Community Dependence on Non-timber Forest Products:
A Household Analysis and its Implication for Forest Conservation

C.S. Shylajan and G. Mythili

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A Household Analysis and its Implication for Forest Conservation[1]

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Abstract

This study explores the factors determining the dependence of local people on protected area of forest based on household analysis of a Protected Area from Kerala. The findings confirm the hypothesis that alternative income source would greatly reduce the dependence and hence ease the conflict between local people interests and forest management in conservation activities. This study raised certain issues in the institutional mechanism of marketing and management of non-wood forest products. The price spread highlighted the large difference between sellers (gatherer's) price and final retail price. Ensuring a fair share to the local people in the final value added and bringing together traditional knowledge of the villager and the commercial ventures making the final product for efficient sharing of benefits would act as incentives for the gatherers to extract the product in a sustainable way and also to cooperate willingly in the conservation activities.

Key Words: forest products, sustainable management, community livelihood
JEL codes: Q23, Q56, O13

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1. Introduction

The interaction between forest and forest dwelling communities received increasing attention from social scientists and policy makers due to its significance from the view point of community welfare and sustainable forest management. This is particularly true in the case of benefits from non-timber forest products (NTFPs). Hence sustainable management of NTFP is of crucial importance for sustaining the livelihood of rural poor. Community -forest relation assumes importance in social development policies also because people who depend on forest for their livelihood suffer from geographical isolation and social exclusion. The role of non-timber forest products (NTFP) in the economic development of local communities and sustainable forest management has been documented by many researchers (Arnold and Perez, 2001; Panayotou and Ashton 1992). Eighty per cent of the populations of the developing world depend on NTFP for their primary and nutritional needs. The global monetary value of plant-based pharmaceuticals in OECD countries is estimated to be 500 billion US dollars. Some 50 million tribal people in India depend on NTFP for meeting their subsistence consumption and income needs.

India occupies 1.8% of World's forests but supports 16% of human population and 18% of livestock population. Forest plays a vital role in the rural poverty eradication program due to its contribution to employment generation to rural poor and support to development of agriculture. National Forest Policies between 1950 and 1970 were mainly timber oriented. Concerned with the increasing depletion of forest biodiversity, the subsequent policies, Wild Life (Protection) Act of 1972, Forest Conservation Act of 1980 and National Forest Policy of 1988 have reoriented the objectives by treating forest as environmental and social resource rather than as a mere revenue earning resource. To overcome depletion of biodiversity, a network of 'protected areas' comprising 504 sanctuaries and 89 national parks encompassing 4.8% of the country's total area constituting all major ecosystem was established. A two fold strategy was adopted; (1) to protect and improve existing forest resources and (2) to undertake afforestation in non-forest and degraded lands. The 1988 Forest Policy also recognized forests as a source of goods for use by the local population. Management of forest

for NTFPs started receiving attention, thanks to a seminal paper by Peters *et al*., (1989), where it has been demonstrated that the potential long-term benefits of managing forest for NTFPs far exceed the benefits from timber or from conversion to agriculture.

Past surveys showed that over 65 per cent of the protected areas were characterized by human settlement and resource use (Kothari *et al*, 1989). Attempts to protect PAs from human intervention by coercion have often led to hostile attitude of local people towards wildlife management and sometimes to open conflict (Nadkarni, 2001). The National Forest Policy of India, 1988 declared that local communities were to be involved in natural resource conservation. The Joint Forest Management (JFM) approach in India seeks to develop partnership between state forest departments as owners and local community as co-managers for sustainable forest management. In this context, it is important to know to what extent the local people depend on and what factors determine the dependence on forest.

2.   Focus and Objectives of the Study

For designing an incentive based mechanism for the conservation of forest which benefits the forest depending community, it is crucial to know the benefits that accrue to the society from the extraction of NWFPs. Forest conservation offers a variety of opportunity benefits such as direct use values, indirect use values, option values and existence or non-use values (Krutilla, 1967; Perrings, 1995). For most of the products there are no proper markets for transaction, and hence economic valuation becomes difficult. They are not properly accounted for in the total value. Keeping this in the background, the present study attempts a) to impute income generated from NWFP using household data (b) to examine the extent and nature of dependence on forest by various local communities in a protected area and factors influencing the dependence (c) to compute the present value of foregone benefits to the local community due to loss of access to the forest and finally d) to draw inferences for sustainable management of NTFPs and community livelihood.

The rest of the paper is organized as follows. The third section surveys the relevant past studies. Methods and data are discussed in section 4. This is followed by empirical analysis of income generated from NWFPs and the community dependence on forest. The sixth section discusses some drawbacks in the present mechanism in resolving the conflicts between local community and forest departments. This section presents some alternative mechanism which could be considered for success of the program. The last section presents policy implications.

3.   Inferences from the Past Studies

There are various studies which estimated income generated from NTFP using household data. Overall the income derived from NTFP ranges between 20% and 40% of the total income of the household. Various approaches such as direct method and indirect method have been used to value the resources. In what follows, few relevant studies have been discussed.

In an interesting study, Gunatilake *et al* (1993) estimated the composition of income in the peripheral communities, particularly from the extraction of non-timber forest products from the National Wilderness Area of Knuckles in Sri Lanka through household survey. The rural economy was described using a farming system approach and the net income contribution by each activity in the farming system was estimated. NTFP formed 16.2 per cent of the total income of the family. The study shows that the share of NTFP declines as income increases.   For the lowest income group, contribution of NTFP accounts for about 31 per cent of the total income of the family, indicating a greater economic role of NTFP among low-income families.

In another study, Chopra, (1994) discussed user valuation of different NTFPs and evaluated marketing channels from the viewpoint of efficiency. Methodologies for the determination of social value with two kinds of market imperfections have been suggested. *viz.* (1) those occurring as a consequence of preferences with respect to income distribution and (2) those relating to imperfect inter-temporal markets. On an average, 40 percent of household income is contributed by the NTFPs. The study also shows that nationalized channels or institutionalized arrangements do not give the gatherer a better deal. According to the study, moving towards more integration with markets is the preferable policy option. The author has examined the concepts of value from various perspectives focusing on preservation value[2]. The vast difference between the price paid to the gatherer or local producer and the retail price has also been noted by a few researchers. It has been reported that for several items of non-wood forest products the local producer receives only a negligible portion of the final consumer price (Chandrasekharan 1996).

