dependent animal in 1999 was between 67 to 115 million (Shooukat Fadaei and Sandgol, 1999). Daily increasing of demand for animal products, because of increasing population in one hand and increasing animal and rancher in order to respond this demand in other hand, have also caused intensifying the irregular optimization and destroying their plant cover, so paying attention to the importance of these resources, to renew and reform them has an important place in the tribal and rural economy in the country. In this regard, up until now, the government as a main trustee has taken strategies and ways to improve and restore the natural resources.

During the five-year economic and social plan and in order to try to engage people in natural resources, it has been attempted that the resources (pastures) to be given to the beneficiaries to take an action to reform and renew them. Thus, in the range of projects, the pasturelands were assigned range for 30 years (Shams-al-din and Khalilian 2000).

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Today, the need of knowledge and to enter the environmental values in investments, pricing, construction projects, and policies related to the decision is quite tangible. In present world, it is accepted that in order to determine the cost of products and services, the overall costs of environmental should also be identified. Generally, the cost or price of products and environmental services include damages and destructions that are imposed along with production, distribution and consumption of products and services over the environment. To respond to the increasing needs of the target audience in terms of decision making and planning, valuation of some goods and services are converted to the debate on the daily issue and forced economists to develop techniques that they use, and monetary values of a string of goods and environmental services should be accurately estimated (Krieger , 2001).

LITERATURE REVIEW

Chand et al (2002 studied the economic evaluation of forests- agricultural land systems in slopes in Nilgris of India. This study was performed using the benefit -cost ratio, and results suggest that, in first year, it is better planting Scented geranium and potato. In addition, the combination of grasses and legumes is also another good option.

Verde and toner and Sanders (2004) found that the existing of European rabbit in fields and pastures in Australia each year causes damages to the farms and imposes costs to control such animals by the government and the producers. In this direction, Verde and toner and Sanders (2004), assessed the economic destruction of such animals by disease (RHD) among them with the benefit -cost ratio and net present value (NPV) of the project. Annual cost imposed on wool producers in Australia is over a reasonable range 7.1 to 38.7 million dollars of Australia. Results showed that with reduction of 25% of rabbits, the benefit-cost ratio is between 2.9 and 16.2 (depending on densities of rabbits) and with a 5% reduction of rabbits, this ratio varies between 5.9 and 32.4. Thus, fighting with rabbits in Australian rangelands using duct prevalence of RHD is economically justified.

Dehghani Tafti (2001) attempted the benefits - costs analysis of summer pasture utilization in Yasouj. This study contains an area which was equivalent to 52,500 hectares of pasture with traditional animal husbandry. In this study, the benefits gained from sale of animal and animal products was calculated to be Rial 3943200000, as it included 28% of total income of average of rural and tribal households. In this study costs of erosion due to grazing by soil erosion and loss of fertile soil fertility reducing land costs were estimated as the equivalent of Rial 4381960000. Accordingly they found non justified pasture utilization based on the calculated benefit-cost ratio of 0.74.

Dehghanian and Nasiri Mahallati (1999) studied the views on how to manage pastures by the rural nomads and herders of northern Khurasan. Management variables of interest in this study were mainly about how to use qualitative range of models. The dependent variables in this study were "optimism" and "lack of optimism" towards the improvement of pastures. According to the results of this study, variable of submitting the permission of grazing as separated or shared, were evaluated as the most important effective variables on development and situation of pasturelands. In all cases the ranchers often prefer joint resolution states.

Abedini (2001) evaluated the participation of ranchers in rehabilitation of pastures and social factors affecting their participation in the project area of Damavand. In this study, at first, different fields of participation and various obstacles were involved. Based on the analysis, it is found that 82 percent of ranchers have good knowledge in areas such as fertilizer, grazing, seeding, grazing capacity and characteristics of a good pasture. 76% of them are willing to invest in the pasture.

Dalton and Masters (1998) studied the effect of changes in animal- farm management pattern and the optimization of this model in Mali and the results showed that the method of free grazing was better than method of monopolization and to create limitation. Meanwhile, in order to prevent condensation of grazing in one region it is necessary to consider a short amount of tax. The authors believe that taxation can increase the welfare of the entire collection.

Var (1998) studied the changes in the productivity of improve pasturelands of Sourh Wales of Australia applying total factor productivity index and the econometric model. Based on the findings of this study. Productivity of livestock that used pastures containing legumes showed a relatively stable trend over time. Productivity index rate in pastures with permanent vegetation was about 4.5, which was significantly higher than those of other pastures. Overall, it was found that despite the growth in productivity and the productivity of livestock pastures during periods of studying the productivity of pastures with legume vegetation was decreasing.

