Potential of Forest Resources to Alleviate Poverty and Unemployment in Rural Nepal[1]

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Abstract

The study examines the importance of community forest resources for income and employment in rural areas of Nepal by studying the effect of current forestry policy on forestland use. Using data from 259 households in six community forest user groups in three hilly districts (Dolakha, Kavre and Nuwakot), the results show that the resources available from private lands and community forests with current polices are inadequate to fully utilize the family labour force of many rural households and are insufficient to meet the bare survival income of the poorest households. Current government policy dictates the use of all community forestland for limited timber production and environmental conservation, and provides little scope for fodder and firewood production. The study shows that community forestland management with an agroforestry model could overcome rural unemployment problems and increase incomes.

Key words: Community welfare model, livelihood, community forestry, incomes

Introduction

Achieving the Millennium Development Goals (alleviating suffering from chronic hunger, social inequalities and disease, and providing incomes sufficient for basic goods and services) is not possible without increasing household income and employment from locally available natural resources. This is particularly so for mountainous regions with many limitations on promoting industrial and service sectors (Dach et al., 2006). The principles/elements of forest management internationally agreed in the Earth Summit (1992) state that national policies should promote appropriate conditions that, "achieve and maintain cultural identity and social organization, as well as adequate levels of livelihood and wellbeing, through, *inter alia*, those land tenure arrangements which serve as incentives for the sustainable management of forests….Sustainable forest management and use should be carried out in accordance with national development priorities and on the basis of environmentally sound national guidelines" (Johnson, 1993: pp. 112-113). However

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the management of forest resources to increase income and reduce unemployment, particularly for the most socially disadvantaged groups, has not been specifically studied.

Of specific interest is the use of community forest resources to complement private resources to meet the basic needs of household income and employment in rural Nepal where alleviation of poverty is a major challenge. Although an agriculture-based economy, farmland in Nepal occupies only 21 percent of the national land area (Ives, 2004; CBS, 2003). The area of farmland is not sufficient to meet employment and food needs, and 48 out of 75 districts have a food deficit (UNDP, 2005). In addtion, creation of sufficient off-farm income and employment opportunities is limited by institutional and resource constraints (Ives, 2004). As a result, many rural people, particularly in isolated and remote mountain areas, persistently suffer from hunger and poverty (UNDP, 2005; Ives, 2004). Poverty and unemployment related social problems have increased over the last few years, and are worse in areas with a food deficit and people having less access to land (Murshed and Gates, 2005). The incidence of poverty is more pronounced for marginal ethnic groups, the elderly, women and children who have little say, little access to resources, and fewer social opportunities (NPC, 2003, Messer, 1997; Huijbers, 1996).

Forests occupy about 40 percent of Nepal's land area (CBS, 2003) and have the potential to be an important complement to private agricultural land in providing for local communities. Despite more than 13,000 forest user groups being established to bring in local management of forests as community forests, the impact of the forestry programme on reducing rural poverty and unemployment is debatable (Dhakal, 2005). This raises the question of why communities who have community forests as an additional resource have generally not seen a significant change in their living standards. The answer to this question requires a study of the way that community forests interact with local economies, and way that community forest management is influenced by national forest policies. The following section outlines an interactive model that examines the potential of community forests to increase income and employment.

Modeling Community Forest Based Households

The income of a household depends on the outputs they produce from their private land (a_p), community forestland (a_c), and household labour endowment (L). Use of community forestland is constrained by government policy (G). The generalised decision problem of a household is then to,

$$\text{Maximise } y = f\left(a_p,\ a_c,\ L,\ G\right)$$

$$\text{Subject to } \sum_{j=1}^{J} A_{rj} X_j \le b_r \text{ and } X_j \ge 0,$$

where y is household income, X_j is a vector of decision variables (a_p, a_c, L, G), A_{rj} is a constraint function with r linear constraints and j decision variable matrices, b_r is a constant and X$\ge$0 denotes non-negativity of the decision variables. The specific model of community forestry used in the study is outlined below.

