Local Institutions and Forest Products Extraction: Evidence from Forest Management in Nepal

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ABSTRACT

This study examines the contribution of forest products from community forestry to household income, with particular emphasis on institutional difference when it comes to management and equity in benefit distribution. Two community-managed forests (with formal and informal institutions) were selected in the Pyuthan district of Nepal. Findings show that the contribution of forest products to household income is higher in the case of forest management without a formal institution than in the case of management under a formal institution. The analysis of household level benefits indicates that poorer households are currently benefiting less from community forestry. It finds that the burden of conservation is higher for poor households where there is a formal organization due to access and conservation rules and regulations imposed by forest user groups.

Key words: Non-Timber Forest Products (NTFPs), Common Property Resource (CPR), Forest User Group (FUG), Contribution

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1. Introduction

The agrarian economy of rural communities in Nepal is well integrated with forest resource use. A majority of the rural households are subsistence farmers and rely heavily on forest products to meet their daily requirements. Fuelwood is used for cooking and heating purposes, fodder and grass for livestock, leaf litter for manure, and timber for constructing houses and for making agricultural implements. In addition, households seasonally collect other forest products such as fruits, vegetables, resins, wax, edible food items, etc. These products play a crucial role in rural consumption strategies.

In recent years forests have been recognized as rich reservoirs of many valuable resources, in addition to timber. A growing body of scientific evidence suggests that, given certain basic conditions, non-timber forest products (NTFPs) can help communities to meet their needs without destroying the forest resources (Peters, *et al*., 1989; Gunatilake, 1998). Furthermore, rights to forest resources are particularly important for poor people in many developing countries because the poor have no capital and few productive assets (Sterner, 2003). Hence, access to commons, or even to degraded open access areas, may constitute a significant, even crucial, contribution to their welfare. Cavendish's (2000) study from Zimbabwe, for example, shows that environmental resources in some rural areas account for more than 40 percent of average total household income and the poorer the household the greater the share of income from these resources. This is partly due to the fact that they are more likely to be dependent on forest resources for their livelihood. Unlike Cavendish's study, Gupta, *et al.,* (2004) argue that poor households are not necessarily more dependent on natural resources than are the rich: dependence declines at first but then increases with an increase in income, especially in areas where forests are abundant and grasslands are well-stocked.

The importance of local institutions[1] in forest resource management is widely recognized and has become a part of the forest management policy of many countries. In Nepal, as in other developing countries, the development of community-based resource management has led to the decentralization of forest management -- from centralized government control to local Forest User Groups (FUG). Within the framework of community forestry projects implemented by the government with support from several international donor agencies, the acreage of forests officially managed through local institutions is expanding, especially in the hilly areas of Nepal. So far, 1.1 million hectares of forest (about 25% of the national forest areas) have been handed over in Nepal to more than thirteen thousand community forest user groups involving 1.4 million households (DOF, 2004).

[1] In this paper, 'institutions' refers to rules that individuals use to order interactions affecting themselves and others. A forest management institution is basically the set of working rules formally or informally adhered to by individuals and/or a group of users for long-term (managed) procurement of products from a particular forest (Ostrom, 1990).

Decentralization of forest management promises more efficient, equitable and sustainable use of the resource (Hobley and Shah, 1996). In Nepal, in terms of governance reform, forest stock improvements and coverage of community forestry projects, there is dramatic success to report. After the community forestry program started, reforestation mostly focused on timber-oriented tree plantations, which has helped increase the physical stock of trees in forests (Branney, *et al.,* 1994). However, there are many challenges as well related to equity, livelihood and the sustainability of forest management (Pokharel, 2002; Adhikari, 2003). Several studies highlight the costs of restrictions that limit the year-round collection of NTFPs and the unequal distribution of benefits among user group members (Maharjan, 1998; Ojha, 2001; Bhattrai and Ojha, 2001; Adhikari, 2003). Given the critical role that forests play in Nepalese rural livelihoods, it is necessary to carefully evaluate the impact of these new management approaches. It is not yet clear whether these reforms improve forest access for low-income people.

Community cooperation to manage local natural resources can emerge endogenously or can be a result of state decree or intervention. Some studies in Nepal (Arnold and Campbell, 1986; Campbell, *et al*., 1987) have investigated the role that local communities can play in protecting the forests without government intervention. Fisher, *et al*., (1989) and Gilmour and Fisher (1991) attempt to analyze some of the features of indigenous systems of forests management and their relevance to forest management policy. Although such studies on indigenous forest management and income distribution from community forestry in Nepal are available, little attention has been paid to the institutional differences in forest management and benefit distribution among user groups within different systems.

This study seeks to understand the implications of local institutions on forest products extraction and benefit distribution among the users. It examines NTFPs extraction in two communities: one, a government-sponsored *formal* forest user group and the other, a self-initiated *informal* forest user group. The key questions addressed in this paper are the following: (i) what are the rules and regulations of NTFP collection in the two types of forest management systems? (ii) how and to what extent does NTFP use differ among the households? (iii) what socio-economic and institutional factors are correlated with differences in NTFP collection?

The rest of the paper is organized as follows. Section two reviews the literature on forest resources and institutional change and briefly discusses forest user groups of Nepal. Section three carries a description of the study site and data collection methods. Section four discusses methods used to estimate household income. Section five and six present the results and discussion. Section six lays out the conclusions.

2. Forest resources and institutional change

After the publication of Garrett Hardin's influential article, "The Tragedy of Commons," in 1968, there has been a great deal of research on common property resource management. Hardin argues that in the absence of property rights, no individual bears the full cost of resource degradation and the result is 'free riding' and over exploitation (Hardin, 1968). A different strand of thought, however, has emerged from the literature on common property and institutional arrangement in the 1980s. Research in the late 1980s showed that local forest

management systems, based on indigenous organizations and decentralized collective management by users, can avoid the tragedy of commons (Arnold and Campbell, 1986; Jodha, 1986; Fisher, 1989; Chopra, *et al.,* 1990).