Jones and colleagues (2000) assessed side costs of distribution of type of weed (toothy) called Nassella Tritochoma in pastures of south-eastern Australia. In these areas of Australia, due to low rainfall and poor soil, conservation of the aforesaid plant is facing serious problem. To estimate the side costs associated with weed and grass seeds distribution and to evaluate the economic benefits resulted from different scenarios, a stochastic simulation model was used in this study. A scenario, which had the highest social output, imp if tree in case study pastures in private lands which are under the ownership of optimizers gain the highest output that should be used to

control the weeds. Additionally, it was recognized that between options that are socially optimum and options that are optimum from viewpoint of individual optimizers, there's a divergence and private utilization will lead to increase the side costs. Accordingly, private use was mentioned as one of market failure.

METHODOLOGY

Form economic view, value of a commodity is equal to the sum of payments for goods and consumer surplus, i.e. the difference between willingness to pay and the price the consumer pays for it. Additionally, in the case of environmental goods, using the commonly used practice for other goods is not enough, because in the case of such goods, individual consumption will have a limited effect on desirability acquired from other people. Pastures reclassified as collective goods that have some characteristics of public goods (Asafo-Ajay, 2000). In the case of public goods, the supply is constant (Wales and Garaudy, 1993).

Thus, the value of such goods through conventional methods cannot be calculated based on supply and demand analysis and other methods need to be used for this purpose. The conventional methods of valuation are as very much functional methods, especially in developing countries; of course, under the credit of some studies like (Whiting et al 1990) in developing countries have high usability.

Contingent Valuation Method (CVM)

In CV method or conventional methods of valuation, people are questioned about the maximum amount they are willing to pay for a place to visit or to protect. Contingent valuation method as the main method of valuating environmental goods was first proposed in 1947 by Ciraicy-Wantrap and applied by Davis (1963) to evaluate the benefits of a river (Jones et al, 2007.

This method includes creation of a hypothetical market for under study general goods through distribution of questionnaire among people in a society and calculation of willingness to pay by people that is believed to contains come biases (Jones et al, 2007), the most important of which are strategic method, starting point and assumed point (Whitting et al, 1990). In the next part, all types of biases and how to deal with them is presented.

Strategic Bias

The strategic bias occurs when a person thinks that via giving correct or incorrect response, he/she can affect making decision. For example, if a person feels that he/she is too willing to pay to provide a service or product that can provide their high willingness to pay will be reported. On the other hand, a person feels that in the case of creating a project, a necessary decision is made and question about the willingness of people to pay in order to evaluate the receivable fee from people, then, willing to pay will report itself low. It is of course believed that this bias is less important (Witting et al, 1990).

Bias of Start Point

The interviewer usually starts with an initial price. Respondents may not be aware of its suitability as a key for it to be the correct price. If you are willing to pay, the ultimate price when a person is under influence of the bias point has been stated (Witting et al, 1990).

Hypothetical Bias

There are two reasons that **hypothetical bias** happens: 1) respondents may not be aware of specifications of a good that the interviewer is taking about. 2) with regard to this point that individual do not practically pay their proposal price, they may not pay attention to the question and first thing that came to mind will announce as their proposal price. If there is a bias between the bids and household characteristics in a way that makes economic theoretical basis, there is no connection. Presence or absence of a reasonable relationship between the economic theoretical bids based on these features can be used as a tool to test bias. However, in the case of public services in developing countries, this bias is less problematic (Witting et al, 1990)

Estimation Method

Witting et al (1990) believe that trust on selective values from a range of numbers is more than values that individuals announce as unit specified amount. Thus, a range of values was considered and the selected ranges were evaluated at both ordered and mean values to analyze the factors affecting the willingness to pay in this study. Whilst the ordered Probit method consists with the ordered ranges the Tobit method can be used where the ranges are at their mean values (Gryyn, 2003).

To start with, let the willing function be illustrated as:

$$y^* = \beta x + \varepsilon \qquad (1)$$

when the level of willingness to pay only has a specific rate and the real values of y* not observable, we have (Gryyn, 2003):

$$\begin{cases} y = 0 & if \;\; y^* \le 0, \\ y = 1 & if \;\; 0 \le y^* \le \mu_1, \\ y = 2 & if \;\; \mu_1 \le y^* \le \mu_2, \\ . \\ . \\ . \\ y = j & if \;\; \mu_{j-1} \le y^* \end{cases} \qquad (2)$$

