Contribution of Leasehold Forestry in Reducing Poverty among Participating Households in Nepal

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Abstract

The paper analyzes the role of leasehold forestry (LHF), an innovative forest management regime being experimented in the hills of Nepal with the objective of reducing poverty among participating households. LHFs are degraded public forest lands granted on a 40 years lease to identified poor households with the purpose of forest regeneration and raising forest incomes. Using micro-data collected from some 508 LHF households and 61 control households, the contribution of the LHF in reducing various dimensions of poverty and inequality has been examined.

The findings reveal that LHF biomass contributed around 5 percent of household income. Though the non-LHF households with similar poverty and resource characteristics receive about one fourth less biomass flow income annually, the poverty incidence, poverty gap and severity among these two categories is not significantly different. However, among LHF households, LHF income contributed to reduce poverty incidence, poverty gap and severity by around 10, 17 and 22 percent respectively. Within the LHF households, there exists considerable inequality in the biomass income from LHF and the LHF benefit sharing was not found to be pro-poor. The study concludes that allocating land alone is not sufficient to ensure utilization and benefit flow for resource poor, socio-economically weak people as high transaction cost and lack of strong economic incentives discourage defending property right and utilization of leased forest land.

Keywords: *leasehold forestry, non-market valuation, poverty impact, inequality*

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1. INTRODUCTION

Forest environmental incomes make a significant contribution to household income with its omission leading to serious underestimation (Vedeld et al. 2007). Forest environmental income is considered very important for rural households as they serve as a gap filling and a safety net to prevent households falling into further poverty (Angelsen and Wunder, 2003). The issue of to what extent could forest environmental income lift households out of poverty, however, is debatable and depends mostly upon the resource condition and the resource management regime (Beach et al. 2003; Smith and Scherr, 2003)). In that respect, societies are in continuous endeavour exploring what would be the most effective form of management of common pool forest resources to ensure sustainable harvesting as well as to address poverty among forest dependent population under different resource conditions.

The issue of sustainable forest resource management regime becomes even more complicated in the context of degraded forest. Several experiments have been made to address the question what kind of economic incentive mechanism would be effective in regenerating such degraded forest. The leasehold forestry (LHF) experience of Nepal is an attempt to regenerate its degraded forests through an economic incentive of forestry income that is expected to improved livelihood and alleviate poverty among participating households. The outcome of this government sponsored forest management experience specifically targeted for the poor with the purpose of forest regeneration and the socio-economic goal of raising household income and alleviation of poverty could be of significant interest for policy purposes.

LHF as a new kind of property right regime was introduced in 1993 by the government of Nepal with a twin objective of regenerating degraded forest land and alleviating rural poverty. Presently 4523 LHF groups with around 38 thousand household members are functional in 26 out of 75 districts in Nepal (MOF/GON 2010).

Under a LHF regime, government owned, virtually open access degraded forest lands are handed over to a group of identified poor households, generally less than ten in number, with each household getting around 0.5 to 1 hectare land in the form of a lease contract. The duration of the lease is 40 years further extensible to another 40 years. This lease legally enables the recipient household to exercise all rights exercised by a private landowner, though the actual ownership of land is vested on the government. It is thus a state owned forest in the de-jure sense and a privately owned forest in de-facto sense. The LHF households are required to protect their forest lands against degradation from open grazing, forest fires, soil erosion etc to enhance natural

regeneration of trees, shrubs and grass, or, cultivate economically beneficial perennial plants in the LHF lands. Another binding rule is to replace open grazing by stall feeding of livestock while cultivation of cereals in the leasehold land is banned. The basic idea is to enhance forest regeneration and make the LHF land more productive to meet livelihood needs; raise livestock income from improved fodder availability; and generate incomes from timber and non timber forest products in a sustainable manner. The government of Nepal has included LHF among its first priority programmes in its five year plans and LHF has been extended to about one third of the total 75 districts in Nepal. The present study aims to analyze the poverty impact of LHF among participating households and examine the distribution of LHF benefits among participants.

A number of earlier studies have reported that the LHF programme has been able to improve the forest cover of the previously degraded land (IFAD 2003; World Bank 2004; NPC/UNDP/PRSP 2005). LHF is considered innovative due to a number of considerations. Firstly, it is based on utilization of degraded forest or wasteland that has low productivity and is available in significant amount (Nepal for instance, has around 11 percent of the total land appropriate for conversion into LHF land) and can be handed over to resource poor population at no economic cost to the government. It can be a most viable strategy for the government in a resource constrained country like Nepal- granting land, the only resource in its hand to the people who lack necessary land to work on. Secondly, its embraces a two pronged strategy- addressing poverty as well as forest regeneration.

Prior experiences and knowledge in this particular kind of resource management is almost non-existent. Similarly, the livelihood, welfare and poverty impacts of the LHF programme are also not very well understood. There is, thus, a need to analyze the poverty reducing impact of this programme on the participating households. The findings of this experience might be very interesting and useful to countries with similar resource circumstances.

The next section deals with leasehold forestry management experiences followed by study methodology, study findings, discussions of the results and concluding remarks.

2. LEASEHOLD FOREST MANAGEMENT EXPERICENCES

Leasehold management regimes are common form of management regimes and extraction contracts of natural resources into private hands have been put into practice elsewhere too, for instance in Indonesia where approximately world's 10 percent tropical forest is located. In Indonesia tropical hardwood forest were leased for a concessional period of 20-35 years to timber companies with provision for re-plantation in those areas (Pearce, 1990). Such leasing practices, however, are less common in the context of forest management for livelihood.

Some leasehold management regimes have been experimented in other parts of the world. In India for instance, under the Capacity 21 project supported by UNDP, the experience of a number of alternative models was compared. Among these was a highly successful experiment of an NGO, the National Tree-Growers' Cooperative Federation (NTGCF), which was replicated in more than 400 villages in six different states of India. The NTGCF set up a village level tree-growers cooperative society (TGCS) with the active participation of the villagers and the stakeholders. All village households were eligible to be members of the society. The state government provided 30 to 40 hectares of degraded land, wasteland (of which there are some 130 to 170 million hectares in India), on a long-term lease usually at no charge. The NTGCF provided a grant to cover the costs of planting trees, fencing the area, protecting it and watering it for a period of five years. The operations were managed by the local society, TGCS, which was managed in a democratic manner. The TGCS owned the resulting forest. The villagers who provided labour for the planting and watering activities were paid wages, which created employment opportunities for the poor (Parikh 1998).