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[2] This is defined as the opportunity cost of reducing present use to sustainable levels.

There are a few studies, which attempted examining the factors determining community dependence on forest. Gunatilake (1998) has examined the community dependence in the tropical rain forest in Sri Lanka. The case studies were conducted at two sites, *viz.* Knuckles and Sinharaja forests. The results of the analysis in both sites indicate that the opportunities of income generation from non-agricultural and non-forestry activities reduce forest dependence, even though some of the variables such as distance to the forest and debt level produce different results between the two sites. From the analysis of Hegde and Enters (2000), level of education was also found to be an important variable in reducing the forest dependence. The study by FAO (1996) has highlighted the role of women in the protection and management of forests.

From the survey of past studies, it is evident that there were wide variations in the level of dependence on NTFP either on a per household basis or based on per unit of area depending on the various socioeconomic factors and the status of the forest. Many studies consider stock of NTFP for valuation purpose. Even though stock is more relevant for forest conservation purpose, from the viewpoint of livelihood of local community, flow concept is more relevant. In the Indian context, none of the studies considered the 'net value' realized by the households. The importance of foregone benefits of forest conservation or the opportunity cost of loss of access to the forest has not received the needed attention in the literature except for a couple of studies. There are still a few methodological issues in the valuation of NTFPs. This has greater policy relevance because government may have to consider compensation when relocating the local people to outside-protected area. This study intends to fill some of these gaps.

4. Data and Methodology

4.1 Study Area

A case study has been conducted from the households of forest depending community in a 'Protected Area' of Forest to analyse the contribution of NTFP to the household income and the extent of their dependence. The region selected for this study is located in the state, Kerala. As per the estimate of the Forest Survey of India, 82 per cent of the forest cover in Kerala is under Dense forests with a Crown density of 10 per cent to 40 per cent and 18 per cent is under Open forests, which is known to be degraded forests. This is in contrast to the

estimates for India according to which extent of forest by density classes has been 58 per cent and 41 per cent under dense forest cover and open forest cover respectively.

A typical forest area from Wayanad district was selected (Box 1). Wayanad is a hilly district of Kerala lying in the sub-region of the Western Ghats in north Kerala. It is one of the 'hot spots' in India having a rich biological diversity. There is a large number of species providing various NTFPs. There are more restrictions and regulations on extraction of NTFPs in protected area. Dependence of local people is less in the non-protected area because of other income earning opportunities like plantations and farming. Secondary data from 'Federation' and 'Tribal Service Co-operative Societies' on marketing aspects have also been used for the study.

Box 1. About the Community in the Study Area

Wayanad Wildlife Sanctuary is situated contiguous to the protected area network of Negarhole and Bandipur of Karnataka State in the Northeast and Mudumalai of Tamil Nadu in the South -East. The whole area is administered under four Wildlife Forest Ranges. The forests in the protected area do not form a continuous stretch of habitat. Thousands of people, both tribal and non-tribal, live in and around the sanctuary benefit from the extraction of forest products. The major tribal communities in the enclosures are Kuruman, Paniyan, Kurichian, Kattinaikkan, Adiyan, and Urali. Kattunaikkan (KN) community is considered as descendants of a nomadic primitive hunter-gatherer group who roamed on the hilltops and caves. Traditionally they are honey collectors, food gatherers and hunters. The Paniyan (PN) is a numerically dominant tribal community. They occupy small plots of land and cultivate paddy, ginger etc. They form a major proportion of the agricultural laborers of the study area. Kuruman (KR) is another major group of tribal community. Compared to other two tribal communities, Kurumans are comparatively better in socio-economic status. Apart from the tribal, the ethnic groups living inside the protected area also depend on forest for various purposes such as fuel-wood, grazing etc.

4.2 Sampling procedure for household survey

To examine the extent and nature of dependence on forest, a household survey was carried out (Shylajan, 2001). For conducting primary household survey, one village Panchayat has been selected from the main portion of the protected area (PA). The Panchayat has been divided into ten village wards for administrative purpose. Out of ten village wards, two from interior forest area and two from periphery were selected for conducting household survey. As per the data collected from the Panchayat, 41 per cent of the households are tribal community and the remaining non-tribal groups. Out of total residential households, eight percent of the households, i.e.; 194 households have been selected for sample survey, of which tribal households form 80 and non-tribals, 114. A Stratified Random Sampling method was used for selection of households. Total number of tribal households are 80 and non-tribals, 114[3].

4.3 Marketing mechanism for the sale of NTFP

(a) Management of NTFP in Kerala

There are number of institutions involved in the management of NWFPs in Kerala. Important among them are 1) Minor Forests Product Committee, (2) Forest Department (3) The Kerala State Scheduled Caste Scheduled Tribe Development Co-operative Federation Limited and (4) Tribal Service Co-operative Societies. A review of historical facts reveals that the tribal communities have been engaged in the collection of various NTFPs since time immemorial (refer Box 2). While in the initial stage the collection was for self-consumption, later they started to extract more NTFPs for commercial purpose to meet their livelihood needs. In the later period, Britishers allowed private contractors to collect NTFPs on an annual lease rent basis. However, local people were allowed to collect some specified items. In 1970, the Government of Kerala granted the right of NTFP extraction from public forest to the tribal people. In 1978, a number of Tribal Service Co-operative Societies (hereafter, Societies) were started with membership reserved only for the tribal people.

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[3] The field survey was conducted during April 2000 to November 2000. A participant observation method was used to gather details on types of NTFP collected, season of availability of various NTFP, method of extraction of various products, labour time involved and distance traveled for collection of various forest products. Informal discussions were conducted with officials of the co-operative societies, forest range officers, tribal chiefs and other key informants in the study area before preparing the questionnaire for household survey.

These societies have monopoly right to procure the forest products, which are extracted by the tribal. In 1981, the Government of Kerala established an apex body of tribal societies viz, The Kerala State Scheduled Caste Scheduled Tribe Development Co-operative Federation Limited (hereafter, 'Federation') and it was entrusted with the right of monopoly marketing of all NTFPs collected by the Tribal Service Co-operative Societies.

