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Bhubaneswor Dhakal

Commerce Division, PO Box 84, Lincoln University. New Zealand

Hugh Bigsby

Commerce Division, PO Box 84, Lincoln University. New Zealand

Ross Cullen

Commerce Division, PO Box 84, Lincoln University. New Zealand

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**Bhubaneswor Dhakal, Hugh Bigsby and Ross Cullen,
Commerce Division, PO Box 84, Lincoln University**

Summary

Common forests in developing countries are valuable sources of raw material supplies, employment and income generation, particularly for low income households. This paper looks at the effect on income and employment when common forest resources have external policies that constrain their use. Using a mixed-integer linear programming model, this 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 focus on environmental outcomes through forest use restriction for environment conservation and timber production, result in a large reduction in employment and income of the poorest households and largely explain the recent increase in poverty of rural areas.

Keywords: Forestry policy, poverty, Nepal

Introduction

The economic, social and environmental values of common property resources are widely recognized in many countries. Globally, common pool resources in mountainous areas have higher values because they have special importance for biodiversity conservation, global warming mitigation, and adventure tourism. These resources are also more valuable for people in developing countries like Nepal who have little access to private land or other opportunities for employment and income.

In Nepal, institutional and geographical factors have made land a limiting factor of production. Forestland including shrub-land and alpine pasture comprises 39 percent and arable land 21 percent of total land area. 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 land owning households have less than one hectare of land. The bottom 47 percent of land-owning households owned 15 percent of total arable land and had an average land area of 0.5 hectares or less. Despite being an agriculture-based economy, 29 percent of households are land-less (UNDP, 2004), and more than 60 percent of the landholding households in Nepal have a food deficit from their own land (CBS, 2003). The landless people manage their household needs by working on others' farms, encroaching on public lands, renting lands (share cropping) or in other employment. In these conditions, it is difficult for poor households to support themselves if they do not have adequate resources from community forestlands. Historically, mountain communities have managed some common lands and used them for the mutual benefit of all households. Households with marginal landholdings had easy access to community resources to complement their private resources and to sustain their livelihoods.

Deforestation increased substantially when the Private Forestry Nationalization Act (1957) abolished the traditional regulation systems of common forestlands. Landslides in Nepal, flooding in Bangladesh, internationally realization on afforestation need for global climate change mitigation occurred at the same time (Hauler 1993; Ives and Messerli, 1989). The government and international agencies believed these environmental problems to be associated with deforestation and in the mid-1970s embarked on a programme of enriching in open patches of common lands and change in forest practices (Hobley, 1996). The initial reforestation and protection done by the government and aid agencies had mixed success (Master Plan, 1988). With the realisation of the importance of users' involvement in making forest conservation effective, in the late 1980s a local user group-based community forestry policy was introduced. 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). With the active involvement of international aid agencies, the government prepared the Forestry Sector Master Plan (1988) to provide guidelines for participatory community forestry policy formulation and implementation.

The community forestry policies have been successful in terms of improvement in forest cover and institutional expansion (Pokhrel and Niraula, 2004). Over 13,000 forestry users groups were formed in the first 12 years of the community forestry programme (CF database, 2003). Deforestation has been halted and tree stocks are being restored (Gautam *et al.*, 2002), in some cases to the extent that forests are overstocked (Bhatta and Dhakal, 2004). Wildlife populations have increased to the extent that the government is being urged to introduce wildlife control policies (Community Forestry Division, 2004). In terms of social outcomes, some communities have also been able to generate funds from sales of forest products from community forests, and these funds are being used for forest conservation and community development (Khadka and Shrestha, 2004; Dongol *et al.*, 2002).

Historically, mountain communities managed pastures and forests together in common. However, at the time that community forestry was introduced, the cause of deforestation, landslides and downstream (Bangladesh) flooding were attributed to livestock farming and firewood use by hill farmers (Hausler, 1993; Ives and Messerli, 1989). As a result, the focus of reforestation activities, laws and institutional changes were on increasing forest cover and limiting access for livestock or firewood. For example, one of the policy strategies for reducing forest products demand, is "reducing and controlling livestock numbers" (Main Report p. 148) and making households fodder supply 'fully self sufficient' from private lands (Master Plan, 1988). Similarly, for reducing demand for firewood from community forests, the plan aimed to introduce improved stoves, alternative energy sources (biogas and electricity) and increase the area of private plantations.

In addition, the government introduced other policies for biodiversity conservation and global warming mitigation to fulfil commitments from the 1992 Earth Summit. The government introduced compliance of forest inventory and sustainable harvesting of forest resources. Those policies further restricted forest harvesting to not greater than 30 percent of mean annual increment (MAI) for slow growing species and 60 percent of MAI for fast growing species (Guidelines for Inventory of Community Forests, 2000). The government has insufficient trained staff to provide

the inventory work. As a result forest inventory compliance has limited harvest of timber in many user groups. In addition to the backlog of forest inventory high rates of VAT and royalties for timber products from community forests have sharply reduced the sale of timber in areas with accessible markets (Community Forestry Division, 2004; Kunwar and Kharel 2004).