Household Production System

In this model, it is assumed that a production (cropping) system can produce more than one product simultaneously and that marginal products are constant. Output of any good *i* under production system *t* on land type *k* is a function of yield per unit area with a production system on a land type (g_{itk}) and the area of land type *k* allocated to a particular production system by a household (a_{tk}). Land can include private land, land used under sharecropping and common forest land. Products may be a single output from a production system or by-products. Total output of any particular good by a household (q_i) is then a function of how much land of various types the household allocates to different production systems.

$$q_i = \sum_{k=1}^{n} \sum_{t=1}^{m} \left(g_{itk} \cdot a_{tk} \right)$$

In a subsistence agricultural household it is impractical to separate household production from household consumption. In this model, only labour that is hired (L_h) and production inputs that are purchased (I) are accounted for as costs. Household labour requirements for a particular output will be either a function of labour hours required per unit area (h^a_{tk}) and the area of land type *k* allocated to a particular production system *t* by a household (a_{tk}), or a function of output (q_i) and harvest productivity for that good (h^v_i). Total household labour (L) required is then,

$$L = \sum_{t=1}^{m} \sum_{k=1}^{n} \left(h^a_{tk} \cdot a_{tk} \right) + \sum_{i=1}^{r} \left(h^v_i \cdot q_i \right)$$

The amount of hired labour (L_h) required is a function of available family labour (L_o) and the total household labour (L) requirement ($L_h = L - L_o$).

Net household income (y) is the difference between revenue and cost. In addition to producing output q_i with a farm-gate price of P_i, households are able to earn external income in the labour market (L_m), earning a wage rate (w). In practice, a household will either earn outside income (L_m) or employ outside labour (L_h), but will not do both. A household can also buy products (food, firewood, timber and fodder) in the market (q^m_i) at market prices (p_i). Market prices will be higher than farm-gate prices ($p_i > P_i$). Total net income for a household is then,

$$y = \sum_{i=1}^{r} \sum_{k=1}^{n} \sum_{t=1}^{m} \left[\left(P_i \times q_i \right) - \left(L_h \times w \right) - I \right] + \left(L_m \times w \right) - \sum_{i=1}^{r} \left(p_i \times q^m_i \right)$$

Community Welfare

In this model the community is structured as *m* different income groups with *n* households in each group. Income groups are categorised as poor (P), medium (M) and rich (R) based on sufficiency of household income from private landholdings to meet basic needs. In this study, poor households are defined as having insufficient private land to meet basic needs, medium households have just sufficient land, and rich households have a surplus of land to meet basic needs. The community forest can be managed for joint benefit and treated as another income group/household, or

it can be treated as semi-private land if rights are allocated to individuals to make individual decisions over a particular area. The objective is maximization of community income (Y) across all households in each income group, including from community managed forests and all products subject to a number of constraints.

$$\text{Maximise } Y = \sum_{x=1}^{n} \sum_{z=1}^{m} [y_{xz}]$$

$$\text{Subject to } \sum_{x=1}^{n} \sum_{z=1}^{m} \sum_{t=1}^{r} a_{xztk} = a_k$$

$$L_{fxz} + L_{cxz} + L_{mxz} \leq L_{xz}$$

$$\sum_{x=1}^{n} \sum_{z=1}^{m} L_{hxz} \geq \sum_{x=1}^{n} \sum_{z=1}^{m} L_{mxz}$$

$$q_{ixz} = d_{ixz}$$

$$y_{xz} \geq y_{xz}^{0}$$

The constraints are as follows. The total amount of land type k used by households x in income groups z and production systems t, cannot exceed the total amount of that land type available in the community (a_k). Labour allocated by any household x of income group z to their own farm (L_{fxz}), to community forest activities (L_{cxz}), or to outside employment (L_{mxz}) cannot exceed available labour for that household (L_{xz}). Employment opportunities are limited to what is available in the community so off-farm employment (L_{mxz}) cannot exceed local employment opportunities (L_{hxz}). Households are required to have minimum amounts (d_{ixz}) of certain goods to meet basic food, heating and housing needs. There is also a restriction against making individual households worse off to maximise community income.