(b) Collection and Marketing of NTFP

The tribal people are legally permitted to collect various NTFP, which have been notified by the state government. Minor Forest Products (MFP) Committee, takes all the decisions relating to collection, allotment of forest ranges to co-operative society, fixing lease rent, collection price (the price at which the products are procured from the primary collectors by the society) and selling price of the NTFP. Tribal people formed co-operative societies in different localities to organize collection. The Societies procure various NWFP from the tribal people giving them collection price fixed by the Federation. The executive committee of each co-operative society has full freedom to re-fix the MFP price, fixed by the MFP Committee. As per the rule, eighty percent of the sales price is given to the gatherers as Collection Price[4]. The twenty per cent of the sales value is shared between Society and Federation to meet their expenses.

The marketing of NTFPs by the private traders has been in existence since a long time and their supremacy in this area continued till the establishment of tribal co-operative societies and the Federation. At present, the Federation is one of the major organized marketing agencies of NTFPs in the State. It determines factors such as prices to be paid to the gatherers and selling price of various products. Auction is the most common marketing practice for sale of NTFPs, especially non-perishable items. The method of negotiation is used in the case of highly perishable items. The federation enters into an agreement with party interested in the purchase of the products and supplies the same at the rate mutually agreeable.

In Kerala, the NTFPs are marketed through different channels depending upon a variety of factors such as nature of the product, demand, distance of the market etc. (Muraleedharan *et al,* 1999). In the first channel, the products are marketed through the

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[4] The collection price paid to the collectors (tribes) by the societies is, at least theoretically, the cost of labour involved in the collection of NTFP .

'Federation'. In the second channel, the products are marketed through private traders. In some part of the State, Forest Department also practices marketing of some products. The primary collectors of the products also sell the products to retail shops. They are mostly owners of small provision stores in the locality.

Box 2. Extraction of NTFPs in the Study Area

Forest in Wayanad, especially the Protected Area, is rich in both plant and animal diversity. Most of the NTFPs are products of medicinal values. The major products collected are honey, various types of medicinal plants, spices, seeds, and gooseberry.

The pharmaceutical companies (Ayurvedic) are main consumers of majority of the products collected from the area. Gooseberry (Philanthus emplica) is one of the major food items collected in large quantity from the forests. It is used as a food item and also for preparation of medicines. Since it is highly perishable, it is mainly sold within the state. The study area is famous for medicinal plants, which are ingredients of many Ayurvedic medicines prepared in Kerala. There is a high seasonal variability in the availability of these products. While a few of the products are available throughout the year, most of the products are available only for a short duration of the year. Most of the medicinal plants are extracted during July to December. The availability of the products over time is determined by many factors such as climatic conditions, rate and nature of extraction, regulation over extraction by the institutional agencies, forest fire, and population pressure.

4.4 Calculation of price spread

An analysis of price spread has been carried out to understand the share of final price going to the primary gatherers. Price spread is the difference between the price paid by the ultimate consumer and price received by the producer (harvester/gatherer/primary collector in the case of NTFP). It includes the costs and margins of different agencies. The marketing costs comprise the costs of transportation, storage, grading and handling. The margins include the returns to the intermediaries for their functions. Analysis of price spread is significant from the policy point of view if the objective is to protect the interests of producers and consumers. The aim is to ensure that the services of intermediaries are made available at reasonable costs. Table 1 gives price spread estimated for some of the NTFP collected by the tribal people from the study area and marketed through the 'Federation'. It is seen that more than 50% of the final consumer price is captured by various marketing agencies for many products. Since Federation has monopoly power over marketing, gatherers are not allowed to market their products as they wish. Some of the products have alternative market in the nearby town. So the society tries to give more share of the sales price to the gatherers to prevent the leakage of these products to private parties. The percentage of collection price to sales price is higher for these products.

Table 1 Estimation of Price Spread of some NTFP marketed through Federation - 1999-2000*   **(Rs. per Kg.)**

NTFP items	Collection price at forest gate	Sales price of the Federation	Final consumer price	Price spread*	% of Collection price
Honey	119	133	200	81	59.5
Honeywax	80	135	203	123	39.4
Kalpasam	51	85	128	77	39.8
Cheevakkai	9	11	16	7	56.3
gooseberry	5	5	8	3	62.5
Kakkumkai	5	7	10	5	50.0
Atthithippali	10	16	24	14	41.7
Kunthirikkam	30	39	58	28	51.7
Kudampuli	74	110	165	91	44.8
Pachottitholi	11	13	19	8	57.9

Source: Mythili and Shylajan, 2002.

* for non-medicinal plants. The computation was not possible for medicinal plants because there is a wide gap between the collection price and sales price. It is so because the society procures the medicinal plants , as a fresh biomass and so the price is less. The Federation sells these products as a dry biomass (value addition just by making it dry) . In dry form, biomass quantity is less but the price is more (almost 6 times more than the fresh biomass)

4.5 *Method of computation of household income from NTFP and its present value*

In the present analysis, only 'non-wood forest products' (NWFPs)[5] are considered for NTFPs. The term 'non-wood forest products' is relatively a new term being used generally to mean forest products other than wood. However, for the present study modified version suggested by FAO (1995) has been used. As per FAO definition, *'Non-wood forest products include all goods of biological origin, as well as services, derived from forest or any land under similar use, and exclude wood in all its forms'.* In this, timber, poles, small wood, fuel-wood and charcoal are excluded. Even though FAO definition includes forest services such as grazing, viewing wilderness, hunting of wild life etc, we have excluded these services from economic valuation. Hunting of wildlife is excluded from the calculation of value since it is legally banned inside the protected area.

Commonly used techniques for valuing the gross annual value of non wood forest products are the income approach or products and services approach, whereby the physical production of goods and services is valued using actual or surrogate market prices of the resource. Non-wood forest products can be distinguished between 'inventory' (the stock) and 'flow' (quantity actually collected by the people). For the present study, the flow of quantity of NWFP extracted by the people, have been used. Products consumed at home are valued at their retail purchasing price in the village town. Wherever the market price was not available, prices of substitutes have been used. The household members sell the products either to 'co-operative society' or market them through the private channel. The gross and net returns from non-wood forest products of commercial use are estimated as follows:

$$GR = \sum_i \sum_j \sum_k P_{ki} Q_{kij}$$

$$NR = GR - \sum_j C_j$$

where GR = Gross income from NWFPs obtained by a household

P_{ki} = The forest-gate price of the product i marketed through
k[th] marketing channel. k = 1 and 2 indicating private market and the society.