The net effect of these policies is to restrict the income that communities can receive from managing timber crops, and the ability of households to meet other needs from community forests. Not surprisingly, a number of studies have shown negative distributional outcomes from community forestry. This includes declining and irregular access to daily fodder and firewood (Bhatta and Dhakal, 2004), falling livestock numbers (Dhakal *et al.*, 2005), and falling employment and income opportunities (Bhatta, 2002). The impacts have been greatest on women and poor households (Timsina, 2003; Agrawal, 2001). In addition, poor households have been shown to have received less benefit from community forests than wealthier households (Adhikari *et al.*, 2004).

In these studies, resource scarcity and distributional issues are largely attributed to problems in decision-making at the community level. The implication is that if community decision-making processes can be improved, this will be sufficient for the poor to become better off under current community forestry programmes.

This study starts from the premise that communities can increase income and employment if given the chance, and looks at the effect of community forestry policies on the ability of communities to generate income and employment. The key question is whether current policy allows communities to meet basic needs from their resources, and if it does not, whether there are alternative policies that will do this. Studies in other countries also have shown that government forest policies affect income and employment of rural households (Berck *et al.*, 2003; Kumar, 2002). However, the effects of policy constraints on the ability of communities in Nepal to use their community forest resources have not been examined in depth.

Modeling Community Forest Based Households

The welfare of a community forestry-based household depends on various sources of production and income. For this model it is assumed that household (j) of income group (z) gets outputs (i) from both private land (a_{pjz}) and community forestland (a_{cjz}). The level of community forestry income depends on type of government policy (G). In addition the household's total family labour endowment (L_{jz}) is available for rest or leisure (l_{jz}), community forestry work (L_{cjz}), market wage work (L_{mjz}) and farm work (L_{fjz}). The household's total (q_{ijz}) supply of products from all sources should be greater than or equal to minimum amounts needed (d_{ijz}) to meet basic needs for food, heating and housing.

The household generates income (y_{ijz}) by supplementing household needs for forest products, or by selling surplus outputs in markets. In addition to forestry products from community and private forest lands, households are able to earn external income (e_{jz}) by sacrificing time spent producing forestry based products. However, total hours of labour in external employment cannot exceed the employment available (E). The households also buy some goods from markets to meet their needs at cost $p_i q_m$. Therefore total income for a household (Y_{jz}) comes from production of i

products from private and community lands (y_{ijz}), external income (e_{jz}), minus expenses on market goods ($p_i q_m$). The decision problem of the household is to

Subject to

$$\sum_{i=1}^n q_{ijzk} \geq d_{jzk} \quad (1)$$

Many households share the community forest to meet their needs. Households are categorised into poor (P), medium (M) and rich (R) households based on sufficiency of household income from private landholdings to meet basic needs. The only difference between income groups is the initial allocation of private land. For example, poor households have insufficient private land, medium households have just sufficient land, and rich households have a surplus of land. Between income groups, the initial allocation of private landholdings differ, while within income groups the initial allocation of private land is homogeneous. Different income groups are able to produce varying amount of output without using community resources. The community forest can be managed for joint benefit and treated as another household in the community, or it can be treated as private land if rights are allocated to individuals to make individual decisions over a particular area.

In this model, we assume that a production system can produce more than one product simultaneously and that marginal product is constant. Output of any good i under land use u on land type k is then a function of yield per unit area (g_{iuk}) and the area of land type k allocated to a particular use by a household (a_{uk}). Total output of any particular good by a household (q_i) is then a function of how much land of various types the household uses to different uses. Products may be a single output from a crop system or byproducts.

$$q_i = \sum_{k=1}^n \sum_{u=1}^m (g_{iuk} \cdot a_{uk}) \quad (2)$$

In some of the policy issues under study, the output of any particular good may be modified by a policy constraint (C_{uk}) which limits the allocation of land to particular uses. In the unconstrained case C_{uk} will generally take the value of 1, and when constrained a value of 0.

$$q_i = \sum_{k=1}^n \sum_{u=1}^m [g_{iuk} \cdot (a_{uk} \cdot C_{uk})] \quad (3)$$

In other policy issues under study, the yield per unit area under a particular use will be constrained by some percentage (R_{iu}). In the unconstrained case R_{iu} will generally take the value of 1.0, and when constrained a value between 0.0 and 1.0.

$$q_i = \sum_{k=1}^n \sum_{u=1}^m [(g_{iuk} \cdot R_{iu}) \cdot (a_{uk} \cdot C_{uk})] \quad (4)$$

In some cases, variable costs are labour effort and cash investment on the basis of land area used. Market prices are net prices that account for purchased inputs. In some cases, the total amount of labour (L_{ijz}) and cash expenses (I_{ijz}) required by a household for a particular output is a function of labour inputs per unit area of land type k (h_{ik}) and cash inputs ($\$_{ik}$) measured as hours per unit area and the area of land type k allocated to a particular use by a household (a_{ijk}). Labour cost for a particular output of a good for a household is then,

$$\dots\dots\dots (3)$$

Cash expenses for a particular output of a good for a household is then,

$$\dots\dots\dots (4)$$

In other cases, the cost is labour effort and cash investment on the basis of harvested quantity. The total amount of labour (L_{ijz}) required by a household for a particular output is a function of output and harvest productivity for that good (h_{ik}) on a particular land type, measured as hours and cash amount per unit output. Similarly total amount of cash (I_{ijz}) required for a particular output is a function of output and harvest productivity for that good ($\$_{ik}$) on a particular land type, measured as cash amount per unit output. Labour cost for a particular output of a good for a household is then,