Villagers were permitted to take away fodder from the plantation but they had to pay for it. The rate reflected the market rate less implicit wage for cutting grass and cost of transport. At the end of the year, the profits were shared equally among the members. The success rate of these societies in converting degraded lands into lush green multi-species (the species planted are determined by the villagers in consultation with experts provided by NTGCF) forests in five years was high. An economic evaluation of a sample of eight TGCSs carried out by the Indira Gandhi Institute of Development Research (IGIDR) showed that the internal rate of return on these projects ranged between 12 per cent and the benefit/cost ratios exceeded 2.5 even when the NTGCF grant was treated as a loan and even when no credit was taken for any environmental benefits such as erosion prevention, enhanced water percolation or carbon sequestration, or any distributional gains. The latter were important as it provided additional employment to the poor as well as provided fuel and fodder to them. The economic rate of return for the society, which accounted for these gains was much higher, and the financial rate of return for the village level society that gets a grant was still higher.

The commercial operation of the TGCS, that is, payment for wages and selling its products even to the members, was an important element in its success and sustainability. It takes away any compulsion on the part of members to extract products from the forest. Free riding is not possible. Even when one does not take anything from the forest one gets the share in the profit. By eliminating this fear that if one does not take anything out, others will get more, the danger of the tragedy of commons was virtually eliminated.

Leasehold forestry practices that do not ensure well defined and enforceable property right, however, have been found to fail to achieve their ecological and socio-economic targets. Failure of such a resource regime has been cited by Pasha (1992) with example from Karnataka. Some land was converted to "Tree Patta" system. This is a kind of leasehold system under which the degraded CPR land planted with trees were allotted to rural poor ranging from 0.50-2.0 acre per household. The beneficiary had to maintain the trees. After one year they were allowed to collect the usufruct from the developed areas. Ownership of the land, however, was bestowed within the forest department. Patta (deed) were issued on the tree; the beneficiaries were not allowed to cut the tree but only to harvest the usufruct. When the trees become old and mature, the forest department would cut them and the beneficiaries would have a share in the value of output (presently no clarity regarding the exact share). Once the plantation was handed over to the beneficiaries, each beneficiary would get Rs. 500 per annum, both as an incentive as well as to look after the planted area. The beneficiaries were also allowed to cultivate crops in the 10-12 feet space between tree rows.

The experiences so far showed that the Patta system was in operation only in the backward areas. This was mainly because in backward villages, one could find large areas of degraded CPR forests. Since the quality of CPR in such was already poor, the mortality rate of trees was high even among fodder and fruit trees. Due to poor quality soil, the beneficiaries did not cultivate crop. Instead they herded cattle there leading to trampling of plants. These behaviour indicate the need for the beneficiaries concern for immediate benefits rather than future ones. Their time horizon was short enough and they did not possess a sense of ownership over the trees too. They felt that since the land belongs to the forest department, it would take away the tree and land from them any time. As a result neither the poor not the CPR were protected properly.

Looking at the above two leasehold forest experiences mentioned above, the incentives mechanisms and the duration of the property rights were different. Thus, there is a

research gap as to whether it is possible for a state sponsored CPR regime organized of only identified poor households to effectively manage a highly degraded CPR forest land to meet their forest product requirement and; would such a state sponsored CPR regime be capable of uplifting such families socio-economically, particularly out of poverty, in a perceivable manner after a given period of tenure

3. STUDY METHODS

3.1 Conceptual analytical framework

The analytical framework of this study is built on the fact that under a LHF forestry regime, households with various socio-economic, demographic and physical access characteristics participate as a LHF group member in the management of degraded forest plot allotted to them by the department of Forests. Participating LHF households with control over open grazing and improved forest regeneration after completing some gestation periods produce higher income flow and forest stocks. The value of biomass from the LHF plot over what was quite negligible in the face of overgrazing and degradation before establishment of LHF provides can be measured using market and non-market valuation of biomass. Household income that includes income from biomass sources including income from LHF besides other normal sources of income provides data on household income at the micro level. The incidence, depth and severity of poverty based on per capita income provide a picture of poverty after years of LHF involvement. The difference in poverty status with and without LHF income provides a measure of this impact. The distribution of LHF income among various income groups provide a picture of equity in distribution of LHF benefits among different socio-economic groups.

3.2 Study area and data

Among the 26 districts where LHF program has been implemented, Makwanpur and Kavrepalanchok (Kavre, for short) were the two mid hill (300-3000m above sea leve) districts in which LHF program first started in Nepal. These two districts were, thus, purposively selected for the study to capture the impacts of mature LHFs. The purpose of selecting two districts rather than one was to make the study representative of the topographical diversity.

Ecological crisis particularly soil erosion is a serious problem in both the districts. These districts comprise of two major ecological regions- the mid mountains and the *Shiwaliks*. The mid-mountains comprises of rocky topography and are quite stable while the Shiwaliks are very fragile. The soil in the Shiwaliks is made up of sandy clay and boulders and desertification is rampant due to flash floods and landslides. Makwanpur has 60 percent of its area under Shiwalik hills and is thus ecologically fragile (in contrast to only 3 percent in Kavre). Due to human encroachment in the forest cover, hundreds of hectares of land are converted into desert land every year. Addressing ecological crisis through appropriate forest management in the mid-hills has been considered very urgent by the government of Nepal (HMGN/MFSC 2002).

The study was mainly based on primary data with information collected through questionnaire interview survey. Secondary information on the distribution of LHF groups in various Village Development Committees (VDC) with their date of establishment and number of households in each group was collected from the Leasehold Forestry Division in Kathmandu and related District Forest Offices. Sampling was conducted after listing all the eligible LHF groups in the study districts.

The study was also designed to obtain information from comparison households from the surveyed LHF VDCs. In course of the pilot study and pre-testing surveys, the researcher was aware of the existence of eligible and enlisted households not included in the LHF group due to their own unwillingness or due to their unavailability at the time of signing in the LHF application document. Some households did not want to become members in the LHF voluntarily, thinking that it would not be worth investing time and resources in the expectation of regenerating forest in such degraded lands. The reasons of the unavailability at the time of signing in application document were temporary migration of the family, household decision maker away from home etc. These households were considered as comparison or control households for the study.