The potential to alleviate poverty and unemployment was evaluated by modeling the effect of different policy scenarios relating to the use of community forests (Table 1) and comparing this to the effect of current policy.

Table 1 Policy Scenarios

Policy	Description
Current Policy	The forest is managed collectively but is only used for timber production. User groups are allowed an annual harvest of only 30 percent of MAI for hardwoods and mixed deciduous forests, and 50 percent of MAI for pine forests. Firewood and fodder are allowed from residual products.
Unconstrained Community Use	The community forest is modelled as a separate household in the community, maximising its income through sales of outputs, and with no constraints on use for firewood, fodder or timber. Since the community forest has no labour supply, it must employ others for production. As is common practice, households can purchase community forest output at a lower price than the market price to meet home consumption needs, with surplus products sold outside the local market.
Unconstrained Leasing	Similar to the base case, there are no constraints on use of community forest for firewood, fodder or timber, however, in this scenario the community forest can be leased to individual households. This scenario allows households with surplus labour to use community forests as if the land was under private management, effectively increasing the land available to a household. The community earns a rental on the area leased to households, and earns income from products from the land remaining in community management. This model is different from existing

Although the alternative policies are notionally unconstrained, since the objective is to maintain environmental benefits, cereal production is constrained to private land and the only unconstrained activites allowed on community forests are some combination of fodder, firewood and timber production. As such, it represents an unconstrained agroforestry alternative.

Data

Data for the model was collected using household surveys, user group surveys and secondary sources. For the study, six community forest user groups in three districts (Dolakha, Kavre and Nuwakot) of the mid-hill region of Nepal were selected on the basis of representative forest condition, type of forage-gathering practices, age of the user group, forest size and level of access to district forest office services. For the household surveys, a structured questionnaire was administered to female heads of 259 farming households in May-July, 2003. The respondents were asked a range of questions including their size of land holding of all types of private lands including share cropping, their level of food sufficiency, family size, household labour, livestock holdings, and firewood and timber collection from community forests. Table 2 outlines the main characteristics of the case study user groups. The average landholdings of those covered by this survey are relatively high compared to the National Agricultural Survey 2002 which found 0.68 ha, 0.55ha and 0.53 ha per household in Dolakha, Kavre and Nuwakot district respectively.

Incomes in the model are estimated assuming that all forest user-groups fully use their timber product allowances up to the government policy limit. However, the Bidure user-group is currently unable to fell any timber because they have not done a mandatory forest inventory. For the policy modelling, this constraint is maintained under the current policy option, but removed for the other options.

Table 2: Characteristics of case studies forest user groups

Forest User Groups	Private Landholding Area (Ha/HH)			Average Community Forest Area (Ha /HH)	Labour Force (Person /HH)	Consumers (unit/HH)	Estimated Altitude of Locality (M)
	Poor HH	Medium HH	Rich HH				
Khorthali	0.40	1.06	2.03	0.35	3.4	4.6	1800-2600
Siddeswori	0.24	0.78	2.06	0.42	3.0	6.0	800-900
Chapanigadi	0.67	1.03	2.75	0.90	3.6	6.2	1200-1400
Banshkharka	0.46	0.76	1.08	0.83	3.1	4.9	1300-1500
Bidur	0.29	0.88	1.18	0.62	3.3	8.6	700-1000
Surayamati	0.42	0.73	0.93	0.62	2.8	5.9	700-800

Data common to all households, such as yields, prices or labour requirements, were collected from local market surveys, key informants, and secondary sources (Dhakal 2005). In addition, it was necessary to make some assumptions due to a lack of data. In particular, it was assumed that a person is available to work only 265 days in a year, and that households all practise the cut-and-carry method of fodder collection from community forests to feed their livestock. This practice generally requires more labour than do other grazing practices.

