THE NATURE OF HOUSEHOLD DEPENDENCE ON COMMON POOL RESOURCES : AN EMPIRICAL STUDY IN INDIA

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Abstract

Common pool resources (CPRs) are resources to which varying degrees of access by local communities exist. While they may not be governed by strictly defined common property regimes, they do not permit of open access . Forests constitute a large component of CPRs. A recent set of studies on forest based CPRs distinguishes between household dependence on high value and low value forest products in terms of its welfare implications, The former is interpreted as dependence in the presence of choice and the latter as dependence in situations without choice. These studies then hypothesize that such a distinction is critical both from the perspective of policy making with a focus on human well-being. This paper aims at testing this hypothesis by distinguishing between collection of non-timber forest products (NTFPs) for self-consumption and for sale, using data collected for a sample of approximately 78,000 households from different states of India. The hypothesis stated above is tested with data from four states, Bihar, Karnataka, Madhya Pradesh and Maharashtra, selected for the presence of a large magnitude of forest CPRs. The econometric analysis of household data (using the multinomial logit and logit frameworks) from the cross-sectional data set is rooted in a simple static household-decision making model.

Results obtained indicate that, in general, in the four states studied, households collecting only for sale are not likely to be income poor; they may even be asset rich and collect because they have more secure property rights. They also have greater access to forests and to markets. In pockets of the country, forest CPRs are providing the basis of income generation for households with multiple options. These results point towards the possibility of a new role for NTFP collection from CPRs in the context of market driven development.

Key Words: Common Pool Resources, , Income and Asset poor households, Non timber Forest Products, Forest Dependence, Collection with and without options

Abbreviations: Common Pool Resources (CPRs), Non Timber Forest Products (NTFPs), Households collecting for sale only (HCSOs)

JEL categories: Q23, C35

The Nature of Household Dependence on Common Pool Resources: An Empirical Study in India[1]

I The Nature of Household Dependence on Common Pool Resources: Alternative Approaches and A Hypothesis

Common pool resources are resources to which varying degrees of access by local communities exist. They are non-exclusive resources to which rights of use are distributed among a number of co-owners, generally identified by their membership of a community or a village. Multiple and often overlapping property rights and regulatory regimes exist. " Common property resources", on the other hand are defined in the literature as ' private property for a group'[2]. Common pool resources thus include community pastures and forests, wastelands, common dumping and threshing grounds, watershed drainages, village ponds, rivers and other common water bodies in the context of which well-defined property regimes do not exist. At the same time, free or open access does not prevail too. The de-facto access may therefore be limited to some groups and legitimised by law, convention, customary rights or traditional practices. In the continuum of property rights "common pool resources" lie between common property

[1] The authors wish to thank the National Sample Survey Organisation for access to household level data collected as part of its Fifty Fourth Round in 1998 and members of the Institute of Economic Growth Faculty seminar for useful comments. Two anonymous referees provided insightful comments which improved the content and presentation of the paper and the authors wish to thank them The usual disclaimer applies.

[2] See, for instance, the definition by Bromley (1989)

resources and openly accessible resources. They include different categories of government forests.

Because of the different social institutions through which access to them is possible, it has not been easy to determine the magnitude of common pool resources (CPRs) in India, as indeed in most other developing economies. Different methodologies have been used to estimate it and estimates have varied.[3] There is general agreement however, that in large parts of the country, CPRs provide a source of consumption and income, and therefore utility augmentation, for households that have access to them. In large parts of the country, mainly in the arid and semi-arid regions, CPRs are of a magnitude large enough to impact labour-time allocation of large numbers of households Further, forests constitute a large part of CPRs[4] and a large part of the literature on CPR dependence is centred around forest dependence. This paper examines whether this forest dependence of households is the consequence of an absence of alternative options for poor households. Or, is it the outcome of choice made in the presence of other alternatives? This

[3] The terms "common property" and "common pool" resources have often been used synonymously in the empirical literature. A distinction is now made with the former being a subset of the latter, relevant only when well laid out rules for entry, use and exit from the group possessing the right exist. Estimations in effect target at common pool resources. In India it is estimated that such land resources are about 70 million hectares, concentrated mainly in the central plateau areas and the arid and semi-arid zones of the country.

[4] Chopra and Gulati (2001) estimate that forest department owned common pool land resources are 25.069 million hectares of the total of 70 million hectares. A large part of the rest (under the ownership of local bodies and private ownership with periodic common access) are also forest ecosystems. Hence the dominance of forest ecosystems in CPRs.

distinction is important in many ways. Its philosophical roots lie in Sen's (1992 and 1999) assertion of the inherent significance of free choice in assessing developmental activities[5]. If affluent households with alternative options still depend on forests and other CPRs, it provides pointers towards heightened future rates of extraction from them. On a more positive note, it indicates that if the "not poor" people view the commons increasingly as a potential source for enhanced livelihood opportunities, the management of the commons as a collective resource holds promise(Vira 2002).

Recent literature provides indications that different kinds of forest dependence exist in all parts of the world. Pattanayak and Sills (2001) find for instance that relatively wealthier households use NTFP collection from forests to reduce risk and smoothen variations in consumption and income. The distinction that Fisher (2004) makes between low return forest activity(LRFA) and high return forest activity(HRFA) is also significant in this context. Fisher concentrates on the significance of these two kinds of activities in determining the role of forests in either "prevention" of poverty (associated with LRFAs which supplement income and may also buffer adverse shocks) or "reduction" of poverty (associated with HRFAs which are market oriented).