3.3 Sampling design

Makwanpur and Kavre had 288 and 243 LHF groups respectively in 2007. Since LHF programme is based on the principle of natural regeneration of forest, five years was considered as a gestation period for forest product harvesting based on discussion with forestry professionals. Accordingly, all of the 245 and 194 LHF groups in the two districts with more than five years of tenure (LHF groups established before 2003) were considered as the population for the study.

A probability proportional to size (PPS) sampling was designed for selection of the VDCs which were the primary sampling units (PSUs). In the next stage, a simple random sampling was performed for the selection of LHF groups within the selected VDC and finally, a census of the all member households in the selected LHF group was conducted. The LHF households were the units of analysis.

For PPS, all the LHF VDCs in the district with LHF groups older than five years were listed in an alphabetical order and the sampling interval was determined to select approximately 50 percent of the VDCs in each district. This resulted in the selection of 12 VDCs out of 23 for Makwanpur and 10 out of 19 VDCs for Kavre. At the next stage 5 LHF groups were randomly selected from the total number of LHF groups in the selected VDCs in Makwanur and 3.5 LHF groups in Kavre (4 LHF groups in 5 VDCs and 3 LHF groups in the other 5 VDCs, alternatively to ensure that the resulting sampled LHF groups are in proportion to the LHF population in the two district. This provided with 95 LHF groups (60 in Makwanpur and 35 in Kavre district). With a mode value of 5 households per LHF in Makwanpur and 7 household per LHF in Kavre provided us with approximately 545 (300+245) households. If a VDC selected through PPS had less than the required number of LHF groups, all LHF groups in that VDC would be automatically selected and the remaining ones would be selected from another nearest LHF VDC.

It was provisioned that if some sampled LHF group could not be visited due to certain reasons (risky access tracks due to landslide, insecurity due to political conflicts etc.) another LHF group in the adjacent location would be selected. Accordingly, four LHF groups, two from each district had to be replaced by adjacent LHF groups mainly due to access problem. Among the selected LHF groups, no replacement of the LHF household was made if more than 50 percent of the LHF group members were available for interview. If only less than 50 percent of the households in the LHF group were available for interview due to various reasons (temporary migration, absence of reliable family member who could provide information, unwillingness to participate in the interview etc), an additional LHF group most proximate was selected and all available members in the group were interviewed (sometimes it was not possible to ensure in the beginning that more than 50 percent LHF households were available in the village for interview due to information gaps and long distances between member households). This was expected to ensure a required number of sample households. Accordingly, additional five LHF groups had to be visited (4 from Makwanpur and 1 from Kavre) to supplement the LHF groups where only less than 50 percent household were available for interview (either due to absence of LHF member or household head) thus making a total of 100 LHF groups included in the survey. None of the household heads or LHF members, who were available at their residence refused to participate in the survey. A

total of 508 LHF households were surveyed, 297 from Makwanpur and 211 from Kavre districts.

In course of the field survey, on identification of the comparision (control) households as discussed above, the survey team administered questionnaire to such non-LHF households with a maximum of two households selected randomly for each LHF group. Accordingly, 61 LHF households were surveyed. This provided a sample of comparison households.

The survey was conducted during Jan 2008 to May 2008. Completing an interview required around 45 minutes as it required simple calculations of household extraction, incomes etc. Efforts were made to reduce the impact of recall bias through discussion and verification among household members and consensus figures were recorded. Community level information was collected simultaneously during the household survey. The community level information saved time and interview fatigue in household survey .

3.4 Measurement of LHF income and other household income

The estimation of the contribution of LHF in household income required valution of biomass extracted from LHF into monetary value. Except for a few forest products, most of the forest product were collected to meet livelihood need and thus market did not exist for those forest products. Thus, finding a price for the forest products was not straight forward and indirect but acceptable standard methods of valuation had to be employed.

The value of the forest biomass when they are available in the open access situation *in situ* is almost nil. They command value when transported to places where they are used and are thus endowed with utlities. The cost of time required in the collection and transportation of natural resources reflect their true prices in such cases and were used to estimate the value of firewood, fodder-grass and leaf-litter. Several earlier studies have adopted time cost as a price of non marketed forest products (Kumar and Hotchkiss, 1988; MacDonald et.al, 2001). Open access forests were used as a reference point for estimating time for collection as these are places where resources do not command price initially. Accordingly, depending on the time each household took to collect these forest product from open access, respective price for these products could be imputed. The product of the time taken to collect forest products and the money value of time yielded the value of forest products such as firewood, fodder

grass and leaf litter. Data on time to collect from open access and LHF was collected from field survey.

Adopting price of forest products based on value of collection time cost leads us to yet another problem to be settled – how to to obtain a price of labour time? Several studies such as Skoufies (1994) and Thapa (2003) have used household production function, particularly agriculture production function to estimate the value of household time in terms of shadow wage rate. The wage rate measured in terms of marginal productivity of labour in agriculture gives an approximation of opportunity cost of labour. But since the present study area is based on rain fed agriculture that lasts only for a few months in a year, the wage rate that prevails only during cropping months could not be used for valuation of household time during normal labour situations due to the possibility of over estimation.

Another alternative to valuation of household time was the calorific value of the additional nutrient requirement in collection activity. This method is based on estimating the value of the calorie required to perform collection activity and would provide the value of the forest product at its lower bound. MacDonald et al. (2001) had applied this method in estimating firewood collection decision study in Zimbabwe. This concept is also implicit in a study by Hartter and Boston (2008) on firewood demand arising from greater calorie needs due to increased distance from forests.