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[5] NTFPs and NWFPs are interchangeably used in the study, though we have considered only NWFPs for the analysis.

Q_{kij} = The quantity of non-wood forest product i collected by the jth member of the household and marketed through kth channel during the season

NR = Net income from NWFPs collected by a household

C_j = Combined cost of extraction of all types of NWFPs by the jth member of the household.

The major part of the cost is labour time involved in extraction. Cost of transporting the products to market, if any, is also included. The two main activities in the forest village are agriculture and collection of NWFPs. In the off-season, the NWFP gatherers work as agricultural laborers. Hence, the wage rate at the time of survey is used as opportunity wage to compute cost of labour time involved for collection of NWFPs. For those products, which are extracted during nights, the time spent during the night has been included to calculate alternative cost of labour. Present worth of the NWFP was calculated for those products that are extracted for commercial use. The estimation was done for two major forest dependent communities; Kattunaikka and Paniya. Based on single year income, the present income was calculated on the assumption of constant annual income. These values would serve as a good indicator of minimum compensation to be made to the local communities if they were to be relocated for the purpose of forest biodiversity conservation.

Alternative discount rates have been for calculation. Following formula has been used for estimating present value.

$$PV = \frac{AV}{r}\left[1-\left(\frac{1}{1+r}\right)^t\right] \quad \text{for a finite time horizon t}$$

$$PV = \frac{AV}{r} \quad \text{for infinite period}$$

Where

AV = annual income from NWFP per household

r = discount rate

t = time horizon

4.6 Estimation Technique for analyzing factors influencing dependence on NWFP

The degree of dependence on forest by the local communities varies according to their socio-economic status and legal right to collect forest products. Dependence on purposes such as food, construction materials, fuel-wood for own consumption and for sale have been

observed. Average annual gross income of the household from the sale of non-wood forest products has been used as a proxy for measuring 'dependence' on forest. The analysis is conducted for those households who have legal or customary right to collect various NWFPs from the protected area.

The factors influencing the households dependence on NWFP for commercial purpose could be explained by the following variables (a) cost of collection (based on distance to the source of forest products) (b) alternative income generating options, (c) overall economic status of the household in terms of total land area under cultivation (d) availability of labor force etc. The equation and the variables are specified as follows:

$$Y = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \delta D_1 + \gamma D_2 + \mu$$

where Y = Annual Household Income from the sale of Non-Wood Forest Products

X_1 = Annual Household Income from daily wage i.e. occupational income

X_2 = Annual Household Income from Cultivation of own land

X_3 = Area under Paddy Cultivation

X_4 = Total area under Cultivation

X_5 = Number of Adult men in the household as a proxy for labor force (people in the group of 14-65)

X_6 = Number of Educated Adults in the age group of 14-65 who can read and write.

D_1 = Location Dummy

   = 1 for interior forest area
   = 0 otherwise

D_2 = Community Dummy

   = 1 for Kattunaikkan and Paniyan Households
   = 0 otherwise

The equation is estimated using Censored Regression *viz.* Tobit Model. In a Censored sample, some observations on the dependent variable, corresponding to known values of the independent variables, are not observable. We do not observe the dependent variable over the entire range. For instance, suppose the regression model is

$$Y = \beta_x + u$$

We observe Y only if $Y > 0$. Thus our model is

$$Y = \beta_x + u \qquad \text{if } \beta_x + u > 0$$
$$= 0 \qquad \text{otherwise}$$

In this case one cannot rely on only the observation for which $y > 0$ to estimate the regression equation by ordinary least squares (OLS) because the residuals do not satisfy the condition $E(u) = 0$ if we consider only those residuals such that $u > -\beta_x$.

In the present study, data on household income from non-wood forest products has zero values for some observations, corresponding to the households who choose not to collect forest products for commercial purpose. Tobit model overcomes bias and inconsistency that arise due to using OLS. Hence Tobit model is used for the present analysis.

5. Local Community and Forest Dependence- An Empirical Analysis

Forest product, besides providing food and other basic needs to the rural population, is a source of inputs into the agricultural system. However, these values are specific to a site and probably vary widely. The intensity of extraction of various products and forest dependency may vary among different communities, among households within communities and between locations in the forest. This section focuses on estimating income from NTFP at the household level and analysing the extent of dependence on NTFP by the local community. Various characteristics of the sample have been initially analysed for different communities.

5.1 Descriptive analysis

The demographic details of the sample households classified by the community are given in Table 2. Out of the 194 sample households, around 59 percent are non-tribe and the remaining 41 percent belong to three different tribal communities, viz. Kattunaikan (KN), Paniyan (PN) and Kuruman (KR). The average family size is 4.56. The average family size is almost same for tribal and non-tribal. Land ownership details given in Table 3 show that KN and PN community possess very little land with ownership entitlements.

Table 2.   Demographic particulars of sample households

Particulars	Tribal Communities				Non-Tribe	Total
	KN	PN	KR	Total Tribe		
No. of sample households	22	29	29	80	114	194
Total Population	93	142	140	375	509	884
% of Male Population	52.69	50.70	55.00	52.80	49.71	51.02
Average Family Size	4.23	4.89	4.83	4.68	4.46	4.56
Sex Ratio$^\$$	897	972	818	894	1011	960

Note: KN = Kattunaikkan, PN = Paniyan, KR = Kuruman
$^\$$ Number of females per 1000 males.

Table 3. Percentage Distribution of Household by Land tenure

Nature of Land Possession	Community				Total
	KN	PN	KR	NT	
Owned with legal deeds	13.64	3.45	68.97	71.05	54.12
Lease land and without legal deeds	4.55	51.72	31.03	28.95	29.90
Reserve Forestland	81.81	44.83	-	-	15.98
Total	22	29	29	114	194

Note: Figures refer to percentages to column total

The overall dependence on forest by the sample households for various purposes is presented in Table 4. All the sample households in the Kattunaikan community depend on forest for the collection of NTFP for sales and collection of food items for subsistence use. While the Paniyan community also largely depends on forest for these two purposes (79.39% and 72.41% of the households respectively); the dependency of Kuruman and non-tribe households on forest for these two purposes is meager. The households who depend on forest mainly for the collection of grass and bamboo for their own use belong to KN and PN

community. It is inferred that the households' dependency on forest for the Kattunaikan community households is the largest.