Results

The results are presented in terms of changes in income, employment and land use patterns for each of the forest user groups with each policy.

Income

Figure 1 shows household incomes under the Current Policy. The vertical bars are average household incomes for each income group, which includes both on-farm and off-farm income. The horizontal Basic Need line is household income required to provide the minimum calorific intake and other non-food items essential for survival. This survival income figure is estimated to be Rs 6725 for a person in 2003 and was calculated from the National Planning Commission Survey 2001 (NPC 2003) and 5 percent inflation. The minimum income needed in each forest user and household income group varies due to differences in the number of consumer units in households (family members under 15 years old were considered equivalent to half an adult). Under the Current Policy, the incomes of all poor households are below the minimum required for survival. For medium income households incomes are reasonably sufficient. In all user groups the incomes of rich households are more than enough for minimum needs.

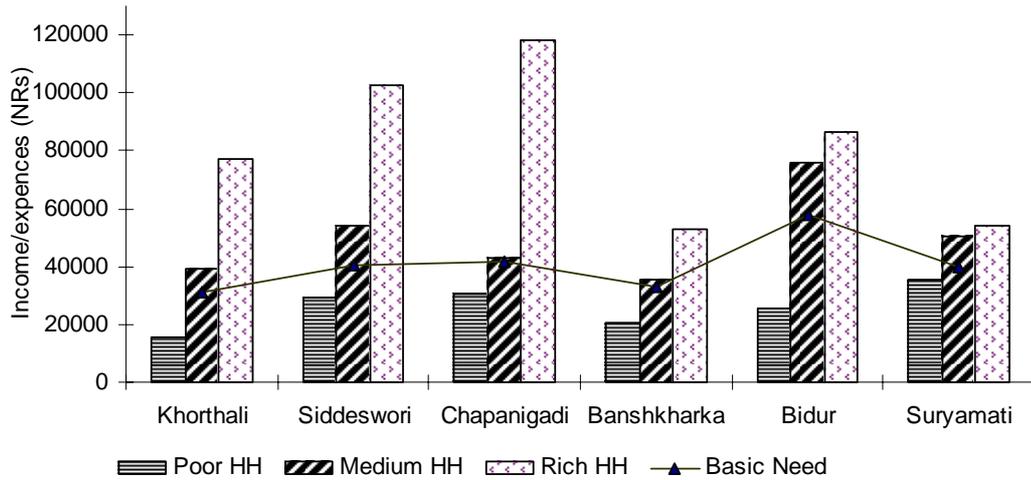Figure 1: Household Incomes under Current Policy

Figure 2 shows household incomes for households under the Unconstrained Community Use policy. Compared to the Base Case, generally all incomes increase, with the highest increase for poor households. The income of poor households increased by 72 percent in the Banshkharka group, and nearly 50 percent in the Khorthali, Chapanigadi and Bidure groups. The income level of poor households in the Chapanigadi, Banshkharka and Suryamati groups were now above the minimum level required for survival. The medium households in all user-groups also gained income to some extent. Even for the rich households income increased in four out of six user-groups. This indicates that the incomes of many poor households could be increased above the minimum needed for survival under a policy of unconstrained community management.