It is now becoming clear that local communities both filter and ignore the central government's rules. More importantly, they also add their own rules, generating local institutions/rules that both in use and patterns of activity could diverge widely from the legislator's and bureaucrat's expectations (Gibson, *et al.,* 1998). According to Ostrom (1990), if resource users are given the right to devise their own institutions without being challenged by external authorities, they would enforce the rules themselves and this in turn would in turn permit the development of internal governance mechanisms that would allocate costs and benefits to the members. Local communities living in proximity to forests are primary users of forest products and create rules that significantly affect forest conditions. Their inclusion in forestry management schemes is now considered essential (Arnold, 1992).

There has been growing interest recently in the decentralization of forest resources management. The promotion of decentralization can be traced to awareness about the numerous problems associated with state-centric institutions for forest resources management (Bray, *et al.,* 2003). Now, both the governments of developing countries and international donor agencies are looking for ways to reduce the cost of delivering services by transferring more of the management responsibilities to the communities themselves. At the same time, communities are demanding greater control over local resources. This "push" by governments and "pull" by communities is seen to varying degrees in common resources management throughout the world.

Nepal is a prominent example of institutional change in forest resources management in South Asia. The history of forest policy in Nepal begins with a move from privatization to nationalization and, then, a return to a decentralization of forest management. The shift to nationalization established new forestry systems that led to gaps in pre-existing indigenous forestry (Wakiyama, 2004). This contributed to a deteriorating in forest conditions and livelihoods of the poor. Subsequently, growing recognition of the benefits of forest management by local communities led, in the 1990s, to the re-introduction of community participation in forest management (Gautam, 1991, Shrestha, 1996, Brown, *et al.,* 2002). Thus, forest management policies in Nepal have gone through a variety of transformations, including the establishment of large protected area networks, and the initiation of community forestry, leasehold forestry, and park buffer zone management programs in the mid-1990s (Agrawal, *et al.,* 1999). After the 1990s, community forestry has received high priority.[1]

Decentralization of forest management in Nepal helped to establish local institutions in areas where the indigenous forest management system was either dissolved by the impact of nationalization or where the local people had not formulated any institutional arrangement (Wakiyama, 2004). Thus, currently, indigenous and government-sponsored community forest user groups are the main local-level forest management institutions in Nepal. These groups are also called informal and formal forest user groups based on legal registration at the district forest office. The primary distinction between the formal and informal community forest user groups

[1] In 1993, the government of Nepal passed the Forest Act of 1993 to transfer all accessible forestland from the central government to local communities through the creation of forest user groups.

is that the forest user committee of a formal community forest is recognized and sponsored by the state. However, regardless of their legal title, indigenous forests are treated by local people as a common property resource and are referred to as *Hamro Ban* (our forest).

Informal community-level forest management institutions have evolved with time without input from outside by way of imposition, inducement, or extension (Gautam, 1991). In this system, local knowledge is well utilized and villagers formulate new rules and regulations based on their past experiences (Agrawal, 1995). This system combines traditional authority with self-regulation in order to organize informal institutions. Generally, households cooperate to minimize damage to the resources they rely on in order to meet their long-term needs (Soussan, *et al.,* 1995). Since the 1990s, many indigenous forests have been transformed into formal community forests. However, in the process of creating new institutions, there is always the danger of destroying indigenous systems (Gautam, 1991). It is open to debate whether government-sponsored community forestry is better than other indigenous forest management systems.

Government-initiated community forests are national forests handed over to the user groups for conservation, development, and utilization for collective benefit. A prerequisite for formal FUG is an operational plan approved by the District Forest Officer, which serves as a contract between the Forest Department and local users. The forest users prepare this plan in collaboration with forest officials. An important feature is the establishment of a village-level forest user committee, which is authorized to implement forest management and to distribute or sell forest products. They are fully legitimized as an autonomous institution of the local community. In the government-initiated community forest, villagers have access to forest products only, but the forest land remains state-owned.

There is limited empirical evidence to support the hypothesis that forest resources are managed more efficiently under the government's community forestry schemes relative to other management systems. Several studies have reported that forest cover and biophysical conditions have improved in many places under the protection and care of community forest user groups, thereby providing economic benefits to the local people (Jackson, *et al*., 1998; Webb and Gautam, 2001; Gautam, *et al.,* 2002; Gautam, *et al*., 2004). However, fewer studies have discussed the issue of benefit distribution when it comes to community forestry and assessed distributional differences between different local systems (Bhattrai and Ojha, 2001; Edmonds, 2002; Adhikari, 2003). This study seeks to bridge this gap.

3. Study site and data collection

This study was undertaken in 2003 in the Pyuthan district of Nepal, which is located in the middle mountain region. Of the total land area in the district, 34 % is cultivated land, 59 % forestland and 7 % other land including degraded pastureland. More than 48 % of the total forest area in the district is under government-initiated community-based forest management. There are some 280 FUGs within the district managing these forests. Agriculture is the main occupation of households and the forest is an indispensable resource for the farming system. The households' main income sources are crop cultivation, livestock raising, off-farm income through agriculture, non-agricultural labor within village and district, government service, and

seasonal out-migration for income-generating labor activity. NTFPs found in the study area include a considerable variety of wild foods, medicinal plants, fuel woods, fodder, grass, thatch grass, leaf litter, etc. NTFPs are collected from common forests as well as private lands. Caste and ethnic diversity is high in the study area. People belong to the *brahmin*, *chhetri*, *magar*, *gurung*, and lower castes like *damai*, *kami*, *sarki*, *sunar,* etc. The dependence on agriculture and forest resources, the presence of community forestry, and the harvesting of domestic as well as commercially valuable NTFPs from different property rights regimes make Pyuthan district a suitable study area for the purposes of this research.

This paper is based on detailed analyses of two different community-based forest management institutions. The two villages are: Chuja with government-sponsored formal FUG, and Gobanpani with self-initiated community forest management. The communities were identified on the basis of common use rights to a particular patch of community (forest) land. In general, specific *toles* (hamlets) can use specific patches of forest. The first village, Chuja with the formal FUG, is within 5 km. of the district headquarters. The second village, Gobanpani, with the informal FUG is more remote, located at 18 km from the district headquarters.

