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CONTINGENT VALUATION METHOD IN MEHAO LAKE FOR DRINKING WATER

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The total economic value of wetlands can be disintegrated into four components namely direct use value, indirect use value, option use value and existence use value. The goods and services which are used for the final consumption or for marketable purposes fulfill the direct use. Many ecological functions of the wetlands like carbon sequestration, breeding ground for many waterfowl and migratory birds, or all those functions which cannot be measured in market prices are the indirect use value. When we are keeping or preserving the resources for the future use is option use value and we are getting benefit or satisfaction by merely knowing its existence is its existence use value. The ecological and some of the economics functions of the wetlands does not have market prices. Hence, to capture its economic value, surrogate market is established which is contingent valuation method. In the present study, an attempt has been made to capture the economic value of Mehao wetland by using contingent valuation method.

Keywords: Wetlands, existence use value, surrogate market, contingent valuation method.

Introduction

According to Ramsar Convention Bureau, a wetland is defined as areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low-tide does not exceed six metres (Barbier, et. al, 1997). The term wetland groups together a wide range of habitats that share a number of common features, the most important of which is continuous, seasonal or periodic standing water or saturated soils and occupy an intermediate position between truly terrestrial and aquatic ecosystems and therefore encompass a diverse array

of habitats (Finlayson & Van Der Valk, 1995). Such habitats where the water table is situated at or near the ground surface, bearing vegetation adapted to more or less continuous water logging and form a buffer between waterways and commercial, residential and agricultural lands (Verma, 2001). In other words, these are transitional zones between land and open water, where plants and animals show adaptation to permanent water logging (Ojoyi, 2008).

In early periods, wetlands were regarded as the breeding ground for many parasitic organisms and hence they were considered as harmful for human beings. Only the freshwater bodies received the attention of the policy makers. Recently, many research studies have revealed the importance of wetlands in ecological functions as well as to meet the economic needs of the people. It is an established fact that the stock of wetlands (i.e. the full wetlands infrastructure) is a multifunctional resource with very significant economic value. The structure value (provided by plants, animals, fish, soil and water) of many tropical wetlands are being directly exploited to support human livelihoods and also provide indirect support and protection provided to economic activity and property. Wetlands also yield non-existence values, i.e. values not derived from either current direct or indirect uses of the wetland (Turner, 1991). It also perform many important functions for humankind-storm protection, flood and water flow control, nutrient and waste absorption and so forth. Wetlands can also be used for recreation and water transport, and their diverse resources can be directly exploited for fishing, agriculture, wildlife products, wood products and water supply. When properly measured, the economic value of a wetland's ecological functions, its services and its resources may exceed the economic gains of converting the area to an alternative use. Direct uses of the wetlands include both consumptive uses of its resources (e.g. livestock grazing, fuelwood collection, forestry activities, agriculture, water use, hunting and fishing) and non-consumptive uses of wetland services (e.g. recreation, tourism, in situ research and education, navigation along water course. The indirect use value of an environmental function is related to the change in the value of production or consumption of the activity or property that it is protecting or supporting (Barbier, 1994).

In many areas, the remoteness and inaccessibility of wetlands has attracted species that may not be totally wetland dependent but take advantage of the protection and shelter they provide. The best known function of wetlands is as a provider of year-round habitats, breeding areas, and wintering sites for migratory birds, depending on their location. Wetlands are efficient in trapping pollution and processing waste in human

dominated landscapes. These have been found to be important sinks for pollutants moving from upland areas, preventing their movement into surface water and ground water (Das, et al., 2000).

Broadly, the total economic value of wetlands can be disintegrated into four components namely direct use value, indirect use value, option use value and existence use value. The goods and services which are used for the final consumption or for marketable purposes fulfill the direct use. For example, firewood, timber, fish, etc. constitutes the direct use value. Many ecological functions of the wetlands like carbon sequestration, breeding ground for many waterfowl and migratory birds, or all those functions which cannot be measured in market prices are the indirect use value. When we are keeping or preserving the resources for the future use is option use value and we are getting benefit or satisfaction by merely knowing its existence is its existence use value.