Godoy and others (1993 and 2002) have also argued that increases in income and modernization of economies lead to changes in the mix of forest activities on which people depend. They postulate that forest extraction opportunities decrease with increase

[5] Of late, a large number of empirical studies support the view that existence of "choice is an indicator of the success of development projects and hence of the absence of poverty.(See, for instance Alkire 2002).

in incomes from cultivation. Gunatileke and Chakravorty (2003) show for Srilanka that households at times make a deliberate choice of spending labour time available on forest extraction as against agricultural activities. Byron and Arnold (1999) emphasize that there exists, "the need to distinguish between those uses of the forest which reflect actual dependency on the forest in the sense that the users would be left seriously worse off in their absence and those uses which reflect choice and the presence of adequate alternatives." Angelson and Wunder (2003) also maintain that forests have both potentials and limitations for improving human welfare. Another way of stating the same is to note that the above studies distinguish between household dependence on forests in the presence of choice and in situations without choice. Such a distinction is critical both from the perspective of human well-being and from that of policy making. The existence and expansion of options or choices extends households' capabilities and constitutes an important component of development processes.

This approach is distinct from the early literature on CPRs, in the developing country context, which postulated that they supplement rural livelihoods and act as safety nets for the poor, seasonally or specially in times of agricultural crises. Earlier studies such as Godoy and Bawa (1993), Cavendish (2000), among others, focuses on the supplemental role of non-timber forest product (NTFP) collection for the poorest households. a Their approach can be characterized as highlighting the "substitution"between CPR based means of livelihood and other primary source of rural livelihood, .e.g. agricultural income[6]. Another strand in the literature points out the

[6] Several micro-studies in different parts of India also provide evidence to support this proposition. The important role of common pool resources in reducing income disparities in the rural areas when other

complementarity between agricultural output and the use of CPRs as inputs to agriculture[7]. Our approach hypothesizes that forests as natural capital may provide independent and market linked livelihoods to the non-poor and attempts to determine empirically whether and to what extent this is true for India.

Further, this paper seeks to understand whether there has been any change in the nature of household dependence on common pool resources in the particular context of non-timber forest products. The present approach postulates that the dependence arises out of market demand for high value products and is independent of self-consumption. It starts from the findings of earlier studies in assuming that collection for self-consumption are mainly by the poor and extends the argument by assuming that collections only for sale are likely to be undertaken by households with more assets and incomes at their disposal. If this

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sources of livelihood fail has been noted by different authors (CWS 2001). The landmark study of Jodha (1986), found that collections from common pool resources contribute 15 to 23% to poor peoples' income. Several others (Pasha 1992, Beck and Ghosh 2000) found that household income of the rural poor was augmented by 12 to 15% from these resources.

[7] This complementarity has been cited in some studies as the *raison'detre* for households of varying socio-economic status to come together to protect and conserve the commons. Chopra, Kadekodi and Murty(1990) focus on the complementarity between agricultural and livestock incomes and protection of upper catchments for fodder collection and common water resources for irrigation. According to one study (Kadekodi and Perwaiz 1998) highlighting the complementarity between the two types of resources, the estimated correlation between them is estimated to be 0.8 from state level data. Such a situation could, in turn, mean that cultivator households get substantial benefits from CPRs. Singh et al (1996) found for instance that for eight villages in the state of Punjab, the annual income from common pool resources, for cultivator households was greater than that for the landless households.

hypothesis is upheld, important implications follow for the rate at which such demand grows in the future and the impact it has on sustainable use of forest products. It is precisely for this reason important to go beyond simple assertions of substitutability or complementarity of income from forests with income from other kinds of economic activity for the poor and, examine the nature of household demand for forest products with reference to the existence or otherwise of alternative options. In other words it is important to examine whether or not market driven demand for forest extraction by the non-poor is increasing.

The hypotheses stated above shall be tested with household level data from four states in India. The econometric analysis of a large cross-sectional data set is rooted in a simple static household-decision making model, both of which are described in Section II. The model serves to give a conceptual framework to the study of household decision making. The data set is described in detail in Section III. For purposes of econometric estimation, we focus on NTFPs, collected both exclusively for sale and sometimes also for self consumption. These are products in which collection exclusively for sale is more extensive. Multinomial logit and logit frameworks are used for analysis of household decision-making. Section IV gives the models and results obtained and Section V concludes with observations and suggestions for further work.

II The Model and the Estimation Equations

Within the framework of a one period labour allocation model, with the stock of the resource and the annual flow of products and services assumed to be given and fixed, households typically divide time between collection from the commons, working for a wage income and, leisure. They may also have some non-labour incomes. In this section we formulate a model to capture household behaviour with regard to labour allocation, with differential returns to time spent in collection and time spent in other wage employment.

The household derives utility from the consumption of non-collected goods as well as from the direct consumption of goods it collects for this purpose from the CPR. The modeling approach explicitly brings in the options for sale of collected products. This is characterised as follows:

- let w be the returns to a given employment available for time T_o (where T_o is thus effectively an employed labour constraint)
- assume that the rest of the time ($T-T_o$) is spent on leisure, collections for consumption and collections for sale. With p^m as the returns per unit time for collection, the model is set up as follows:

The utility function is given by:

$$U = f(X, L, C)$$

$U_x, U_L, U_c > 0; U_{xx}, U_{LL}, U_{cc} < 0$ .. …… (1)

and $C = F(\alpha_c, T_c)$…….(2)

X: Consumption of non-collected goods with a price of unity

L: leisure time

C: Consumption of goods collected from the commons

$\alpha_c = T_{cc}/T_c$ where $T_{cc} + T_{cs} = T_c$

Distinguishing between time spent in collection for consumption (T_{cc}) and time spent on collection for sale (T_{cs}), implies : $T_c = T_{cc} + T_{cs}$ where, T_c is total time spent on collection activities. Let α_c be the proportion of time spent in collection for self-consumption out of the total time spent in collection activities (T_c). Collection is proportional to time spent; hence consumption C can be assumed to depend on α_c and T_c, the total time spent on collection. Therefore, α_c is treated as the decision variable with the time constraint being such that:

$T = T_c + T_o + L$ …….(3)

The full income budget constraint is defined in terms of a time constraint as:

$I + p^m(T - T_o) + w T_o = p^m L + X + \alpha_c p^m T_c$……..(4)

In this constraint I represents non-labour income (for instance remittances, interest income on assets).