$$L_{ijz} = \sum_{k=1}^n (q_{ijk} \cdot h_{ik}) \dots\dots\dots (5)$$

Cash expenses for a particular output of a good for a household is then,

$$\dots\dots\dots (6)$$

Some production costs are must be incurred irrespective of the level of production. The total fixed cost (FC_{ijk}) for product i on land type k for a household, measured as labour hours and cash expenses, is a function of the area allocated to the production of a good on a particular land type and the unit area fixed cost (fc_{ik}). For private land, before-harvest cost is,

$$FC_{ijk} = fc_{ik} \cdot a_{ijk} \dots\dots\dots (7)$$

For community forests, all households are required to contribute to the cost of forest management equally to retain their property rights irrespective of their level of consumption or production. This constitutes what is effectively a labour cost in terms

While allocating common resource the initial income of all households should not be reduced.

$$\dots\dots\dots \text{for all } j \text{ households in all } z \text{ groups.} \dots\dots\dots (13)$$

For land type k in private ownership, the area of land used by a household to produce all products must be less than or equal to the area available.

$$\sum_{i=1}^n a_{ijzk} \leq a_{jzk} \dots\dots\dots (14)$$

For land type k in community ownership, the area of land used by all households to produce all products must be less than or equal to the area available.

$$\sum_{j=1}^n \sum_{z=1}^m \sum_{i=1}^r a_{ijzk} \leq a_k \dots\dots\dots (15)$$

Total hours of labour for a household used to produce goods privately (L_{jz}), contribute in community forestry () to retain common property rights or work in external employment (t_{jz}) must be less than or equal to the hours available for that household (S_{jz}).

$$\dots\dots\dots (16)$$

Total hours of labour in external employment must be less than or equal to the available employment (E).

$$\dots\dots\dots (17)$$

A household needs minimum amounts of particular outputs (d_{ijz}) to meet basic needs for food, heating and housing.

$$\sum_{i=1}^n q_{ijzk} \geq d_{jzk} \dots\dots\dots (18)$$

In this model, community forests are treated as another household trying to maximise income. How the community distributes income from community forests is not the issue, only the amount of income that is possible.

Policy Scenarios

The model will show how land and labour resources would be allocated by households to maximize income from their land resources if there are no additional

constraints (Base Case). The effects of policy scenarios can be examined by applying additional constraints, or by changing the value of parameters or constraints, and then comparing the outcome with the Base Case. The scenarios to be studied relate to government policies that dictate the use of particular outputs or lands, and to forest user group policies about community forest management.

a) *Base Case*

The base case is a community forest managed by the community with no outside constraints on land use. This community forest management is modelled as a separate household in the community maximising its income through sales of outputs. Since this household has no labour supply, it must employ others for production. The labour for its management decision comes from voluntary contribution of user members. The households buy the products from common management to meet their needs and the surpluses of the products are sold in the market. As is common practice households can purchase community forest output at a lower price than the market price to meet its home consumption and employment needs. The model determines the distribution of community forest products between the households based on profitability of resources uses and community income maximization principles.

b) *Leasing of Community Forest Land*

In this case, all constraints on community forest land distribution across households and use for firewood, timber and fodder production are relaxed. Community forest is allocated (leased) to each household according to their ability to use it to maximise community income. In effect, this scenario allows households with surplus labour to use community forests as if the land was under private management. This policy effectively increases the area available to each household depending on labour availability and land productivity. The households pays substantial payment to community for leasing land. This scenario may not consistent with current leasehold forest practices in Nepal.

c) *Timber Production From Full MAI*

In this case, the community forest is modelled as a separate household and can only be used for timber production. The community is allowed an annual harvest 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. In this scenario, C_u from Equation (4) is 1 for timber production and 0 for all other main outputs. By-products include firewood produced from offcuts or residuals and fodder harvested from under storey species.

d) *Timber Production From Partial MAI*

In this case, the community forest is modelled as a separate household and can only be used for timber production. However, this case models current government 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 include firewood produced from offcuts or residuals

and fodder harvested from under storey species. In this scenario, R_{iu} is 0.3 for timber and firewood production in hardwood forests, and 0.5 in pine forests.

e) *Provision of Adequate Firewood*

This case is similar to the existing policy in Scenario (d), with the constraint on firewood supply relaxed to allow other firewood harvesting to meet household requirements. This allows some area to be allocated to firewood production. R_{iu} is again 0.3 for timber production in hardwood forests, and 0.5 in pine forests. C_u will be 1.0 for both timber and firewood production, with firewood production from community forests being constrained to the difference between household requirements and private supply.

f) *No Timber Market*

This case is similar to the existing policy in Scenario (d), except that the timber market is limited to the community. This case prevails in many forest user groups in remote districts, where distance from markets and high transport costs limit markets for timber output. In this case timber output is constrained to the level of household consumption.

g) *Immature Forest or Strict Prohibition on Use*

This case demonstrates the outcome for communities when the community forest has young age classes and is not producing timber, or is strictly prohibited from any kind of use. In the former case there will still be under-storey fodder production ($R_{iu} = 1.0$) but no income from timber ($R_{iu} = 0.0$), while in the latter case there is no income at all ($R_{iu} = 0.0$ for all community forest timber outputs, and C_u will be 0 for all non-timber land uses).

