Dependency on Common Property Forest Resources: Evidences from Few Villages of East Siang District of Arunachal Pradesh

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Abstract

Forest resources are life supporting in rural North-East India. Culture, tradition, ethos and indigenous knowledge of people of the region to a great extent are influence by forest; hence conservation and sustainable use of forest has become the priority. Based on household level primary data from few villages of East Siang district, this study attempts to bring out the importance of the Common Property Forest Resources (CPRs) in the rural economy in spite of gradual commercialization of forest economy in the state of Arunachal Pradesh. However, there is diversity in degree and nature of forest dependency among different socio-economic groups. The present analysis deals on the forest dependency among different economic categories poor and non-poor. In addition an attempt is also made to determine the significant socio-economic variables determining the forest dependency. It is found that the household's characteristics such as size of landholdings, education, livestock and distance from market significantly affect the dependency on community forests.

1. Introduction

There is a spectrum of property right regimes of natural resources namely, private, state, common and open access regime. The most commonly known property rights regime is private property holding. Under this regime, individual households or even groups (corporate bodies and firms etc.) can own resources with exclusive rights to use them, rights to exclude others from using them and rights to sell them or all of them or buy more of them (Bromley, 1991). Neoclassical economists propose that resources under private property regimes are effectively manageable under a competitive market condition (Varin, 1984). In reality, such market situations do not exist for a large number of resources such as land, forests, water or fishery. Apart from lack of proper markets,

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these resources such as water bodies, forests, meadows are not easy to make into fraction or divide or sell. Resources like water, fishery, terrestrial wildlife, and forest resources, would have different enforcement features and thereby generate varied incentives for collective action. These goods are often characterized by non-excludability and non-rivalry in consumption causes free rider problem (Agrawal and Chhatre, 2006).

Common property resources (CPRs) are those "resources which are collectively used by a group of people" (Pasha, 1992). Alternatively they can be defined as 'those (non-exclusive resources) in which a group of people have co-equal use rights. Membership in the group of co-owners is typically conferred by membership in some other group generally a group whose central purpose is not the use or administration of the resource (per se) such as village, a tribe etc. (Jodha, 1990). More precisely "a property on which well defined collective claims by an exclusive group are established, the use of the resource is subtractive, having the characteristics of a public good such as indivisibility shall be termed as common property resources" (Kadekodi, 2004).

In India, the National Sample survey Organization (NSSO, 1999) has defined common property resources (CPRs) as those resources which are accessible to and collectively owned/held/ managed by an identifiable community or group and on which no individual claims exclusive property rights. The first, is common village land or commons which lie within the boundary of the village and are held by village community or village panchayat. Second, is the un-classed forests as well as protected forests. The third is the common water resources. Over the years, significant economic growth has been accomplished in India and the same has percolated at least partially into the country side in terms of proliferation of alternative livelihood system. Along with this development, men-environment relationship might have changed considerably particularly in rural areas, impacting on people's dependence on common resource systems, adoption of resource management practices and sustainability of the resource base to cater to the needs of future generations.

Arunachal Pradesh, with its abundance of forest covers (79. 6 percent forest cover as per satellite based imaginary data, 2017) is home to communities who have a direct dependence on the forest resources for their livelihood. The state is reported to have one of the highest collection as well dependence on CPRs for supply of fuel wood (NSS 50th and 54th round). As per the data (DCH, 2014), highest source of fuel consumption is from firewood (68.7 percent) which is higher the all India average of 49.0 percent. The village communities look after and take care of its boundaries and disputes besides controlling the natural resources.

The importance of the communitarian resource ownership was recognized when the Sadiya Frontier Tract Jhum land Regulation, 1947 was enacted to define the rights and liabilities in relation to jhum land over which a community had a customary right in Arunachal Pradesh. However, the tradition of land ownership varies across tribes and has been followed to tribe and they over the years, a tradition that is integral to the community way of life in the state. Given this backdrop, the present study makes an

attempt to understand the inter-related issues of dependence, heterogeneity, livelihood opportunities and the sustainability of common property forest resources in the context of Arunachal Pradesh.