This constraint reflects the fact that given a labour employment constraint of T_o, the household allocates the rest of its time $(T - T_o)$ between leisure (L) and collections from commons (T_c), whether for sale or consumption. Thus, the returns to T_o are evaluated at w, while the returns to time spent on collections and leisure are evaluated at p^m .

The Lagrangean is set up as follows to derive the optimality conditions.

$£ = U(X, L, C) + ë \{I + p^m (T - T_o) + w T_o - p^m L - X - \alpha_c p^m T_C\}$…….. (5)

The first order conditions on the decision variables imply:

$£ x = U_x - ë = 0$ …….(a)
$£_L = U_L - ë p^m = 0$ ……(b)
$£ \alpha_c = U_c C \alpha_c - ë p^m T_c = 0$ ……(c)
$£ T_c = U_c C_{Tc} - \alpha_c ëp^m = 0$ ……(d)
$£_{ë} = \{I + p^m (T - T_o) + w T_o - p^m L - X - \alpha_c p^m T_c$ ….. (e)

from (a) and (b) : $U_x/U_L = 1/p^m$

$ë = U_x = U_L / p^m$

from (c) and (d) : $Uc C \alpha_c - ë p^m T_c = U_c C_{Tc} - \alpha_c ëp^m$

Since, $Uc C \alpha_c / ë p^m = T_c$,

This leads to the following:

$\alpha_c ëp^m = U_c C_{Tc} - Uc C \alpha_c + ë p^m Uc C\alpha_c / ë p^m$ ……(6)
$\alpha_c ëp^m = U_c C_{Tc}$ ……..(7)

The above condition implies the following:

The left hand side gives the gain in terms of the proportion of time spent in collection for consumption, evaluated at the market rate of return. This is equated to the (right hand side)gain in utility (in terms of X) from a unit increase in T_c through increased access to marketed commodities arising from the returns (sale value) out of collection time (T_c) that the household is able to sell.

This system would therefore solve for an optimal α_c where,

$\alpha_c = \alpha_c (p^m, w, T_o, I)$ …….. (8)

It follows that (1- α_c), the time spent on collection for sale, say call it

$Ù^* = Ù^* (p^m, w, T_o, I)$ …….. (9)

Note that in this formulation the returns to time spent on CPR collection differ from w. We model an empirical context where we do not assume p^m and w to be equal because of imperfections in the market for labour caused by access related variables. Segmented labour markets thus co-exist at a point in time, with p^m the price of the marketed product, being different from the wage rate, w. Additional amounts of labour spent on collection are valued at w whereas the price available in the market for sale of collected goods is p^m, and with perfect labour mobility p^m would equate to w.

Thus it is evident that p_m and w need not be equal and that household responses would be dependent on the constraints they face. Households differ with respect to their capability to access product and labour markets and earn income at a rate of return of w, or to sell products at p^m . This access depends on household characteristics and is the basis for the differences in the nature of their dependence on forests. The categorization of households follows from the recognition of this fact that households can or cannot respond optimally because of the constraints faced by them.

The analytical model helps to locate household characteristics such as access to labour and product markets that determine the opportunity cost of their time and hence the time

spent on collection for sale. Analytically, households are distinguished between on the basis of the choice set available to them, which in turn is determined by access to product and labour markets. Through the opportunity cost of time, the effect of these distinguishing characteristics is reflected in determining which category the household belongs to. In the empirical investigation of household behaviour with respect to CPRs, a set of characteristics reflecting both exogenously determined factors and the household characteristics including asset and income position are included as explanatory variables.

In other words,

$$H_i(T_c, \Omega) = x\beta_i + e \text{.....(10)}$$

where $H_i(T_c, \Omega)$ stands for household category with respect to collection and sale of CPR products

In order to capture this differential access, the econometric model distinguishes between three categories of households as described below

β_i represents household characteristics as specified by a set of independent variables, x.

In the model, the dependent variable stands for the category into which a household falls with respect to its decision with respect to collections from CPRs.

Three categories of households are defined as follows: :

- The household collects and consumes but does not sell CPR products[8]: this category of households typifies dependence for survival at low income levels i.e. $\alpha_c=1$
- The household collects and sells, but does not consume CPR products: these households collections are market driven as they do not consume these products at all i.e. $\alpha_c= 0$
- The household collects for both sale and self-consumption: this category is typically a mix of the first two kinds of households i.e. $1> \alpha_c >0$

Further, we hypothesize that, in the household context, the decisions to collect/not collect and consume/sell are taken simultaneously at a point in time rather than in a sequential manner. Each household, faced with a set of conditions defining its income and asset situation and its market and CPR access situation, takes decisions which place it in one of the three categories. Since household decisions are not taken in a sequential manner, we consider a multinomial logit framework (MNL) to be appropriate for analyzing the data.