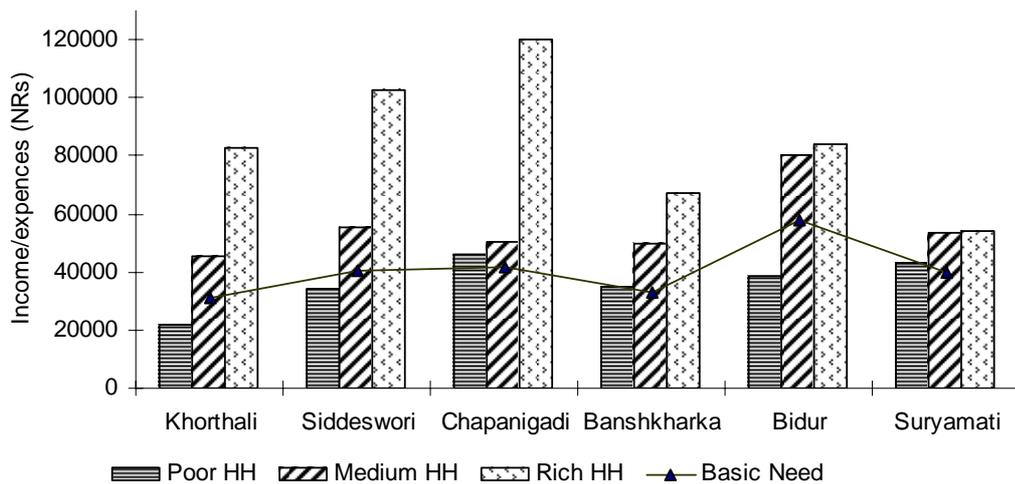Figure 2: Household Incomes under the Unconstrained Community Use Policy

Figure 3 shows household income under the Lease Policy. The income increase under the Lease policy alternative was greater than that under the Unconstrained Community Use policy. Again, the highest income increase was for poor households, ranging from 44 percent in the Suryamati group to 110 percent in the Banshkharka group. Medium-income households also increased their incomes almost in the same proportion. The highest income increase for rich households was about 47 percent in the Banshkharka group but was almost zero in other groups.

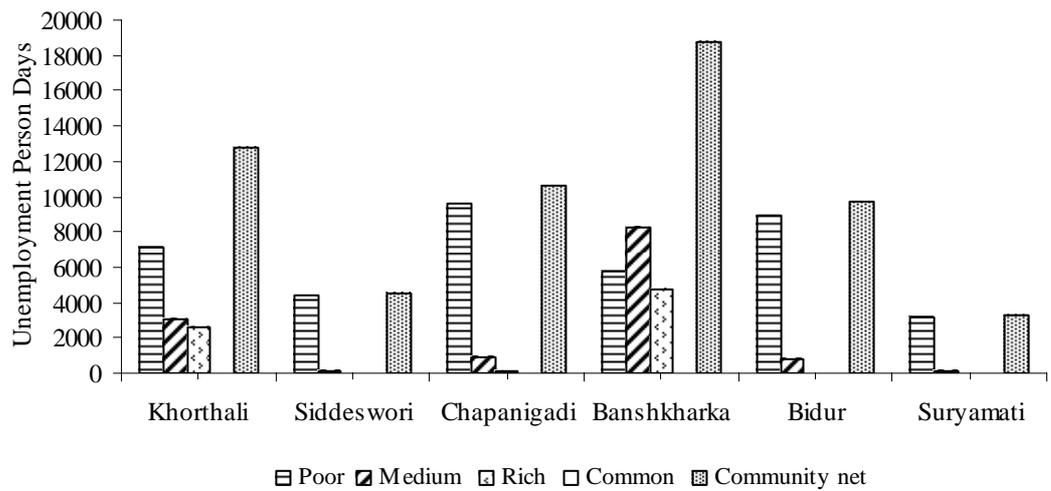Figure 3: Household Incomes under the Lease Policy
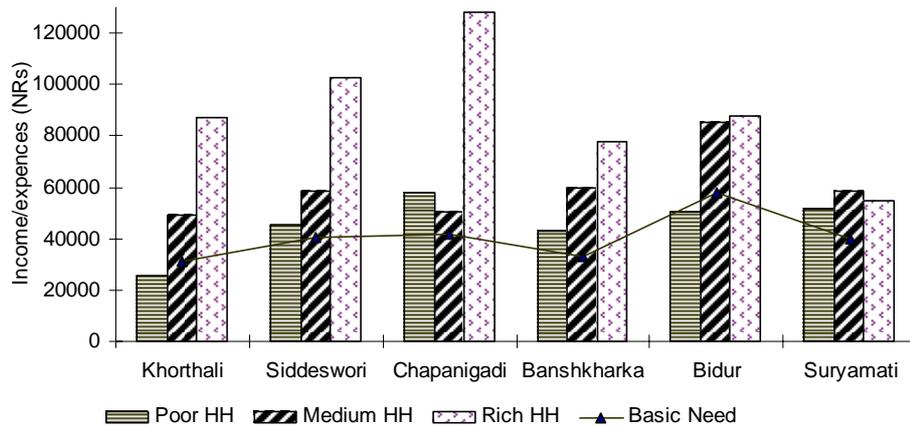
In general, the results indicate that poor households could be able to meet their survival income from a combination of farm and community forest resources when all policy constraints on land use were fully relaxed and user-groups were allowed to maximise income. Except for the Khorthali and Bidur user groups, the incomes of poor households were above the minimum survival level. In the Khorthali user group, low productivity due to its location in a high altitude region and relatively less community forest area are the main reasons why incomes for poor households are still below survival levels. In the Bidur user group, relatively larger family sizes for poor households is one of the main reasons incomes are insufficient meet the survival level. For both of these user groups there are insufficient local resources to support these communities.