Quantities of μ are unknown and must be estimated using β. Each of the respondents is willingness to pay (WTP) its own specific function of measurable factors (x) and immeasurable factors of ε. If limited options are offered to people, they tend to choose the closest option to pay their mental pay. Like the binomial Probit Model, here can also be assumed to have a normal distribution and so the statements in the form of probability values will be as follows (Gryyn, 2003):

$$\begin{aligned} &prob(y=0) = \phi(-\beta x), \\ &prob(y=1) = \phi(\mu_1 - \beta x) - \phi(-\beta x) \\ &prob(y=2) = \phi(\mu_2 - \beta x) - \phi(\mu_1 - \beta x) \\ &. \\ &. \\ &. \\ &prob(y=j) = 1 - \phi(\mu_{j-1} - \beta x) \end{aligned} \qquad (3)$$

For all positive probabilities, we should have the following relationship for willingness values to pay:

$$0 \le \mu_1 \le \mu_2 \le \ldots \le \mu_{j-1} \qquad (4)$$

When dependant variables are as domain of values and if we convert this domain into unit value, the Tobit Pattern can be used for evaluation (Gryyn, 2003). The general shape of this model is as follows:

$$\begin{cases} y^* = \beta' x_i + \varepsilon \\ y = 0 & if \;\; y^* \le 0, \\ y = y^* & if \;\; y^* \ge 0, \end{cases} \qquad (5)$$

In Tobit method, the coefficients obtained by the method of the independent variable on the dependent variable, the following equation can be used to show the effect of changes in the independent variable gain (Gryyn, 2003):

$$\frac{\partial E[y|X]}{\partial X} \beta \times \Pr ob[a \prec y^* \prec b] \qquad (6)$$

In above equations, y is dependant value, X the vector of independent variables, β the vector of estimated coefficients, and *a* and*b* respectively show the minimum and maximum values for each domain or range of values.

In order to use Tobit method, values of willingness to pay for a range of values (fuzzy) can be converted to absolute values using the following equation (Han et al, 2006):

$$F_{crisp} = f_l + [(f_m - f_l) + (f_r - f_l)]/3 \quad (7)$$

In the above equation, *i*, *m* and *r* respectively represent minimum, the geometric mean and maximum values of *F*-Series.

In order to determine a model to measure willingness to pay for the model, we assume that the amount proposed for the protective value ranges based on their utility to the maximum under the condition it accepts or rejects (Lee and Mojalled, 2007).

$$U(Y;S) \quad (8)$$

$$U(1, Y - A; S) + \varepsilon_1 \geq U(0, Y; S) + \varepsilon_0 \quad (9)$$

U is an indirect desirability that a person obtains. *A* and *Y* are individual income, proposal fee and *S* is other social-economic features (education, age, sex, income, family members and being familiar with the region) which are effected by individual taste. ε_0 and ε_1 are random variables.

The desirability difference can be described as follows (Lee and Mojalled, 2007, Proon and Ismaili 2010):

$$\Delta U = U(1, Y - A; S) - U(0, Y; S) + (\varepsilon_1 - \varepsilon_0) \quad (10)$$

$$\Delta U = \alpha + \beta A + \gamma Y + \theta S \quad (11)$$

Generally, models of Legit and Probit and Qualitative Regression Methods are used to evaluate the models above. The probability (Pi) that individual accepts offers (A), can be stated based on Legit Model (Lee and Mojalled, 2007, Proon and Ismaili 2010):

$$P_i = F_\eta(\Delta U) = \frac{1}{1 + \exp(-\Delta U)} = \frac{1}{1 + \exp\{-(\alpha - \beta A + \gamma Y + \theta S)\}} \quad (12)$$

Where, $F_\eta(\Delta U)$ β ، γ و θ are evaluated coefficients.

The parameters of Legit model are estimated using Maximum Likelihood.. Then, with the use of numerical integral in limit of zero to the highest offer (A) the expected values of WTP is accounted (Lee and Mojalled, 2007):

$$E(\text{WTP}) = \int_0^{MaxA} F_\eta(\Delta U) dA = \int_0^{MaxA} \left(\frac{1}{1 + \exp\{-(\alpha^* + \beta A)\}} \right) dA \quad (13)$$

Where E (WTP) is expected value of WTP and α^* is adjusted intercept modified by adding socio- economic counterpart to the primarily intercept (Martinez and ML 2011, Peron, Ismaili, 2010, KhodaverdiZadeh et al 2009, Keane et al. 2007).

This function is estimated applying on data of the 200 completed questionnaires .

RESULTS AND DISCUSSION

The social economic characteristics of the respondents are represented in Tables 1 and 2. As can be seen, the mean age is 46 years ranging between 19 and 76. On average, each respondent is educated for 14 years and has a family of 4.5 people. The monthly income of a typical household is over 7 million Iranian rial (approximately USD 235 in 2012).

