Poverty Alleviation or Aggravation?
The Impacts of Community Forestry Policies in Nepal

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Abstract

This research studies the effects on income and employment when externally imposed policies constrain use of common forest resources. Using a mixed-integer linear programming model, the study examines the impacts of conservation-oriented community forest policies in Nepal on three household income groups. The results show that current community forest policies, which direct forest use towards environment conservation and timber production, cause large reductions in employment and income of the poorest households and largely explain the recent increase in rural poverty.

Introduction

In physical and institutional terms, land is a limiting factor for primary production in Nepal. Forestland, including shrub-land and alpine pasture, comprises 39 percent of the total land area in Nepal, and arable land covers 21 percent. The rest of the land provides little scope for

economic use. In the 2002 agricultural census, the average land holding was less than 0.8 hectares per household and 74.1 percent of land-owning households had less than one hectare of land. The bottom 47 percent of land-owning households had an average land area of 0.5 hectares (CBS, 2003). Despite being an agriculture-based economy, 29 percent of farming households are landless (UNDP, 2005), and more than 60 percent of the land-owning households in Nepal have a food deficit from their own land (CBS, 2003).

Historically, mountain communities managed pastures and forests together in common. Households with marginal landholdings had easy access to community resources to complement their private resources and to sustain their livelihoods. When the Government introduced the *Private Forestry Nationalization Act* (1957), it abolished the traditional regulation systems of common forestlands. This was followed by substantial deforestation, which the government and international agencies believed caused landslides in Nepal and flooding in Bangladesh (Ives and Messerli, 1989). Livestock farming and firewood use by hill farmers were believed to be the main factors causing deforestation (Ives and Messerli, 1989; Master Plan, 1988).

With the realisation of the importance of users' involvement in making forest conservation effective, the government prepared the Forestry Sector Master Plan (1988) (hereafter "The Plan"). The Plan provided guidelines for participatory community forestry implementation, and a local user group-based community forestry policy was introduced in the late 1980s. The objectives for the policy were, "[T]o meet people's needs" for forestry products, "[T]o support other sectors… in meeting people's basic needs" and "[T]o conserve and maintain safe and wholesome natural environment" (Master Plan 1988: pp 68-69).

Community forestry policies have achieved their goals in terms of the number of forest user groups and in improving forest cover. Over 14,000 forestry users groups were formed in the first 12 years of the community forestry program (CFUG Database 2005). Deforestation has been halted and high forest stocks are being restored (Gautam *et al*., 2002), in some cases to the extent that forests are over-stocked (Nurse et. al. 2004). Wildlife populations have increased and the government is being urged to introduce wildlife control policies (Community Forestry Division 2004). Some communities have also been able to generate funds from sales of forest products from community forests (Dongol et. al. 2002).

Despite these successes, a number of studies have shown that there are negative distributional outcomes under community forestry policies, with poor households receiving less benefit from community forests than wealthier households (Dhakal *et al*., 2005; Agrawal, 2001; Adhikari *et al.*, 2004). Generally, the regressive outcomes from community forestry are largely attributed to problems in decision-making at the community level (Pokharel and Nurse, 2004). However, the focus of reforestation activities, forest laws and institutional changes were on increasing forest cover and limiting access for livestock or firewood (Master Plan, 1988). For example, one of the policy strategies for reducing forest products demand, is "reducing and controlling livestock numbers" (Master Plan 1988 p. 148) and making household fodder supply "fully self sufficient" from private lands (Master Plan 1988 p. 85). The government also introduced compulsory forest inventories and forest harvesting to less than 30 percent of mean annual increment (MAI) for slow growing species and 60 percent of MAI for fast growing species. As a result, the negative distributional outcomes under community forestry could instead be attrbutable to government constraints on use of community forests rather than how user groups decide how to use them.

A key question addressed by this study is whether constraints on use of community forests under current community forestry policy are linked to the inability of communities to meet the needs of the poorest households. If there is a link, then the second question is whether there are alternative policies that will make it easier for communities to meet the needs of the poor. In this context, the issue is one of constrained income-maximization. The following section outlines a model for studying the effects of household and community forest land allocation on income and employment under different constraints.

Modeling Community Forest Based Households

It is assumed that the welfare of a household depends on various outputs from its limited private land (a_p), community forestland (a_c), and household labour endowment (L). Community forestland use is constrained by government policy (G_v). The generalised decision problem of a household is then to,

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

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

where y is household income, X_j is a vector of decision variables (a_p, a_c, L, G_v), A_r is constraint function with r linear constraints, j decision variable matrices, b_r is a constant term for the j decision variable matrices and $X \geq 0$ 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 product is 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, 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, fodder) in the market (q^m_i) at market prices (p_i). Total net income for a household is then,

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

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 constraints on area, labour availability, employment opportunities, the need to meet basic food, heating and housing needs, and a restriction against making individual households worse off to maximise community income.