Further, households that collect only for sale are the critically different group. For them, sale of collected goods is an income enhancing activity, even in the absence of self-consumption requirements. For such households, this activity is the most appropriate mode of generating higher incomes, given other possible options. This paper focuses on such households. By highlighting their characteristics, the paper investigates into the

[8] Such a household is characterized also by limited or no access to product and labour markets. It typifies the household in the early CPR literature for which CPRs are a means of survival.

conditions under which and the extent to which forest based CPR dependence is an activity undertaken in the presence of other options and represents a market linked expansion of choices. The mixed category of households, those that collect for sale and consumption are difficult to identify as belonging to either the subsistence or the commercial sale categories. They represent parts of the process of change from collection for self use to sale of surpluses in the market, a continuum which as hypothesized above is not extended to include those who collect with the express intention of sale.[9] We estimate the above model for studying the nature of household dependence on CPRs for selected non-timber forest products collected from CPRs – fruits; roots, tubers, spinach, gums & resins, honey, medicinal/herbs, fish, leaves, weeds, grass, cane, bamboo, etc.

We consider a situation with three outcomes 1,2,3, recorded in y, and a vector of explanatory variables X. The three outcomes are unordered. In the MNL model, we estimate a set of coefficients $\hat{a}^{(1)}$, $\hat{a}^{(2)}$, $\hat{a}^{(3)}$ corresponding to each outcome category. The model however is unidentified in the sense that there is more than one solution to $\hat{a}^{(1)}$,

[9] In order to determine that households which collect only for sale are indeed located in a different cluster from the mixed category the following exercise was undertaken: the variable, proportion of sales to collection was generated for the mixed category and the mean value and variation in it studied. This simple diagnostic investigation on the households in the mixed category was done to capture variation within this category in terms of the proportion of sales out of total collections. The results are on the whole reassuring in terms of the low standard deviations. They indicate that mixed category households tend to cluster around the mean with low variation and those collecting only for sale are located in a 'distant' cluster away from them.

$\hat{a}^{(2)}$ and $\hat{a}^{(3)}$ that leads to the same probabilities for y=1, y=2, and y=3. To identify the model, we set $\hat{a}^{(1)}$ =0. The coefficients , $\hat{a}^{(2)}$ and $\hat{a}^{(3)}$ would measure the change relative to the y = 1 group..

The relative probability of y = 2 to the base category is

$\Pr(y=2)/\Pr(y=1) = e^{X\hat{a}^{(2)}}$

The signs and significance levels of these coefficients are interpreted relative to the base category of households, i.e. the group of households that collect from the CPRs for consumption only. It was considered appropriate to treat 1 as the base category since it is a "pure" case of households that collect for consumption only. The results shall be interpreted accordingly. Marginal effects have been calculated and interpreted in arriving at conclusions. In some cases where one category or more have very few observations, a logit estimation is conducted.

III The Data Set

III.1 Household Dependence on CPRs

The data used in this paper is taken from the 54th round survey conducted in 1998 by the National Sample Survey Organisation (NSSO) of India. Summary statistics was published in the NSSO Report (1999). We use the detailed household level data obtained from the NSSO for our estimations.

The survey relates to CPRs in the life and economy of the *rural* population. The major contribution of the report is that it provides for the first time in India a comprehensive state and national level database on the size, utilization and contribution of CPRs. It also provides disaggregated information at the State level in terms of agro-climatic zones.

The survey aims at an assessment of CPRs in terms of their contribution to the lives of the rural people. Thus, the role of CPRs in providing biomass, fuel, irrigation water, fodder for livestock and other forms of economic sustenance has been the main focus of the survey. The results are based on a comprehensive survey of 78,990 rural households in 10978 villages across the country[10].

The NSSO defines common property resources as resources that are accessible to and collectively owned/held/managed by an identifiable community and on which no individual has exclusive property rights. Two different concepts have been used to determine the size and access to CPRs in this report. The *de jure* concept was used for collection of data on the *size* of CPRs[11]. The second the *de facto* concept was used for collecting information on *use* of CPRs. According to this, CPRs were extended to include all resources which were in use by the community by convention irrespective of ownership, even if they were located outside the boundary of the village. The "use" data

[10] The details of the methodology used in the survey are given in the Appendix.

[11] In this approach only those resources were treated as CPRs which were within the boundary of the village and were formally held (by legal sanction or official assignment) by the village panchayat or a community of the village.

took into account the actual position with regard to access.while the size of CPRs was based on a stricter *de jure* definition Since in this paper, we use data on collections, it is the *de facto* notion of CPRs that underlies the data. This is consistent with our definition of CPRs as resources to which access is possible because of the existence of alternative legal and conventional sanctions. Further, the NSSO study (1999) is based on a substantially larger sample as compared to the micro studies on which earlier evidence with respect to CPR dependence has been reported[12]. It gives information on 78,990 households in 10, 978 villages. However, the proportion of CPR area in total geographical area falls in the same range as reported from the micro-studies. On average, the NSSO reports lower percentages for the value of collection to consumption expenditure. Further in qualitative terms, the relative dependence of the poor is more than of the non-poor. This is in keeping with the evidence from micro studies. Further, the country wide survey also corroborates the more critical dependence of the poor on CPRs for fuelwood in almost all parts of the country.

Insert Table Ia

Table Ia provides summary statistics on CPRs in India as estimated by the NSS. It becomes clear from the table that CPRs form a substantial part of the total geographical area (15% for the country) and that a large percentage (48%) of rural households report

[12] Some studies that may be mentioned are : Jodha (1986 and 1997), Pasha (1992), Chopra et al. (1990), Iyengar and Shukla (1999), and CWS (2001). For more detailed comparison of the two approaches to the study of CPRs see Chopra and Dasgupta (2002).

collection from CPRs. Additionally, the share of fuelwood in collection from commons amounts to 58% of the value of collections.