Impact of Policies

This study examines the effect of community forestry policies in three areas, ability to meet basic needs, income, and employment. A household needs minimum amounts of certain goods (d_i) for basic survival. The hypothesis is that quantities of these goods in the unconstrained case (q_{iu}) will be adequate for each household but will be lower and perhaps insufficient in the constrained case (q_{ic}).

$$q_{ic} \leq d_i \leq q_{iu}$$

In terms of income, it is believed that the total income of the community with policy constraints (Y_c) will be lower than in the unconstrained case (Y_u).

$$Y_c \leq Y_u$$

In addition, it is believed that the reduction in income will be greater for poor households (Y^P), less for medium income households (Y^M) and least for rich households (Y^R) and that income disparity will increase.

$$\frac{Y_c^R - Y_u^R}{Y_u^R} < \frac{Y_c^M - Y_u^M}{Y_u^M} < \frac{Y_c^P - Y_u^P}{Y_u^P}$$

$$Y_c^R - Y_c^P > Y_u^R - Y_u^P$$

$$Y_c^R - Y_c^M > Y_u^R - Y_u^M$$

$$Y_c^M - Y_c^P > Y_u^M - Y_u^P$$

In terms of employment, total employment under constraints imposed by government policies (T_c) is expected to be lower than an unconstrained situation (T_u).

$$T_c < T_u$$

In addition, the reduction in employment is expected to be borne more by poor households (T^P) than by medium (T^M) or rich (T^R) households.

$$\frac{T_c^R - T_u^R}{T_u^R} < \frac{T_c^M - T_u^M}{T_u^M} < \frac{T_c^P - T_u^P}{T_u^P}$$

Data

User groups 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. The household samples within user groups were selected considering geographical location, ethnicity and living conditions. The sample population of households were prepared by asking people knowledgeable about the general economic condition of households in their communities, which households had high, average, and low standards of living in terms of access to resources for daily necessities and participation in common social activities. However, self sufficiency in food was the main determinant used to group rich, medium or poor households.

A semi-structured questionnaire was administered to female heads of 259 farming households in six forest user groups in three districts of the mid-hill region of Nepal was completed in May-July, 2003. of households. The respondents were asked to report their size of land holding of all types of private lands (upland, lowland and grassland) including share cropping. They were also asked about their level of food sufficiency: deficit for family requirements, just sufficient or surplus available for sale. Family size and household labour data were also collected to estimate household consumption requirements and available labour force. Information on livestock holdings, and firewood and timber collection from community forests were also collected.

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. To calculate household calories and livestock feed requirements two young animals were considered to have the same feed requirement as one adult. Since the survey districts belong to a high population region where the access to community forestry

is relatively small (per capita 0.17 ha in survey groups), the national average of 0.2 ha per capita (FAO, 2000) was used.

The information common to all households were collected from local market surveys and key informants. The information includes output and input prices, crop production costs, livestock productivity, marketing and livestock labour requirements. Input price refers to market prices and product prices refer to farm gate prices. The value of firewood and timber used for domestic purposes were mostly shadow priced by reference to those prices prevailing in neighbouring communities.

Some data were collected from secondary sources. The data on food productivity and nutritional information were collected from FAO (2003) database. Information on crop byproduct production was taken from the Forestry Sector Master Plan (1988). The labour requirement for timber harvesting and utilization was obtained from the Australian Community Forestry Project (2001).

Results

A mixed integer linear programming model based on income maximisation was developed to evaluate government forest policies. The model was designed to fit a subsistence agriculture economy, particularly in the context of Nepal. In this model, resources available in the community, markets and common property were included. This has captured the key elements of a multiple-output production system like agroforestry. The results are divided into a model validation section which shows how well the model represent the communities in the survey, and a policy analysis section that evaluates the effect of policies on household incomes, income disparities and employment.

Validation

Before using the model for policy analysis, the model was validated by comparing the results of a model run that imposed constraints similar to the situation faced by a particular user group to information from the survey of households. Table 1 shows the difference between predicted and actual results for firewood, timber and livestock production. The difference is expressed as a percentage of the actual production. A negative value means the model under-predicted and a positive value means it over-predicted. The predicted values were reasonably close to survey estimates (within 20%) for firewood and livestock. Studies shows a big variation on firewood consumption survey figures (Garner 1997), and these errors cannot not be avoided unless location specific factor based parameters used. Where there are large differences, such as in some timber production estimates, this is likely the result of incomplete survey data. Actual income data was not collected so cannot be compared.