Keeping into multidimensional role of wetland, the present study has been undertaken in Mehao lake and the data has been collected both from primary and secondary sources. For primary information, 303 households have been surveyed covering six villages to know their economics activities nearby the lake. Further, field study have been conducted for 130 households from Roing for economics valuation of Mehao Lake by applying contingent valuation method.

Mehao Lake

Mehao Lake has deep forest in their vicinity. These forests are the source of livelihoods for the nearby population. These forests have an important function of directly supplying such indispensable resources as timber, fuel wood, building materials, food (honey, fruits and mushrooms), fodder, fiber and medicinal plants etc. Hence these forest resources are the important sources of livelihood which play an integral part in rural household economies. The myth, belief and tradition are centered on the forests and its environment and its dependency on it becomes crucial due to many socio-economic functions like predominance of jhum cultivation under certain circumstances. Obviously the rural households are compelled to depend on different forest products.

Table 1

Value of Forest Products (in terms of rupees) by Surveyed Households

Forest Products	Approximate Value (in rupees)
Firewood	31,54,700 (49.94)
Hunting of Animals	5,81,400 (9.20)
Timber	1,65,000 (2.61)
Cane	3,29,600 (5.22)
Bamboo	1,41,100 (2.23)
Building materials	5,19,900 (8.23)
Edible items	8,59,200 (13.60)
Others	5,66,500 (8.97)

Note: Figures in parentheses indicate the percentage against the total value

Source: Field Study, 2016

From Table 1, it was found that firewood consumption 49.94 emerged as the most important item in term of value among all the forest products. That means, the surveyed villages of nearby lakes were dependent mostly on forests for firewood. This is because of traditional dependence on firewood due to climatic condition as well as non-availability of alternative fuels. The next important item was edible items like leafy vegetables etc (13.60 percent) followed by hunting of animals (9.20 percent). It was interesting to observe that the timber (2.61 percent) consisted of a less percentage of consumption items among the forest products. Hence it appears that the surveyed households were dependent on forests nearby lakes basically for consumption purpose. However there were variations of dependence among the surveyed villages. Hence the details are given in Table 2.

Table 2

Percentage Value of Forest Products (in terms of rupees) by Surveyed Households (Village wise)

Forest Products	Village					
	Balek	Koronu	Simare	Abango	Injunno	Denlo
Firewood	36.91	13.09	21.71	10.88	16.86	0.54
Hunting of Animals	12.50	54.87	11.35	13.24	2.49	5.54

Timber	30.30	30.30	36.36	Nil	3.03	Nil
Cane	Nil	50.36	4.25	15.78	19.26	10.34
Bamboo	11.69	35.22	Nil	20.69	23.39	9.00
Building materials	59.80	11.16	29.04	Nil	Nil	Nil
Edible items	70.32	15.01	Nil	11.17	3.49	Nil
Others	Nil	14.29	Nil	Nil	70.60	15.09
Total	35.12	20.04	15.45	9.46	17.06	2.87

Source: Field Study, 16

It was found that among the surveyed villages, the households in Balek village collected the highest value of forest products from the periphery of the wetland areas which is around 35.12 percent followed by Koronu Village (20.04 percent). The least value of forest products collected by the surveyed households were from Denlo village which is only 2.87 percent of the total value.

Dependence on Mehao Lake for Drinking Water

It was observed that villagers were not using the surveyed lake for drinking water purposes. They used the stream water for drinking purposes. However, it was found that the outlet from the Mehao Lake passes through Roing town and its water is used by good percentage of population of Roing Town for drinking water purpose. Recently, Public Health Engineering Department, Government of Arunachal Pradesh constructed the pipeline in order to distribute its water for drinking water purposes to the people of Roing. Hence, an attempt was made to conduct a sample survey among the people of Roing in order to know their willingness to pay for preservation of the surveyed lake i.e. Mehao Lake from where the water of the outlet is used for drinking water purpose.