Table 4.   Percentage distribution of sample households depending on forest for various purposes

Particulars	Community				
	KN (n=22)	PN (n=29)	KR (n=29)	Total Tribal (n=80)	NT (n=114)
Collection of Non-wood Forest Products for Sale	22 (100)	23 (79.39)	2 (6.89)	47 (58.75)	7 (6.14)
Collection of Food Items for subsistence use	22 (100)	21 (72.41)	5 (17.24)	48 (60.00)	11 (9.65)
Fishing for subsistence use	16 (72.72)	19 (65.52)	8 (27.59)	43 (53.75)	9 (7.89)
Animal Food for subsistence use	7 (31.82)	2 (6.89)	1 (3.45)	10 (12.50)	-
Collection of Grass and Bamboo	21 (95.45)	16 (55.17)	11 (37.93)	48 (60.00)	47 (41.23)
Material for Agricultural purpose	0	0	9 (31.03)	9 (11.25)	13 (11.40)

Note: Figures in the parentheses are percentage of households in the particular community to the total.

Location of the households in the protected area is one of the important factors, which is hypothesized to influence the extent of dependence. Out of 71 sample households in the interior area, 36 percent of the households collect various non-wood forest products for sale. On the other hand, in peripheral area, percentage share of households who go for extraction is less (22 percent). It is expected due to two major reasons. In interior area, the major activity of the households is collection of NTFP. In the peripheral area, the alternative source of livelihood is more compared to interior area. Income from occupation and cultivation is more for people living in the peripheral area. The percentage of households who consume various forest products as food is also higher in the interior forest area. For instance, 46 percent of the households in the interior area collect various NTFP of plant origin as food items.

5.2 Income derived from NTFP

Products consumed at home are valued at their retail purchasing price in the village/ town and products sold in the market are valued at their forest gate price. The major group of NTFP is edible products, which include honey and gooseberry, and medicinal plants. Gross income per household derived from the sale of edible products was Rs.2673 and Rs.604 for medicinal plants (Table 5). While 76 percent was derived from sale of edible products, medicinal plants accounted for 17 percent. Since edible products, such as honey and gooseberry have private market in the nearby town, the intensity of extraction of these products is much higher compared to other products.

The major items collected for self-consumption are honey, gooseberry, various types of tuberous roots and mushrooms. The value of these items is calculated from the market price, if available, or from the price of the substitutes. The value derived from the products for consumption accounted for Rs.49 per household.

Table 5 .   Mean income from NTFP per household of tribes (both for sale and consumption) – Item wise classification

NTFP items	Value per household (in Rs.)	% to Sub-Total
A) NTFP of Commercial Use		
Edible Products*	2673.19	75.66
Medicinal Plants	604.37	17.11
Other Items	255.41	7.23
Sub-Total (A)	3532.97	100.00
B) NTFP of Consumption		
Honey	22.00	44.84
Tuberous Roots	7.95	16.20
Gooseberry*	15.40	31.38
Mushroom*	3.72	7.58
Sub-Total (B)	49.07	100.00
Grand Total (A+B)	3582.04	

*- Value includes collection by non-tribes also and it is negligible.

Gross income per household worked out for the two communities, Kattunaikan and Paniyan, are Rs.9542 and Rs.1936 respectively. If we deduct (labour) cost of collection and transportation, the net incomes are derived as Rs.4265 and Rs.325 per household respectively. The cost of labour time spent in collection of NTFP is imputed from the opportunity wage rate prevailing in the village. Further, if we allow for cost of labour time spent during night in collecting honey, net income per household is reduced to Rs.3544 for Kattunaikan community who are traditionally honey collectors; *viz.* a 17% decrease in value.

5.3 Present worth of NTFP

One of the major objectives of the Management Working Plan of Protected Area of Wayanad is to conserve forest biodiversity by rehabilitating various forest dependent communities from interior part of the PA to the outside protected area. In this context, it is important to know the foregone benefits of extraction of NTFP due to complete protection of the sanctuary. Table 6 describes the present worth of gross annual income from NTFP per household calculated for different time horizons and at different discount rates. We have calculated the present worth for two major tribal communities namely Kattunaikkan (KN) and Paniyan (PN). The present worth of gross income per household for Kattunaikan community is Rs.64030 at 8 percent discount rate for a time horizon of 10 years. The gross income projected for the population of this particular community is Rs.17.74 million at 8 percent discount rate for the ten-year period (Table 7). On the other hand, for Paniyan Community, the present worth of gross income per household is Rs.12996 at the same rate of discount and time period. The value projected for the population is around Rs.4.60 million, which is comparatively low compared to other community. Similarly, the values estimated at various discount rates and different time horizon is self-explanatory. In a recent study, Ninan *et al* (2000) have estimated that total value of non-timber forest products per household was around Rs. 6287 per annum. The foregone benefits of biodiversity conservation from NTFP in terms of present value was estimated as Rs. 67123 at 8 per cent discount rate assuming a time horizon of 25 years sample.

Table 6　　**Present worth of NTFP (gross) per household extracted for commercial use (in 1000 Rs.)**

Discount Rate (%)	10 Years		20 Years		Infinite Stream	
	KN	PN	KN	PN	KN	PN
8	64.03	13.00	93.70	19.01	119.28	24.21
10	58.63	11.90	81.24	16.49	95.43	19.37
12	53.92	10.94	71.27	14.47	79.52	16.14

Table 7　　**Present worth of NTFP (gross) of commercial use projected for the population (in million Rs.)**

Discount Rate (%)	10 Years		20 Years		Infinite Stream	
	KN	PN	KN	PN	KN	PN
8	17.74	4.64	25.95	6.79	33.04	8.64
10	16.24	4.25	22.50	5.89	26.43	6.91
12	14.93	3.91	19.74	5.16	22.03	5.76

Net present worth (NPW) of non-wood forest products per household and projected for population is reported in Table 8. It is derived after deducting cost of labour time spent for collection of various forest products and cost of transportation. The calculation is done on the assumption that NTFP extractors have positive opportunity cost of labour. Net present worth projected for population of KN community for infinite time horizon at 10 per cent discount rate is Rs.11.81 million while for Paniyan community it is Rs. 1.16 million. The values estimated by above procedure could be interpreted as the foregone benefits of biodiversity conservation from NTFP. These values would serve as good indicators of minimum compensation to be made to the local community if they are to be relocated for the purpose of forest / biodiversity conservation. However employment generation thorough alternative activities are equally important for the people who are relocated in order to sustain their livelihood in the long run.

