Community Forestry and Livelihoods

Household characteristics and common property forest use: complementarities and contradictions

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Abstract

Being limited in supply but accessible for community usage, sustainable management of Common pool resources is still an important question facing both development planners and the academia. Experience from community forestry program in Nepal, and elsewhere, has so far indicated that poorer households are still marginalized even if resources are managed under community ownership. In this paper, I seek to analyze the socio-economic attributes of households that determine labor allocation decisions for forest product collection activities. This will help better understand why poorer groups have not been benefited from the management of community forests. I will then highlight the need for more effective policy and institutional interventions that would help ensure efficient and equitable access to the local level natural resource base.

Key words: Common Pool Resources, labor allocation, collective action, socio-economic attributes

INTRODUCTION

Common- pool resource (CPR) management has emerged as the top resource management priority as well as a major subject of discourse in environmental conservation and local level economic development in many countries in recent years. Being limited in supply but accessible for community usage, sustainable management of CPRs is still an important question facing both development planner and the academia (Sekher, 2001). The externalities associated with individual actions in the appropriation of such resources often gives rise to environmental problems, which threaten sustainable management and utilization of common resources. The interdependencies created by their physical characteristics demand the establishment of well-defined property rights over these resources, to generate incentives for greater internalizatin of externalities and for careful husbanding of resources by their users and owners.

In the literature of property rights and common-pool resource management, various forms of institutional arrangements have been proposed for sustainable management of natural resources. Among them, institution building at the community level has emerged as the most viable option for managing common pool resources. The emphasis on the community-based approach arises from the wisdom that local communities not only understand their problems rightly, but also have solutions because their livelihoods depend on the natural resource, and are assumed to have greater incentives to manage resource base sustainably over time. An increasing number of scholars advocate that decentralized collective management of CPRs by their users could be an appropriate system for overrating the 'tragedy of the commons' (Ostrom, 1990; Berkes, 1989; Wade, 1989; Jodha, 1986; Bromley, 1991). More careful analysis of the foundation of common property regimes in developing countries have shown that local institutional arrangements including customs and social conventions designed to induce cooperative solutions can overcome

the collective action problem and help achieve efficiency in the use of such resources. Participatory approach to natural resource management," in which promotion of community-based property rights regime is taken as one of the key areas of thrusts, has received much attention following the Rio Earth Summit, where it was accepted as an integral part of the sustainable development process (Dearden *et al*., 1999).

Like in other developing countries, the recognition of community-based resource management has led to the devolution of natural resources from centralized government management to local user groups in Nepal. Devolution of forest management has been underway since 1990 under which national forests are handed over to forest user groups (FUG) for use and management. Devolution of authority to groups of forest users to manage forest resources has become the main operational strategy for the community forestry program. Forest user groups are being encouraged to become independent and self-governing organizations, and be fully involved in all aspects of forest management. This shift in policy is no more than a belated recognition that sustainable resource management can never be independent of the sustainability of collective human institutions since local users are often the ones with the greatest stake in sustainability of resources and institutions (Agrawal.2001).

Although local control over natural resources is now regarded as a win-win solution for environmental preservation and local development, the empirical evidence regarding the livelihood implications of community-based forest management is rather mixed. Some recent studies indicate that though the institutional change of resource management has brought significant positive impacts on the biophysical condition of forests, equitable access to and use of forest resources within the community has not been clearly demonstrated (Branney and Yadav, 1998; Malla, 2000). Das (2000) notes that much of the analysis of common resources in the Himalayas has been concerned with village level institutions rather than individual incentives (awards the protection of common resources in the hills. The stated objectives of such programs in terms of positive impact on resource productivity, equity among stakeholders, poverty alleviation, organizational and environmental sustainability are often not met (Meinzen-Ruth and Knox,1999).

One possible reason for this is that most analyses of the efficiency of natural resource management have failed to recognize that resources often have multiple uses and that there tend to be sub-groups of users who are characterized by their use pattern (Meinzen-Ruth and Sallow, 1997). Experience from community forestry (CF) program in Nepal, and elsewhere, has so far indicated that poorer households are still marginalized even if resources are managed under community ownership. Since the level of wealth of individual users affects the leadership quality in the sphere of public decisions as well as the extent of resource exploitation and appropriation, scholars on common property management argue that economic inequality in terms of private wealth (social and physical capital) among the members of a resource-using group might be associated with different degrees of control to and access over the local commons. The socio-economic status, gender, and ethnicity of individual community members may limit the opportunity available to weaker members to participate in and benefit from community decision-making.