Accordingly, it was assumed that when no alternative employment opportunities are available, the labour stays idle. The energy consumed in terms of calories remain at some minimum level during rest. Instead, if a labourer performs some physical activities, the labourer necessarily consumes some additional energy to be compensated through the food they consume. The difference between the calorie consumed during work and the calorie consumed when staying idle per hour gives a measure of the minimum additional calorie consumption due to physical activity. The money value of additional energy consumed during the extra physical work gives a measure of the minimum subsistence cost of human labour. The number of hours spent in collection of forest products could be converted into money value of the additional staple food to produce the required energy equivalent of calorie for work. Accordingly, from literature, traveling to the site, collecting forest product and carrying them back can be broadly classified as a moderate kind of physical activity requiring 150-350 calories per hour. Thus the average calorific figure of 250 calories per hour could be used. Likewise, the calorie consumption for an average person doing nothing was 84 calories per hour (McArdle 1986; Williams 1983). Thus an average adult would need an additional 166 calories per hour to engage in collection activity rather than remain idle. As open access are the most likely site of collection of forest products throughout the year (community forest often restrict collections to particular times and quantities in a

year), the product of the additional calories per hour and the number of hours engaged in collection activities if they were to collect from open access forests gives the total calorie required to collect each forest product. The cost of the additional calorie requirement could then be obtained by estimating the amount of staple food grain that should be consumed to extract the given calories of energy in performing the activity. The conversion factor in terms of maize which was the staple food for most of the households was 3.42 calories per gram (World Bank 1998). Finally, money value of the quantity of maize so estimated could be obtained using locally prevailing market price for maize in the community. This estimate would give a lower bound (subsistence) value of time taken in hours in collection activity. The average wage rate using the calorific nutrient requirement was accordingly estimated to be NRs. 0.98 per hour. This provided us with a lower bound alternative valuation of forest product.

Further, since work is not available throughout the year at the local wage rate that prevails during peak seasons, and a labour cannot be hired below equivalent subsistence calorific value, an adjusted wage rate reflective of equilibrium of demand for and supply of labour was constructed. A most appropriate wage rate that could be devised was by averaging the lower bound calorific wage rate and the prevailing real wage rate for agriculture labour. This is because all practical wage settlement deals round the year are likely to take place through the interaction of these two market forces: the necessity to hire labour on the part of the employer (demand for labour) and the need for finding work on the part of the labourer (supply of labour) with the lower bound calorific value and the upper bound prevailing wage rate as references. Thus, under very shallow labor market situation, practical wage rates can be expected to be determined as a compromise between the employer and the employee in between these two reference wage rates.

Once the price of labour time is determined, each load of forest products extracted could be converted into a monetary value based on the time taken to collect the products.

The hourly money wage rate in practice was NRs. 8 and 7 respectively for male and female labours. The prevailing average real wage rate was NRs. 13.4 per hour. The real wage comprises of cash wage plus the value of food served in kind. Data for prevailing wage rate for casual labour and the value of food served by households was collected at household level. As discussed in the methodology section, adjusted wage rate was devised by averaging the calorific wage rate and the labour market real wage rate. This adjusted average wage rate came out to be NRs. 7.2 (std dev. 2.0) per hour for both sexes of labour.

Accordingly, based on the time taken to collect forest products from open access, the average shadow prices were NRs. 11.63, 13.06 and 7.69 per load of firewood, fodder-grass and leaf-litter respectively in the study area and it is assumed that people could obtain these forest products at these prices at door step. Other household income from farm and non-farm sources were calculated from household data for income sources. Net incomes were estimated from expenditures deducted from gross income in agriculture, livestock, business and other sources.

3.5 Measurement of poverty impact and distribution of LHF income

This study compares the poverty status in terms of incidence (or headcount ratio), gap and severity of poverty among households with LHF and without LHF. The comparision of poverty status with and without LHF biomass income and between LHF households and non LHF households provides an estimate of the impact of the LHF. For the purpose of poverty measurement the Foster Greer Thorbecke (FGT) classes of poverty measures were used to measure the headcount, poverty gap and the intensity of poverty. The headcount ratio (PG_0) measures how widespread poverty is; the poverty gap index (PG_1) measures how poor the poor are from the reference poverty line; the squared poverty gap (PG_2) measures the severity or intensity of poverty. Poverty gap and poverty severity provide an idea of the magnitude of the effort required to bring households out of poverty. In mathematical notations,

$$P_a(x;z) = (1/n)\sum_{i=1}^{q}(g_i / z)^a$$

Where,

x = income

n = total number of households

q = number of poor households

g_i = (z-x) is the income shortfall of the ith household.

z> 0 is the predetermined poverty line

a is a measure of poverty aversion (measures with larger a are more sensitive to the poorest poor)

for a = 0, Pa will be equal to the headcount ratio

for a = 1, Pa will be equal to normalized poverty gap

for a = 2, Pa will be equal to the squared normalized poverty gap ratio

Source: Foster, Greer and Thorbecke (1984)

In the present study, the head count ratio [FGT: a=0], normalized poverty gap [FGT: a=1], and the squared normalized poverty gaps [FGT: a=2], are indicated as PG_0, PG_1, and PG_2. The inflation adjusted and geographical region specific poverty line based on Nepal Living Standard Survey was used to determine the poverty line income (CBS 2004). The distributional aspects of LHF benefits among households was examined through an analysis of the percentage share of LHF income among per capita income quintiles.

4. RESULTS

This section discusses the contribution of LHF in households income and poverty alleviation based on evidences from the field data. For better insight into the issues, the author discusses the general characteristics of the LHF households and the leasehold forest management regime as a background.

4.1 General characteristics of LHF households and leasehold forest plots

The average family size of the LHF Households was 6.52 and fifteen percent of the households were female headed. Seventy-five percent of the LHF members in the LHF groups were male. Sixty-three percent household heads were literate while the rest 37 percent were illiterate. Three percent of the households had all members illiterate.The mean highest school grade attained within literate family members was seven years. Majority of the household head's main occupation was agriculture with 52 percent self employed in ones own agriculture and 26 percent depending on agriculture wage

labour. Thus, the proportion of household depending primairly on agriculture for livelihood was almost 80 percent. Fifty six percent households had electricty supply for lighting and 48 percent had permanent toilets. About a quarter of the LHF households had television sets too. Eighteen percent of the LHF households had access to modern communication system through mobile sets. The average distance to motorable road head and a market where milk could be sold was 3.4 hours and 3.5 hours one way respectively indicating poor prospects for commercialization of perishable farm and livestock products.