Table 1: Statistics of Important Socio- Economic Variables of Respondents

Variables	Mean	Standard Deviation	Min	Max
Age of respondents	46	9.12	19	76
Years of education of respondents	14	2.01	0	24
Size of families	4.5	2.22	1	7
Monthly income (Rls)	7276250	5306770	500000	17000000

As shown in Table 2, almost one fourth of the sample households have BS.c and a little more than 10 percent are illiterate.

Table 2: Frequency Distribution of Educational Level of Respondents

Level of education	Master and higher (MS.c)	Bachelor (BS.c)	Associate	Diploma	Less than diploma	Illiterate	Total
Number	27	52	31	39	27	23	200
%	14	26	15.5	19.5	13.5	11.5	100

The respondents' willingness to pay for conservation of rangelands revealed that 135 person (67.5%) are not interested to pay the primarily proposed monthly amount of 10000 rial to conserve pastures while 72 person (36%) showed interest to pay even more and 63 person (31.5%) accepted to pay less 65 respondents (32.5%) accepted the bid price. Out of 72 persons who did not accept the price, 34 persons (47/2%) accepted the second suggested price of 5,000 rial. The price of 20,000 rial was offered to those who were willing to pay higher prices, and 39 respondents (61.9%) admitted showed interest to pay such amount and 24 person (38.1%) were willing to pay even the higher amount.

Factors affecting the willingness to pay for conservation of rangelands are shown in Table 3. According to the Table, the variable of proposed bid that is a key explanatory variable for the probability of willingness to pay is statistically significant with the expected negative sign. This shows that under the scenario of hypothetical market, the probability of willingness to pay decreases by increasing the proposed price.

Table 3: Determinants of rangeland conservation in Fars, Iran

Variables	Coefficient	Standard error
Consonant coefficient	-0.23	0.512
Offer	-0.000023**	0.0000097
Education	0.209***	0.038
Income	0.0012	0.0095
Number of Family	-0.12*	0.061
Farmer & rancher	0.872**	0.398
Log Likelihood = -333.24- McFadden R^2 = 0.66 Probability (LR stat) = 0.000011		

*,**, *** are significant 10, 5 and 1 percent , respectively.

Coefficient of household size positive is significant and has a negative sign exhibiting that the willingness to accept the suggested price decreases as the household dimension increase. Based on the finding, the probability goes up with increasing the level of education. As was discussed earlier, a reasonable number of respondents who are mostly educated are also interested to pay almost a high price to conserve the pasture. Type of job, being a farmer and/or rancher is significant and has positive coefficient implying that farmers and ranchers are willing to pay to protect their pastures. This is because the fact that their live and business are strongly dependent to the pastures.

The expected value that is the average willingness to pay is calculated based on the following equation as equals a bit more than 6350 rial per person.

$$\text{rial}\, WTP = \int_0^{52000} \frac{1}{1+\exp\{-(-1.42-(0.0000229A))\}} = 6357.7 \qquad (14)$$

Following Lomys and Costanzia (1998), having the individual willing to pay amount, as well as the average dimension of household, 4.5, the protective value of pasture in province of Fars is calculated to be over 28600 rial per households as shown below:

Conservation Value = mean of willing to pay a moderate amount × average number of household

Conservation value = (6357.7 × 4.5) = 28609.6 (rial) (15)

CONCLUSIONS AND RECOMMENDATIONS

In this study, the protective value of the pasture in Fars province, Iran was calculated for each individual and household use. To calculate this value, the willingness to pay for conservation of rangelands, was investigated. The results showed that 80.5% of respondents (161 people) are willing to pay for the conservation and survival of this resource. CVM Method was used to calculate the current value. Based on the findings, people of the region have much willingness to protect pastureland, and as expected, farmers and ranchers are interested to pay more than the other people for this purpose.

The following recommendations can help the decision makers to keep and improve the quantity and quality of the pasture in the region:

-The results showed the tendency of individuals to preserve the grasslands for future generations and their possible use in their future. In addition to the importance of grasslands as a food source, particularly in the provinces of Fars, the semi-arid rangelands in maintaining the investment is justifiable. The authorities can do more to protect.

-According to the results obtained directly from the people who use it for their livelihood, a high willingness to pay to protect their natural resources is possible. In this context, teaching people to avoid the destruction of the pasture can be very useful to protect the resource.

Acknowledgment

The authors thank the Arsenjan Branch of Islamic Azad University for partial financial support.

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