Before the questionnaire survey, households were stratified into large, medium and small based on the landholding size of the households. Small, medium, and large households own 5 *Ropani*[2], 5.1-10 *Ropani,* and above 10 *Ropani* of land respectively. The income level and incidence of poverty is highly correlated with landholding size in Nepal. The average household income of large landholders is almost double that of small holders and the incidence of poverty is very much concentrated among the small landholders (NRB, 1988; Sharma and Chhetri, 1996). Therefore, stratification of households based on landholding size in rural areas reflects a household's wealth level.

Primary data on the collection and use of forest products were collected through a questionnaire survey of 100 households in the two communities. In the total sample, 50 percent respondents were from the government-initiated formal forest user group and the remaining 50 percent were from self-initiated community forestry user group. The number of small, medium and large landholders is 35, 34 and 31 respectively. Households collected NTFPs from private forests as well as common forests. During data collection, questionnaires were designed to separate uses from different types of forest within the household.

Before the household survey, a checklist of all potential NTFPs that user-households extract from the different types of forest was prepared to avoid underestimation of harvested NTFPs. Standardization of local units (e.g., *doko, muri, pathi, mana, dharni*) was also done during the household survey. The NTFPs include tree and grass fodder, roots, stems, bark and leaf of medicinal plants, wild vegetables, fruits, leaf litter, etc. Household-level data also includes information on production, income and consumption expenditure.

4. Estimating household income

To determine the distribution of NTFPs income, household incomes were calculated according to economic activities. Household income sources were grouped into five major sources, namely,

[2] 1 hectare = 19.79 *ropani*

(i) income from agriculture, (ii) income from livestock, (iii) income from private forest, (iv) off-farm income, and (v) income from common-property resources collection.

Income from agriculture: To calculate agriculture income data, information on different crops cultivated by each household in one year, in terms of area and output, was collected. The households for this study were mostly small-scale farmers producing primarily for home consumption. Most of the inputs are self-supplied; households rarely hire a labor force or purchase other inputs like seeds, fertilizer, manure and pesticides for agriculture production. However, labor exchange practices were common. To avoid miscalculation of partially applied labor force due to difficulty in recalling the exact number of laborers using during cropping time, the gross value of agriculture output was calculated based on the output data.

Income from livestock: The major livestock in the study area were cattle, buffalo, goat, sheep and poultry. The total income from livestock includes the value of milk and eggs as well as animals sold and consumed by family. Livestock dung was excluded to avoid double counting because all households used dung in agriculture production. Hiring labor for livestock rearing was not found in this area. Inputs for the livestock were self-supplied and collected from the forests.

Income from private forest: Households use most of the outputs derived from the private forest for livestock and agricultural production. In this paper, income from private forest includes the sale of highly valuable commercial NTFPs and timber and excludes subsistence use for livestock and agriculture production. Commercially valuable NTFPs like *timur* (*Zanthoxylum aramatum*), *dalchini* (*Cinnamomum tamala*), *rittha* (*Sapindus mukorossi*) and *chiuri* (*Bassia butyracea*) are collected from private lands. These NTFPs make a significant contribution to household cash income.

Off-farm income: In this study, income from wage labor, professional work (teaching, government and non-government employment), remittance, and pensions are included as off farm income. Only a few households were found to be engaged in business.

Income from common-property resource collection: Households in the study areas collect (i) dry wood for fuel; (ii) grass, leaf-fodder and leaf-litter for livestock; (iii) thatch grass for roof construction; and (iv) medicinal herbs and plants. Among these NTFPs, five products, i.e., firewood, grass, leaf-fodder, leaf-litter and thatch grass contribute significantly to the household economy. For a majority of households, the income from NTFPs collection was the sum of the revenue obtained from these five NTFPs.

Calculation of gross and net value of NTFP income from the CPR: Gross income from the NTFPs was calculated by multiplying the total quantity of NTFPs collected for 12 months by their respective prices. The potential problem for valuation was that many NTFPs were not traded in formal markets; rather they were traded or bartered locally. To value the forest products, different methods of NTFP valuation were used**.** Valuation of fuelwood and thatch grass was done based on the market prices of these products. Leaf-litter, fodder and grass are non-marketed NTFPs but it was found that some households barter fodder and grass for grain in the dry season. To value leaf-litter, households were asked how much money or food grain they would pay for a particular amount of leaf litter. All NTFPs were valued based on the average

reported price of particular products. The net income from NTFPs is calculated by deducting all cash and labor costs, including cost of tools and equipment used, in the collection of NTFPs. The net return is the gross value of NTFPs minus all costs except the value of household labor. Labor cost of time is valued as time costs directly associated with reaching the forest, collection and transportation of NTFPs from the forest to house. Total costs include labor costs, the cost of tools and equipment, and the cost of monitoring and other mandatory activities, mainly tree planting and cleaning of unwanted bushes.

5. Results and discussion

5.1 Characteristics of households in the two communities

The households included for this study are mostly small-scale farm households producing all crops and livestock products for home consumption. Maize, rice, wheat, barley, buckwheat and finger millets are the principal crops in the region. In the first village, which is characterized by the formal FUG, 82 percent of the households are high caste[3] (*brahmin* and *chhetri*) while 18 percent are ethnic groups[4] (*gurung* and *magar*) and occupational[5] (or so-called) lower castes (*kami*, *sunar*, *damai* and *sarki*). In the case of the second village, which is characterized by the informal FUG, 20 percent households are *brahmin* and *chhetri*, 42 percent are ethnic groups and 38 percent are occupational castes. In the total sample, therefore, 51 percent of the households are *brahmin* and *chhetri*, 23 percent *gurung*/*magar,* and 26 percent occupational/lower castes.