About a quarter of the LHF households had land holdings less than 0.25 hectares. Similarly, 57 percent households had less than 0.5 hectares. More than forty percent households with LHF plots had agriculture land holding above 0.5 hectares. The general government criteria for eligibility of obtaining the LHF plot is land holding of less than 0.5 hectares. Due to very low productivity of agriculture land, ownership of agriculture land above 0.5 hectares did not ensure food self-sufficiency. The average size of large ruminants (cows, buffalo, bullocks) and small ruminants (goat and sheep) were 2.87 and 5.01 respectively. Twelve percent of the total LHF households were receiving remittance income from their family members abroad. This figure was quite low compared to the national average of 33 percent (CBS 2004).

The size, distance to the LHF plots and land quality of the plots are by and large the most important factors determining LHF benefits to the households. The area of the LHF plots varied from 0.3 hectares to 1.5 hectares with a mean of 0.69 (std dev. 0.24) hectares though the initial official target was to provide around one hectare per household on average. The distance to the LHF plot varied from a close distance of one minute to two and a half hours of walking distance one way. The mean walking time was 17 minutes. Even if we disregard the longer walking distance, the mean walking distance of 17 minutes is sufficient to impose a significant management cost in preventing open grazing in the LHF plots as grazing cattle in the crop fields after harvest and open access such as river sides, road sides etc. were quite common in the study area.

The average number of years the households had been in the LHF was about ten years (std. dev 2 years). This was because of the sampling design which considered LHF groups with more than 5 years of participation as inclusion critera. The average number of households in the LHF group was 6.4 households. Twenty six percent LHF plots were of very poor quality in terms of biophysical characteristics (steep slope, poor soil quality and covered by nuisance species) and would yield very low outputs. About 24 percent of the LHF households did not collect any product from the LHF plots possibly due to

long distance, almost no yield from their plots or availability of alternatives sources such as community forests. The LHF land by definition are already degraded forest lands.

The average number of households in a LHF group was 6 with a minimum 4 and a maximum of 10 member households. LHF plots could be managed collectively in groups or as individual household plots. Management of LHF plot by individual households could have greater incentives for more effective utilization than management by groups. Only 28 percent households were under individual management while the remaining 72 percent were under group management.

Regarding the interface of the LHF with community forestry, almost 89 percent of the LHF households were also members of the community forestry user groups and were extracting forest products from community forests. Community Forests are the largest grass root institutions in the rural communities and serve as a important social network in rural areas. LHF households might continue to be involved in community forestry to continue to receive benefits from such a social capital.

The households on an average spent 5.34 workdays in a year in forest floor clearing of unwanted species, thinning and pruning and removing of dry branches etc. This was quite low figure than expected. The money value of the time so spent was NRs 253. The cost of depreciation of tools and implement was quite negligible and thus the production cost of leasehold forest products was only NRs. 253. The LHF households assembled periodically in their groups to discuss on LHF issues and collect their monthly savings or sometimes went to the District Forest Office (DFO) for consultations. The total trasaction cost of time and travel expenses was NRs. 418. The households thus incurred a total production cost of NRs. 671 in LHF related activities.

Regarding problems faced by LHF groups, the largest number of respondents pointed out to the problem in exercising the right to exclude non-LHF households from illegally intruding in the LHF plots individually or in groups for collecting forest products, grazing cattle in the LHF plot etc. Ninety-four percent households reported of the problem of intrusion by outsiders into the LHF plots. Defending property right was pointed as the most serious problem by 38 percent LHF households. One of the main lessons of new institutional economics and the new political economy was that transaction cost matters enormously in explaining the effectiveness of collective action (Janvry et.al 1993). If transaction cost of managing LHF property rights becomes very high, the economic incentive to manage LHF effectively is adversely affected for these resource poor and socio-economically and politically vulnerable LHF households. Another most serious problem was the lack of monitoring and supervision from District Forestry Department.

Sixty percent LHF households pointed that there had been no visits by the concerned officials from the forestry department to supervise and monitor the activities of the LHF. In fact, due to the armed conflict and political instability in the country for the last one decade, government offices had been passive as officials could not visit the rural areas.

Poor quality of the LHF land was indicated as a third important problem by about one fourth LHF households. The land allocated was either very steep, were rocky with very shallow top soil or were covered with noxious species making natural regeneration or plantation of useful plants difficult. Land being allocated collectively to the group rather than to the individual households was another problem identified by the LHF households.

4.2 LHF contribution in total Biomass consumption and household income

Households supplemented daily biomass requirement from private lands by collection from public lands. Fodder grass which constituted the largest bulk of biomass was collected mostly from private agriculture and forest land while the rest was collected from public lands including open access. Community forests were the largest sources of firewood followed by private land. Leaf litter essential as bedding material for livestock and composted for manure in agriculture were collected mostly from community forests too. Of the total requirement, LHF contributes around 15 percent of firewood, 16 percent of fodder grass and 24 percent of leaf litter. However among the public forest sources, the contribution of LHF is relatively significant with 22 to 41 percent share in firewood, fodder grass and leaf litter.

Table 1. Extraction of main biomass by sources in percentage

Forest Product	Total (loads)	Private agri./forest land	Community Forest	LHF	Government owned forest	Open access	Purchase
Firewood	112	28.2	37.1	15.4	10.9	7.1	1.4
Fodder-grass	602	62.1	14.8	15.6	5.9	1.6	0.0
Leaf-litter	273	31.2	35.8	23.8	7.6	1.5	0.0

Source: Field Survey (2008)

Table 2. Extraction of main biomass consumption by non-private sources in percentage

Forest Products	Total loads	Percentage distribution by non-private forest sources in percentage			
		CF	LHF	Govt. owned	open access

Firewood	81	52.6	21.8	15.5	10.1
Fodder-grass	228	39.1	41.2	15.6	4.1
Leaf-litter	188	52.0	34.6	11.1	2.2

Source: Field survey (2008)

The household income of the sampled LHF households was NRs. 87369 with a standard deviation of 82282 indicating high variance among households. The per capita income of the LHF households was NRs. 14089 (median= NRs. 10524; std dev. 12994). Regarding household income by sources, 78 percent households considered agriculture as the major occupation though crop income did not constitute a very large share. Crop income constituted 26.1 percent followed by salary and business income (25.9 percent). The net income from livestock products and sales of live animals constituted relatively small share of 7.9. Remittance income (12.0 percent) exceeded the local wage income (10.9 percent). Total transfer income (-0.03 percent) was negligible as the receipts and contributions would generally cancel out as expected.