In this paper I seek to provide answers to the following question: What are the socio-economic attributes of households that determine labor allocation decisions for forest product collection? The answer to this question will help better understand why poorer groups have not been benefited from the management of community forests, and then highlight the need for more effective policy and institutional interventions that would ensure efficient and equitable access to the local level natural resource base.

Since biomass use is directly related to human and livestock population, and that the agricultural assets of households drive biomass use ((Reddy et al., 1986; Nadkarni *et al*., 1989), here, my working hypothesis is that demand for forest products is a function of a number of characteristics that provide a measure of household dependency on the local commons. In line with recent literature (Leie, 1997), I hypothesize that demand for forest biomass is primarily a function of a) cultivated land holdings and crop types (driving demand for mulch and manure) b) livestock assets (driving demand for fodder and cut grass) c) the number of people in the household (for both fuel wood production and consumption) d) education, ethnicity and caste of household (caste of an individual influences cultural attitudes towards food, bathing and rituals which might drive demand for fuel wood), and e) distance between forest and house (determines relative control as well as household behavior regarding unauthorized harvesting). In brief, this paper will examine the relationship between socio-economic conditions and constraints of households, in particular, ownership of land and livestock assets, and determinants of labor allocation decisions for gathering activities.

STUDY SITE, DATA COLLECTION AND SURVEY METHODS

This study was undertaken in two selected districts of the mid-hills of Nepal where community forestry programs have been implemented for the last two decades. From the lists of user groups in these two districts, Eight Forest User Groups[1] were selected for the study. A stratified sample of households was chosen by compiling a census of village households. All user households were divided into three different groups i.e. poor, middle wealth and richer households based on criteria [2]that villagers think important while assessing an individual's socio-economic position in the village.

Household questionnaires were designed to elicit forest use information from the respondent households. Pre-testing of the questionnaire was undertaken in one of the FUGs in Nasikathan VDC in Kavre district, which resides outside the sample frame. The response to pre-testing of the questionnaire resulted in the revision of sensitive questions such as gender bias in forest product extraction. Questions were asked to obtain information on four general areas: 1) demographic information; 2) land holding, tenure and off-farm production systems; 3) natural resource management and utilization; and 4) household awareness/participation/policy issues in community forest management.

Since both on-farm and off-farm agricultural activities are seasonal, care was taken to consider allocation of family labor seasonally. The data on biomass use are a combination of the survey questionnaire data and monitoring of actual use carried out by the research team in the study sites. This was elicited mainly from questionnaire (recall) survey. A total of 20 per cent of households were randomly selected from each stakeholder group, with a total of 309 households that belong to 3 different wealth groups. Finally an econometric analysis was undertaken in order to

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[1] *Saradadevi FUG, Jyala Chiti FUG, Mahavedsthan FUG and Thuli Ban FUG in Kavre districts and Gaurati FUG, Shree Chhap FUG, Janghare FUG and Karki Tar FUG in Sindupalchowk district.*

[2] *Main criteria used were the amount of land owned, the number of livestock owned, loans given and taken and income from off-farm agricultural activities. Poor households own between 0 to 5 Ropani of land, with a mean of 2.95 Ropani. Middle-wealth households own between 5.5 to 15 Ropani, with a mean of 10.12 Ropani. Richer households own between 15.5 to 85 Ropani, with a mean of 26.65 Ropani.*

understand the determinants of labor allocation decisions for forest products collection. Variables included in regression analysis as "independent variables" are given in the box 1.

Box 1. Independent variables

Ethnicity = Measured by caste (dummy, if untouchable caste = 1)

Gender = Sex of respondents (Male = 1)

Education = Education of respondents measured as number of school years

Landholding = Land area under household management (*Ropani*)

Livestock = Number of livestock owned by a household

Distance = Distance between community forests and house (Km)

Transaction days = Number of days spent in various obligatory forestry activities

Technology = Tools used in collection and harvesting (proxy for technology)

Household size = Number of people in work force

Trees on private land = Number of trees grown on private land for fuel and fodder

Type of membership = leadership (Dummy variable, if member of executive committee = 1)

RESULTS AND DISCUSSION

Household labor allocations

Household labor allocations in four areas included in the analytical model (firewood, tree fodder, grass fodder and leaf litter collection) are presented in Table 1. In most of the sites, gathering activities include collecting firewood, tree and grass fodder, leaf litter; and some herbal plants for medicinal purposes. However, the only ones of significant economic value are firewood, tree and grass fodder, and leaf litter.