In general, the proportion of sales in total collections is uniformally higher for NTFPs according to the NSSO report, indicating a higher level of commercial activity for this product. Other studies also indicate that collection of non-timber forest products (NTFPs) from CPRs is more market driven than that of fuelwood and fodder[13]. , Some studies also note that at present there are no regulations on extraction for most NTFPs in most of the locations investigated (even in joint forest management and community forest management locations). This could have harmful consequences in terms of over-extraction and long-term sustainability[14]. Alternatively, improving access to markets, and higher returns from NTFP sales, could provide the motivating factor for better preservation of the forest.

b) India is a geographically large country and resource endowments differ across states. States for the detailed empirical study are selected on the basis of the significance of CPRs in their economies [15]CPRs are concentrated in the central plateau region and in arid and semi-arid tracts of the country. Hence in this paper

[13] See, for instance Rao(2000) for Andhra Pradesh,and Ravindranath et al (2000) for a study covering several states,

[14] In a recent article, Gaudet, Moreaux and Salant (2002) show that when storage is possible for future use, the extraction and depletion from common property resources is much faster. This is a hazard that could be enhanced with the expansion of market linkages.

[15] See the evidence in Chopra and Gulati (2001) on the magnitude of CPRs in different states in 1990-91.

we selected for study the states of Karnataka, Madhya Pradesh, Maharashtra and Bihar. According to the NSS data base too, CPRs constitute 22% of the land area in Madhya Pradesh and 11, 10 and 8% in Maharashtra, Karnataka and Bihar respectively. We have therefore a fairly representative sample of states with varying levels of CPR dependence. We estimate the multinomial logit and logit models a)for all four states as a single composite model for each of the four selected states using household level data.

Table Ib indicates the magnitude of dependence of households at the all-India level and in the selected states on CPRs as measured by numbers collecting each of three commodities, fuelwood, fodder and NTFPs. NTFP collection involves 7 to 24% of households in the four states, Madhya Pradesh having the highest percentage of 24%. Large numbers collect fuelwood from the commons in all four states, the percentage varying from 40 to 60, while the average for India is 36%. The percentage of households collecting fodder is lower, ranging from 9% for India to 17% for Karnataka. It is lowest in Madhya Pradesh at 9%.

Insert Table Ib

Table Ic gives the value of annual collections by households as reported in the NSSO study. On average the numbers seem lower than those reported by micro-studies. Note that value of NTFP collection per household at Rs 1936 per household for India is higher than that of fuelwood or fodder. Households in Maharashtra collect NTFPs of highest value at Rs 3047 approximately.

Insert Table Ic

Table Id gives a picture of the range of non-timber forest products collected in the states and in the country as a whole. At the all India level, leaves, weeds, cane grass, bamboo constitute a large part of total collections. Fruit and fish follow these. Maharashtra and Bihar follow the same pattern but in Karnataka, cane grass and bamboo are more significant than leaves. Fruit also constitute a larger part of total collections. In Madhya Pradesh where 24% of households are engaged in NTFP collection, 43.28% of the collections consists of leaves (possibly tendu leaves for bidi-making contribute significantly to this).

Insert Table Id

III.2 Collection, Consumption and Sales Behavior of households

In the analysis that follows we examine collection, consumption and sales behaviour of households with respect to NTFPs for all India and for the selected states i.e. Bihar, Karnataka, Madhya Pradesh and Maharashtra. The commercialized nature of this activity is evident from the fact that collection "for sale only" is a large percentage with 31.72% at the all-India level falling in this category. The percentage increases to 32 and 45% approximately in the states of Karnataka and Maharashtra. It is highest in Madhya Pradesh at about 68%.

Insert Table Ie

III.3 The Explanatory Variables

The multinomial logit and logit models seek to explain the varying nature of dependence of households on NTFPs through variations in household characteristics. Characteristics considered relevant for determining collection, consumption and sale behaviour with respect to CPRs are divided into four different categories, reflecting respectively, economic status, access to CPRs, access to markets and institutional arrangements governing collection.

For methodological consistency, we use the same data source, i.e. the NSS 1998 survey for generating household level information on the following sets of characteristics:

- Household economic status as approximated by the following three variables (these three indicators reflect different aspects of poverty: asset poverty, comparative social deprivation due to access factors or disempowerment and, income poverty): (i) Extent of land and livestock ownership : Data on livestock ownership is a categorical variable with two categories, ownership versus non-ownership. Land ownership is specified in terms of number of hectares owned, possessed and sown "Asset poverty " is defined as a condition describing households that do not own livestock and possess less than one hectare of land, and is used as a variable to capture household economic status.

  (ii) Net Area Sown . Area sown is an indicator of agricultural income in the current year

- (iii) Access to mechanized and irrigated agriculture is an indicator of a higher level of agricultural income from land sown.
- Ease of physical access to CPRs, the source of supply for NTFPs, is approximated by the variable "distance from forests"
- Ease of access to markets, the source for demand, is approximated by the explanatory variable "distance from metalled road,"
- Existence or otherwise of institutions for CPR management is defined as informal or formal norms governing access to and collection from CPRs, such as the existence of tree patta schemes which are in essence rights to the products of trees in existence in some parts of the country.

Table If gives descriptive statistics for the independent variables defined above.

IV The Model and the Results

IV.1 Model Estimation

As indicated in Section II, the multinomial logit and logit frameworks are used to determine factors impinging on household behaviour with respect to collection and sale of NTFPs. The focus of the study is on the characteristics of households which are "collectors from CPRs for sale", a category which is particularly large in the case of NTFPs as seen from the data presented in Section III..

NTFP Collection and Sale: Estimates from Pooled Data

The results for pooled data for all states show that households that collect for sale are typically those which have access to forests through some institutional arrangements such as tree pattas. They are also located at a greater distance from metalled roads. Households collecting for consumption and sale have less access to both irrigation and forest institutions. They appear to be the less privileged.