Among the LHF households, 2.4 percent had negative agriculture income due to crop failure or losses in commercial vegetable farming while around 24 percent households had negative cash income from livestock when the value of self consumed milk, animal manure, live animals and drought power are not taken into consideration. However, the negative cash income from livestock are counter balanced by crop yield from compost manure prepared at family yard, self consumed livestock products and draught power requirement that motivates them to keep livestock.

Table 3. Components of environmental and non-environmental income

Income components	Mean (NRs)	Std. dev.	Percentage
Net agricultural income	22812.72	31160.41	26.11
Net livestock income	6895.54	18995.45	7.89
Wage income	9498.56	19025.52	10.87
Salary and business	22586.32	50562.88	25.85
Remittance income	10521.11	34221.07	12.04
Transfer income	-22.37	9530.94	-0.03
Other income (interest, rent)	1241.30	10118.07	1.42
household income without biomass	73533.18	81128.23	84.16
Aggregate biomass income	13836.2	6073.76	15.84
Aggregate household income	87369.39	82282.84	100.00
Agg .biomass income from public source	7695.92	4976.97	8.81

Total biomass from LHF	4104.10	4392.63	4.70

Source: Field Survey (2008)

The non-environmental income was 84 percent and the rest 16 percent was environmental income. Fifty-six percent of the environmental income came from non-private land sources while 44 percent came from private land sources.The share of LHF biomass (flow and annualized value of timber in LHF plots) was NRs. 4104 and constituted 5 percent of household income. Among the non-private land sources, LHF contributed 53 percent while 47 percent came from community forest, government forest and open access soruces.The LHF thus was found to be a significantly large contributor in the household biomass income from non-private land sources of biomass only, though the contribution of LHF from both private and non-private sources combined is small.

It is worth noting that cash income (from sales of thatching grass, grass seeds, broom grass etc.) from LHF was about 4 percent of the total value produced from LHF while the remaining 96 percent constituted livelihood resources. Poor performance of LHF in generating cash income so important for rural households point to the need for serious reorientation of LHF to produce for the market.

4.3 Poverty situation and poverty impact of LHF

The head count index of poverty for the LHF households was 43.8 percent. The national average head count index for the study area which falls under eastern hills is 42.9 percent (CBS, 2005). This indicates that the poverty among LHF households is not lower than the average poverty prevalent in the region on average. There are two possible interpretations of the results. Firstly, if we assume that all the LHF households were under poverty when the LHF programmes started, then around 53 percent of the households have been lifted up from poverty in 10 years of LHF engagement. This assumption is based on the Leasehold Forestry Policy of the government of Nepal, 2002 (GON 2002) which clearly mentions of the LHF requires handing over the LHF plots to population below the poverty line. However, since we do not have a baseline data on the exact income or consumption of the households when LHF started, this could be one strain of argument. We can accordingly, consider LHF having some

contribution to reduce poverty among the participating households with allowance for other confounding factors. The headcount index had increased from 36.1 to 42.9 percent between period 1997 to 2004 for the average population in the reference region[1]. In this backdrop, a fall of poverty incidence from the previous level with all households being under poverty initially to the present status of around 43 percent might be considered as an improvement.

The other strain of argument could be that LHF could not significantly contribute to reduce poverty among participating households and even after around 10 years of operation, 44 percent households are still under poverty. Given the lack of income diversification from LHF and its contribution of merely around 5 percent of household incomes ever after ten years, there is not enough evidence against this claim either. The poverty incidence among comparable non-LHF households was almost equal of around 44 percent either indicating that poverty incidence among comparable non-LHF households is not different from poverty incidence among LHF households. Thus, the poverty impact of LHF is quite debatable and inconclusive from this perspective.

The depth of poverty measured in terms of poverty gap was 17 percent for the LHF households and 20 percent for the non-LHF households and is quite equal. The poverty gap among general population in the two survey districts was 29.4 percent in 2004. The poverty gap is thus quite low among the LHF households compared to 2004 figure but the difference in poverty gap between LHF and non-LHF households does not seem to be significantly different. The squared poverty gap, a measure of the severity of poverty was 9 percent for the LHF households and 12 percent for the non-LHF households. The regional comparable figure was 21 percent in 2004. The severity thus among both LHF and non-LHF households appears lower than the regional severity of poverty perhaps due to exclusion of biomass income in household income estimation.

Table 4. Poverty index (headcount P0), poverty gap (P1) and severity (P2) for LHF and Non-LHF Households

Poverty dimension	LHF households	Non-LHF households	All households

[1] The poverty measurement at the national level in Nepal under National Living Standard Survey does not include environmental income which would otherwise lead to lower poverty rates than presently estimated.

	Estimate	Std. Error	Estimate	Std. Error	Estimate	Std. Error
Headcount Index (p0)	0.4390	0.0220	0.4426	0.0641	0.4394	0.0208
Average poverty gap index (p1)	0.1722	0.0112	0.2015	0.0369	0.1753	0.0108
Average Severity index(p2)	0.0937	0.0086	0.1224	0.0282	0.0967	0.0082

The Stata command used to get a measure of poverty incidence (P0), poverty gap (P1) and squared poverty gap (P2) was "sepov".

Source: Authors' Calculation

Overall, the results indicated that though there was some difference economically, there was no statistically significant difference in the poverty incidence, depth and severity of poverty among the LHF and the non-LHF households (t statistics were -0.05, -0.76 and -0.97 respectively and were less than required critical values)

Among the LHF households, an additional analysis was made to examine the contribution of biomass income from various sources in poverty dimensions (headcount, gap and severity). Estimates were made to compare poverty dimensions for household income with biomass income, household income without biomass income, household income without biomass income from public sources and household income without LHF biomass income. The analysis produced interesting results.

The standard household living standard survey data collected by countries periodically to measure standard of living does not include the environmental income. Inclusion of environmental income would give a different picture as most rural households obtain a significant amount household income from environmental sources. Cavendish's (1999) finding of a study in Zimbabwe for instance has shown that poverty incidence (P0), gap (P1) and severity (P2) declined by 17, 42 and 56 percent when environmental incomes were included in the definition of income. In the present case also it was found that inclusion of environmental income reduced P0, P1 and P2 by 28, 66 and 103 percent respectively. The reductions were both economically as well as statistically significant. Likewise, the inclusion of biomass income from public sources reduced P0, P1 and P2 by 28, 66 and 103 percent respectively and the differences were statistically significant as well.