In Arunachal Pradesh, CPRs are important sources for household income, livestock sustenance, domestic fuel use etc. However, over the years there has been changes in the structure of property rights as well as natural resource base (Mishra, 2006). Earlier in most parts of the State, forests were owned by the community (Mitra, 1998) and studies (Mitra and Mishra, 2011 and Singh, 2010) found that contribution of community forests to the households economies was quite significant. However, there has been a change and individual ownership of forests has been growing. Rapid monetisation of the economy, sudden exposure to the material comforts of life, commercialisation of forest products and market exposure and its penetration in the state are major factors responsible for conversion of common property resources to private property resources (Mitra 1998; Kuri, 2011). In our present analysis, we make an attempt to examine the importance of CPRs in rural household economies and also the nature of consumption of different types of forest products from CPRs under condition of declining dense forest cover and change of property right regime. The paper has four sections. The first section deals with introduction, the second section covers objectives, methodology and limitations and third section deals with results and discussion and last section discusses summary and conclusion.

2. Objectives, Methodology and Limitations

The study primarily begins with two major objectives which are summarized below:

1. An analysis of the relationship between CPR dependency and household's socio-economic characteristics.

2. Study the nature of consumption that accrues to relatively poor and non-poor households from community forests resources.

The Study is premised on two hypotheses. The first hypothesis states that: *the socio-economic heterogeneity in rural community is expected to determine the different level of consumption from the community forests,* And the second hypotheis is – *access to market may reduce the dependency of households on the community forest since the community members may have some opportunities of earning outside the village.*

Since the hypotheses aim to understand the dynamics of CPR, livelihood and market one district of the State i.e. East Siang was selected purposively on the basis of forest coverage as well as existence of various forms of property right structure. A multi-stage sampling technique was adopted. In the first stage the district was selected, in the second stage four circles were selected from the district to represent the overall situatedness of the district. At third stage, two villages from each circle were selected considering the information on common property forest coverage. At the final stage, attempt was made to include all households in small villages and 30 to 40 percent of the households in relatively bigger villages. A household was taken as the preliminary unit of study. Finally, 110 households were selected randomly from four villages..In addition to it, a

village level questionnaire was prepared for collection of village level data. Since most of the households in the study areas were subsistence farmers, they were categorized into relatively poor and relatively non-poor households. This was done by compiling the census of village households with Participatory Rural Appraisal (PRA) techniques.

The participants in PRA exercise were asked to categories all the households into two different household groups in the criteria as what the villages consider as important like having a number of Mithuns (a semi domesticated animals), type of dwelling house etc. which villages consider are important for assessing an individual's socio-economic position in the village. Finally, the relationship between forest dependency and the socio-economic determinants were studied on the basis of an econometric model. The details are discussed in subsequent sections.

2.1 Limitations

The present study has certain limitations. There is no traditional standard measure of land as it is considered to be one of the most productive assets of rural Arunachal Pradesh. Many people in the villages, especially in the remote areas are not well acquainted with the modern quantitative measurements. For example, in the measurement of agricultural output, the volume and not the standard weights are used. Still today the common practice at the surveyed villages in the measurement of agricultural output such as paddy, millets, maize, soyabean, large cardamom, kodo, etc. by baskets while fruits, eatable roots, pumpkin, gourds etc. by numbers and size of the items and firewood by bundles. The level of literacy is very low in the study area. It was not possible to get the reliable income data at the household level. Hence, proxy variable was used by taking household level consumption value from community forest.

3. Results and Discussions

The extractions of forest product from Common Forest Resources depend on a host of factors relating to households and village characteristics. A host factors like demographic features, based on geographical location, economic position and some are institutional like customary extraction rule etc. (Jodha, 1990, 1986) are important determinants. The extent of forest dependency is measured on the basis of the share of total forest products collected in total consumption expenditures by the households. The CPR based collections for which data was collected included timber, firewood, bamboo, wild leafy vegetables, edible roots, bamboo, herbs and other wild animals hunted for consumption following the 54th round of NSS data, 1999. The study was based on the hypothesis that household level benefits from common property forests would be associated with household and community attributes. In this context, a conceptual framework was developed to understand the relationship between the variation in dependency on community forests among the surveyed households and the socio-economic status of the user-households. In order to understand this relationship the study focused on few socio economic variables which have strong influence. These include total consumption expenditure, family size, size of land holding, education, average distance from the market and road connectivity.

