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WILLINGNESS TO PARTICIPATE IN BIODIVERSITY CONSERVATION IN PERIYAR TIGER RESERVE: A CONTINGENT VALUATION

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WILLINGNESS TO PARTICIPATE IN BIODIVERSITY CONSERVATION IN PERIYAR TIGER RESERVE: A CONTINGENT VALUATION¹

JYOTHIS S.*

Abstract

The study largely draws from the preference elicitation of the people living in and around the Periyar Tiger Reserve (PTR) in the Western Ghat Regions of Kerala State, using a contingent evaluation questionnaire. We found that there is a higher probability to materialise people's participation in the protected area management for biodiversity conservation. From the findings of this study, it is important to say that the immediate needs of forest protection can be expected only from tribes with considerable source of income and lower caste migrants. Moreover, the economic value of people's preference towards biodiversity conservation, which we arrived at through a contingent valuation survey, is important as far as the sustainability of the existing eco-development committees is concerned even after the completion of the donor agencies funding on eco-development projects.

Key words: Biodiversity, Protected Area, Willingness to Participate, Willingness to Join, Willingness to Pay

Introduction

Biological diversity is also referred to as biodiversity. Historically, ecologists defined biodiversity as corresponding to three hierarchically related levels of biological alliance such as genes, species, and ecosystems. These three levels deal with the number, variety and variability of living organisms. Genetic diversity is the subtlest form among the three levels of biodiversity. It concerns the genetic details contained in the genes of individual plants, animals and micro-organisms-the diversity within the species so that each species contains an extensive genetic information. Moreover, the members of the same species are not to be genetically identical. Thus, even if an endangered species

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is saved from extinction, it probably must have lost much of its internal diversity (Pearce et al, 1995). Species diversity is defined as the variety and variability of species in a given region or area. It is used almost synonymously with species richness in an area. Ecosystem diversity can be defined as a variety of habitats, biotic communities and the ecological process in biosphere, as well as the diversity within the ecosystem. After having understood the importance and the threat to biodiversity, several measures are taken worldwide to protect and conserve it. These measures can be grouped into two broad categories. First, those which aim at rehabilitating or improving the environmental resources in or adjacent to settlement areas to improve living conditions of such groups as farmers, pastoralists, the landless and women. Soil conservation and water retention, afforestation, agroforestry and regeneration of forests and grasslands are some of the initiatives commonly undertaken. Second, there are programmes that seek to preserve important tracts of forests and water bodies for biodiversity protection or scientific research, sometimes combined with recreation and tourism development. The present paper is concerned primarily with the second category of conservation measures, which includes national parks, game reserves, wildlife sanctuaries and bird sanctuaries. In conservation discourse, we call these 'protected areas', essential for the conservation of biodiversity. However, it has been pointed out that while the establishment of protected areas was a fairly successful strategy in developed countries, it did not work well in the poor tropical countries with high population growth rates (Kramer 1994). This has serious implications for a country like India with a high population growth. The issue becomes more complex when we take into account the fact that a large number of poor in this country depend either directly or indirectly on the forest resources. To improve the welfare of the poor living adjacent to the protected areas, the recent measures and proposals taken are the establishment of eco-development projects around some protected areas and the call for a system of joint protected area management. These measures

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1. India Eco-development Project was conceived as a pilot project in June, 1994, on the basis of an Indicative Plan prepared by the Indian Institute of Public Administration on behalf of the Government of India after the study of eight sites selected by the Ministry of Environment & Forests. This study was funded by the UNDP. The project was to cost US \$ 70 million to be shared by the International Development Association, Global Environment Facility Trust, Government of India, Government of Project States and the beneficiaries. Subsequently one project site viz. Simlipal in Orissa was dropped due to non-observance of World Bank norms and the project was confined to seven sites and the total cost was brought down to USD 67 million. Global Environment Facility Trust Fund is one of the financiers of this project. Out of total cost of USD 20 million in the form of Grant to Government of India. The project is being implemented in seven sites in seven different States, viz., Palamau in Bihar, Buxa in West Bengal, Nagarhole in Karnataka, Periyar in Kerala, Pench in Madhya Pradesh, Gir in Gujarat and Ranthambhore in Rajasthan. The main objective of the project is to conserve bio-diversity through eco-development support. The project also envisages preparation of future biodiversity projects covering a larger number of protected areas.

and proposals are important moves not only toward decentralising government control over forest and toward increasing the participation of communities in habitat management but also making biodiversity conservation a reality. In this context, we conducted a study in the settlement area near the Periyar Tiger Reserve (PTR) in the Western Ghat Regions of Kerala State to examine the willingness of the local community to participate in such programmes. We applied the contingent valuation survey technique to establish their willingness to participation (WTP). This study is important as far as the sustainability of the existing eco-development committees is concerned even after the completion of the donor agencies funding for eco-development projects.