An interesting inquiry of LHF households would be to examine what would be the poverty dimensions if incomes from LHF were excluded. The results indicated that P0, P1 and P2 would increase by 10, 16 and 22 percent respectively or alternatively, LHF income has contributed to reduce P0, P1 and P2 by 10, 17 and 22 percent respectively. The difference was statistically significant for P1 at 5 percent level and for P0 and P2 at 10 percent level.

Table 5. Change in poverty index (headcount P0), poverty gap (P1) and severity (P2) for households with and without LHF biomass income

Descriptions	**P0**	**Std. Err**	**P1**	**Std. Err**	**P2**	**Std. Err**
With biomass Income (A)	0.439	0.022	0.172	0.011	0.094	0.009
Without biomass income (B)	0.561	0.022	0.285	0.015	0.190	0.013
Without Public biomass income (C)	0.504	0.022	0.231	0.013	0.140	0.011
Without LHF income (D)	0.484	0.022	0.201	0.012	0.114	0.010
	Percentage change in poverty and t-statistics of difference					
Difference Category	p0	t-stat	P1	t-stat	P2	t-stat
Difference(E=B-A)	27.803	3.921***	65.771	6.0749***	102.636	6.072***
Difference(F=C-A)	14.798	2.089***	0.201	3.465***	49.483	3.237***
Difference (G=D-A)	10.314	1.446*	16.522	1.782**	21.602	1.487*

, ** and * indicate significance at 10, 5 and 1 percent level (one sided test).*

Source: field Survey (2008)

The above results provide some support to the LHF impact regarding poverty reduction. However, the exact impact depends upon the previous use of LHF plots. If LHF plots were highly degraded before conversion and yielded almost no biomass income, conversion of such land into LHF generated biomass, biomass income and contributed to poverty reduction.

4.4 Equity in distribution of LHF contribution

The distribution of LHF biomass products among the LHF households among various per capita income (PCI) quintiles was examined to assess the equity in the distribution

of LHF benefits. There was some notable variation in the socio-economic status of LHF households such as literacy of household head among lowest and highest PCI quintile (54 Vs. 75 percent); percentage of household with participation in foreign labour (9 versus 19 percent); permanent toilets (31 vs. 67 percent); ownership of television (9 vs. 42 percent); biogas installed (8 vs. 32 percent); mobile phone ownership (4 vs. 36 percent). Though there was no great variation in landholding (0.5 vs 0.69 hectares), the productivity of land matters a lot with irrigated rice field being much productive with multiple cropping while upland fields are dependent on monsoon, and have low productivity.

Along with variation in socio-economic characteristics and resource ownership, the value of the products extracted by the various PCI quintile groups from various sources varied considerably. The value of biomass income from all sources (private, community forest, LHF, open access etc) do not show much variation though the lowest PCI quintile extracted the lowest. The extraction from non-private sources varied considerably with the lowest PCI quintile extracting 55 percent less than the highest extracting fourth quintile. The extraction from private sources has the lowest variation indicating ownership of private sources of biomass (agriculture and waste land) is almost equal among all income groups. With regards to the collection of biomass from public sources other than the LHF sources, the highest PCI quintile collected relatively less. The third quintile collecting less from public sources other than LHF sources is surprising. The fourth PCI quintile has relatively greater biomass income in almost all cases perhaps due to higher asset holding (land and livestock) but higher dependence on farm income rather than non-farm income.

Table 6. Quintile distribution of biomass income by sources

PCI Quintile	Mean Per capita income (Rs)	Biomass income from				
		All biomass sources	all non-private sources	All private sources	LHF sources	Public sources other than LHF
1	3686	16.4	15.6	17.4	11.6	20.1
2	7099	20.3	20.3	20.3	17.0	24.0
3	10547	19.6	19.0	20.4	20.7	17.1
4	15731	22.3	24.2	19.9	24.4	23.9
5	32388	21.4	21.0	22.0	26.2	15.0
Mean	14089	20.0	20.0	20.0	20.0	20.0

Source: Author's calculation

These above differences indicated that income per capita is a function as well as an outcome of a wide range of factors such as literacy and educational status, occupation, land and livestock holdings, access to physical facilities, productivity of factors owned by households etc. The production and extraction from LHF are in that sense more determined by access to and ownership of productive factors (human, physical and natural resources etc). The extraction of biomass income from LHF sources with the highest income group extracting more than double (26.2 vs. 11.6 percent) the biomass income compared to the lowest PCI quintile indicate that the rural elites are capable of utilizing all opportunities related resource management regime introduced in the community.

As discussed earlier, environmental income constitute around 16 percent of household income and less than 5 percent came from LHF. Thus, the potential of LHF to raise household income appears to be much limited under present mode of utilization of LHF plots. Thus, considering income from LHF as a subset in the income stream, an examination of how income among different per capita income quintile groups from various non environmental sources differ would also be helpful in devising poverty alleviating strategy under existing scenario. The four major non-environmental sources of income were agriculture, livestock, business/salary and remittance. Agriculture and livestock raising were mainly farm based economic activities while business/salary earning are mostly off-farm activities.

Table 7. Distribution of income share by per capita income quintiles and non –environmental economic activities

PCI Quintile	Percentage share by quintile group			
	Agriculture	Livestock	Business/salary	Remittance

1	8.6	-0.1	4.1	0.4
2	13.1	11.6	9.1	3.3
3	16.3	16.4	14.7	12.1
4	24.3	26.1	24.2	23.4
5	37.7	46.1	47.9	60.8

Source: Field survey

There appears a huge variation in income among quintile groups from all non-environmental sources. These variations are relatively higher for livestock, business/salary and remittance income indicating relatively higher potential for raising incomes among low income households through improved access to these opportunities to the poor households.