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

$$\text{Subject to } \sum_{x=1}^{n} \sum_{z=1}^{m} \sum_{i=1}^{r} a_{ixzk} \leq a_k$$

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

$$E \geq \sum_{x=1}^{n} \sum_{z=1}^{m} (L_{xz})$$

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

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

Policy Scenarios

The model is used to test how land and labour resources would be allocated by households to maximize income from their land resources under various policy scenarios by applying constraints, or by changing the value of parameters or constraints. In total, seven policy scenarios are evaluated which represent current policy, actual forest use situations faced by particular communities, and alternatives that are considered to be viable (Table 1).

Table 1 about here

The effect of community forestry policies are examined from two perspectives, income, and employment. There are two types of possible effects on income, total income available and distribution of income. In terms of total income, it is hypothesized that the total income of the community with policy constraints will be lower than in unconstrained cases. In terms of income distribution, it is hypothesized that any reduction in income will be greatest for poor households, less for medium income households, and least for rich households, and that this

would cause income disparity to increase. In addition, a household needs minimum amounts of some goods for survival. The hypothesis is that the ability to meet these needs will be adequate for each household in the unconstrained cases, and lower and perhaps insufficient in constrained cases. There are two types of effects on employment. Total employment under constraints imposed by government policies is expected to be lower than an unconstrained situation. Any reduction in employment with constraints is also expected to be borne more by poor households than by medium or rich households.

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 semi-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. The information common to all households were collected from local market surveys, key informants, and secondary sources. For the policy modelling, a proforma community was derived from an average of the six survey groups for private landholding size, consumer units, and labour supply.

Results

The effects of different policy scenarios on total community and householde income are presented in Figure 1. As expected, total community and household incomes decrease as more restrictive forest policies are imposed. The changes are largest for poor and medium income households but generally very small (one percent) for rich households.

Figure 1 about here

The Family Basic Need line in Figure 1 shows the officially-defined, bare survival income needed for minimum calories and other basic non-food items, estimated to be Rs 33,626 for 2003 based on 2001 prices inflated at 5 percent (NPC 2003). The Survival Needs line is the income required to meet essential food (calories), firewood and timber requirements as estimated from the model. In the Base and the Lease scenarios, all households have more than sufficient to meet these minimum amounts. In the Full MAI and Firewood scenarios the income barely meets the minimum need of the poor household. In the Current Policy, the No Log Market and the Zero Income scenarios income is insufficient to meet the needs for the poor household.

Figure 2 illustrates the income share across the households in the community with different policy scenarios. Income inequality increases as forest policy constraints are imposed, and the impact is greatest on poor households. The lowest income inequality is found in the Leasehold policy scenario.

Figure 2 about here

The analysis shows that income across households are associated with restrictions on land uses. Community forestry policy effects are greatest for poor households who have far smaller landholdings to produce food and other income. The policies have less effect on rich and medium income households who have larger private landholdings. Resource supply from the community forest is essential to sustain the livelihood of the poor households. However forest policy constrains community land uses and employment opportunities. For all households, the highest income was in the Leasing scenario. The Leasing scenario created greater land use flexibility and employment, and increased total income.

Figure 3 shows comparative results for total community and household unemployment under different policy scenarios. The employment is provided from within the community and does not include employment from outside the community. In the Base case and the Lease case scenario there is a net demand for labour from outside the community. In all other scenarios there is net unemployment that increases with policy restrictions. The unemployment is also more pronounced for poor households, while rich households hired some labour in most cases.

Figure 3 about here

The results show that community forestry policy constraints have a big influence on household employment opportunities. The level of employment is directly related to the land type. In the Base case, the rich household uses its private land mostly for firewood production. In the Current Policy scenario the land was distributed almost equally for timber and firewood production. Firewood production on private land saved household labour for the

rich household. Similarly, the number of unemployed people is less in the Current Policy scenario than for the Zero Log market scenario. The reason is that many labour days were engaged in labour intensive firewood collection. Therefore, the income of poor households is greater in the Current Policy scenario than in the Zero Log market scenario.

Conclusions

The research shows that Nepal's current community forest policies could have contributed to much of the existing rural poverty and unemployment through limitations on use of community forests. Current community forest policies emphasise environmental conservation as their primary goal. This in turn constrains income and employment opportunities for poor households. Supplies of raw materials from common land are essential to fulfil the basic needs of the poorest households in rural areas where private land and other employment opportunities are limited. The policies have also increased income disparities between low income and high income households. Among the policy options, leasing of community forestland or producing forest products according to household needs are the most productive and helpful alternatives in terms of both income and employment generation. The Nepalese government could reduce rural poverty and unemployment related social problems if this makes shift from existing community forest policies into those alternative policy models.