Table 1: Descriptive statistics

Variables	Formal FUG (Mean value)	Informal FUG (Mean value)	Mean difference
Education of household members (Years of schooling)	5.72	1.58	4.14 (3.51)
Age of household head (years)	41.34	48.75	-7.41 (3.20)
Household size (Number)	6.80	6.92	-0.12 (0.21)
Total land holding (*ropani*)	15.88	9.80	6.08 (1.95)
Irrigated land holding (*ropani*)	2.26	1.04	1.22 (1.52)
Non-irrigated land holding (*ropani*)	5.83	5.20	0.63 (0.48)
Land under private forest (*ropani*)	7.87	3.58	4.29 (2.86)
Total livestock holding (cattle equivalent)	4.80	6.43	-1.63 (2.12)
Distance to nearest market (km.)	5.08	8.36	-3.28 (7.39)
Distance to community forest (km.)	2.35	2.40	-0.05 (0.20)

Note: Figures in parentheses are t-values

[3] One integral aspect of Nepalese society is the existence of the Hindu caste system, modeled after the ancient and orthodox Brahmanism of the Indian plains. Its establishment became the basis of the emergence of the feudalistic economic structure of Nepal: the high-caste Hindus began to appropriate lands--particularly lowlands--that were more easily accessible, more cultivatable, and more productive.

[4] Ethnic groups share a common origin and are readily distinguishable by outsiders on the basis of traits originating from a common racial, linguistic or religious source.

[5] Occupational castes--also known as the Dalits or the untouchables--is a group of people outside of the four castes (*bahun, chhetri, baisya, sudra*) system--and are considered below them.

As seen in Table 1, sixty-two percent of household heads are literate in the formal FUG area whereas in the informal FUG only 11 percent are literate, which could be considered fairly low. The average year of schooling of a household head in the formal FUG area is lower secondary level while in the informal FUG this is only the primary level. In the total sampled households, only 42 percent of household heads are literate. Average household size is 6.80 and 6.92 in formal and informal FUG areas respectively.

Farmland among the sampled households may be divided into three types: lowland (*khet*), which is irrigated and usually found in valley bottoms, upland (*pakho*), which consists of hillside terraces where irrigation is not possible, and private forest (*khoriya*), which is non-cultivated slope, and terrace land with fodder trees, grass, timber as well as other NTFPs. Community forestry area with formal FUG seems to be better off in terms of total land holding as well as irrigated and private forest land. The average total land holding in the formal FUG area is 6.08 *ropani*, which is higher than that in the informal FUG area. Similarly, more land is under private forest in the formal FUG area. But the livestock-holding size is higher in informal FUG area as compared to the formal FUG area.

Most of the households own some combination of cattle, buffaloes, goat, sheep and a small number of chickens. For the purposes of this study, livestock ownership is computed in terms of livestock units calibrated in cattle equivalents. Households often stall-feed their livestock in the formal FUG area due to restrictions on grazing in the community forest. But in the case of the informal FUG area, grazing is free throughout the year. The distance to the nearest market from the formal FUG area is less in comparison with the informal FUG area. The distance to the community forest is higher in the informal FUG area. The One-way ANOVA indicates that the four wealth groups (lower 25%, 25-50%, 50-75% and top 25%) significantly differ in terms of the different types of land- and livestock-holding.

5.2 Institutional arrangement and forest products collection

Tables 2 and 3 present the institutional arrangement in the two types of forest management systems based on discussions with the villagers.

In the informal FUG village, the institution evolved through the passage of time. This was due to the self-realization of villagers that protection of the forest was to their own benefit. The customary rights of the users were recognized and identified in the indigenous system, which was later legalized with indigenous codes.[6]

In the formal FUG, forest department officials insisted on formulating and registering the FUG in the District Forest Office. The formal FUG controls and manages the local forests, including independent harvesting and pricing of all forest products. An executive committee elected at the FUG assembly governs forest management activities. In this study, the local elite led both informal and formal committees. This would suggest that when it comes to the formation of local level forest management institutions, local elite play a bigger role regardless of the formal or informal status of the institution.

[6] Indigenous code refers to the rules and regulations concerning forest resource management and use, at least in nominated areas, that were developed based on local people's long experience (Gautam, 1991).

Table 2: Institutional arrangement in the two types of forest management systems

		Informal FUG	Formal FUG
Institution	Formation	Villagers' initiation and self-organization	Government's intervention and sponsorship
	Process	* Self-realization on the need to protect the forest * Control in collection and breakdown of rules took place continuously in the formation of self-organization	*Forest department officials influence the making of formal FUG. * Local elite and forest officials developed village level forest management committee in consultation
	Committee	* Unofficial committee, led by the most influential and respected person in the village, which meets when somebody breaks the rule.	* Officially registered 9 member committee, led by the local elite, which meets every month.
Rules and Regulations	Characteristics	* Unwritten rules (norms and codes) developed through the passage of time. * Customary law	* Official documents (developed through consultation with villagers and forest officials). * Statute law
	Management	* All villagers, as a resident in the community.	* All villagers, as a member of a formal institution.
Legitimacy		* No legal right to collect and sell forest products * Informal cooperation between villagers and local forest officials	* Legal right to collect and sell forest products * Formal cooperation between District Forest Office and FUG

The collection of forest products differs based on institutional regimes. Before community forestry, state-owned forests were utilized often on the basis of open access to collect NTFPs. In formal FUG-managed forests, access rules (flow management) and conservation rules (stock management) are defined adequately during FUG registration in the district forest office. Management practices mostly consist of control when it comes to the collection of timber as well as non-timber forest products through the definition of user rights. Only the members of a forest user group are allowed to extract NTFPs. Other people living in the area regard these rights as legitimate. The user groups can decide to close NTFPs collection for a certain period. In such instances, the forest user committee fixes the opening date.

The FUG formulates regulations on collection techniques in order to enhance regeneration and production of NTFPs. For example, branch lopping and uprooting, are prohibited. The collection time in FUG-managed forests is short, as the largest quantity is collected on the opening days and only a limited number of members of each household can gain admission to the forest after paying a fee to the committee. The user group committee has a right to decide the punishment for illegal collection of forest products and cutting of trees and poles. Watchmen, employed by the FUG, monitor the forest year round and receive a monthly payment from the FUG. As a result of the harvesting rules and regulations, resource stock management in community forestry is better. But the collection ban for the seasonally regenerated NTFPs from the natural forest is an important issue in community forests managed by the formal FUG.