As already mentioned, estimation of household income derived from community forest poses difficulty in rural Arunachal Pradesh because of low market transaction. Hence to overcome this difficulty, it was decided to take a proxy variable of *household consumption expenditure* value derived from the community forests. The *size of the family* is an important factor in determining the extraction of products from community forests. In the absence of wage labour market, family labour is the main sources of labour supply for agricultural operation, collection of forest products etc. Hence, it is likely that larger the family size, the larger is the extraction of forest products from the community forest. It may be noted that collection and gathering from community forests is found to be associated with the ownership of private property of the household specially the land. In times of need, mainly in times of jungle clearance, sowing, harvesting etc. an alternative source of labour is provided by community labour (Kuri and Laha, 2011). It has been observed that the households who take support of the community labour have to bear the expenses for providing food, drinks etc to all members of the group. Therefore, it is obvious that there is a close relationship between land size and forest extraction; the ownership of large cultivable land was found to be consistent with large quantity of extraction of forest products from CPRs. Studies have shown education is one of the foremost factors that affects the decision making process, perception of various phenomenons and adoption of new ideas and ways of living and sustenance. Therefore *a priori,* education is expected to be negatively correlated with extraction of forest products from CPRs. Attainment of higher educational level may be associated with greater opportunity cost of labour. In fact, opening up of better earning opportunities beyond the boundaries of village commons is likely to see lesser preference for forest extraction activities. People tend to seek for alternatives if such opportunities are associated with higher educational attainment. Another important factor is the access for households. The households located in isolated areas with limited access to external markets and infrastructure facilities are likely to continue their dependence on community resources. On the other hand, communities closer to urban areas have access to wide range of opportunities such as employment in temporary or permanent jobs, contracts, small business, etc Therefore, closer market access for the village or rural households is likely to wean them away from forest dependent activities. Rather access to market opens up opportunities for engaging in other gainful activities. Together with access connectivity is an important factor in diversification of livelihood opportunities for village households. Remotely located households are likely to be more engaged in forest dependent activities unlike the village households where connectivity is better. The survey findings show similar results for Arunachal Pradesh. Villages which are less connected and remotely located have more households that are associated with extraction of forest products from community forest. Villages with better connectivity to semi-urban and markets areas show lesser dependence on community forests as a source of livelihood and sustenance. The expected sign for the explanatory variables are summarized and given in Table1.

Table 1: Description of Explanatory variables

Variable	Description	Expected Sign
CONEX	Total consumption expenditure of households (in 000 rupee)	+
FSIZE	Size of family member (in Numbers)	+
OWNLAND	Size of landholding(in hectare)	+
EDU	Average year of schooling of the households	–
DMKT	Average distance from the market	+
CONECTY	Road connectivity	-

The relationship between household consumption from forest extraction can be represented by the equation expressed as:

$$Yi = f\,(CONEX,\ HSIZE,\ LANDHO,\ EDU,\ VIDMKT,\ CONECTY)$$

Where,

Yi = Household-level consumption value from the community forest (a proxy for household's income from community forests in 000 rupee)
CONEX = Total consumption expenditure of households (a proxy for the income status of households) in 000 rupee
FSIZE = Size of household i.e., number of family members in a households
OWNLAND = Size of landholding in hectare
EDU = Average year of schooling of the households
DMKT = Average distance (a dummy variable for a village nearest to the market i.e 5 km (above = 1 and below 5 km = 0)
CONECTY = Road connectivity between surveyed village and a constructed road (in km)

To analyze this hypothesized relation double-log model has been used since the relationship is found to be non-linear. It is based on a similar model used by Di Falco and Ferrings (2003) to understand the effect of cooperative production on inter-specific crop genetic diversity.