5. DISCUSSION

First of all, it would be appropriate to discuss the limitation of this study. The lack of systematic baseline data imposed a limitation to more systematic study of LHF resource regime. Recall bias in the cross sectional data provided by LHF households also imposed a limitation on the study despite measures employed to reduce them. To reduce recall bias, the study distinguished forest product collection into three distinct seasons that communities are used to for collecting forest collection activities. Likewise, the LHF member, household head and other members were encouraged to participate in the interview to cross check and verify information, whenever possible. Household members were facilitated to arrive at a unanimous figure in case of diversity of responses. The information provided by household head was however, recorded in case variation in response persisted.

Likewise, another limitation was with the control households selected to provide a "without program" scenario. This selection has its inherent weakness that exists in non-experimental study and this study is no exception.

During the last one and a half decade, LHF has established itself as an important forest management regime in Nepal and discussion on forestry sector in Nepal becomes incomplete without considering LHF. Regarding the poverty impact of LHF, poverty

reduction strategies fall mainly into two groups: poverty mitigation and poverty alleviation. Poverty alleviation is an ambitious target while mitigation becomes a relatively achievable target. Likewise, the effects of public policies on poverty also are twofold: promotional efforts which helps to raise household out of poverty and protective measure which prevents non- poor households from slipping into poverty (Ravillion et al. 1995). LHF needs to be examined from these perspectives. The results have indicated that LHF income prevented 10 percent households from slipping into poverty (i. e. there would be 48.4 percent households under poverty rather than 44 percent), reduced poverty gap by 17 percent (from 20 to 17 percent) and reduced poor households' severity of poverty by 22 percent (from 11 to 9 percent). Thus this study has created an evidence of LHF clearly serving as a preventive measure against poverty though the magnitude of this impact is not very large and could be improved further.

Except for well stocked tropical forests, temperate forests in the hills such as the LHF are mainly used for subsistence and self use. The size of the market for forest products in the place of origin is often very limited. Commercialization of forest product is problematic due to weak forward linkage. The value addition of the forestry sector is heavily dependent on the other sectors which are not technically efficient either. The value addition along production and market chain takes place outside the communities of the forest dependent population that avoids benefit of value addition to local communities. Thus, there is a need for including special provisions for commercial forestry research and development (R&D) to introduce cash income yielding plant species such as medicinal and aromatic plants in the LHF program to link LHF activities in production of marketable products and local employment generation. Such economic incentives can only retain peoples' attention for actively engaging in LHF forestry activities.

The LHF forest lands are degraded forest lands in the hills that are mainly rain fed. They are poor in soil quality, topography and demand high labour input for forest clearing and other forestry operation activities. Due to temperate climate, the biomass growth is slow. Even more serious is the problem in defending property rights. Ninety-four percent households complained of intrusion into LHF land by outsiders and the cost of defending their rights in the absence of institutional mechanism become unbearably high. Institutions related to local administration, legal and security structures were almost absent in the LHF villages due to existing armed insurgency and political instability during the survey period. The LHF regime is awaiting strong institutional restructuring to reduce transaction cost arising from high cost of defending property rights due to weak law and order situation where they are located.

The results have indicated that forest environmental resources contribute around 15 percent of households income and thus imposes a limit of its contribution to poverty alleviation. The LHF contribution stands only one third of the forest environmental income. Of the total yield or NRs. 4104 from LHF, only four percent were in the form of cash or potential cash incomes while the rest were livelihood goods. This seriously limits the role of LHF as a poverty alleviation policy instrument under present pattern of utilization.

The average poverty incidence after 10 years of participation in LHF among LHF households on an average was 44 percent. Due to lack of scientifically collected baseline data, the impact of LHF on poverty reduction is not very clear. If we consider all LHF households under poverty before participating in LHF, there is a huge improvement. However, given that present poverty incidence figures are not significantly different for comparable non-LHF households, the claim cannot be substantiated. The role of confounding factors needs to be examined.

The average poverty gap (P1) of the FGT index of around 17 percent indicate that LHF household income needs to be raised by around 17 percent to raise the household out of poverty from their present status. Reducing the poverty gap by LHF income alone will be grossly ambitious. There is a need for seriously looking at other linkages to household's income to lift existing LHF households from poverty.

From the above analysis, LHF needs to be redefined as a poverty mitigation strategy rather than a poverty alleviation strategy. Obviously, the role of LHF is important in improving livelihood but insufficient from the perspective of poverty alleviation. However, LHF resources can play an important role in complementing efforts towards poverty reduction through other measures such as commercial NTFP production, livestock income etc and other off-farm employment generation. Non-environmental income constitute more than 80 percent income and have a relatively higher potential for poverty alleviation. Alleviating poverty without harnessing the non-environmental sources of income thus, appears unrealistic. LHF program therefore needs to be oriented towards cash income and rural employment generation to achieve its goal of poverty reduction.

6. CONCLUSIONS

LHF which is based on positive discrimination towards the poor rural households has emerged as an innovative property right regime in the forestry sector. The resource cost is quite low due to provision of handling over degraded forest land which the government has in its disposal at no extra cost. This study, however, does not include the management cost on the part of the government and its effectiveness. The environmental contribution of LHF in terms of biomass regeneration has already been well established in literature (IFAD 2003; NPC/UNDP/PRSP 2005; World Bank 2004). The poverty impact of LHF was not well understood. This study aimed to shed some light on this aspect.

LHF has been able to serve as a poverty preventive measure - protecting dependent households from falling into poverty along with reduction in poverty gap and severity. But the strength of this measure was not very strong. The study concluded that forest environmental income constitute only a small part of the household income and LHF occupies only about one third of this environmental income. It was also found that the environmental income from LHF comes mainly in the form of livelihood resources rather than cash incomes which could have wider implications. Thus, alleviating poverty through leasehold forestry would be a very ambitious and unrealistic target under present LHF management regime. The LHF regime needs to be looked into as a component of a wider and integrated rural development strategy rather than a stand alone program of the government.

All property right arrangements survive on institutional arrangements that prevent transaction and production costs from rising. Due to the absence of government institution to enforce property right, such transaction cost which include the cost of defending and policing LHF plots have increased significantly. Since transaction costs are critical determinants of economic performance (Musole 1991), the LHF regime needs to wait for some time until normal political situation is restored. The actual potential of the LHF program regarding in raising household income can only be evaluated when normal law and order situation necessary to defend and enforce property rights granted by the government itself is restored.

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