Table 1: Model Validation

| Product types | Forest user groups | Household Income Group (% difference) | | | |
|---------------|--------------------|---------------------------------------|--------|------|-----|
| | | Poor | Medium | Rich | All |
| Firewood Kg | Khorthali | -32 | 15 | -255 | -35 |
| | Siddeswori | 17 | 27 | -7 | 14 |

| | | | | | |
|--------------------------|-------------|------|-------|------|-------|
| | Chapanigadi | -5 | -16 | -146 | -47 |
| | BanshKharka | 28 | 47 | -22 | 27 |
| | Bidur | 50 | 79 | 66 | 69 |
| | Suryamati | 23 | -222 | -196 | -54 |
| | Total | 9 | 30 | -68 | 2 |
| Timber m ³ | Khorthali | 25 | 0 | 100 | 58 |
| | Siddeswori | -5 | -12 | 100 | 11 |
| | Chapanigadi | -1 | 67 | 0 | 39 |
| | BanshKharka | -765 | -1569 | 0 | -2289 |
| | Bidur | -5 | 0 | 0 | -5 |
| | Suryamati | -149 | -390 | -425 | -338 |
| | Total | -60 | -209 | -208 | -159 |
| Livestock units | Khorthali | 38 | 43 | -191 | -5 |
| | Siddeswori | 23 | 6 | -38 | -5 |
| | Chapanigadi | 8 | 33 | -31 | -2 |
| | BanshKharka | 37 | 0 | -23 | 2 |
| | Bidur | 18 | -21 | -14 | -8 |
| | Suryamati | 0 | -5 | 28 | 9 |
| | Total | 17 | 11 | -33 | -3 |

Effect of Policies on Income

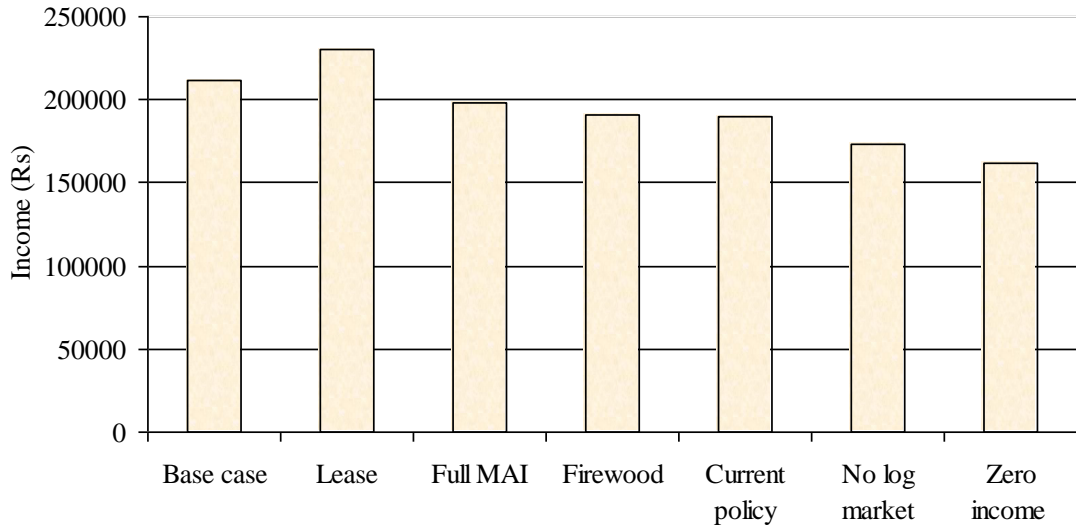
In the following discussion, the different policy scenarios will be denoted as follows:

| Scenario | Short Name |
|--|----------------|
| a) Base Case – Community forest as a household | Base Case |
| b) Community forest leased to households | Leasing |
| c) Timber production only from full MAI | Full MAI |
| d) Timber production only from partial MAI | Current Policy |
| e) Production of adequate firewood for community | Firewood |
| f) No local timber market | No Log Market |
| g) Immature forest | Zero Income |

Income

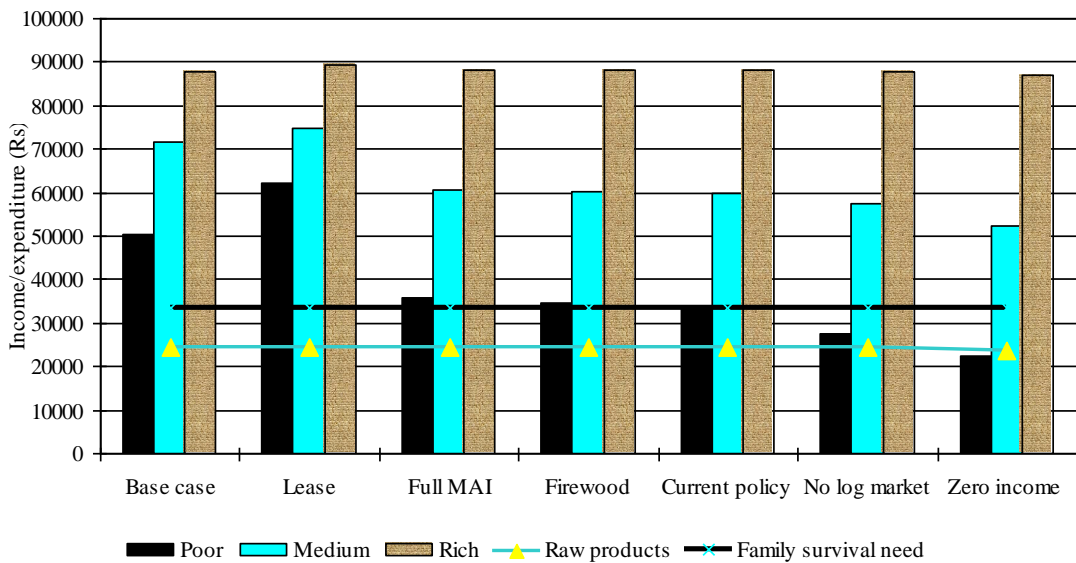
The effect of different policy scenarios on community total income are presented in Figure 1. Total community income is reduced from the base case with any of the restrictive policies. The lowest income is in the zero income forest case.