Employment

Figure 4 shows unemployment levels under Current Policy. There is a large variation in unemployment across user-groups and across household income groups, however, in all user-groups there was net unemployment in the community. In all cases, poor households faced the highest unemployment, but medium-income households are affected in most user-groups. In the high altitude Khorthali and Banshkharka user-groups, even rich households face unemployment. A key factor for most user-groups is that the direct employment contributions of the community forest are small.

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Figure 4: Household Group Unemployment Rates under Current Policy

The unemployment status under the Unconstrained Community Use policy is shown in Figure 5 and under the Lease policy in Figure 6. Under thess policies there is no unemployment in any group except for the poor and medium-income households of the high altitude Khorthali user-group. Other than for the Khorthali user-group, communities now experience labour shortages. In most cases labour is employed for community forest work. The main difference between the Unconstrained Community Use and Lease policies is that there is generally no labour shortage problem with the Lease policy.

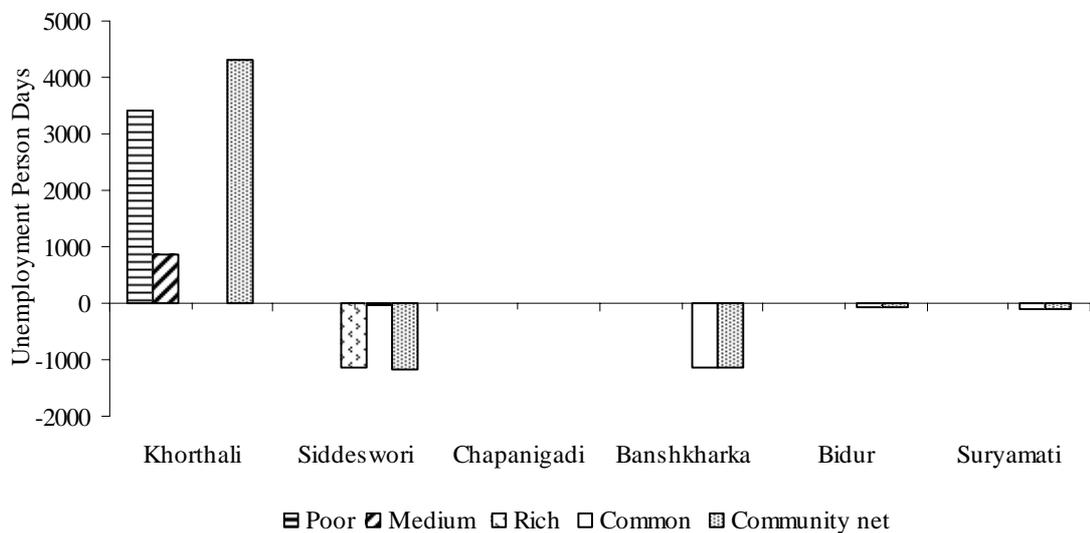Figure 5: Unemployment Rates in the Unconstrained Community Use Policy

Figure 6: Household Group Unemployment Rates Under the Lease Policy

In summary, under the Current Policy ther is about 30 percent community unemployment. The unemployment of almost all user-groups reduced to zero under the Lease and Unconstrained Community Use policy alternatives. The key difference is that a labour deficit appears under the Unconstrained Community Use policy but not under the Lease policy. The difference is determined by labour transaction costs. More labour days are required for buying fodder, timber and firewood from the community forest under the Unconstrained Community Use policy than in individually producing and collecting it under the Lease policy.