Insert Table II a

However, from Table IIa, it is clear the model does not explain well the factors that distinguish households collecting for sale only (referred to as HCSOs) by using pooled state level data. This suggests that in a country as diverse and large as India, it makes sense to examine regional pictures. Household behaviour across states may vary because of their being faced with different resource supply situations.. Introducing state level dummies in the estimation further corroborates such an understanding. It indicates that for households collecting for sale, the dummies are significant for the states of Madhya Pradesh and Karnataka. This means that we expect collection behaviour to be different for these two states. For household type 3, those collecting for sale and consumption, the dummies for Madhya Pradesh, Karnataka and Bihar are all significant. (See Table IIb), An analysis of state level data is therefore called for in order to have a better understanding of the factors determining the nature of household dependence on NTFPs collected from forest CPRs.

Insert Table IIb

NTFP Collection and Sale: State wise estimates

The state specific analysis uses the same set of explanatory variables for analysis of each of the four states. The total number of observations for each state-specific analysis obviously decline but are nevertheless sufficient to enable us to arrive at dependable results.

From Table IVc, the MNL results indicate that in the state of Bihar, households collecting NTFPs for sale only (HCSOs), are likely to have larger net sown area and hence obtain larger income from agriculture, be at a greater distance from forests and have greater access to tree pattas (an institutional form of access to the product of trees) than those who collect only for self-consumption. The magnitude of the marginal effects is also high for the variables net sown area and tree patta. This indicates that existence of secure property rights (through tree pattas) is more important than proximity to forests to enable a household to collect for sale only. Asset poverty is also a significant explanatory variable. It can be concluded that some asset poor households may also collect just for sale.

Households that collect for sale and consumption also are located further away from forests and have more land.

Insert Table IIc

In Karnataka,(from Table IId) households that collect NTFPs for sale only (the HCSOs) are less asset poor than those who collect for consumption only. They also have higher income from agriculture since they have more access to irrigation, though less sown

area. They are at a lesser distance from forests. Magnitudes of marginal effects are also high for the asset poverty, the irrigation and the land area variables. In other words, the results indicate that the HCSO households are not "poor"; on the other hand, they have better access to both assets and to better lands because of irrigation.

Insert Table II d

Additionally, the model does not provide good indications of the distinguishing characteristics of households which collect for both sale and consumption They do not seem to be substantially different from those households which collect NTFPs for consumption only. This indicates that a small group of comparatively better -off HCSO households who collect NTFPs for sale is emerging in this state.

The results of the multinomial logit for Madhya Pradesh (Table IIe) indicate that households which collect for sale only (the HCSOs) have less access to irrigation and are at shorter distances from forests than those that collect for consumption only. The HCSOs are also likely to be located away from metalled roads. The results indicates that NTFP collection, even for sale in this state continues to be a subsistence activity with HCSOs being in all probability, forest villages located in the interior away from roads.

Insert Table IIe

The above conclusion with respect to the state of Madhya Pradesh receives support from the results with respect to households which collect both for sale and consumption. These households, similar to the HCSOs have less irrigation and are at lesser distance from

forests. There is not much difference between these two sets of households indicating that HCSOs have not emerged as a separate group in response to commercial forces.

Insert Table II f

Results from the state of Maharashtra (Table IIf) indicate that the nature of NTFP collection and sale is different in this state. Fewer households collect NTFPs, either for sale or consumption. However, households that collect for sale only (HCSOs) are located closer to roads , farther away from forests and cultivate more land than those that collect for self consumption only. However, since they have a lower level of irrigation facilities, their incomes may not be higher than that of the other two categories. The access variable (in particular, market access represented by closeness to metalled roads) is significant. Further, households that collect for sale and consumption are also significantly located further away from forests than those that collect for consumption only. It can be deduced that they are located closer to markets. This corroborates the significance of market access in this state.

V Interpretation of Results and Concluding Remarks

An interesting picture emerges from the above results. Income related variables are significant in all states. Asset and access related variables are also significant on average in three out of four states and better property rights as a distinguishing characteristic of HCSOs turn out to be significant only in one state.

Insert table IIIa

The HCSOs in Karnataka are income and asset rich and collect for sale mainly due to the better opportunities provided by access to markets and nearness to forests. It can be concluded that collection for sale is therefore an option that they choose in a situation of expanded options. The situation is analogous to Fisher's (2004) high return forest activities.

In Bihar , the HCSOs are income rich and have better defined property rights, though they may be asset poor and have a lower level of access to forests as sources of supply. HCSOs in Maharashtra too are income rich and have better access to markets, though they are not close to sources of supply, i.e. forests. Both these states throw up a mixed kind of picture with both asset and income rich and poor households collecting for sale given appropriate property rights structures and access to markets.

Finally, HCSOs in Madhya Pradesh are income poor, have less access to markets and are closer in location to forests. These households represent the typical case of NTFP collection as a subsistence activity in times of need.

To recapitulate, the results for Karnataka in particular, and, Bihar and Maharashtra in a less dramatic fashion, indicate that non-poor households are taking up NTFP collection and sale as well, provided access and property rights conditions are set up clearly. This is significant and provides pointers towards the development of NTFP related economic activity as an income diversification route for relatively affluent rural households. Our

study indicates that in certain pockets of the country, CPRs are providing the basis of income generation for households with multiple options, quite distinct from their role as providers of subsistence incomes. This is particularly true for collection of NTFPs. These results point towards the possibility of a new role for NTFP collection from CPRs in the context of market oriented development, a role that has significant implications for the paradigm of development with and through conservation. It may mean that a greater possibility exists for the success of newer forms of collective management of the resources supporting such incomes. It may also imply that in the absence of such management, market driven over-exploitation of such resources increases at a greater pace or, that the demand for privatisation of these CPRs gathers momentum as they are conceived of as significant income generating assets.