Respondents were asked about their labor allocations in four areas included in the analytical model: fuel wood, fodder, cut grass and leaf litter collection. Labor allocation decisions of households for forest product collection efforts are presented in the table 1. Although survey questions based on the recall approach are likely to suffer from biased and unreliable responses, valid answers can be expected if households are engaged in regular patterns of collection activities (Juster and Stafford, 1991), a situation that can be expected within a given season in most part of the mid-hills of Nepal. Poorer households on average allocated a total of 115, 16, 178, and 328 hours annually for fuel wood, tree fodder, leaf litter and grass fodder collection respectively. Richer households on average allocate 143, 29, 871, and 960 hours annually for fuel wood, fodder, and leaf litter and grass collection. From the table it is evident that forest products i.e. tree and grass fodder and leaf litter are highly wealth sensitive.

Table 1 Annual labor allocation for forest product collection by stakeholder categories (Hour)

Activities (by stakeholders)	Sample Size Number (ii)	Mean	Standard Deviation
Poor stakeholder			
Fuel wood collection	81	115.78	125.73
Fodder collection	81	16.42	49.96
Leaf litter collection	81	178.01	313.82
Grass collection	81	328.49	502.24
Medium wealth stakeholder			
Fuel wood collection	136	114.87	110.69
Fodder collection	136	13.79	50.77
Leaf litter collection	136	393.90	540.16
Grass collection	136	679.48	1052.76
Rich stakeholder			
Fuel wood collection	92	143.97	149.11
Fodder collection	92	29.00	105.43
Leaf litter collection	92	871.17	979.24
Grass collation	92	960.45	1029.40

ECONOMETRIC RESULTS

Determinants of HH labor allocation for fuel wood collection

Table 2 presents the regression analysis of fuel wood production from CF, which explains annual fuel wood collection from community forestry in bhari (1 Bhari green fuel wood = 50 kg) as a function of various socio-economic variables. Five estimates are significant in the decision equation. The result showed that ethnicity, gender, education, transaction costs days and technologies used in forest product harvesting are statistically significant. Lower caste households extract less firewood from the community forests. Leie (1997) argues that caste of individual influences cultural attitudes towards food, bathing and rituals, which might drive demand for fuel wood. Moreover, lower caste households may have less access to CF than higher caste households. Second, fuel wood collection shows an interesting gender pattern as female-headed households extract less from CF than that of male-headed households. This result is similar to Kohlin (1998) who observed that males contribute significantly to fuel wood collection than females. However, this is in contrast with traditional view that producing energy is mainly a female activity. This observation is also similar to that of Amacher *et al.* (1993), who observed that women are not the sole collectors of fuel wood.

Table 2 Determinants of HH labor allocation for fuel wood collection

Independent Variables	Expected Sign	Coefficient Estimate	Standard Error	t-ratio	P-value
Constant		1.63	0.45	3.65	0.003
Landholding	+	0.06	0.08	0.78	0.434
Livestock unit	+	0.05	0.09	0.59	0.554
Household size	+	0.021	0.14	1.56	0.120
Ethnicity	-	-0.39	0.17	-2.27	0.024
Gender	+	0.64	0.19	3.34	0.0008
Education	-	-0.43	0.11	-3.87	0.001
Transaction cost (days)	+	0.08	0.06	1.37	0.17
Distance between forest and HH	-	0.08	0.05	1.71	0.088
Technology	+	0.15	0.07	2.26	0.025
Trees in Private Land	-	0.02	0.05	0.45	0.65
Log-Log 2SLS Regression	F (11, 252) = 6.07 R2 = 0.21				

Third, it is evident that those households involving in various forms of decision-making activities (measured by transaction costs in such activities) produce more fuel wood. This might be due to the information gained through various forms of community meetings about when to collect and where to collect fuel wood from CF. Fourth; education shows a negative relationship with fuel wood collection from the commons as increasing educational level makes fuel wood collection increasingly unprofitable. This finding is similar to Gunatilake (1998), who concludes that education level of the family is negatively related to forest dependency. Lastly, technology used in forest products harvesting is significantly and positively associated with fuel wood production since advanced technology makes household labor more productive and marginal productivity of labor increases with advanced technology used in collection.