The Western Ghat region of Kerala State and Periyar Tiger Reserve

Physiography

The Western Ghat region of Kerala State lies in the southwestern boundary of peninsular India. This region covers an area of approximately 21,861 square kilometers in a latitude of 8°30' N to 12°30' N and 75°15' E to 77°45' E, out of which, administratively the forest area covers about 9400 sq. km. This forest area consists of 36.90 per cent tropical wet evergreen and semi evergreen forests, 43 per cent of tropical moist deciduous, 1.06 per cent of tropical dry deciduous, 0.74 per cent of mountain sub tropical temperate sholas, 1.76 per cent grassland and the remaining 16.50 percent are plantations. This part of the Western Ghat consists of a variety of forest ecosystems with many groups of plants and animals and shows its richness in species diversity. It has been pointed out that this area, with potential conservation values in the tropical moist forests of south western ghats covers Agasthyamalai Range, the

The Project Agreements were signed between the parties on 30th September 1996 and the project was declared effective from 27 December 1996. The project could not take off from the effective date as the clearance of the Cabinet Committee on Economic Affairs was accorded in October 1997. Soon after the receipt of this approval, funds were released to the Project States between Dec. 1997 - January 1998. The total funds released at first installment amounted to Rs. 13.865 crores. The flow of expenditure on various activities of the project during 1997-98 remained slow due to late approval by the Cabinet Committee. A provision of Rs. 58.82 crores has been made in the Budget estimates for 1998-99 and it is expected that the implementation of the project by the Project States will show definite improvement during the next financial year (Taken from Web site Ministry of Environment and Forest Government of India).

Pandalam hills, Cardamom hills, the high ranges, the Nelliampathi and Anamalai, the Palghat hills, the Nilgiris, Wayanad and Brahmagiries.²

Deforestation and Forest Degradation

The Western Ghat region of Kerala faced serious environmental degradation in the course of socio-economic development. The forest has declined tremendously over the years.³ According to estimates, the area under natural vegetation decreased from 36.04 per cent of the total area during 1965 to 11.56 per cent during 1989-90 in Kerala. The change in the percentage area during this period was as high as 24.48 per cent (Jeena 1997). The reasons for the decline in the natural vegetation cover have been primarily attributed to the extension of agriculture, overexploitation of timber from the forest, conversion of forests for commercial tree plantations, clearance of large tracts of forests for the construction of hydroelectric projects and other developmental activities. Moreover, it has been claimed in studies that in Kerala, the forest depletion continues to be unabated either by encroachment or by the replacement of natural vegetation by plantations or qualitative degradation by a variety of factors like fire, fuelwood collection, etc. (Chadhoadyay 1985). Since natural vegetation constitutes the habitat of a wide range of animals, birds and reptile species, the shrinking habitat due to vegetation loss has major implications on the integrity of these species. All these mean that there is a quantitative and qualitative decline of forest.

Protection as a Conservation Measure since 1950

Since 1950, formation of protected areas assumed great importance in this region. In the subsequent years we brought more forest area under protection. According to official statistics, the total protected area during the period 1950 to 1960 was 10.96 per cent of the total reserve forest. This had reached as high as 24.63 per cent in 1990. Thus one can say the most important measure for conserving biodiversity in this region was the establishment of protected areas. Table 1 shows the cumulative percentage of area under

2. Nair Sathesh Chandran (1991) pointed out there are at least 3500 species of flowering plant, including species of trees. The diversity of lower forms of plants is equally rich. There are 48 genera of mammals, 275 genera of birds, 60 genera of reptiles.

3. Chattopadhyay (1984), Jeena (1997) provides the following figures for deforestation at Kerala State level.

Total geographic area	3885497 ha	100%
Forest area 1905	1712082 ha	44.07%
Forest area 1965	1072656 ha	27.71%
Forest area 1973	662772 ha	17.06%
Forest area 1991	449164 ha	11.56%
Official figure for area under forest jurisdiction		24.31%

protection to the total forest area in this region. For the purpose of the present study we have selected an oldest protected area from the western ghat region of Kerala, i.e., the Periyar Tiger Reserve (PTR).