It was found that out of 130 households survey conducted, all were willing to pay for preservation of the lake. The average willingness to pay was estimated to be around rupees 596 which appear to be relatively high. Finally an attempt was made to know the determinants of household's willingness to pay for preservation for drinking water purpose by running the linear regression model. The estimated equations are as follows.

$$\text{Max WTP} = \alpha + \beta 1\text{Edn} + \beta 2\text{TFM} + \beta 3\text{Y} + \beta 4\ \text{Gen} + \varepsilon i$$

Max WTP = 84.337*** +43.595 Edn* +14.137 TFM** +2.17Y** -26.723Gen +εi

(1.737) (14.728) (2.177) (2.088) (-0.723)

R Square = 0.713 Adjusted R Square = 0.703 F =77.457 N=130

Where,

Max WTP = Maximum Willingness to Pay (in rupees)

Edn = Number of Years of Schooling

TFM = Total Family Members of the Household

Y = Annual Household Income

Gen = Gender

εi = Error Term

Note: 1. The figures in parenthesis are t-values

2. The asterisk symbols (*, ** and ***) denote significant level at 0.01, 0.05 and 0.10 level.

It is evident from the analysis that except the gender all the explanatory variables like level of education, total family members of the household and income were positively influencing the maximum willingness to pay and they were significant. The educational qualification of the respondents was also positively influencing the willingness to pay and it was significant at 0.01 level. This shows that the more educated people the more they were willing to pay more. It was also found that total family members of the respondent positively influence the willingness to pay and is significant at 0.05 levels. This indicates that the larger the family members, the more they were getting benefits from the outlet of the lake in terms of drinking water and hence they were willing to pay more for its preservation. The other explanatory variable was income, which was significant at 0.05 levels. The R-square and adjusted R-square for the estimation was found to be 71.3 percent and 70.3 percent which was quite high. The F-statistic for overall goodness of fit of the model was found to be 77.457 which were significant at 0.01 levels.

Major Activities Reported by Surveyed Households in Villages around the Mehao Lake

The importance of the natural wetlands depends on the dependency level on the various resources collected by the households in surveyed villages. In addition to scenic beauty, the wetland provides many livelihood resources to the people and proper valuation of these resources was not possible through market prices. Hence, the ordinal measurement of the dependency level was used to measure their activities. The surveyed households were asked to specify the major economic activities around the lakes and rank them. The scoring was accorded in the order of their rankings. For first ranking score of five was accorded, four for second ranking, three for third ranking, two for fourth ranking and one for fifth and above ranking.

Table shows that the major economic activity was firewood collection with a total score of 895 which ranked topped among other activities. The other major activities were the collection of minor forest products with 739 score, recreation with 478 score, hunting with 319 score, building materials with 222 score and the least is animal grazing with only 8 scores. This supported the evidences that the surveyed households were dependent on lakes i.e. more specifically on nearby forests around the lakes for firewood collection, collection of minor forest products, recreation and hunting.

Table 5.10
Major Activities Reported by Surveyed Households in Villages around the Mehao Lake

Activities	Rank *(Total Score)*
Firewood Collection	1 (895)
Minor Forest Products (Cane, Bamboo, Edible Items, etc.)	2 (739)
Recreation	3 (478)
Hunting	4 (319)
Building Materials	5 (222)
Any other (Drinking, Wet Rice Cultivation and Other)	6 (108)
Fishing	7 (33)
Animal Grazing	8 (8)

Source: Compiled from Field Study of 2012-14

Among the villages, the highest number of households of Balek village is dependent on the wetland areas for the firewood resources. Similarly, in the collection of minor forest products which includes bamboo, cane, edible leaves and bamboo was found to be highest in the Balek village with a score of two hundred twenty

six. On the other hand the recreational activities were also found highest in Balek village where the score was one hundred thirty nine.

Conclusion

The study highlighted that the natural lakes provide many direct and indirect services to the people. They provide resources in terms of firewood, edible items, source of drinking water, cane, bamboo, fodder, etc to the nearby villagers. In addition to it, there are indirect services like ecological functions, ecotourism, etc. being performed by the wetlands which are not valuated at market prices. Hence, with growing ecotourism and increasing interest among the stakeholders, there is need for economic valuation of the lakes or wetlands so that various stakeholders can come forward to preserve these lakes or wetlands.

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