THE VALUE OF THE INDIAN GAZELLE (*GAZELLA GAZELLA)* : A CASE STUDY IN HARYANA, INDIA

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Introduction

The growing environmental awareness in the past decades has witnessed an increasing interest in biodiversity, both locally and world-wide. Biodiversity requires immediate attention for two reasons. First, it provides a wide range of benefits to mankind and human activities have contributed to unprecedented rates of biodiversity loss, which threatens the stability and continuity of ecosystems as well as flow of goods and services from them. Consequently, in recent years much attention has been directed towards the analysis and valuation of the biodiversity.

Although a great deal is now known of the value of wildlife for hunting and fishing, only a handful of studies quantify the value of non-consumptive wildlife and most of these focus on existence value (Gregory *et al*., 1989; Clayton and Medelsohn, 1993; Loomis and White, 1996, Blamford *et al*., 2002). Nevertheless non-consumptive use is clearly driving a great deal of public awareness in developing countries as well as ecotourism movement across the world.

In the last couple of decades, economists have made great strides in quantifying the value of threatened and endangered species. Using contingent valuation (CV) approach and cost benefit analysis, many workers (Slachoono, 1995; Rubin *et al*., 1991) have relied on survey questions to estimate the benefits of species preservation. Boyle and Bishop (1987) were one of the first to conduct species valuation study to estimate the existence value for wildlife species. More recently, Van Kooten (1993) studied the economic value of waterfowl in Canada. The shadow values of marginal land converted to waterfowl habitat were estimated to be US$ 50 to US$ 60 per acre. Loomis and Larson (1994) valued an "emblematic" endangered species, namely 'Gray Whale' and estimated the willingness to pay between US$ 16 and US$ 18 per household. Boman and Bostedt (1995) did the economic valuation of the conservation of the wolf in Sweden and the mean WTP was US$ 126 per year.

The Blackbuck (Fig. 1) is a Bovidae species found in arid and semi-arid areas of North-West and Central India. It is classified as extremely vulnerable and is considered in the highly endangered species list. In recent years, its population has dramatically decreased due to hunting and habitat destruction. This species is protected by the law as well as local village communities like the 'Bishnois' in

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Fig. 1

The Blackbuck (*Gazella gazella*)

Rajasthan. A vegetarian lifestyle of the villagers also supports its existence. Blackbuck is a symbol of pride for the people and they are emotionally attached to it due to the sacrifice of Bishnoi community. People see it as a sign of the conservation of habitat. It is directly related to the presence of trees or vegetation cover, which are very important in this harsh climate. This paper focuses on the application of contingent valuation method to estimate the benefits of preserving endangered species and their habitat. An attempt has been made to estimate the economic value of the non-consumptive uses of Indian Gazelle (*Gazella gazella*) by analyzing the results of the field surveys comprising interviews of the villagers using carefully designed questionnaires.

Study Area

Haryana is located in the North- West part of the country having a population of 21,082,989 (2001 census). Rainfall is varied, with Shivalik Hills region being the wettest and the Aravalis being the driest. Around 70% rainfall is received during July to September and the remaining from December to February. The main tree species of this region are Jandi (*Prosopis cineraria*), Desi kikar (*Acacia nilotica*), Vilayati kikar (*Acacia tortilis*), Raheda (*Tecomella undulata*), etc.

The present study was carried out in three villages of Bhiwani District in Haryana. These villages are located close to a Blackbuck Breeding Farm at varying distance. The farm is spread

Table 1

Brief profile of the selected villages

Village	Kairu	Deorala	Nimriwali
Block	Tosham	Tosham	Bhiwani
No. of households	1,349	878	461
Household size	6	6	6
Population	8,077	5,387	2,599
Male	4,355	2,895	1,386
Female	3,722	2,492	1,213
Sex ratio	855	861	875
SC population	2,068	848	402
	(25.60%)	(15.70%)	(15.50%)
No. of literate	4,278	3,004	1,527
	(63.70%)	(66.66%)	(68.40%)
Total workers	2,380	2,343	1,114
Cultivators	1,186	1,556	551
Agri. Labourers	337	436	260

over 60 ha of area. Village Kairu is located in the neighbourhood of the farm; Nimriwali is farthest while Deorala is located between these two villages. A brief profile of the selected villages is mentioned in Table 1.

Material and Methods

Contingent valuation method was used to assess peoples' WTP (Willingness to pay) in terms of money as well as mandays ("willingness to work" or WTW) for the protection of the blackbuck habitat by the people of these selected villages. A questionnaire was developed, tested and modified. Further sampling was done on the basis of household size, annual income, landholding, literacy status, and the numbers of cattle possessed. A total of 180 questionnaires were filled during the fieldwork.