Table 1. Decade-Wise Distribution of Protected Area in the Western Ghat Regions of Kerala

Period of Establishment of Protected Areas	Area in sq Km	Percent to total forest area	Cumulative Percentage of Area
1950- 60	1030.54	10.96	10.96
1960-70	285.00	3.03	13.99
1970-80	511.46	5.44	19.43
1980-90	488.44	5.20	24.63
Total	2315.44	24.63	24.63

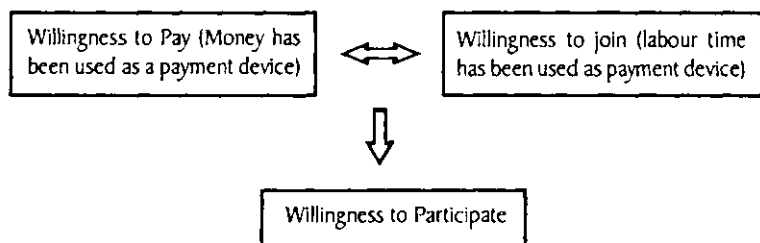
Source: Estimated from Forest Statistics published by the Kerala Forest Department.

Historically, the origin of the Periyar Tiger Reserve is linked to the establishment of the Nellikkampetti Reserve. The Nellikkampetti Reserve, established along with the construction of a Mansory dam across the river Periyar in 1895 for irrigation purposes, resulted in the creation of an artificial lake of about 26 sq. km. In 1899, the forest around the lake was declared as Reserve forest. The Maharaja of erstwhile Travancore State appointed C H Robinson as the first game warden to constitute and maintain a sanctuary there in 1933 (Vijayan et al, 1979). The Travancore Maharaja proclaimed the sanctuary in 1934 as the Nellikkampetti Reserve. Thus, one of the first reserves in India was established in Travancore (Nair 1991). In 1950, the reserve forest was extended to the adjacent forests near Periyar Lake and Sabarimala, and in 1978, the sanctuary was officially announced as the Periyar Tiger Reserve to protect the endangered species of the world.

Methodology: Contingent Valuation

The contingent valuation method (CVM) uses the survey technique to establish the value of goods and services that are not exchanged in the market. In the CVM framework, demand for non-market goods is established by first describing a simulated market to the respondent and then asking them directly to reveal their preference in terms of some common denominator. The advantage of using CVM is that it is suitable for valuing a wide range of environmental goods and services (Kramer, 1994). There were two important methodological considerations that emerged in the contingent valuation interview schedule due to the forest dependency, agrarian and settlement nature

of the study area and also the nature and objectives of the ongoing eco-development programme of the sanctuary. These relate to the *willingness to accept* (WTA) and *willingness to pay* (WTP) and the choice among them. We found the WTP format would be more appropriate since the focus of the study is on 'willingness to participate in biodiversity conservation programme, because willingness to participate is defined as people's willingness, either to join by spending their own time or pay money to a hypothetically proposed conservation programme.



The interview schedule used in the study is prepared for a face-to-face survey. The basic interview schedule was designed in English although the interviews were conducted in regional language, Malayalam. The interview schedule contained three types of questions i) questions relating to the respondent's demographic characteristics and the attitudes and preference for the conservation of biodiversity, ii) questions to check the logical consistency between responses and their sincerity, iii) questions to minimise the known and anticipated biases. Explanations on biodiversity conservation were given to the respondent in the course of the interview. Moreover, we presented general information to the respondent about the Periyar Tiger Reserve and described some of the environmentally sensitive issues that PTR is facing. Also, adequate information was imparted to the local community regarding the benefits to preserve and maintain PTR. We also introduced a hypothetical programme to strengthen the conservation programme of PTR through environmental education, which reads as follows:

We have only limited Tigers in PTR (only 39 tigers according to Wild Life Census). These tigers require a certain kind of habitat in order to survive. In recent years this habitat has been increasingly threatened due to different forms of institutional and developmental activities (already explained). Moreover, there are studies, which pointed out several threats to PTR. Moreover, if the present trend of development activities and human interference in the sanctuary continues, there will

not be any tiger in PTR for the coming generation. Research studies related to PTR's problems also suggested the need for the establishment of voluntary organisations, NGO and forest fraternities to promote participatory forest protection in the fringe area of PTR. To ensure the survival of the tiger in PTR for the future generation (say your kith and kin), if a reliable organisation were to take up initiatives, would you be willing to participate in it.