Land Use Change

Land uses under the different policy scenarios are shown in Table 3. The area in all cases is a combination of private and community forest areas. In each case the area used totals less than 100 percent with the residual being areas allocated to homestead use. Under Current Policy, land is generally allocated equally to either food or timber production. This reflects the focus on timber production in community forests in the Current Policy.

Table 3: Land Use by Products (% of total community lands)

User Group	Uses	Policy			User Group	Uses	Policy		
		Current	Unconstrained Community	Lease			Current	Unconstrained Community	Lease
Khorthali	Food	67	66	67	Banshkharka	Food	40	40	40
	Fodder	1	24	24		Fodder	6	53	46
	Firewood	0	0	0		Firewood	0	0	5
	Timber	31	8	8		Timber	52	6	7
	Total	**98**	**98**	**98**		**Total**	**99**	**98**	**98**
Siddeswori	Food	60	59	59	Bidur	Food	42	43	42
	Fodder	2	27	26		Fodder	1	44	35
	Firewood	4	5	6		Firewood	7	1	8
	Timber	32	7	7		Timber	48	11	13
	Total	**98**	**98**	**98**		**Total**	**98**	**99**	**98**
Chapanigadi	Food	47	47	47	Suryamati	Food	44	44	43
	Fodder	4	47	31		Fodder	4	43	28
	Firewood	0	0	4		Firewood	4	4	8
	Timber	48	5	17		Timber	47	8	19
	Total	**99**	**99**	**99**		**Total**	**98**	**98**	**98**

Under the Unconstrained Community Use and Lease Policies, there is a major shift in the use of community forest land from timber to fodder production. The main cause of this is that timber is the least profitable use land and fodder production the most profitable use. Log production on only a small proportion of the community forest is sufficient for all of the required household timber needs in the (5-8 percent of total area). Where there is still a significant production of timber in some communities under the Lease Policy, this associated with a scarcity of labour that makes it infeasible to allocate more area to fodder production. The results also show substantial shifts in land use to firewood production in some user-groups. This is generally related to the needs of poor households who have limited access to land and to the availability of fuels produced as a byproduct of other activities.

Conclusions

This study examined the potential of community forestlands to increase income and employment in rural communities. The essence of the problem is that the private lands of most of rural households are insufficient to meet bare survival income and inadequate to utilize family labour. The results show that under current forest policy, community forest land has been over-allocated towards timber production relative to how user-groups would allocate land to maximize income. To make communities better off, policies need to be changed so that communities can make decisions about the best mix of land use.

The results here show that user-groups would shift to fodder production in community forests. An increase in fodder supplies from community forests increases livestock farming, which in turn increases household income, manure supply and food production. This land use model is particularly beneficial in high-altitude and isolated communities where the incidence of food deficits and poverty are highest. In addition, fodder and firewood are collected daily, generally by women, and adequate supplies of these products could reduce the workload of females. Since fodder production is based on an agroforestry land use model, this change should have little effect on environmental services while increasing incomes and employment.

The implication of this study is that the restrictions on use of community forestland limit their potential to significantly meet local income and employment requirements, and in particular address the plight of the poorest households. To make socially disadvantaged people (women, high-altitude communities, and poor households) better off, the Nepalese government should consider at a minimum allowing communities unconstrained use of their community forests for agroforestry as well as timber uses. To have a much larger impact on rural unemployment, the governemnt should consider a policy change that allows user-groups to lease community forestlands to individual households based on their needs and ability to use land.

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