Table 8   **Net present worth of NTFP for infinite stream**

Discount Rate (%)	KN community		PN community	
	NPW per household (in 1000 Rs.)	Projected for population (in million Rs.)	NPW per household (in 1000 Rs.)	Projected for population (in million Rs)
8	53.317	14.77	4.063	1.45
10	42.653	11.81	3.251	1.16
12	35.544	9.85	2.709	0.97

5.4 Estimates of Forest dependence model

In this section, the estimated results of the extent of influence of various factors on forest dependency, specifically dependence on NTFP, are presented. For reasons mentioned earlier, Censored Regression Model (Tobit Model) is used to estimate the parameters. The sample is restricted to tribal communities who are legally permitted to collect various forest products. As mentioned earlier, the dependent variable is gross annual household income from non-wood forest products for which market exist.

The estimated results given in Table 9 confirm that there is a significant negative relationship between the NTFP extraction and annual household income from cultivation. The inverse relationship between household income from non-wood forest products and income from cultivation indicate that households with more agricultural income depend less on NTFP. "Location" is a dummy variable introduced to know whether the settlement or hamlet in the forest area influences the intensity of extraction of various forest products. The coefficient of the dummy variable for location has expected sign but not statistically significant at 5 percent level. On an average a household living in the interior forest area derives an additional income of Rs.1464 per annum from NTFP compared to households living in the periphery, holding all the other factors constant. Since major source of income of the households located in the interior area is forest products, the intensity of extraction and pressure on forest will be much higher. "Community" dummy variable is introduced with 'Kuruman' community as the reference category. Both Kattunaikkan and Paniyan Communities collect more NTFP and derive more income from the products as compared to Kuruman community. On an average a household belonging to either Kattunaikkan or Paniya Community derive an additional income of Rs.10370 per annum as compared to the Kuruman community . The coefficient is statistically significant.

Table 9   **Estimates of Factors determining Forest Dependence**

Variable:	Coefficient	Standard Error	t	P > t
Annual income from occupation (Rs.)	-0.0388	0.0720	-0.54	0.591
Annual income from cultivation (Rs.)	-0.5042	0.2306	-2.19*	0.032
Number of adult men in the age group 14-65	-233.97	886.36	-0.26	0.793
Paddy area (cents)	-98.32	47.31	-2.08*	0.041
Total area (cents)	111.07	40.68	2.73*	0.008
Location dummy	1464.21	1444.83	1.01	0.314
Community dummy	10370.62	3179.78	3.26*	0.002
Educated adults in the age group 14-65	-1345.03	725.76	-1.85	0.068
Constant	-4900.13	3521.10	-1.39	0.168

* Significant at 5% level.

Number of Observations = 80
LR Chi^2 (8) = 64.17
Pseudo R^2 = 0.0630
Log Likelihood = - 477.275
Left – censored observations at $P < = 0$ =33
Uncensored Observations = 47

Another important variable that determines the extent of dependency is level of education. The inverse relationship between income from NTFP and number of educated adults in the household indicates that more the educational level more will be the exposure to the employment opportunities outside PA. The coefficient of total land area is significant but it does not have expected sign. It shows that the mere possession of land may not generate revenue flows unless it is put to use. If the households could not cultivate due to cash constraint or fear of crop damage from wild animals, then they depend more on forest as a major source of income. Similarly, due to fear of relocation of the households from the protected area to outside, people may hesitate to grow cash crops, which gives yield in later years. Another factor, the coefficient of which produced a sign against the hypothesis, is the number of adult men in the household. The result shows that there is a negative relationship between number of adult men in the household and income from forest products. However,

the result is not statistically significant. The reason may be that the women also actively participate in extraction activities. The negative relationship between annual household occupational income and forest dependence is as expected.

6. Issues in the Sustainable Management of Forest Products

6.1 Participatory framework and its failure

One of the policy issues in the rural livelihood of forest depending community is how to manage the products sustainably, so that it provides continuous flow of resources. Since the commercial value of the NTFPs have been increasing and estimated as Rs.90 million in 1988, state realized that it would be difficult to protect and regenerate the forests without the cooperation of the local people who depend on forest for their livelihood. That was the birth of Joint Forest Management (JFM). The 1988 Forest Policy facilitated implementation of JFM. Government of India provided guidelines to all the states for the "involvement of village communities and voluntary agencies in the regeneration of degraded forests" in 1990.

Even though the period between seventies and nineties was significant in shaping up what was evolved later as participatory approach, still it was not helping the poor to participate in the development process. The major part of planning and decision making was still centralized. In the period after nineties, a new set of policies gave way for more participation of the private sector. There was a move to reduce state's role and give more power for the user group and beneficiary group in the everyday management. In this period Panchayati Raj as local governance were provided more power and responsibilities. Even though joint forest Management agree upon sharing the responsibility and power with the local user groups, however ultimate procedures are greatly influenced by state and related departments' decisions. Even with the conducive environment for community involvement in the management of forests, number of problems arise in making the institutional arrangement sustainable. Deserving of mention are: (1) absence of legal rights for communities ;subjecting them to the approval of departments (2) Large share of benefits being appropriated by the forest departments. Substantial power still vests with Forest Departments to suspend and dissolve JFM committees. One of the noted criticism is that very poor and marginal have little say in the management process and often locally powerful groups in coordination with forest department highly influence the final outcome in deciding who should claim rights over a particular forest area.

Madhu Sarin et al., (2003) summed up very nicely how the state driven devolution policy, such as JFM have reduced scope for exercising democratic local control over forest management decisions. From a case study, they have found that reserve and protected forest policies have in fact increased the state control overall and hence delinked forest dependent communities from the management of local forest and land resources. There are certain political factors held responsible for the poor performance of JFM. Based on various studies, Damodaran *et al.*(2003) concluded that the whole JFM process can be understood as "a battle between Centre and State governments to operationalise their respective policy and property right perceptions on forests". Indeed the 1990 guidelines clearly laid down that local village communities, should have access to forestlands and usufruct benefits. This had the effect of setting in motion a new system of rights and concessions in reserved and protected forest areas of the country. There are other sources of conflicts between the Center and State Governments on JFM. Many states were not in favor of changing the existing forest working plans in JFM areas. Most of the States did not believe in empowering Forest Protection Committees with executive and financial responsibilities. The states are not willing to relegate powers due to the personal gain such power provides. Linking conservation with livelihood, Amita Shah (2004) highlighted the need for an appropriate combination of public private partnership such that public sector retains the regulatory role leaving other functions to private initiative through development of markets and institutions.