By taking log on both sides, the standard equation can be written as:

$$\sum_{i=1}^{N} Yij \sum_{i=1}^{N} Yij = \beta o + \beta 1 CONEXi + \beta 2 FSIZEi + \beta 3 OWNLANDi + \beta 4 EDUi + \beta 5 ADFMKTi + \beta 6 CONECTYi$$

Where,
'j'= Forest products (timber, firewood, bamboo, leafy vegetables, roots, wild animals etc.)
'i' = (1,2,3....,N) observations.

The household income derived from community forest is taken as dependent variables. However, there were inherent difficulties associated with collecting income data in a partially monetized economy in Arunachal Pradesh. Though the quantities of different items gathered from community forest are dependable, but the problem lies in the

non-existence of their village level prices.. A significant portion of community forest products were used for self – consumption and that is why these were non-tradable in the local context. Some of these forest products are no doubt, locally bartered but do not provide the absolute prices which is necessary to arrive at the value. Since, obtaining reliable household income data from sample households an alternative measure was used where the value of total household level consumption of community forest goods as well as total consumption expenditure of household was taken as proxy for income from forests. The result of regression for determinants of household consumption value (Y) derived from Common Property Resources is given in Table 2.

Table 2: Determinants of Consumption from Community Forests

Variables	Unstandardized Coefficients		Standardized Coefficients	t
	B	Std. Error	Beta	
COSTAN	11.689	1.442		8.108
CONEX	-.349	.147	-.246	-2.372
FSIZE	1.236	.220	.533	5.626
OWNLAND	.128	.060	.197	2.128
EDUCATION	.019	.109	.014	.171
ADFMKT	.256	.059	.734	4.337
CONECTY	-.217	.093	-.368	-2.328

The result of estimated equation for determinants of household consumption value (y) derived from common property forest resources is :

In In = 11.689*** – .349** InCONEXi + 1.236*** InFSIZEi + .128** InOWNLANDi

     (8.108)   (-2.372)   (5.626)   (2.128)

 + .019 InEDUi + .256*** InADFMKTi – .217** InCONECTYi

     (.171)   (4.337)   (-2.328)

$R2$ = 0.85 Ajj. $R2$ = 0.73 F= 17.665** N = 110

*(Note: 1. Figure in Parantheses are t – values 2. The asterisk symbol ***and ** denote significant at 0.01 and 0.05 level respectively).*

It is evident from the results of the estimated equation that most of the estimated values of explanatory variables were significant with the expected sign and significant at one percent or five percent level of significance. In particular, household-level consumption from community forests was significantly influenced by the family size, size of land holdings and distance to nearest market. The R-square and adjusted R-square (R^2) for the estimation was as high as 85 percent and 73 percent respectively. The F-test for overall goodness of fit of the model is 17.665 which was highly significant at μ =0.000. The estimates indicate the robustness of the estimated equation and significance of the explanatory variables. The variable 'FSIZE' was found to be significant at 0.01 levels;

this may be due to the fact that in the absence of wage labour market, family labour is the main source of labour supply for agricultural operation as well as for the collection of common forest resources. The household members are required to spend substantial time and labour for their forest collections. The larger the family size, the higher is the labour and time available to collect the forest resources. The other explanatory variables like 'OWNLAND' i.e the size of land holdings was found to be positive and statistically significant. Due to the prevalence of the system of community labour, the larger ownership of cultivable land was found consistent with larger quantity of extraction of forest products from community forest.

It is interesting to observe that the variable 'EDU' though was found to be positively associated with CPR collection, but it was not statistically significant. In earlier study (Mitra and Mishra, 2011) education was found to be negatively and significantly related to community forest consumption. The present study shows there has been significant changes over the years and it education did not matter much on extraction of community resources. There may be two possible explanation, either education assists to explore the market of CPR products or in the absence of alternative employment despite educational attainment, people continue to be engaged in forest extraction.