The importance of Blackbuck Breeding Farm was explained to the people in terms of habitat function and they were asked to reveal their WTP and WTW in terms of money and labour for the protection of the blackbuck farm. The concept of measuring the "willingness to work" is probably being used for the first time in this study. It has been tried in this case to elaborate the willingness to pay value. The need for this method arose due to the fact that the economy of the people in this region centers on agriculture, therefore, most of the people specially those belonging to low income group, were not willing to contribute much in terms of money. However, on being asked about their willingness to work as a volunteer for the protection of this habitat, they were willing to contribute in terms of physical labour for certain number of hours during a month. Consequently, this value can be

converted into money terms by multiplying with the prevalent wage rates of the State Government.

These questions were asked to the members of the selected families during the household survey. In addition to this, data on literacy, income, family size, landholdings, number of cattle, etc. was also gathered. Results were tabulated and analysed by using SPSS 11.0 software package.

Results and Discussion

In all, 180 households were surveyed in the selected villages. The age of respondents ranged from 14 to 76 with a mean of 36.51 years. The education level was from illiterate to postgraduate. Income ranged from Rs. 500 to Rs. 2,00,000 per annum with an average of Rs. 34,680.73 per annum. Landholding ranged from 0 to75 acres. Adult cattle unit were in the range of 0 to 32. The willingness to pay for protection of Blackbuck breeding farm ranged from Re. 0 to Rs. 3,000 per year. The average WTP came to be Rs. 99.36 per year. The willingness to work (WTW) ranged from 0 to 120 days per year with an average of 16.77 days per year. The summary of data analysis and correlation matrix is presented in Tables 2 and 3.

The results of the analysis show that the villagers were willing to pay from Rs. 9.35 to Rs. 94.86 per household per year for its protection. In addition, they were willing to spare average 12.47 to 21.54 mandays per year for protection of its habitat. Moreover, villagers were ready to pay Rs. 1.25 to Rs. 3.36 per person per visit to the Blackbuck Breeding Farm.

Table 2

Summary of data analysis

	Age	Education	Income	Agri. land	ACU*	WTP	WTW
Mean	36.51	7.23	34680.73	7.22	2.99	99.36	16.77
S.E.	1.09	0.38	3165.27	0.71	0.26	23.45	1.32
Median	34.50	8.00	18000.00	4.00	2.05	5.00	12.00
Mode	35.00	0.00	18000.00	0.00	0.00	0.00	12.00
S.D.	14.58	5.03	42466.52	9.49	3.55	314.55	17.67
Sample Variance	212.65	25.32	1803404911.18	90.11	12.57	98941.33	312.30
Kurtosis	-0.27	-0.99	2.36	17.02	25.62	43.69	7.65
Skewness	0.72	-0.13	1.67	3.34	3.91	5.83	2.29
Range	62.00	18.00	199500.00	75.00	32.00	3000.00	120.00
Minimum	14.00	0.00	500.00	0.00	0.00	0.00	0.00
Maximum	76.00	18.00	200000.00	75.00	32.00	3000.00	120.00
Sum	6572.00	1302.00	6242531.00	1300.00	538.40	17884.00	3018.00
Count	180	180	180	180	180	180	180

*ACU=Average Cattle Unit

The analysis shows that the percentage of the people aware of the Blackbuck Breeding Farm was highest for Kairu (94.91) and lowest for Nimriwali (58.83). The people of Kairu, which is nearest to this farm, gave highest average willingness to pay i.e. Rs. 192.71 per household per year. On the other hand, WTP for the people of Nimriwali that is located farthest from the farm was lowest i.e. Rs. 9.35 per household per year. It was also observed that the WTP decreased as one moves away from the breeding farm.

At present there is free entry to the farm for the visitors. The frequency of visit