Table Ia All India Summary Findings

I. Size of Common Property Land Resources (CPLR)	
Percentage of CPLR in total geographical area	15 %
CPLR per household (hectare)	0.31
CPLR per capita (hectare)	0.06
Reduction in CPLR during last 5 years(per 1000 hectares)	19 ha
II. Collections from CPR	
Households reporting collection of any material from CPRs	48 %
Average value of annual collections per household (Rs)	693
Ratio of average value of collection to average value of consumption expenditure	3.02 %
III. Nature of use of CPRs (*data per household*)	
Share of fuelwood in value of collection from CPRs	58%
Average quantity of fuelwood collected from CPRs annually	500 kg
Average quantity of fodder collected from CPRs annually	275 kg

Source: NSSO, 54th Round, 1999

Table Ib Distribution of Households Collecting from Commons (number and percentage of households)

State	*Fuelwood*	*Fodder*	*NTFPs*	*State Total*
India	24744 (36)	6450 (9)	9365 (14)	67674 (100)
Bihar	2977 (40)	1117 (15)	582 (7)	7482 (100)
Karnataka	1666 (53)	539 (17)	304 (10)	3161 (100)
Madhya Pradesh	3184 (55)	516 (9)	1408 (24)	5812 (100)
Maharashtra	3222 (60)	679 (13)	514 (9)	5374 (100)

Note: Figures in parentheses denote percentage of households in each category

Table Ic Average Annual Value of Collections by Households
(Rs per household per annum)

State	*Fuelwood*	*Fodder*	*NTFPs*
India	1191.39	1339.95	1936.85
Bihar	846.68	1108.03	1479.67
Karnataka	775.68	944.90	1218.45
Madhya Pradesh	1022.29	1633.04	1150.59
Maharashtra	835.04	1406.08	3047.41

Table Id NTFPs Collected and Percentage Distribution of Collected Items

State / NTFP	*India*	*Bihar*	*Karnataka*	*Madhya Pradesh*	*Maharashtra*
1. Fruits	17.86	15.48	31.03	28.21	25.29
2. Roots, tubers, spinach, etc.	9.10	14.22	1.59	7.93	0.33
3. Gums & resins	0.61			1.65	0.16
4. Honey	2.96	1.83	9.28	2.21	2.30
5. Medicinal/herbs	2.72	0.69		2.38	0.49
6. Fish	16.93	19.72	11.41	4.96	16.91
7. Leaves	26.51	28.78	10.34	43.28	29.72
8.Weeds,grass,cane,bamboo	23.31	19.27	36.34	9.38	24.79

Note: Column totals equal 100

Table Ie NTFP Collection, Consumption and Sale: Distribution of Collecting Households

Household Type	India	Bihar	Karnataka	Madhya Pradesh	Maharashtra
1Collection for Consumption	45.88	55.15	59.29	11.51	37.67
2 Collection for Sale only	31.72	26.80	32.24	67.83	45.83
3. Collection for Sale and Consumption	22.38	18.54	8.55	20.67	16.50
Total number of households	9377	582	304	1408	

Table If Descriptive statistics for the Variables

Variable	*Mean Value*	*No. of observations*
Asset Poverty (=1 if poor)	0.199	2809
Net Sown Area (in hectares)	1.147	2039
Irrigation (=1 if access to irrigation &/or mechanisation)	0.307	1616
Distance from forests (in kms)	3.353	1792
Distance from metalled road (in kms)	2.518	2757
Patta (=1 if access to Patta)	0.016	2807

TableIIa: All States (Pooled data for four states)

Household type 2: Collecting for sale	MNL coefficients	Marginal Effects
Asset Poverty	0.19	-0.007
Irrigation	0.112	0.079
Net sown area	0.022	-0.007
Distance from forest	-0.01	0.00
Distance from metalled road	0.375*	0.033
Patta	0.91*	0.223
Constant	0.01	
Household type 3: Sale and Consumption		
Asset Poverty	0.302	0.048
Irrigation	-0.49*	-0.13
Net sown area	0.0 83	0.017
Distance from forest	-0.013	-0.002
Distance from metalled road	0.23	0.007
Patta	-0.57*	-0.252
Constant term	-0.62*	
Prob.chi2	0.000	
No. of observations	1144	

Table IIb: Pooled data with state dummies

Household type 2: Collecting for sale	MNL coefficients	Marginal Effects
Asset Poverty	0.151	-0.012
Irrigation	0.196	0.079
Net sown area	-0.0154*	-0.020
Distance from forest	-0.046*	-0.002
Distance from metalled road	0.054	0.022
Patta	1.794*	0.349
Dummy M.P.	2.258*	0.053
Dummy Karnataka	-0.747*	0.211
Dummy Bihar	-0.007	-0.156
Constant	0.01	
Household type 3: Sale and Consumption		
Asset Poverty	0.291	0.051
Irrigation	-0.373	-0.114
Net sown area	-0400.	0.010
Distance from forest	-0.044	-0.005
Distance from metalled road	-0.104	-0.032
Patta	-0.416	-0.326
Dummy M.P.	2.54*	0.322
Dummy Karnataka	-2.65*	-0.539
Dummy Bihar	1.23**	0.295
Constant term	-0.987**	
Prob.chi2	0.000	
No. of observations	1144	

Table IIc NTFP Collection and Sale in Bihar

NTFP *Household type 2: HCSOs*	*MNL Coefficients*	*Marginal Effects*
Irrigation	-0.36	-0.014
Net sown area	1.39*	0.178
Asset Poverty	1.77*	0.427
Distance from forest	0.47*	0.023
Distance from metalled road	0.3	0.099
Patta	24.81*	2.306
Constant term	- 3.29*	
Household type 3: Collectors for sale and self-consumption		
Irrigation	-0.66	-0.113
Net sown area	0.89**	0.027
Asset poverty	-0.32	-0.324
Distance from forest	0.57*	0.075
Distance from metalled road	-0.25	-0.103
Patta	22.08	2.001
Constant term	-1.64*	
Prob > chi2	0.000	
No. of observations	180	

Note: In Tables 7 to 10, ** indicates significance at 1% level and * indicates significance of the coefficient at 5% level.