Figure 1: Total Community Income



The results for household incomes in the policy scenarios are presented in Figure 2. The incomes of all households decrease as more restrictive forest policies are imposed. In the base case scenario, poor and medium income households earn more than they do in the zero income community forest scenario (about 124 and 36 percent respectively). However, the income difference with the policy change is small (one percent) for the rich household. The income of leasehold case was nearly double for the poor household in comparison to existing policy scenario. In the No Log Market scenario, the community income from the forest is small. The incomes of all households and the total community increase to some extent when policy is relaxed for need-based firewood production or for harvesting of the full MAI. Income under the Lease scenario was greater than in the Base Case for all households.

Figure 2: Comparative Household Incomes And Basic Needs Threshold Level



The horizontal lines in Figure 2 show the minimum income needed for household survival. The lower line is the income required to meet essential food (calories), firewood and timber requirements as estimated from the model. Without community

forest supply, poor households are unable to meet their needs for essential goods. The upper line is the income needed for minimum calories and other basic non-food items, estimated in 2003 to be Rs 33,626 based on 2001 price inflated at 5 percent (NPC 2003). In the No Log Market scenario the income of poor households is below this level. However, the other households have a surplus over the income needed for survival. The incomes in the Base Case and Lease scenarios are above the survival level for all households.

The levels of changes in income across the households under different policy scenarios are associated with access to other lands. For example, the rich household has a large private landholding. Thus the forest policy affects little to its income. On contrast, the poor household has far smaller landholding which is insufficient to produce sufficient food and other income. These forest policy constrained community land uses and employment opportunities that determined household incomes. For all households, the highest income was in forest lease scenario, even higher than base case. The lease policy created greater land use flexibilities and also saved labour. The resources use efficiencies increased total income.

The resource supply from community forest is essential to sustain the livelihood of the poor household. This income effect analysis shows that forest policy constrains motivated for environment conservation makes the poor households worse than other household groups. This finding is consistent with Gunatilake (1995) study in SriLanka, and Kumar (2002) study in India. Fisher (2004) also found a similar result that asset poor households benefit more from forest income than others when they have access to forest resources.

Income Disparities In Community

Figure 3: Inter Household Income Disparities Across The Forest Policy Scenarios.

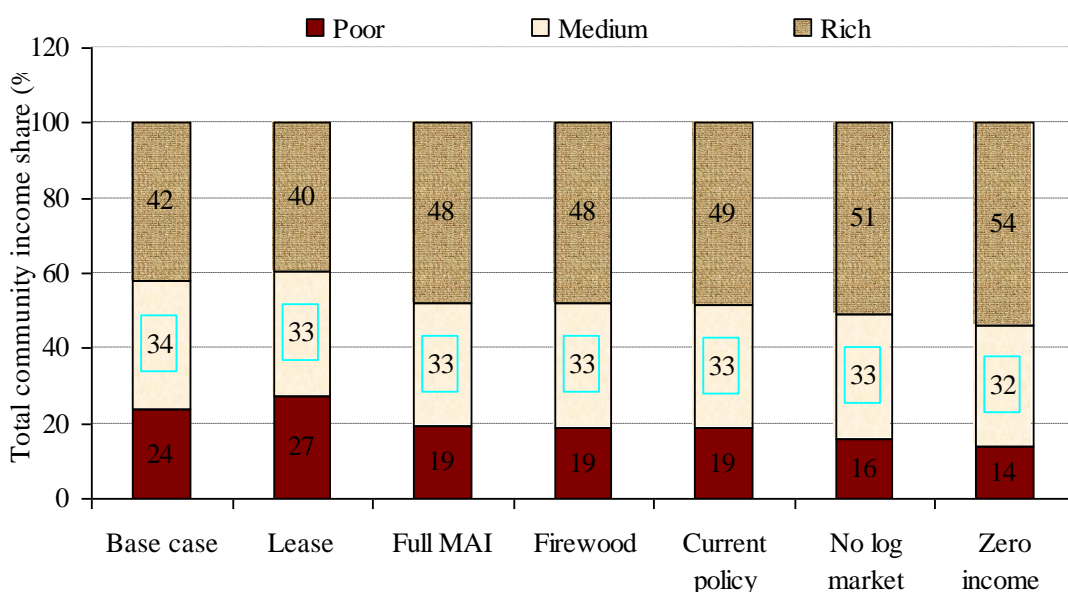


Figure 3 illustrates the income disparities across the households in the community. The income disparities between households varied between forest policy scenarios. The shares of the poor, medium and rich households of total community income were 24, 34 and 42 percent respectively in the base case scenario. The disparities increased as the forest policy constraints are imposed. The shares were 19, 33 and 49