In order to arrive at the exact preference of the people for the conservation of biodiversity, we have presented the above said hypothetical situation in an alternative institutional setting- i.e. decentralised government (e.g. grama panchayath) organisation and non governmental organisation. Finally, there was an option to choose their mode of participation without any institutional conditions, i.e. irrespective of the institutional nature.

Even though money was used as a payment device, we gave another option to those who expressed their income as a constraint to participate in the proposed programme i.e., their willingness to spend time for conservation activities. Willingness to pay for the people who agreed to spend their time has been calculated by multiplying the time with the existing agriculture wage rate (the opportunity cost) of the surveyed area. Here we assumed the agriculture wage rate is more appropriate to calculate opportunity cost of spending time for conservation activity because of the agrarian nature of the village. The elicitation method used in this study was a dichotomous method, also known as the discrete choice method. This method seeks simple "Yes" and "No" replies to an offered bid. The discrete choice method was preferred over other methods for two reasons: i) It is easier for villagers to react to the questions; ii) we ensured that households responded with budget and time constraints in mind. Finally, the study tested two important hypotheses to examine the feasibility of people's participation in protected area management at micro level (In the present situation it is for protecting the tiger in the PTR).

- **Hypothesis I:** There is a positive relationship between people's willingness to participate and their socio-economic characteristics. This hypothesis is based on economic theory, which says there is a positive relationship between people's willingness to pay and socioeconomic characteristics.
- **Hypothesis II:** There is a positive relationship between people's willingness to participate and biomass-based primeval community settlements. This hypothesis is important in the present context since there is consensus among sociological researchers in this area, saying that the biomass-based primeval community settlements are one of the important determinants of people's participation in protected area management.

Willingness to Participate in the Proposed Participatory Protection Scheme.

The viability of the participatory conservation programme requires detailed information that can come from an analysis of the willingness to participate in a participatory conservation programme. These programmes may be designed and implemented either by a decentralized governmental or non-governmental agency. Willingness to participate in such a scheme is discrete – willing or not willing. Therefore, an appropriate estimator was used to explain the qualitative response. Out of 177 households, 65.5 percent said they were willing to participate in the proposed scheme (see Appendix 1). Moreover, the preferences of the people, for two types of institutional set-up (either government or non-governmental organisation (NGO)) to implement the proposed scheme, shows that 15.3 per cent of the total households expressed their willingness to participate only with NGO's. Another, 16.9 per cent of the total households expressed their willingness to participate only with a decentralised governmental organization. In both the cases, they ensured to participate by willing to pay an amount for the proposed scheme. Moreover, another 35.5 per cent of the total population confirmed their willingness to spend time to work (willingness to join) for the proposed scheme, irrespective of the nature of institutions.

Table 2. Willingness to Pay for the Proposed Participatory Conservation Programme per Year.

WTP in Rupees	Mean WTP	Std Dev	Number of Households	Cumulative Percentage
Less than 120	65.46	29.84	84	72.4
121 – 240	169.44	26.51	18	88.1
241 – 360	285.00	33.75	10	96.6
361 – 480	400.00	0.00	1	97.5
481 – 600	500.00	0.00	3	100
Total	113.8136	100.30	118	100

The survey included direct questions on each household's willingness to pay for the proposed scheme. Households were asked to state the maximum amount of money they could pay. Table 2 shows the survey results of the households' average willingness to pay for the proposed programme. The survey also included the questions on refusal of the respondent to pay for a proposed programme. In this table, willingness to pay for the people who agreed to spend their time has been calculated by multiplying the time with the existing average agriculture wage rate of the surveyed area—that is Rs 100 per day. Here we assumed the agriculture wage rate is more appropriate to calculate

opportunity cost of spending time for conservation activity, because of the agrarian nature of the study area. Therefore, the willingness to pay for the proposed conservation programme shows not only the payment in terms of cash but also the money value of their preference to participate in terms of spending labour time.

The feasibility of the proposed programme depends on the socio-economic and demographic determinants of the willingness to pay. The feasibility of the programme is tested in this study by estimating a logistic regression.

Explanation of Variables, Results and Discussion

In the model, response of people's willingness or unwillingness to join or pay for a participatory biodiversity conservation programme in the hypothetical situation was considered as the dependent variable. The explanatory variables were classified into three categories such as demographic (age, family size, and schooling), social (caste and migration) and economic (size of landholding).⁴ The relationship of these variables has been examined in the case of willingness to pay for both Non governmental and governmental set-up separately.

4.