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Table 1 Policy Scenarios

a)	Base Case (Base Case)	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.
b)	Leasing of Community Forest Land (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.
c)	Timber Production from full MAI (Full MAI)	The community forest is modelled as a separate household similar to the Base case, but use is constrained to only annual timber production equal to the mean annual increment (MAI). By-products, including firewood produced from offcuts or residuals, and fodder harvested from under storey species, are also produced for sale.
d)	Timber Production from partial MAI (Current Policy)	This scenario is similar to (c), however it models current government community forest policy which is to allow an annual harvest of only 30 percent of MAI for hardwoods and mixed deciduous forests, and 50 percent of MAI for pine forests. By-products can again be produced.
e)	Provision of Adequate Firewood (Firewood)	This scenario is similar to (d) but with the constraint on firewood supply relaxed to allow additional firewood harvesting to meet household requirements.
f)	Limitations on Timber Production (No Log Market)	This scenario is similar to (d), except that timber production is constrained to the level of household consumption. This case applies to forest user groups in remote districts, where distance from markets and high transport costs limit markets for timber output, and to community forests in the wildlife buffer zone.
g)	No Production (Zero Income)	This scenario applies to communities where the community forest has young age classes and is not producing timber, or there is a strict prohibition on any kind of use.

Note: Short names in parentheses will be used in presentation of policy scenario results