Some studies have highlighted the adverse intra community distribution of benefits from participatory approach. In an interesting study Adhikari (2003) described distributional implications of Common Property Resource Management. This is especially a concern when the community consists of socio economically heterogeneous groups and the benefits are derived jointly. There are some startling evidences that the formalized system of community property rights may result in gradual exclusion of poor or relatively less and less benefits accruing to the poor. This implies success of institutions may collapse and hence any type of participatory arrangement must address this issue for its success when dealing with heterogeneous groups. A case study of Nepal has been used to illustrate this problem. Bardhan and Dayton-Johnson (2000) observed a U-shaped relation between heterogeneity and common management. Very high and very low degree of inequality are likely to result in better management of 'common' whereas middle range inequality are liable to have poor

outcomes. The point is, differential returns to different groups within a resource using community must be given adequate emphasize to derive the successful management options.

Ghate (2004) has also examined distributional implications of benefits sharing among the communities under 'Joint forest Management' regime. It has been emphasized that equitable distribution of benefits is a pre condition for sustaining the collective action type of participatory approach to management. Another neglected factor in the discussion is acknowledgement of women's special values, knowledge and use of forest produce (Locke, 1999). Gender dimensions are never studied in JFM management. Added to this is the insensitivity of JFM to the intra-community variations regarding forest dependence. While the JFM agreement mention about the way of sharing benefits from timber, it never specified anything for sharing NTFP benefits.

6.2 *How to sustain participatory approach?*

Even though forests provide adequate physical resource flow to the community, there are problems in transforming it into a reasonable revenue flow. One of the major contention in JFM approach is that the gatherers get a very low share for the products extracted whereas the final value added fetches very high returns. This is especially the case when the products enter the pharmaceuticals. One way to tackle with this is to bring together the traditional knowledge of the villager and the commercial ventures making the final product. There were discussions on how to effectively devise incentive based schemes in the system where communities and pharmaceuticals enter into an agreement to develop traditional knowledge based innovations (eg. Aparna Bhagirathy, 2005). The interesting question is "what factors should be taken into account in sharing the benefits arising from commercial use of traditional knowledge?"

Practical difficulties need to be sorted out before working out a viable participatory framework. In European and North American countries where there is a reasonable degree of transparency and rationality in forest governance, the issues are settled through open public debates. JFM has the potential to generate diversified livelihood in rural communities and local empowerment as well as improved management through local participation. However the success very much depends on the nature of power sharing and benefit sharing (Castren, 2005). The state has to be free from undue rent seeking qualities. Case and Context specific strategy is needed for sustaining the JFM regime. One finds gap in the literature about complete stake holder participation in forest management.

6.3 Direct payment mechanism

Sustaining community involved forest management very much depends on the benefits to the community in such regime to sustain the interest of the community. However in degraded forests where the benefits to the community is meager, it is difficult to sustain their interests. Community contribution to forest protection and management provide number of off site environmental benefits. The community has to be compensated for providing such services. If the value of the variety of functions is accounted for, then providing compensation for the local people for their effort in maintaining the ecological stability would result in a win-win situation for both the beneficiaries of conservation and the local people who undertake the major task of conservation[6]. In soil and water conservation programs, people who participate enjoy direct benefits such as subsidies for inputs or technologies to continue with the program. But such concept is not extended to forest conservation. Direct payments approach has been working successfully in other countries (e.g. Brazil, Costa Rica, Guyana and Kenya). For instance, in Costa Rica, the National Forestry Financial Fund generate money from international donors, fuel taxes, hydroelectronic companies and other sources and make payment to the community directly involved in forest conservation. According to the Government of India, 1990 guidelines, JFM strategy is meant for regeneration of degraded forests. Less forest productivity and the absence of adequate resource flow to the community has been cited as one of the major reasons for failure of this strategy. Conservation provides external benefits such as climate regulation, water shed protection and variety of environmental services. However the notion of compensating local people for providing such benefits rarely find mention in the conservation strategy. There are strong empirical evidences to show that direct payment approach is more cost efficient than any indirect approach (Contrad *et al.*, 2001). Potential obstacles to direct payment approach in developing economies are (i) insecurity of land tenure (ii) inadequate enforcement of legal contracts and (iii) limited opportunities for non-agricultural investment. Designing a requisite institutional arrangement is crucial for the success of direct payment mechanism. One problem in direct payment of compensation is the measurement of off site benefits. Context specific analysis is needed to value the services to make the program sustainable.

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[6] If many beneficiaries are involved, direct payment mechanism may entail sizable transaction cost. In such instances, fiscal instruments such as taxes and subsidies may have to be followed.

7.   Policy Implications

The conflict between management and the local people is an unresolved issue in the protection of forest biodiversity and community welfare. The existing institutional mechanism for collection and marketing of NWFP in the study area faces many weaknesses. In the present marketing system by the Federation, there are many intermediaries between marketing agency and final consumer. Higher marketing margin by these middlemen results in higher consumer prices and low collection price received by the gatherers. An analysis of price spread in the present study has revealed that the percentage of the difference between final consumer price and the collection price was almost 60% for certain products. Hence, eliminating cost of intermediaries will improve the community benefits from the collection of NWFPs. This will also serve as an incentive for the gatherers to cooperate willingly in managing the products sustainably.

The conflict between centre's and states' interests have also been discussed in the literature. Viable mechanism for operationalising the participatory type needs to be worked out. When the JFM is practiced to degraded areas, which do not provide sufficient resource flow to the communities, it is difficult to obtain willingness of the locals to protect the forests sustainably. Hence offsite benefits must be accounted for in valuing the service of the community and a direct payment mechanism by the beneficiaries to those contributing to the conservation may be a better option as compared to JFM strategy.