Descriptive Statistics of Socio-Economic Variables Used in the Logistic Regression Analysis

Variable	Mean	Std Dev	Minimum	Maximum
Land Size	1.91	2.08	0.02	15.00
Household size	4.32	1.47	1.00	10.00
Schooling in years	6.98	2.40	4.00	10.00
Age	46.30	11.63	18.00	78.00

Source: Estimated from Survey data

Frequency Distribution of Families in Different Social Groups

Variable	No of families	Percentage	Cumulative per cent
Scheduled Tribe	61	34.5	34.5
Scheduled Caste	51	28.8	63.3
Upper Caste Migrants	65	36.7	100.0

Source: Estimated from Survey data.

As far as the participation with the NGOs is concerned, tribes, lower caste migrants and less educated people (schooling less than 4 years) are less willing to participate (Table 3).⁵ The odds ratios calculated for these categories show significantly lower values in relation to their reference category such as upper caste migrants and higher educated people. In this case, we found significantly high odd ratios in the case of large landholding households. This shows the willingness of the higher income group to participate with a voluntary organisation (NGO) for the proposed conservation programme in this area. Since it is a cash crop cultivating agriculture area, one can assume that there is a positive correlation between largest landholdings (asset) and income earning. Therefore we considered landholding as a proxy variable for income of the household.

5. Table 3 Logistic Regression Estimate of Willingness to Pay to a Non-Governmental Organisation for Strengthening Biodiversity Conservation at Periyar Tiger Reserve (PTR).

Explanatory Variable	Reference Category Variable	Willingness to pay - Odds ratios [Exp (B)]
<u>Age</u>	Youthful (18 to 30)	
Middle Age (30 to 50)		0.4756
Old Age (50 above)		2.1063
<u>Family Size</u>	Small (1 to 3 members)	
Medium (4 to 6 members)		1.082
Large (Above 6 members)		3.143
<u>Schooling</u>	11 to 17 years	
5 to 10 years		1.4914
0 to 4 years		0.1707*
<u>Caste</u>	Upper caste Migrants	
Lower caste (SC) migrants		0.2468*
Tribes (ST)		0.0126*
<u>Land holding</u>	Less than one acre of land	
1 to 2		3.7826**
2 to 3		2.6335***
3 to 4		2.2786
4 to 5		14.1668*
More than 5 acres		22.3363*
-2 Log Likelihood	98.189	
Goodness of Fit	182.413	
Model Chi-Square	53.002*	
Degrees of freedom	13	
*represents 1 per cent and ** 5 per cent significance level		

Source: Estimated from Survey data

Table 4 shows that most of the tribes have chosen a decentralised governmental set up as a condition for their willingness to pay.⁶ It shows a very high odds ratio in favour of tribes with respect to the reference category, that is the upper caste migrants. Another two important variables in this respect are large family size and less education. The odds ratios are significantly very less for these variables. Where land is concerned, odds ratios of the largest landholders were significantly high. Therefore, in general one can say, the tribes with largest landholding (or economically better) have chosen the decentralised governmental organisation as a condition for their willingness to participate.

6. Table 4 Logistic Regression Estimate of Willingness to Pay to a Decentralised Governmental Organisation for Strengthening Biodiversity Conservation at Periyar Tiger Reserve

Explanatory Variable	Reference Category Variable	Willingness to pay - Odds ratios [Exp (B)]
<u>Age</u>	Youthful	
Middle Age		0.5160
Old Age		0.3781
<u>Family Size</u>	Small	
Medium		1.4605
Large (Above 6 members)		0.1389*
<u>Schooling</u>	11 to 17 years	
5 to 10 years		1.3893
0 to 4 years		0.2133*
<u>Caste</u>	Upper Caste Migrants	
Lower caste (SC) migrants		2.1839
Tribes (ST)		11.3813*
<u>Land holding</u>	Less than one acre of land	
1 to 2		2.9757
2 to 3		2.9499
3 to 4		2.2040
4 to 5		1.3820
More than 5 acres		35.7332*
-2 Log Likelihood	114.028	
Goodness of Fit	151.754	
Model Chi-Square	47.070*	
Degrees of freedom	13	

*represents 1 per cent and ** 5 per cent significance level

Source. Estimated from Survey data

As far as the willingness to join (spending time for the conservation activities) is concerned, table 5 shows a different picture⁷. The odds ratios of the lower caste migrants and tribes are high with respect to their reference category, i.e., upper caste migrants. At the same time, the medium landholders' odd ratios are also significantly high with respect to their reference category, i.e., lowest landholders. If we club these two results, it shows the lower caste medium landholding communities have the highest probability to join with the proposed conservation program irrespective of the nature of the institution. Since their willingness to join (or value) does not have an institutional constraint, it is more important, when the policy makers expect an immediate response towards the needs of forest protection from this group of people.