Forest management under informal FUG differs in many ways. While informal FUGs impose restrictions on timber and green fuelwood collection, NTFPs collection is free and open throughout the year. Villagers employ a forest watchman, who is responsible for patrolling the forest and controlling access to collection and cutting of timber, green fuelwood, and livestock grazing as well as for excluding outsiders according to the rules set up by the user group committee. He collects seasonal agricultural products from every household as payment. One important difference between the two forest management institutions is that formal FUGs have the legal right to cut and sell the timber in future whereas informal FUGs do not.

Table 3: Rules and regulations in forest products collection and management

Rules and regulations	Formal FUG		Informal FUG	
	NTFPs	Timber	NTFPs	Timber
Quantity restriction	Limiting through number and period of entry	FUGs have legal right to cut and sell	No restriction	FUG have no legal right to cut and sell
Entry fees	NRs. 15/person/day	No fee	No fee	-
Monitoring	Watchman and villagers		Watchman	
Organizing investment for maintenance and conservation	Low	High	Low	Low
Payment for watchman	By FUG from collected fund		Agricultural products by all users	

5.3 Economic activities and household income

Table 4 shows the various income sources of the sample households in the two different forest user and wealth groups. The off-farm income source is the most important activity in both communities, which contributes more than 55% and 62% in the formal and informal FUG areas respectively. This income source includes skilled and unskilled wage labor, services in government and non-government offices, remittances and small businesses. Seasonal and year round out-migration within district and outside district was a prominent feature in both areas. In most of the surveyed households, one or two adult men out-migrated to earn money, particularly to India. The second and third important sources are agriculture and livestock farming in the formal FUG area whereas livestock is the second important income source in informal FUG areas. It is interesting to note that livestock income in both villages follows an inverted U curve relative to wealth. In other words, as wealth increases livestock income increases too for the middle two wealth categories and then decreases for the highest wealth category.

Table 4: Annual average income by economic activity and wealth group (NRs)

Variables	Average total income	Wealth groups			
		Lowest 25%	25-50 %	50-75 %	Top 25%
Community forest (formal FUG)					
Average income from agriculture	16,138 (23.80)	6,750 (17.81)	13,825 (33.04)	13,133 (20.89)	30,434 (24.05)
Average income from livestock	7,667 (11.30)	3,732 (9.85)	6,835 (16.33)	8,002 (12.72)	12,062 (9.53)
Average off-farm income	42,066 (62.04)	25,912 (68.40)	19,992 (47.78)	39,280 (62.48)	81,170 (64.14
Commercial NTFPs income [a] (Private land)	1,927 (2.84)	1,487 (3.92)	1,183 (2.82)	2,445 (3.88)	2,878 (2.27)
Community forest (informal FUG)					
Average income from agriculture	5,908 (17.34)	2,533 (15.88)	5,498 (16.14)	6,821 (14.44)	8,817 (17.71)
Average income from livestock	7,228 (21.26)	2,497 (15.65)	7,624 (22.38)	10,975 (23.24)	8,136 (16.35)
Average off-farm income	17,830 (52.46)	8,769 (54.98)	17,417 (51.14)	27,350 (54.93)	18,487 (57.24)
Commercial NTFPs income (Private land)	3,020 (8.88)	2,148 (13.48)	3,513 (10.31)	2,063 (4.36)	4,320 (8.64)

a. Income derived from selling forest products from private forest (excluding subsistence use). Percentage income from each activity to total income in parenthesis. 1US$ = 75.00 Nepalese Rupees

In the study areas, some commercially valuable NTFPs were found abundantly in common forests a few years ago. Gradually, the marketing agents started visiting villages to collect more NTFPs paying a higher price, which encouraged local people to extract more NTFPs from the common forest. Now these valuable NTFPs are hardly found in the forest. During this process, a gradual transition from the collection of NTFPs from common forest to the purposeful cultivation of NTFPs in private land took place. Now, significant amounts of commercially valuable NTFPs are collected and sold from private land. A large proportion of the income is derived from selling commercial NTFPs such as *timur* (*Zanthoxylum aramatum*), *dalchini* (*Cinnamomum tamala*), *rittha* (*Sapindus mukorossi*) and *chiuri* (*Bassia butyracea*).

5.4 Value of NTFPs collected from the forest

Among all NTFPs, the most significant are fodder, grass, leaf-litter and fuelwood extraction from common forests. Fodder, grass and leaf-litter do not provide direct cash income but play a crucial role in the farming system. Fuelwood is mostly used for cooking and heating purposes althoug some households generate cash by selling fuelwood to nearby markets. Other NTFPs such as wild fruits and vegetables too are collected in small quantities during the different seasons for home consumption.

Table 5 shows the average annual value of NTFPs extraction from the two types of forest. As the Table demonstrates, all wealth groups commonly rely on the local forest for fuelwood needs although blacksmiths and local alcohol distillers are more dependent on fuelwood and forest

yeast (*marcha*) for their traditional businesses. Generally, poorer households collect more wild fruits, vegetables and other consumable NTFPs for own consumption and sale on a small scale. The average NTFPs extracted value is higher in forests managed by informal FUG. In the formal FUG area, collection of fodder is restricted while thatch grass was not found in the informal FUG area.