The dummy variable 'VIDMKT' was positively related to consumption from community forests and it was found to be a very factor. The results indicate that the availability of market close to the village may divert rural communities from forest dependent activities and engage in other gainful activities due to alternative earning opportunities. At the same time, the rural communities living far away from market may have to depend more on community forests in order to sustain their livelihoods.

With regard to the road connectivity, it was observed that it is negatively but significantly related with the consumption of community resources. It was found that the villages having better connectivity have to depend less on community forests and vice-versa. Possibly dependence on community forest resources is reduced with better accessibility and thereby alternative livelihood options become available for the villagers. The analysis thus highlights that most of the explanatory variables had the expected results and were statistically significant.

4. CPR and the Contribution to Consumption Expenditure relative to Poor and Non Poor

In order to get better insights and to examine the distributional implications of CPRs, all the surveyed households were classified into two groups namely relatively poor and non-poor. However, it is very difficult to identify the households as poor or not. The commonly used classification of poor and non-poor in terms of land ownership does not reflect the reality in Arunachal Pradesh because of problem of measuring land especially in remote areas. Hence, in order to get a rough idea of relatively poor and non poor, the households were classified on the basis of owing the mithuns (a semi domesticated animals), types of houses, types of asset ownership. Based on these criteria, sample of 110 surveyed households were classified where 20 households were identified as

relatively non poor and remaining 90 households were identified as relatively poor. This helped in making a comparative analysis of the income from community forests that accrued to relatively poor and non poor households.

Table 3: CPRs and its Contribution to Total Consumption Expenditure

Village	Category of household	Percentage of consumption of Forest Production CPRs to total consumption expenditure	Difference Non-poor and Poor
Sigar	Poor	28.51	+ 14.57
	Non Poor	13.94	
	Total	23.25	
Sakuand Loglu	Poor	41.34	-9.09
	NonPoor	50.43	
	Total	42.40	
Namey	Poor	33.17	+ 16.3
	Non Poor	16.87	
	Total	29.85	
Seren	Poor	29.97	+ 10.64
	Non Poor	19.33	
	Total	26.64	
Total	Poor	33.45	+13.55
	Non Poor	19.90	
	Total	29.93	

Source: Field Survey, 2017-18

Table 3 shows that contribution of CPRs to the household economy was significant in surveyed villages. On an average, 29.93 percent of the consumption expenditure of the households of the surveyed villages was derived from community forests. However, there were variations among the different villages and across the two categories. For example in Saku and Loglu village, it was as high as 42.40 percent. This may be due to high altitude and extensive use of forest for heating purposes. Among the two categories it was found that the relatively poor households depend more on community forest for their livelihood. It was found that around one-third of their consumption expenditure was derived from community forests. However, there were variations among the villages. It was interesting to observe that in Saku and Loglu Village, the dependence on CPRs was relatively high both among the poor and non-poor households. Also, the consumption of non-poor households was relatively high compared to other villages. This may be due to the fact that the village is located in remote hilly area and is far away from the main town. It is also less accessible due to poor road communication and is surrounded by dense community forests where people have high dependence on community forest resources. Also, non-poor households from this village extracted more quantity of timber and firewood from forests. The distribution of CPR collection is shown in Table 4.

Table 4: Annual Consumption of Different Types of Common Forest Resources in the Surveyed Villages (in Percentage)

Name of Village	Economic criteria	Bamboo	Timber	Firewood	Animal Hunted	Fish and-Prawn	Vegetables, Roots & Fruits
Sigar	Poor	0.77	2.88	45.06	6.06	15.31	29.92
	Non-poor	1.54	5.73	61.84	4.01	13.23	13.65
Saku and-Loglu	Poor	1.32	5.47	43.24	3.72	10.73	35.52
	Non-poor	0.19	17.42	31.53	4.06	20.9	25.9
Namey	Poor	0.72	8.42	51.7	3.03	4.31	31.82
	Non-poor	0.53	25.9	49.22	0	2.33	22.02
Seren	Poor	0.67	3.84	44.72	2.3	12.5	35.97
	Non-poor	0.17	4.24	40.35	0.84	13.63	40.77