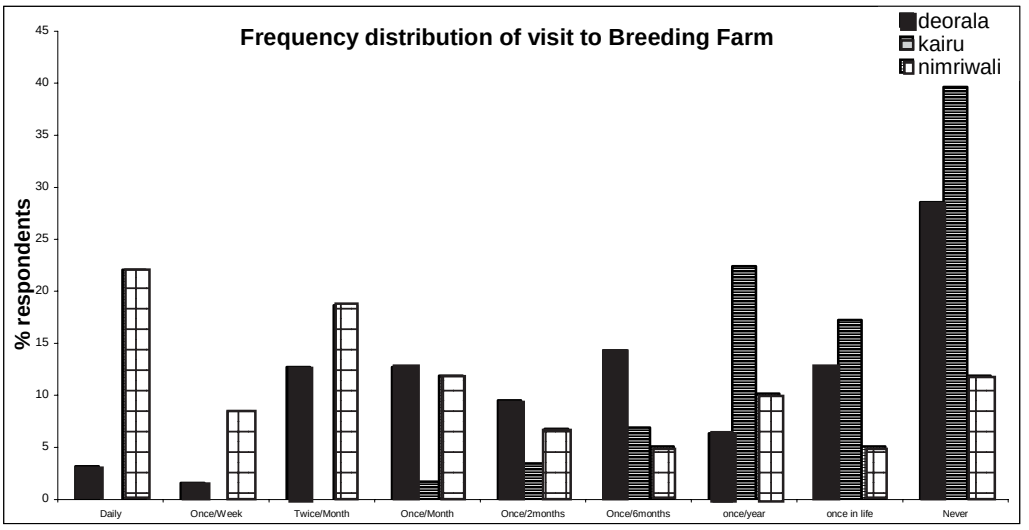
Table 3

Correlation matrix

	Age	Education	Income	Agri. land	ACU	WTP	WTW
Age	1.000						
Education	-0.356**	1.000					
Income	0.123	0.186*	1.000				
Agri. land	0.094	0.068	0.357**	1.000			
ACU	0.044	-0.046	0.269**	0.418**	1.000		
WTP	-0.117	0.247**	-0.034	0.090	0.071	1.000	
WTW	-0.119	0.111	0.062	0.002	-0.033	0.459**	1.000

(**indicates correlation is significant at 0.01 level, *indicates correlation is significant at 0.05 level)

Fig. 2



The frequency distribution of the breeding farm visitors from the villages

to the farm is presented in Fig. 2. While assessing their willing to pay if entry fee is charged, the value for the entry fee ranged from Rs. 1.25 to Rs. 3.36 for the villagers and Rs. 3.08 to Rs. 14.24 for the visitors outside the area.

The correlation analysis shows that the value of WTP was related to the value of WTW as well as on education level. Other parameters such as age, landholding, cattle etc. were not seen to affect valuation results in this study.

The results indicated that the people of Kairu, which is located closest to the farm, were willing to pay Rs. 192.71 per year per household for the Black- buck Breeding Farm, which is highest for the studied villages. It was lowest i.e. Rs. 9.28 per year per household for the Nimriwali which had the maximum distance from this farm among the studied villages. The value in terms of "willingness to work" was also maximum for Kairu i.e. 21.54 days per year. This value was converted to rupees equivalent by multiplying with Rs. 25 per day (for 2 hours per day at the rate Rs. 100 per day). These values, if extrapolated to the whole village came to Rs. 9,86,484.80 per year for this village. On the other hand the average WTP and WTW were the lowest i.e. Rs. 9.28 and 12.79 days, respectively per year per household for Nimriwali, which was located farthest to the farm. These values, if added and extrapolated to the whole village came to Rs. 1,51,716.7 per year for the village showing the effect of distance on the value given to breeding farm.

The total value of the Blackbuck Breeding Farm was Rs. 15,71,641 per year for three villages out of which Rs. 12,24,112 per year came from the WTP in the form of mandays. This value is quite significant considering the socio-economic status of the area.

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SUMMARY

A study was undertaken in three villages of Bhiwani District in Haryana to assess the value of habitat function of planted forests. These villages were located at varying distance from a Blackbuck (*Gazella gazella)* Breeding Farm, which is a planted forest. Contingent valuation method was by asking the people to reveal their willingness to pay, both in terms of money as well as mandays, for the protection and improvement of the habitat for continued habitat function benefits. The total value of habitat functions provided by the farm was Rs. 15,71,641 per year for three villages out of which Rs. 12,24,112 per year came from the WTP in the form of labour mandays.

Key words **: Indian Gazelle (*Gazella gazella)*, Habitat function, Value, Haryana, India.**

भारत कुरंग (*गैजेल्ला गैजेल्ला*) का महत्व : हरियाणा, भारत में किया गया एक अध्ययन

ए०के० सक्सेना व एन०एस० बिष्ट

सारांश

हरियाणा राज्य के भिवानी जिले के तीन गांवों में रोपकर लगाए हुए वनों में आवासन कार्य में उनके महत्व का आकलन करने के लिए एक अध्ययन किया गया। ये गाँव कृष्णासार या भारत कुरंग के प्रजनन फार्म से भिन्न–भिन्न दूरियों पर बसे हुए हैं, तथा फार्म में वन लगाया हुआ है। मूल्यांकन की संभाव्य विधि लोगों से यह पूछने की रखी गई कि नैरन्तरिक आवासन–कार्य लाभों को प्राप्त करने के लिए वे प्राकृतावास की सुरक्षा और परिष्कार के लिए आती धनराशि और मानवदिन श्रम दोनों के रूप में मूल्य चुकाने के लिए अपनी रज़ामंदी प्रकृट करें। फार्म द्वारा दिए जाने वाले प्राकृतावासन कार्य का कुल मूल्य इन तीनों गांवों के लिए रु० 15,71,641/- प्रति वर्ष आंका गया जिसमें से श्रम मानवदिनों के रूप में रु० 12,24,112/- प्रतिवर्ष डब्लूटीपी से प्राप्त हुए।

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