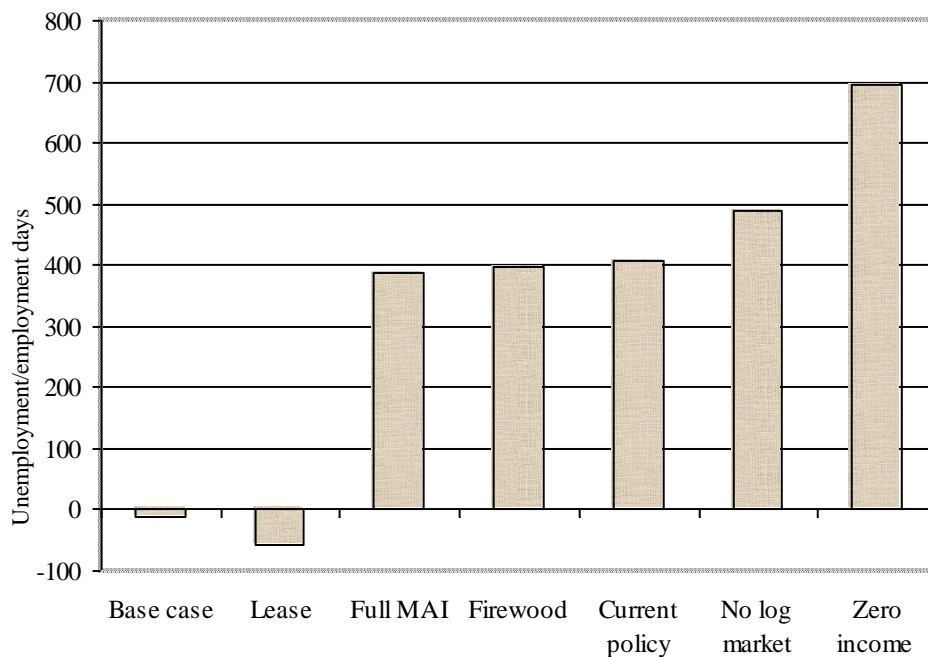
percent in the current policy. Income disparities increase in the ‘no log’ scenario. The leasehold case has 27, 33 and 40 percent shares. Surprisingly, the position of the medium income household varies little in the scenarios.

The analysis shows that the community forest policy is a major determinant of income disparity in the community. The lowest income disparity among households is found in the leasehold forest policy scenario. Forest policies increase income disparities and the effect is greatest for poor households.

Effects on Employment

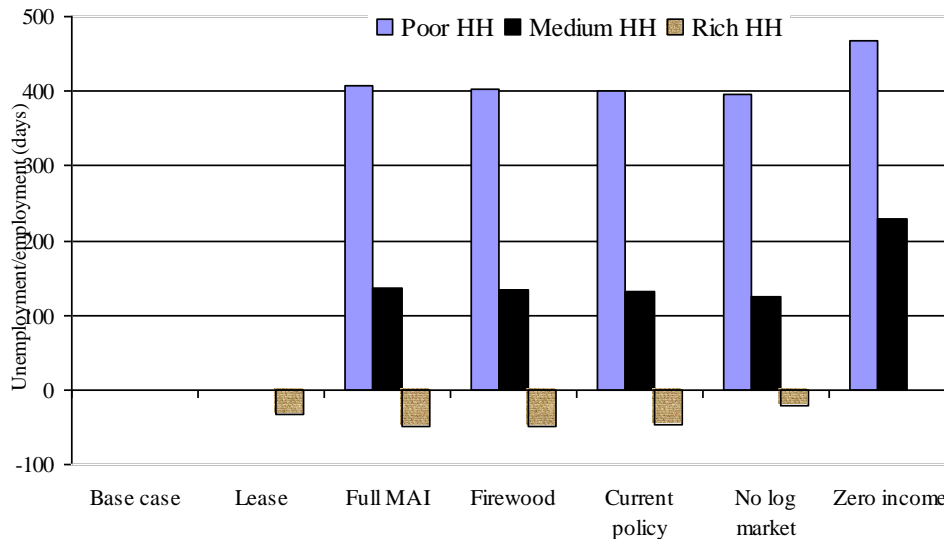
Figure 4 shows comparative results for total unemployment in community under different policy scenarios. The employment assessed is based on households direct involvement in production and market activities. In the base case, the community could employ people from outside the community. In the forest leasehold scenario, the demand for labour is notably more than what is available in the community. The total community unemployment increases with increases in policy restrictions.

Figure 4: Total Community Unemployment In Different Policy Scenarios



The impacts of these policies on household labour unemployment are presented in Figure 5. The graph shows that there is no labour unemployment in the base case. Rather the leasehold case has some labour shortage. The policy restriction on forest use increase unemployment. The unemployment is more pronounced in the poor household than less poor ones. For example, in the current policy scenario, the poor and medium households had 400 and 131 unemployment days respectively. On the other hand, the rich household hired some labour in most cases.

Figure 5: Household Labour Unemployment



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

The results show that the policies constraints have a big influence on household employment opportunities. The level of employment is directly related to the land use type. Some results are unique and need some clarification. For example, in base case, the rich household has not hired labour. Firewood collection from community forest needs generally more labour than that of private land. In the Base case the rich household used its private mostly for firewood production. In existing policy scenario the land was distributed almost equally for timber and firewood production. The firewood production in private land saved household labour for the rich household. Similarly, the number of unemployed people is less in the ‘no log market’ scenario than for the existing policy. The reason is that many labour days were engaged in labour intensive firewood collection. Therefore, the income of poor household is greater in the existing policy scenario than the no log market scenario.