Source: Field Survey, 2017-18

It was found that firewood consumption was the most significant contribution to total consumption expenditure of the surveyed households, followed by vegetables roots and fruits. In a traditional tribal society, firewood is the only fuel used for cooking and heating purpose. In spite of availability of alternative fuel like gas in a few accessible areas, the local people hardly use it since they are not accustomed to it. Further it was revealed by the households during survey that they preferred the taste of the food prepared from the firewood. Thus taste of food after preparation was an important determinant in choice of fuel for cooking. The consumption of firewood was relatively high in Sigar village as compared to other villages among the poor and non-poor households. This may be due to availability of more firewood, within a radius of 2 km which is considered to be common property resources by the village council and hence opportunity cost of collecting firewood is low. However, a comparative analysis of firewood consumption among the poor households across sample villages showed that it was highest in Namey village (51.7 percent) and Sigar village (45.06 percent). In case of non-poor households, the villages which had high dependence were Sigar village (61.84 percent), Namey village (49.22 percent) while Siku and Loglu village of Koyu Circle had the lowest share (31.53 percent). The consumption of timber products among the non-poor households had higher variation as compared to the poor households. Among the non poor households, Namey villages of Nari circle had the highest timber consumption while Seren Village of Seren circle had lowest consumption. From the study area it found that accessibility and usability are the main reason for the extraction of timber product which varies from village to village. However, the rural non-poor households extracted relatively more timber since they had the resources to extract timber from deep within the community forests.

Edible roots and fruits emerged as the second highest contributor to consumption from community forests. Among the poor households, Saku and Loglu village (35.52 percent) and Namey Village (31.82 percent) both contribute the highest consumption in the surveyed villages. It may be noted that animal hunting was found to contribute significantly to total consumption expenditure in surveyed villages among the poor and

non-poor households except in one village Namey. During survey, it was revealed by households that in Namey village strict legal enforcement was implemented by the Village Council against the hunters due to deforestation and rapid extinction of wild animals and birds. The enforcement had therefore reduced dependence on hunting of animals for consumption.

In so far as consumption of aquatic lives was concerned, the survey findings showed that fish was the most preferred item. There were however wide variations among the village households. Namey village accounted for lowest consumption of acquatic animals among poor (4.31 percent) and non poor (2.33 percent) households. Among the non poor households, highest consumption of fish was observed among households in Saku and Loglu (20.9 percent) village. In Sigar village too, both poor (15.31 percent) and non poor (13.23 percent) households consumed fish and prawn due to their proximity to river Siang.

5. Conclusion

The study reiterates the importance and role played by Common Property Resources (CPRs) in the rural economy of Arunachal Pradesh. CPRs have been significant sources of food and fodder, materials for construction of houses, medicinal leaves and edible roots, timbers and other consumption needs like fuel wood etc for forest dependent communities and also communities living in hilly areas. However, over the years there has been a decline in dependence on CPRs as evident from studies (Mitra and Mishra, 2011, and Singh, 2010) yet about 30 percent of the consumption expenditures of the households of the surveyed villages were derived from community forests. The study shows that there is a strong relationship between socio-economic characteristics of households, connectivity of road etc. and dependency on community forests. In other words, heterogeneity of household characteristics, as discussed in this study affects the variation of use and consumption from common property resources.

The point of discussion is that relatively poor households depend more on community forests for basic needs and essentials than the relatively non-poor households. The relatively non-poor households depend on community forests mainly for timber and firewood extraction. The variations in use may call for interventions, considering the sustainability factor. The interventions on conservation and to facilitate use for the weaker section of households are of further importance in this ecologically fragile and relatively underdeveloped state. This calls for detailed assessment on the status and uses of common property resource in the state. The assessment and conservation is of immense importance so that economically weaker section of households could derive continuous support from CPRs for their consumption and wellbeing. Conservation and regulated (institutionally – both by traditional bodies and supported by the state) use of CPR would, as revealed by survey findings would to a large extent complement the provisioning made by the state, which is constrained at this time.

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Even after extensive survey, the income data suffered from a lot of error, as respondents normally were both reluctant and incapable to response their income