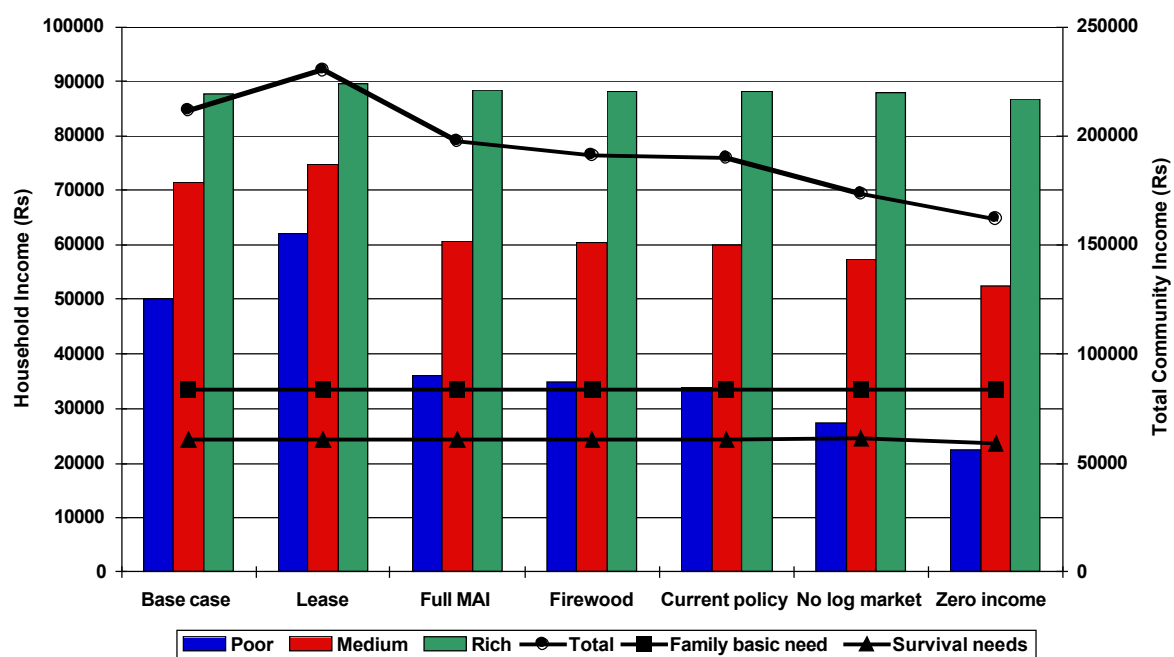Figure 1 Effect of Policies on Incomes
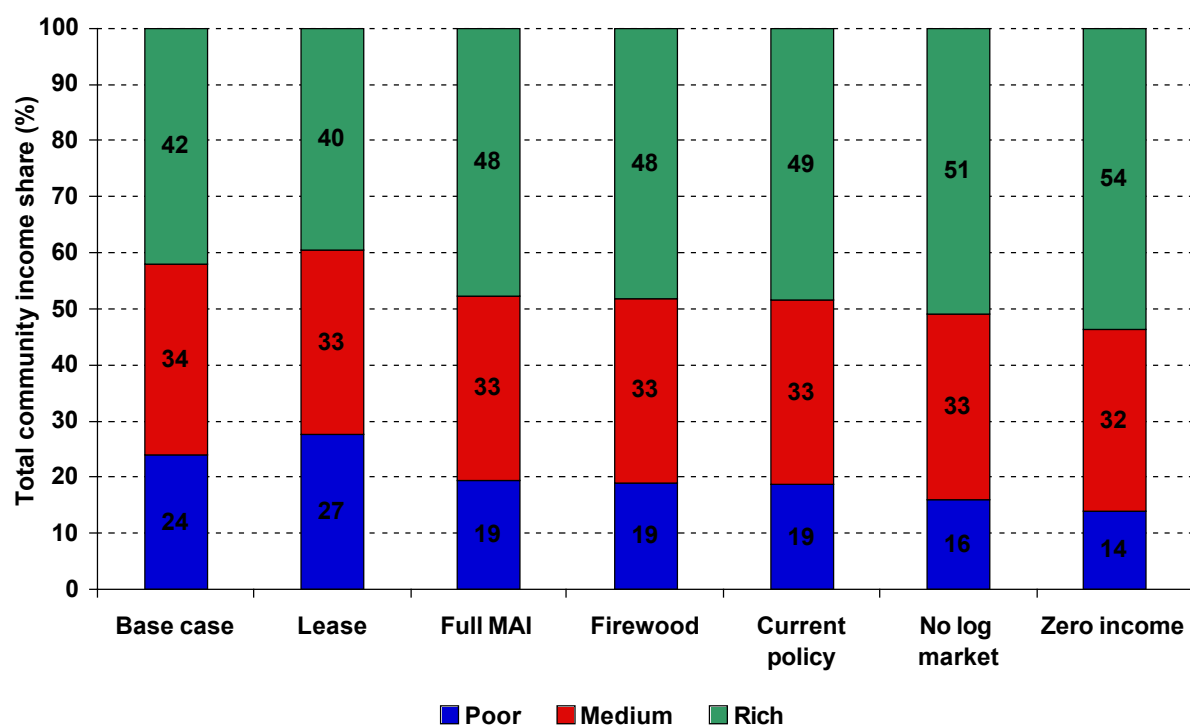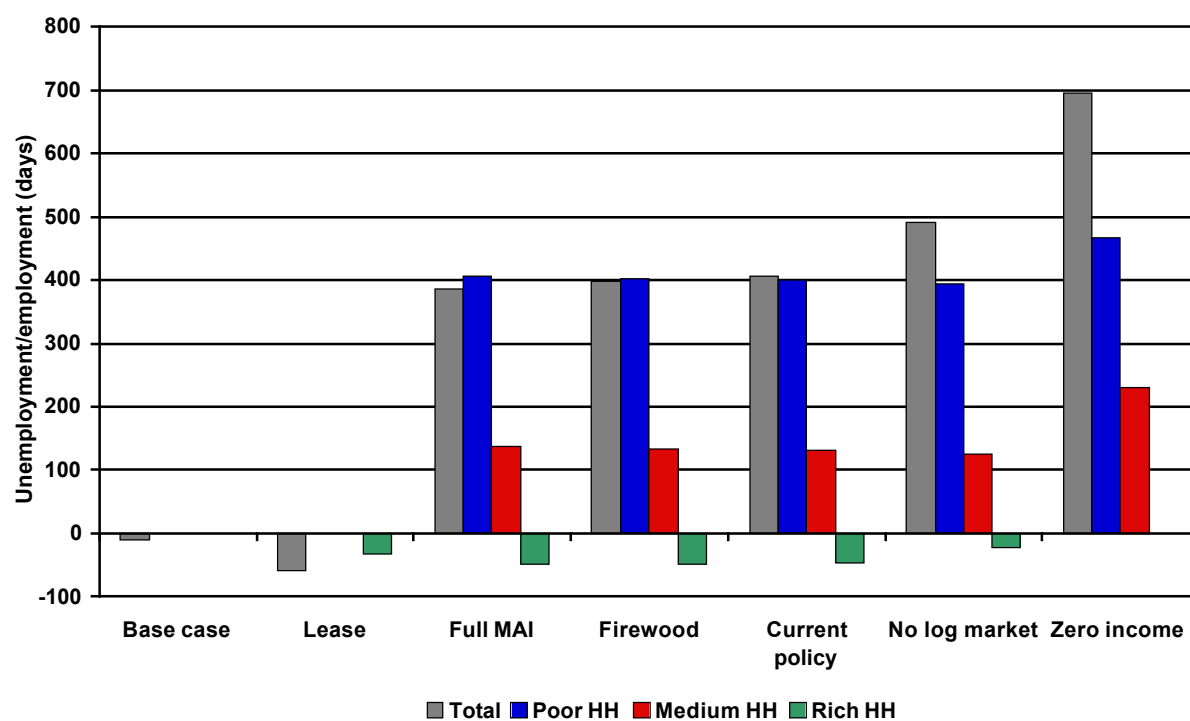
Figure 2 Income Inequality

Figure 3 Effect of Policies on Unemployment

Note: Negative signs for hired labourers (need more than household labour supply)