Table 5: Average value of NTFPs collected by households (NRs)

NTFPs	Formal FUG			Informal FUG		
	% of households collecting NTFPs	Mean value (NRs.)	Std. dev.	% of households collecting NTFPs	Mean value (NRs.)	Std. Dev.
Leaf-litter	80	140	198	88	1,743	2,069
Grass	86	248	309	82	796	451
Fodder	0	0	0	98	3,689	1,874
Fuelwood	92	688	415	100	8,759	5,950
Thatch Grass	82	438	307	0	0	0
Total		1367	719		14,987	8,310

5.5 NTFPs income distribution among the households

Distribution of net income from NTFPs in the two study sites is illustrated in Table 6. This is the average value of extracted NTFPs from the community forest in a harvesting period (12 months). The average extracted value of NTFPs between the two sites differs significantly. This value increases from less wealthy to wealthier households. This is due to the fact that less wealthy households have small land holding size and fewer numbers of livestock so that they cannot use intermediate forest products like grass, fodder, leaf litter, etc., which is a major contribution of NTFPs from the community forest. The one-way ANOVA analysis indicates that NTFPs income distribution differs significantly between the lowest 25% and other upper wealth groups in both the sites.

Table 6: Distribution of net income from NTFPs collection based on wealth group (NRs)

Forest type	Average net income	Wealth groups and net value of NTFPs			
		Lowest 25%	25-50 %	50-75 %	Top 25%
Formal FUG	1,175	964	1,103	1,005	1,621
Informal FUG	9,554	6,218	9,168	10,830	12,000

Table 7 shows the average share of NTFPs from community forest to total income of the households. Forest resource dependence decreases with increase in wealth. Table 6 and Table 7 indicate that the rich households are not all that dependent on common property resources although they use more natural resources in terms of quantity.

Table 7: Contribution of NTFPs extracted from common property to total household gross income based on wealth group.

Community	Wealth groups and % contribution of NTFPs			
	Lowest 25%	25-50 %	50-75 %	Top 25%
Formal FUG	2.10	1.74	1.30	1.13
Informal FUG	19.52	18.49	12.34	13.90
Total	12.56	11.67	6.63	5.69

Table 8 presents the regression results of the effect of income level on total NTFPs extraction and dependence on NTFPs. Regression of NTFPs income to total income and income squared shows that within a certain level of household income NTFPs extraction increases and then falls with the increase in total income. The second regression of ratio of NTFPs income to total income indicates that a household's dependence decreases gradually with a higher income level. But the positive sign with income squared indicates that NTFPs dependence on forest decreases at an increasing rate.

Table 8: Effect of income level on total NTFPs extraction and dependence on NTFPs

Variables	Dependent variable: NTFPs income		Dependent variable: ratio of NTFPs income to non-NTFPs income	
	Coefficients	t- Value	Coefficients	t- Value
constant	1411.606	0.855	0.397	8.741
tot- income	0.239	4.135***	-4.389E-06	-4.180***
tot- income-sq	-8.743E-07	-2.337**	1.017E-11	2.971***

$R^2 = 0.46$, Adj.$R^2 = 0.44$ and $R^2 = 0.19$, Adj.$R^2 = 0.18$ **, *** imply significance at 5% and 1% probability levels respectively

5.6 Household socio-economic characteristics and NTFPs extraction

Knowledge about the socio-economic determinants of forest dependency and the nature of their impact are important in forest management policy (Gunatilake, 1998). Moreover, the effectiveness in utilization of community forests appears to be linked with a number of socio-economic factors that have affected decision-making in the FUGs in Nepal (Rejal and Petheram, 2001). Besides socio-economic factors, rules and regulations imposed by particular institutions may influence the value of NTFPs extraction from the forest.

Gross NTFP income from the forest was regressed on socio-economic variables interacted with a dummy for the formal FUG in order to examine the effect of socio-economic variables under the two different types of management. Since NTFP income from private lands may substitute for NTFP income from the forest in the village with greater restrictions on forest use, the second column in Table 10 below reports results from a regression in which the dependent variable is the *total* gross NTFP income from forests and private lands. Table 9 defines the explanatory variables incorporated in the econometric analysis.

Table 9: Definition of explanatory variables

Variables	Description
HAGE	Age of household head (years)
EDUCATION	Average education of household (no of schooling years)
LANDPF	Area under private forest (in hectare)
LIVESTOCK	Number of livestock owned by a household
GENDER	Gender of household head (Dummy, 1 = female headed households, 0 = otherwise)
CASTEL	Lower caste (Dummy, 1= if lower caste, 0 = otherwise
FORMALFUG	Forest type (Dummy, 1 = If with formal forest user group, 0 = otherwise)
FAMSIZE	Number of people in household
dFAMSIZE	Number of people in household x Formal dummy
LANDT	Land area under household management excluding private forest (in hectare)
dLANDT	Land area under household management excluding private forest x Formal dummy
DISTANCE	Distance to forest from households (km.)
dDISTANCE	Distance to forest from household (km.) x Formal dummy

I first regressed Y (for both dependent variables) on all the explanatory variables and their interactions with the FORMALFUG dummy to test whether the slope coefficients in the two villages were the same. This hypothesis was rejected at the 1% level (F = 21.00). However, another F-test for the hypothesis that all variables except FAMSIZE, LANDT, and DISTANCE had the same coefficient in the two villages was accepted for both dependent variables. Accordingly, Table 10 presents the regressions that allow only the coefficient on these three variables to differ between villages.

To see whether NTFP collection from the forest is lower in the formal FUG village, as might be expected due to stricter regulation, we see whether the predicted difference in NTFP income between formal and informal FUG villages at the mean values of FAMSIZE, LANDT, and DISTANCE, is less than zero using an F-test. We find that the predicted difference is -5797 rupees with a p-value of 0.008. This finding is similar to that of Edmonds (2002) who observes that the presence of a forest user group reduces fuelwood collection from the community forests. This indicates that along with socio-economic characteristics, rules and regulations in NTFP collection have a significant impact.

The total value of NTFPs is also significantly lower (p-value 0.061) by Rs.2457 in the FUG area. This suggests that NTFP collection from private lands in the village with the formal FUG is not sufficient to make up for the reduced collection from the forest.