Though it is not statistically significant, land and cattle ownership is positively associated with fuel wood production. This implies that households with larger livestock and landholding are more inclined to use CF for their increasing demand for fuel wood. The coefficient of distance to the forest is positive, which is opposite what was expected before. Though it is not significant, it appears that distance between households and community forests could not explain the effort for fuel wood collection. This seems an unreasonable finding. However, this may be due to the fact that households residing near to the forests could not harvest unauthorized forest products since there are strict rules and penalties in place for the rule violators. Though not significant, household size is positively associated with fuel wood collection. A family with a larger labor force can mobilize household labor in collecting more dry woody materials and forest extraction activities than households with a smaller labor force. In most of the FUGs, products of a very subsistence nature like dead twigs, leaf litter and forage grasses can be collected either during certain periods or all year round. There is no restriction on the number of people that each household can allocate to harvest such products. In this scenario, households with more members

tend to collect a larger portion of such products. Though not significant, number of trees on private land is negatively associated with fuel wood production from the commons.

Determinants of HH labor allocation for leaf fodder and grass collection

The following Table presents the model of leaf fodder and cut grass collection effort from CF. Within the category 'grass' long grasses like *'Babio'* and *'Khar'* which are used for covering roofs of houses and stables, are included. Small branches, leaves, herbs and shrubs are collected as tree fodder. The empirical estimation is presented in Table 5. Most of the variables incorporated into this model are statistically significant. So are the expected signs. It appears that households with large numbers of livestock spent a lot of time on fodder collection effort. This is not surprising for wealthier households who usually maintain large livestock herds, and collect much of their animal feeds from the nearby forests. Ethnicity has again a negative effect and is significant. This indicates that since lower caste households do not have more animals they extract less from CF. Similarly, men were found to allocate more time then women in collection fodder and grass, though it is not significant. This is also contrary to traditional thinking that female members spend more time on grass collection effort. Women also have other household responsibilities that might affect gathering activities.

Table 3 Determinants of HH labor allocation for leaf fodder and grass collection

Independent Variables	Expected Sign	Coefficient Estimate	Standard Error	t-ratio	P-value
Constant		1.85	0.52	3.57	0.000
Landholding	+	0.18	0.09	2.07	0.039
Livestock unit	+	0.41	0.11	3.93	0.000
Ethnicity	-	-0.21	0.20	-1.00	0.316
Gender	+	1.07	0.21	5.02	0.000
Education	-	-0.31	0.13	-2.39	0.017
Household size	+	0.07	0.16	0.47	0.638
Transaction cost days	+	0.14	0.06	2.29	0.023
Number of trees in private land	-	0.06	0.05	1.05	0.294
Distance between forest and HH	-	0.09	0.06	1.54	0.125
Technology	+	0.25	0.08	3.26	0.001
Log-Log 2SLS Regression		F (11,248) = 12.38 R2 = 0.35			

With regard to the 'transaction costs day' variable, households who spent a lot of time on decision-making and implementation activities often appear to spend more time on fodder collection effort.

Households get correct information by engaging in the decision-making process about when and where to collect. This might increase the household's collection effort. The numbers of people in a family has positive impacts on fodder and grass collection though not significantly in this model. These findings are similar to Heltberg (2000) and Kumar and Hotchkiss (1988), who concluded that a larger family implies more labor available for fodder collection. Distance again shows the negative relationship with fodder and grass collection effort. The reason is already explained earlier.

Determinants of HH labor allocation for leaf litter collection

Table 4 shows the estimates of household leaf litter collection from community forests. Given the purpose for which leafy matter is used, one would hypothesizes that land area and its quality, would primarily influence the extraction levels of leafy matter for mulch and manure, with the later also being influenced by livestock holding, since it is usually used as animal bedding prior to dumping in the manure pot (Lele, 1997). In most of the sites, users collect leaf litter as animal bedding materials. The importance of bedding material and compost was apparent amongst the sample; all households (except landless) used composted bedding materials in crop production.

The positive signs of land and livestock holding indicate, once more, that livestock and land apparently act as major sources for consumption of leafy materials. That is, wealthier households extract more leaf litter from the commons. This is particularly important in the mid-hills where leaf litter is a major source of compost. This finding is similar to the observation made by Collett *et al.* (1996), who observed that the rates of use of composted bedding material in crop production in the same area vary between crops, land types, households (land area and animal numbers) and sites.

Gender and ethnicity once again show negative and significant relationships with leaf litter collection. Technology used in leaf litter collection is positively and significantly associated with collection of leaf litter. Household participation in various stages of meetings and decision-making through transaction costs days spent in CF enhances the quantity of leaf litter collection. Awareness of the potential gains achievable through the public good may be enhanced by regular meetings and discussions through which relevant information is conveyed or even generated (Gaspart *et al*. 1999). Distance has a negative, albeit insignificant, impact on leaf litter collection. This implies those households residing adjoining to the CF collect more leaf matter than those living far away from the community forest. In many forest resource systems, users who live closer to the forest have a more secure and accessible supply of produce regardless of whether or not there are allocation rules in place (Varughese, 1998). Families living close to the forest have the advantage of less time being required to reach to CF so their links with forests are, therefore, expected to be high (Gunatilake, 1998).