Community Forestland Distribution Under Policy Scenarios

Table 2 shows the land uses in different policy scenarios. In the base case and leasehold forestry scenarios, the community forestland is used in fodder and timber production. In other cases the land is used mostly for timber production. The forestland is fully used only in the base case, leasing and full MAI use scenarios. In other cases, the community forestland is under used.

The result shows that the greater the land use for timber products the lesser the employment and income for the poor households. The finding that low employment in timber based land uses is consistent with Fisher (2001) finding that the land use in timber based forestry increased unemployment based poverty in the USA and Japan. The timber industry provides few job opportunities for local people when local wood industries are not labour intensive (Wunder, 1999). The land use blocks other labour intensive activities. This result is consistent with Itodia and Shaha (2002) finding that poor household benefits more than less poor households from fodder based community forest management. Similarly, the result of the higher employment and decreased poverty from livestock based land uses is consistent with the results of Anderson et al (2002). Employment opportunity for poor people decreased as the timber stocks increase and fodder products decrease in community forests.

Table 2: Land Uses In Different Policy Scenarios

| Policy Scenarios | House hold types | Fire wood ha | Fodder buffalo ha | Fodder goat ha | Soft wood timber ha | Hard wood timber ha | Unused land ha | Policy Scenarios | House hold types | Fire wood ha | Fodder buffalo ha | Fodder goat ha | Soft wood timber ha | Hard wood ha | Unused land ha |
|----------------------------|------------------|--------------|-------------------|----------------|---------------------|---------------------|----------------|----------------------------|------------------|--------------|-------------------|----------------|---------------------|--------------|----------------|
| Base case | Poor | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | Need based firewood supply | Poor | 0 | 0 | 0 | 0 | 0 | |
| | Medium | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | Medium | 0 | 0 | 0 | 0 | 0 | |
| | Rich | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | Rich | 0 | 0 | 0 | 0 | 0 | |
| | Common | 0.00 | 2.26 | 0.26 | 0.00 | 0.47 | | | Common | 0.18 | 0 | 0 | 1.25 | 0.75 | |
| | Total | 0.00 | 2.26 | 0.26 | 0.00 | 0.47 | 0.00 | | Total | 0.18 | 0 | 0 | 1.25 | 0.75 | 0.82 |
| Lease | Poor | 0.00 | 1.11 | 0.00 | 0.00 | 0.00 | | Existing policy | Poor | 0 | 0 | 0 | 0 | 0 | |
| | Medium | 0.00 | 0.61 | 0.00 | 0.02 | 0.04 | | | Medium | 0 | 0 | 0 | 0 | 0 | |
| | Rich | 0.00 | 0.00 | 0.00 | 0.02 | 0.11 | | | Rich | 0 | 0 | 0 | 0 | 0 | |
| | Common | 0.00 | 0.00 | 0.00 | 0.00 | 1.08 | | | Common | 0 | 0 | 0 | 1.25 | 0.75 | |
| | Total | 0.00 | 1.73 | 0.00 | 0.04 | 1.23 | 0.00 | | Total | 0 | 0 | 0 | 1.25 | 0.75 | 1.00 |
| Full MAI timber harvesting | Poor | 0 | 0 | 0 | 0 | 0 | | No log market | Poor | 0 | 0 | 0 | 0 | 0 | |
| | Medium | 0 | 0 | 0 | 0 | 0 | | | Medium | 0 | 0 | 0 | 0 | 0 | |
| | Rich | 0 | 0 | 0 | 0 | 0 | | | Rich | 0 | 0 | 0 | 0 | 0 | |
| | Common | 0 | 0 | 0 | 1.5 | 1.5 | | | Common | 0 | 0 | 0 | 0 | 0.31 | |
| | Total | 0 | 0 | 0 | 1.5 | 1.5 | 0.00 | | Total | 0 | 0 | 0 | 0 | 0.31 | 2.69 |

Conclusions

The effects of government policies on households' income and rural employment are analysed in this paper. The findings show that the community forest policies have decreased poor household access to land and contributed to rural poverty and unemployment. The policies have also increased income disparities between low income and high income households. On this basis it is concluded that existing forest policies of Nepal are counterproductive and worsen the income distribution.

In Nepal armed conflicts occur more frequently in rural areas with low access to private land (Murshed and Gates 2005). Social unrest and violence are growing with increasing imposition of conservative forest policies. This situation is consistent that social unrest and rebellious action increasing with unemployment and poverty (Olzak and Shanahan 1996), resource scarcity, social inequality and low access to livelihood base-land increases (Murshed and Gates 2005; Homer-Dixon, 1999). It is reasonable to conclude that current Nepalese forest policies may have contributed to armed conflicts and social unrest in Nepal.

This study has many policy implications. The study showed that the supplies of raw materials from common lands are essential to fulfil the basic needs of the poorest households. Forests managed for poor households' benefit not only fulfil their basic needs but also reduce income disparity in the community. Among the policy options, leasehold (semi-privatization) approach of forest policy is the most productive and helpful in terms of both income and employment generation. If daily need products are produced the community management approach is also reasonably good. If the policy objective of the community forests management is employment and income generation for socio-political stability, Nepal should change its existing forest

management policies towards producing income and employment promoting forest products.

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