Only family size, landholding, and distance from the forest have statistically significant effects on NTFPs extraction in the informal FUG village and these effects are fairly large. Larger families imply larger labour supply, larger landholdings a greater demand for manure as well as an income effect, so that, as might be expected, the effects of family size and landholding are positive. Also as expected, distance from the forest has a negative effect on NTFP income in the informal FUG village. But these three variables have small and statistically insignificant effects on NTFP income in the formal FUG village. This may be seen by observing that the sums of the coefficients of the three variables with the coefficients on the respective interactions with the FORMALFUG dummy are close to zero. This suggests that NTFP collection in the formal FUG village is constrained by regulations made by the FUG so that collection cannot increase with

increases in labour supply and landholding or with reduced distance. In the formal FUG area, all households collect NTFPs during the period when the forest is open, whatever the distance from the community forest. But in the informal FUG area, households near the forest visit the forest more frequently than those residing far from the forest.

In this analysis, other independent variables (age of household head, education, land under private forest, livestock, and gender and caste) are insignificant when it comes to NTFPs value extracted from the forest. Therefore, the conclusions regarding the effect of these variables on NTFPs extraction cannot be drawn. Instead, further analysis, taking into consideration the sample size, is required to find out whether these variables have effects on NTFP income once family size, land, and distance are controlled for.

Table 10: Determinants of NTFPs income from the forest

	Forest NTFPs	Forest + Private NTFPs
Variable	*Coefficient*	*Coefficient*
HAGE	-13.74 (37.81)	-15.78 (44.55)
EDUCATION	-43.47 (204.96)	-192.62 (241.51)
LANDPF	-35.35 (102.26)	-160.79 (120.50)
LIVESTOCK	164.83 (159.06)	360.93 (187.42)
GENDER	-106.05 (1081.70)	-645.17 (1274.58)
CASTEL	1017.07 (1120.61)	2367.6 (1320.42)
FORMALFUG	-7994.21** (3997.77)	-18334.77* (4710.60)
FAMSIZE	1048.06*** (253.05)	1127.77*** (298.17)
dFAMSIZE	-1078.36*** (413.86)	-933.27** (487.66)
LANDT	647.22*** (128.19)	721.94*** (151.05)
dLANDT	-637.94*** (141.25)	-727.07*** (166.44)
DISTANCE	-3130.78*** (746.33)	-4078.08*** (879.40)
dDISTANCE	2960.45*** (812.74)	4013.08*** (957.66)
CONSTANT	9468.44*** (3310.37)	14356.66*** (3900.63)

R^2 = 83% and Adj.R^2 = 80%, (Forest NTFP), and R^2 = 78% and Adj. R^2 = 75% (Forest + Private NTFPs) *, ** and *** imply significance at 10%, 5% and 1% probability levels respectively. (F = 32.65, N = 100 and μ = 0.000 in Forest NTFPs, and F = 24.47, N =100 and μ = 0.000 in Forest + Private NTFPs)

6. Conclusions

The main objective of this study was to understand the effect of local institutions on the collection of forest resources for the daily livelihood and for distribution of income among the households. This study has found that NTFPs collection from the common property resources is an important economic activity because local people rely on NTFPs, particularly grass, fodder, leaf-litter, etc., for subsistence agriculture and livestock farming, and fuelwood for household energy demands. The rules and regulations in the two institutions are different for NTFPs and timber collection. It is found that the total value of NTFPs collected from the forest is significantly lower in the formal FUG areas as compared to the informal area. The lower NTFPs income in the FUG managed forest is due to new rules and regulations of NTFP collection after community forestry interventions.

In this study, the distribution of income from the forest is unequal among the forest users in both the management systems. Like the previous studies, collection of NTFPs from the forest increases with the income level: poor households use fewer forest resources than do rich households. But household dependence on NTFPs decreases gradually with higher income and this dependence decreases at an increasing rate after a certain level of income. In these study villages, rich households have large private forests, and they can substitute privately grown resources for NTFPs collected from the common forest. In a comparison between the two institutions, the poorer segments bear more of the cost of the reduction of forest resource extraction than the richer segments due to the ban on seasonal NTFPs collection in the formal FUG-managed village.

The econometric analysis shows that a household's family size and landholding size would have a positive impact on NTFPs collection in informal FUG managed forests but that these variables have insignificant impacts on formal FUG-managed forests. Due to the limited number and period of entry to collect NTFPs, family size and land holding size have less effect on total NTFPs collection. On the other hand, the total value of NTFPs consumption is significantly lower in the formal FUG area.

In the formal FUG management system, emphasis has been given to reforestation by timber oriented trees rather than NTFPs, which are valuable for commercial purposes. For those who cannot use more agriculture and livestock related NTFPs from the community forests, regeneration of commercial NTFPs may be an alternative strategy to increase benefits for poorer households. With some harvesting rules and regulations, disadvantaged groups among forest users can derive more benefits by extracting commercial NTFPs from the existing system of management. With certain harvesting rules and techniques, these NTFPs could be collected year round as in the informal FUG management system.

References

Adhikari, B (2003), "Property rights and natural resources: socio-economic heterogeneity and distributional implications of common property resource management," Working Paper No. 1-03, Kathmandu, Nepal: South Asian Network for Development and Environmental Economics (SANDEE).

Agrawal, A (1995), "Dismantling the divide between indigenous and scientific knowledge," *Journal of Development and Change,* 26 (2): 413-434.

Agrawal, A, C Britt and K Kanel (1999), *Decentralization in Nepal: A Comparative Analysis*, Oakland, California: ICS Press.

Arnold, J E and J G Campbell (1986), "Collective management of hill forests in Nepal: the community forestry development project," In "Proceedings of the Conference on Common Property Resource Management," April 21-26, Washington DC: National Academic Press.

Bhattrai, B and H R Ojha (2001), "Distributional impacts of community forestry: who is benefiting from Nepal's community forests?" *ForestAction Research* Series 00/01, Kathmandu: ForestAction Nepal.

Branney, P, G C King and Y B Malla (1994), "Mid-term Review of Nepal's Hill Community Forestry Project," Washington D C: World Bank.

Bray, D B, L Merino-Pérez, P Negreros-Castillo, G Segura-Warnholtz, J M Torres-Rojo and H F M Vester (2003), "Mexico's community managed forests as a global model for sustainable landscapes," *Journal of Conservation Biology,* 17: 672-677.