Table 4 Determinants of HH labor allocation for leaf litter collection

Independent Variables	Expected Sign	Coefficient Estimate	Standard Error	t-ratio	P-value
Constant		2.08	0.67	3.01	0.002
Landholding	+	0.61	0.11	5.28	0.000
Livestock unit	+	0.23	0.14	1.65	0.100
Ethnicity	-	-0.62	0.26	-2.35	0.011
Gender	+	0.25	0.28	0.90	0.368
Education	-	-0.26	0.16	-1.59	0.11
Transaction cost days	+	0.11	0.08	1.36	0.183
Distance between forest and HH	-	-0.01	0.07	-0.19	0.85
Technology	+	0.26	0.01	2.60	0.001
Log-Log 2SLS Regression	F (9,267) = 14.04 R2 = 0.32				

Most of the variables show the signs expected by the postulated model. Results from the household model confirm that labor allocation decisions of rural households are largely dictated by their socio-economic attributes.

CONCLUSIONS AND POLICY IMPLICATIONS

The relationship between socio-economic attributes of households and their access to communally managed resources is getting much attention in recent years in the context of local level collective action. In this paper I have examined the determinants of household labor allocation decisions for extraction and gathering activities from common property forestry. The main emphasis was to investigate whether the socio-economic characteristics of user households are associated with household level access to, and benefits from, community forests. The empirical analysis of household data offers affirmative answers to the hypothesis that relatively wealthier households have higher and increasing access to community forestry than poorer households.

The study shows that household dependency on community forests in most of the study sites is for fuel wood, fodder, leaf litter with a major proportion of household benefit contributed by fuel wood, tree fodder and cut grass and leaf litter. As I hypothesized, econometric analysis suggests that labor allocation decisions for forest extraction activities are functions of various socio-economic and demographic variables. In general, it appears that household land and livestock holdings, household composition, gender, education, and household participation in community decision-making processes exert more influence on household labor allocation decisions for extraction and gathering activities than other factors. The results also show that women are not sole collectors of fuel wood as conventionally accepted since access to community forestry is somehow influenced by gender of respondents.

It appears that more conservation-oriented forest regimes favor the larger and wealthier households as they produce intermediate forestry products that are inputs into forestry-based farming systems. Poorer households in general cannot internalize the benefits generated from these products. This implies that the community forestry program so far has not been able to contribute significantly to the livelihoods of very poor and vulnerable sections of the community. Changing the management regimes of common pool resources, therefore, may alter the direction of incentives, which might induce negative effects on the access of poorer and marginalized

households to the local commons. In one hand, it has been often argued that poor people extract more natural resources due to greater reliance on the natural resource base. On the other hand, it is claimed that compared to non-poor, the poor may depend more on the commons in relative terms, but in the absolute terms their dependency is lower, particularly for resources with good market opportunities (Dasgupta, 1993). There is a fair degree of misplaced optimism that every household in a community will gain egalitarian access to, and benefits from, collective action if a resource is held under community ownership. In contrast, this study shows that poorer households are still marginalized even if resources are managed under community ownership. I reconsider the issue of persistent socio-economic inequality in communities and argue that restricting the access of poor people through changes in property rights structure in common-pool resources is likely to increase the level of poverty unless specific measures of compensatory transfer schemes are in place to safeguard the interests of the most marginalized sections of the community.

One of the important policy implications of this study is that intervention seeking to reduce poverty in a forest dependent rural economy through community forestry may have limited impact unless the underlying factors causing inequitable access to the resource base are addressed. Since poor people are unable to internalize benefits from intermediate forest products, forest management regimes need to be oriented towards production and management of NTFPs, which can contribute significantly to the economy of poorer and land less households. Equally important is to improve both the productivity of forests and distribution systems. Another important policy implication of this result is the need to reconsider household and community characteristics and respective management regime while handing over the forests from government ownership to community management. Since patterns of forest use differ among rural households, CF policy in this respect should be directed towards diversifying the products that meet the demand of different interest groups within the community. Policy measures to this end include the non-timber forest product oriented management systems, empowerment of women and politically marginalized users, fair representation of weaker sections of community in the decision-making process, and distribution of leadership roles across all sections within the community. To this end, the challenge is to develop management institutions that are efficient, equitable that ensure egalitarian access to the local commons.

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