Table IId NTFP Collection and Sale in Karnataka

NTFP *Household type 2: HCSOs*	*MNL Coefficients*	*Marginal Effects*
Irrigation	1.12**	22.54
Net sown area	--2.18*	--1.18
Distance from forest	-0.73**	– 3.91
Asset poverty	-2.87*	–2.03
Distance from metalled road	-0.71*	–7.86
Patta	-38.56	-15.42
Constant term	3.09*	
Household type 3: Collectors for sale and self consumption		
Irrigation	1.08	22.88
Net sown area	3.38	1.18
Distance from forest	14.38	3.23
Asset poverty	6.67	2.03
Distance from metalled road	36.59	7.97
Patta	33.35	15.26
Constant term	-2.95	
Prob > chi2	0.000	
No. of observations	94	

Table IIe NTFP Collection and Sale in Madhya Pradesh

NTFP *Household type 2*	*MNL Coefficients*	*Marginal Effects*
Irrigation	-15.9*	-0.236
Net sown area	-0.16	-0.011
Asset Poverty	0.12	-0.03
Distance from forest	-0.1**	0.009
Distance from metalled road	0.26**	0.013
Patta	36.37	3.10
Constant term	17.94**	
Household type 3		
Irrigation	-16.45**	-2.48
Net sown area	-0.01	0.007
Asset Poverty	0.69	0.135
Distance from forest	-0.15**	-0.025
Distance from metalled road	-0.11	0.008
Patta	-7.51	-3.61
Constant term	17.61**	
Prob > chi2	0.000	
No. of observations	738	

Table IIf NTFP Collection and Sale: Maharashtra

NTFP *Household type 2: collectors for sale only*	*MNL Coefficients*	*Marginal Effects*
Irrigation	- –0.68	–0.579
Net sown area	0.34*	-0.098
Asset Poverty	0.01	0.304
Distance from forest	0.26*	-0.012
Distance from metalled road	-0.57*	–0.019
Patta	-1.44	6.008
Constant term	17.94*	
Household type 3		
Irrigation	2.1**	0.650
Net sown area	–0.93	–0.162
Asset Poverty	-1.54	-0.381
Distance from forest	0.39**	0.045
Distance from metalled road	–0.62	-0.041
Patta	-32.5	-7.722
Constant term	–0.98	
Prob > chi2	0.000	
No. of observations	132	

Table IIIa Characteristics of HCSOs in the Four States

	Bihar	Karnataka	Madhya Pradesh	Maharashtra
Income	Income rich 1	Income rich 2	Income poor2	Income rich 1
Assets	Asset poor	Asset rich	N.S.	N.S.
Access to markets	N.S.	More access	Less access	More access
Access to supply source	Lower access	More access	More access	Less access
Appropriate Property rights	Better property rights	N.S.	N.S.	N.S.

Notes: 1.Income rich 1 stands for " rich as measured by one index". Income rich 2 stands for "rich as measured by two indices"

2. N.S. stands for not a significant distinguishing characteristic

Appendix

Methodology for the NSSO Survey of CPRs in India

A stratified multi-stage sampling design was adopted for the survey. The first stage units for the sampling were census villages while the ultimate stage units were the households that were to be surveyed. The survey period was January – June 1998. In all 10,978 villages were planned to be surveyed of which, 5242 were allocated to the Central sample and the rest to the State sample. The former was surveyed mainly by the NSSO field staff while the latter was surveyed by State agencies. For purposes of the present discussion, the focus is only on rural areas and is therefore based on the data collected from villages in the Central sample only. The main schedules used in the 54th round were schedule 1 on consumer expenditure, schedule 3.3 on village facilities and common property resources, and schedule 31 which related to Cultivation Practices and Common Property Resources apart from other heads. For schedule 31, 16 households were planned to be surveyed in each village and in all 78,990 rural households were surveyed for the study.

The list of census villages of the 1991 population census for each state formed the sampling frame. From these list of villages, three strata were initially identified by identifying villages with no population, very small population (range 1 – 50) and very high population (more than 15000). The remaining villages were subsequently considered for the formation of the general strata. The total All India sample of 5242 villages for the Central sample was allocated to the different states in proportion to their investigator strength. Whereas for villages with a very small or no population the sample size allocated ranged between 2 to 6 villages, the number of villages for stratum 3 with high population was either 2 or 4, depending on whether the number of such villages in the stratum was less than 20 or more. The remaining sample was allocated to the general strata in each state in proportion to their population.

For selecting households, all the households of a sample village were first classified into three strata. These were households engaged in collection, households possessing land less than 0.40 ha and all the rest formed strata 3. As mentioned earlier, for schedule 31 a sample of 16 households from each selected village was surveyed. The 16 households selected from such a sample village, were allocated among these three

household strata in proportion to the number of households in each sampling frame subject to a minimum allocation of 4,2 and 2 households respectively in strata 1, 2 and 3. The sampled households were selected by circular systematic sampling with random starts in each stratum.

From the above brief description of the sampling procedure, it is clear that the sampling was done in a comprehensive and unbiased manner, keeping in view the need to develop a dataset that would accurately reflect the state-level macro picture. It is of interest to see how far these overall state and all India level estimates on contribution of Common Property Resources compare with the evidence gathered by micro studies conducted in different states of India.

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