Brown, D, Y B Malla, K Schreckrnberg and O S Baginski (2002), *Form Supervising "Subjects" to Supporting "Citizens": Recent Developments in Community Forestry in Asia and Africa,* London, UK: Overseas Development Institution.

Campbell, J G, R P Shrestha and F Euphrat (1987), "Socio-economic actors in traditional forest use and management: Preliminary results from a study of community forest management in Nepal," *Banko Janakari,* 1(4): 45-54.

Cavendish, W (2000), "Empirical Regularities in the Poverty-Environment Relationship of African Rural Household," Working Paper Series 99-21, London: Center for the Study of African Economies.

Chopra, K, G Kadekodi and M Murty (1990), "Participatory development: people and common property resources," *Studies on Economic Development and Planning,* No. 52, Delhi: Delhi Institute of Economic Growth and Sage Publication.

DOF (2004), "Forth-National Workshop on Community Forestry," 4-6 August 2004, Kathmandu, Nepal: Community Forestry Division, Department of Forests.

Edmonds, E V (2002), "Government-initiated community resource management and local resource extraction from Nepal's forests," *Journal of Development Economics*, 68: 89-115.

Fisher, R J (1989), "Indigenous systems of common property forest management in Nepal," Working Paper No. 18, Environment and Policy Institute, Honolulu: East-West Center.

Fisher, R J, H K Singh, D Pandey and H Lang (1989), "The management of forest resources in rural development: A case study of Sindhu Palchok and Kavre Palanchok district of Nepal," Kathmandu: ICIMOD.

Gautam, A P, E L Webb and G P Shivakoti (2002), "Local participants' perceptions about socio-economic and environmental impacts of community forestry in the middle hills of Nepal," *Asia Pacific Journal of Rural Development,* 12(2): 60-81.

Gautam, A P, G P Shivakoti and E L Webb (2004), "A review of forest policies, institutions, and change in the resource condition in Nepal," *International Forestry Review,* 6(2): 136-148.

Gautam, K H (1991), "Indigenous Forest Management System in the Hills of Nepal," Thesis Submitted to the Australian National University, http://www.mtnforum.org/resources.

Gibson, C, M A McKean and E Ostrom (1998), "Explaining Deforestation: The Role of Local Institutions," *Forest Resources and Institutions,* Ed. C Gibson, M A McKean and E Ostrom, Rome: FAO.

Gilmour, D A and R J Fisher (1991), *Villagers, Forests and Foresters – The Philosophy, Process and Practice of Community Forestry in Nepal*, Kathmandu: Sahayogi Press.

Gunatilake, H (1998), "The role of rural development in protecting tropical rainforests: Evidence from Sri Lanka," *Journal of Environment Management*, 53: 273-293.

Gupta, S, N Urvashi and V Klaas vant (2004), *Poverty and the Environment: Exploring the Relationship between Household Incomes, Private Assets, and Natural Assets,* Santa Barbara, USA: Department of Economics, University of California.

Hardin, G (1968), "The tragedy of commons," *Science*, 162.

Hobley, M and K Shah (1996), *What makes a local organization robust? Evidence from India and Nepal,* London, UK: Overseas Development Institute.

Jackson, W J, R M Tamrakar, S Hunt and K R Shepherd (1998), "Land-use changes in two middle hill districts of Nepal," *Mountain Research and Development,* 18(3): 193-212.

Jodha, N S (1986), "Common property resources and the rural poor in dry regions of India," *Economic and Political Weekly,* 21(27): 169-181.

Johnson, O E G (1972), "Economic analysis, the legal framework and land tenure system," *Journal of Law and Economics,* 15: 259-276.

Maharjan, M R (1998), "The flow and distribution of costs and benefits in the Chuliban community forest, Dhankuta District, Nepal," Network Paper No. 23, UK: Overseas Development Institute.

NRB (1988), *Multipurpose Household Budget Survey,* Kathmandu, Nepal: Nepal Rastra Bank.

Ojha. H R (2001), "Current policy issues in NTFPs development in Nepal," NepalNet: An Electronic Networking for Sustainable Development in Nepal.

Ostrom, E (1990), *Governing the Commons: The Evolution of Institutions for Collective Action,* Cambridge: Cambridge University Press.

Peter, C, A Gentry and R Mendelsohn (1989), "Valuation of an Amazonia Rainforest," *Nature,* 339: 655-656.

Pokharel, B K (2002), "Contribution of community forestry to people's livelihoods and forest sustainability: experience from Nepal," *World Rainforest Movement*, www.wrm.org.uy/countries/Asia/Nepal.html.

Rejal, B and R J Petheram (2001), "Extension for Community Forestry Development in the Mid-hill Zone of Nepal," Proceedings of the Extension Working Party (S6.-06-03), Symposium 2001, Austria: International Union of Forestry Study Organizations.

Sharma, S and D Chhetry (1996), "MIMAP research on poverty in Nepal: A Synthesis," Kathmandu, Nepal: APROSC and International Development Center.

Shrestha, K B (1996), "Community forestry in Nepal: An overview of conflicts," Nepal Madhyasthata Samuha, Discussion Paper Series No. MNR 96/2, Kathmandu, Nepal: ICIMOD.

Smith, R J (1981), "Resolving the tragedy of the commons by creating private property rights in wildlife," *The CATO Journal,* 1: 439-468.

Soussan, J, B K Shrestha and L P Uprety (1995), *The Social Dynamics of Deforestation: A Case Study from Nepal,* New York: The Parthenon Publishing Group.

Sterner, T (2003), *Policy Instruments for Environmental and Natural Resource Management,* Washington, DC: Resource for the Future.

Wakiyama, T (2004), "Community forestry in Nepal: a comparison of management systems between indigenous forestry and modern community forestry," Policy Report 2004, Japan: Institute for Global Environmental Strategies.

Webb, E L and A P Gautam (2001), "Effects of community forest management on the structure and diversity of a successional broadleaf forest in Nepal," *International Forestry Review,* 3(2): 146-157.