There are strong empirical evidences that people who depend on forest products continue to remain poor. Given the limited resources, if the population expands, then dependence on NTFPs serves as a poverty trap than safety net for the poor. Some studies highlighted the ambiguous role of NTFPs in forest-poverty link. A diminishing forest resource base combined with limited ability to take advantage of other opportunities place the poor at risk for further deprivation. Hence the long-term goal should be to make the community less forest dependent. The household analysis of the present study on overall dependence on forest shows that income from other sources like cultivation is inversely related to extraction of NWFP. Hence providing alternate source of income for the livelihood either through employment opportunities or by a secured source of income from cultivation will help the community in the long run. The overall socio-economic upliftment of forest dependent communities will reduce the human pressure on PA and promote conservation of biological diversity.

REFERENCES

Adhikari B. (2003) " Property Rights and Natural Resources: Socio-Economic hetero-geneity and Distributional Implications of Common Property Resource Management" SANDEE Working Paper No. 1-03.

Aparna Bhagirathy (2005) "Using Traditional Knowledge for Commercial Innovations: Incentives, Bargaining and Community Profits", SANDEE Working Paper, No. 11-05.

Arnold, J E M and M. R. Perez (2001) "Can Non-timber Forest Products match Tropical Forest Conservation and Development Objectives?" *Ecological Economics* 39, 437-447.

Bardhan, P. and J. Dayton-Johnson (2000), "Heterogeneity and Commons Management" Research Report, Department of Economics, University of California, Berkeley, USA.

Chandrasekharan C (1996) "Non-Wood Forest Products- A Global View of Potentials and Challenges" in Shiva M P and R.B. Mathur Management of Minor Forest Produce for Sustainability, Oxford and IBH, New Delhi.

Castren, T (2005) "Ownership and Incentives in Joint Forest Management: A Survey", *Development Policy Review,* 23, vol 1, 87-104.

Chopra, K (1994) "Valuation and Pricing of Non-timber Forest Products: A Study for Raipur District of Madhya Pradesh", in SPWD (Society for Promotion of Wastelands Development) Valuing India's Natural Resources, New Delhi.

Conrad, J.C. and P. J. Ferraro, (2001) "Habitat conservation: The dynamics of direct and indirect payments" , Environmental Policy Working Paper Series, 2001-005, Andrew Young School of Policy Studies, Georgia State University,Atlanta.

Damodaran A. and Engel Stefanie (2003) "Joint Forest Management in India: Assessment of Performance and Evaluation of Impacts" Discussion Paper on Development Policy, Centre for Development Research, Bonn, No.77, October.

FAO (1995). Report of the International Expert Consultation on Non-wood Forest Products, FAO, Rome (www.fao.org/docrep/v7540e/v7540e28.htm).

FAO (1996). Forest Dependent Survival Strategies of Tribal Women: Implications for Joint Forest Management in Andhra Pradesh, India, www.fao.org/docrep/x0212e/x0212e09.htm)

Ghate, Rucha (2004) "The Issue of Equity in Three Institutional Structures in India" Paper presented at the 10th IASCP Biennial Conference at Mexico.

Godoy, R, H. Overman, and J. Demmer (2002). "Local Financial Benefits of Rain Forests: Comparative evidence from Amerindian societies in Bolivia and Honduras", *Ecological Economics* 40, 397-409.

Gunatilake, H. M., D.M.A.H. Senaratne, and P. Abeygunawardana (1993). Role of Non-Timber Forest Products in the Economy of Peripheral Communities of Knukles National Wilderness Area of Sri Lanka: A Farming System Approach, *Economic Botany* 47(3), 275-281.

Gunatilake, H.M. (1998). The Role of Rural Development in protecting Tropical Rainforests: Evidence from Sri Lanka, *Journal of Environmental Management*, 53, 273-292.

Hegde, R and T. Enters (2000) 'Forest Products and Household Economy: a Case Study from Mudumalai Wildlife Sanctuary, South India' *Environmental Conservation* 27(3), 250 –259.

Kothari, A.P., Pande., S. Shakhar and V. Dilnavaz (1989). Management of National Parks and Sanctuaries in India: A Status Report, Environmental Studies Division, Indian Institute of Public Administration, New Delhi.

Krutilla, J.V. (1967). Conservation Reconsidered, *American Economic Review*, 57, 777-786.

Locke, C. (1999) " Constructing a Gender Policy for Joint Forest Management in India" *Development and Change*, 30(2), 265-285.

Madhu Sarin, Neera Singh and R. K. Gopal (2003) , "Devolution as a Threat to Democratic Decision Making in Forestry? : Findings from 3 States in India" Working Paper 197, Overseas Development Institute, UK.

Muraleedharan, P.K.,U.M. Chandrashekhara,K.K. Seethalakshmi and N. Sasidharan (1999). Biodiversity in Tropical Moist Forests: A Study of Sustainable Use of Non-Wood Forest Products in the Western Ghats, Kerala: Monitoring and Evaluation of Ecological and Socio-economic Variables, KFRI Research Report No 162, KFRI, Peechi, Trichur.

Nadkarni, M.V (2001). Poverty, Environment and Development in India, in Hayes, A and M.V. Nadkarni (ed.) Poverty, Environment and Development.UNESCO, Thailand.

Ninan, K.N., S. Jyothis, P. Babu, and V. Ramakrishnan (2000). Economic Analysis of Biodiversity Conservation: The Case of Tropical Forests in the Western Ghats, Project Report submitted to World Bank aided India-Environmental Management Capacity Building Technical Assistance Project, ISEC, Banglore.

Panayotou, T and P. Ashton (1992) *Not by Timber Alone: Economy and Ecology for Sustaining Tropical Forests*, Island Press, Washington D.C.

Perrings, Charles (1995). The Economic Value of Biodiversity, In: Heywood, V.H.(ed) *Global Biodiversity Assessment,* UNEP, Cambridge University Press.

Peters, C.M., A.H. Gentry and R. Mendelsohn (1989). Valuation of an Amazonian Rain Forest', *Nature* 339, 655-656.

Shah, Amita (2004) " Linking Conservation with livelihood: Lessons from Management of Gir-Protected Area in Western India", Working Paper No. 148, Gujarat Institute of Development Research, September.

Shylajan, C.S. (2001). Economic Valuation of Non-wood Forest Products: A Study of Community dependence on Protected Area of Forest, Unpublished Ph.D. Thesis submitted to the University of Madras.