7. Table 5 Logistic Regression Estimate of Willingness to Join for Strengthening Biodiversity Conservation at Periyar Tiger Reserve irrespective of the Institutions

Explanatory Variable	Reference Category Variable	Willingness to join - Odds ratios [Exp (B)]
<u>Age</u>	Youthful	
Middle Age		1.0918
Old Age		0.1408***
<u>Family Size</u>	Small	
Medium		0.4563
Large (Above 6 members)		1.5215
<u>Schooling</u>	11 to 17 years	
5 to 10 years		1.8538
0 to 4 years		1.8943
<u>Caste</u>	Upper caste Migrants	
Lower caste (SC) migrants		18.7768*
Tribes (ST)		14.0478*
<u>Land holding</u>	Less than one acre of land	
1 to 2		5.5554*
2 to 3		3.8226**
3 to 4		25.4608*
4 to 5		1.8694
More than 5 acres		0.3235
-2 Log Likelihood	162.644	
Goodness of Fit	189.791	
Model Chi-Square	67.824*	
Degrees of freedom	13	
*represents 1 per cent and ** 5 per cent significance level		

Source: Estimated from Survey data

When we extended the analysis for the entire sample, assuming that there is no barrier or condition in the willingness to participate, the odds ratios of tribes and lower caste were significantly as high as we have seen in the earlier analysis. Table 6 also shows the odds ratios of higher landholders are also significantly high, as seen in table 5. Therefore, these results again substantiate the present view that the spontaneous response towards the needs of forest protection can be expected, only from tribes with considerable source of income (agriculture land) and lower caste migrants. Hence, the policy makers and managers of this sanctuary have to focus on the tribes and other lower caste communities for a spontaneous response towards the needs of the sanctuary's protection.

8. Table 6 Logistic Regression Estimate of Willingness to Participate for Strengthening Biodiversity Conservation at Periyar Tiger Reserve irrespective of the Institutions.

Explanatory Variable	Reference Category Variable	Willingness to Participate - Odds ratios [Exp (B)]
<u>Age</u>	Youthful	
Middle Age		0.8686
Old Age		0.4126
<u>Family Size</u>	Small	
Medium		0.8568
Large (Above 6 members)		1.0251*
<u>Schooling</u>	11 to 17 years	
5 to 10 years		0.5451
0 to 4 years		0.7204
<u>Caste</u>	Upper caste Migrants	
Lower caste (SC) migrants		5.7853*
Tribes (ST)		10.8266*
<u>Land holding</u>	Less than one acre of land	
1 to 2		14.4867*
2 to 3		7.4410
3 to 4		12.7101*
4 to 5		12.7101*
More than 5 acres		12705.96
-2 Log Likelihood	148.647	
Goodness of Fit	168.45	
Model Chi-Square	79.350*	
Degrees of freedom	13	

Source: Estimated from Survey data

From this analysis, we found the hypotheses stated above is valid since the socio-economic variables like landholding, higher level of schooling, small family size, caste, etc have a significant role in explaining willingness to participate. The high significant odds ratio of the tribal community shows the importance of community root in the participatory protected area management.

Conclusion

The study largely draws from the preference elicitation of the people living in and around the Periyar Tiger Reserve of Kerala State, using a contingent evaluation format questionnaire. We found that there is a higher probability to materialise people's participation in the protected area management for biodiversity conservation. Above all, there is an economic value for biodiversity conservation, which is the most important factor determining people's participation in protected area management. The recent measures and proposals taken in this respect have resulted in the establishment of eco-development projects around some protected areas and the call for a system of joint protected area management. These measures and proposals are important moves not only toward decentralising government control over forest and toward increasing the participation of people in habitat management but also to make the biodiversity conservation a reality. As far as the eco-development programme of the PTR is concerned, it is important to say that the immediate needs of forest protection can be expected only from tribes with considerable source of income (agriculture land) and lower caste migrants.

Appendix

Sampling Distribution of the Household in the Study Area (Year of Survey September 1998)

Landholding Class in Acres	Sample	Population
Less than 1	56	188
1-2	48	164
2-3	31	105
3-4	20	68
4-5	10	34
Above 5	12	41
Total	177	600

Source: Estimated from Survey data.

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