(A Proposal Submitted to SANDEE for Fall 2006 Research Competition)

Poverty Alleviation through Forest Resource Management: An Analysis of Leasehold Forestry Practice in Nepal

Principal Investigator:

Bishnu Prasad Sharma
(Lecturer in Economics and PhD Scholar)
Tribhuvan University, Nepal
Tel (R): 00977-1-4473449
Tel (O): 00977-1-5526394
Email: bisunita@wlink.com.np

Institutional Affiliation:
Patan Multiple Campus
Tribhuvan University, Nepal

November 7, 2006

Budget Request: US$ 14644

Duration of the Study: 18 months

Summary of the Research Project

Natural resources are the key assets on which the poor build their livelihoods. In the absence of appropriate institutional mechanism poverty and natural resource become interlinked in a manner with one exacerbating the other. In this regards, appropriate property right regimes are considered vital both for addressing the problem of resource degradation and alleviation of absolute poverty. Based on this conceptual framework the Leasehold Forestry (LHF) for the poor has been practiced in Nepal for a decade.

This study aims to examine through quantitative evidence how far the programme has been successful in reducing poverty incidence among participating LHF households. The study also aims to analyze the exogenous factors determining forest output using a household production function under imperfect market condition. As LHF programme is a demand based programme that has rapidly expanded to 26 of the 75 districts of Nepal within a short span of time, positive changes in socio-economic indicators among LHF is anticipated. The results of this study will provide policy makers with important insights on management of degraded land for poverty alleviation. If proved successful, this innovative experiment of Nepal can provide valuable lessons to countries facing similar resource degradation and poverty problems.

Project Description

A. Research Problem

There is growing literature that provides insights into poverty environmental inter-linkages and its possible pathways (Parikh, 1998). In a search for what would be the efficient solution to prevent further degradation of environmental resources, new paradigms of environmental resource management are being put into practices (Ostrom, 2000). In the context of the world community being committed to the achievement of the goals of reducing population living under poverty by half by 2015, the need to effectively inter-link natural resource conservation and poverty alleviation has become more pronounced (UNDP, 2006). Many natural resource management activities have been undertaken in different parts of the world with the expectation that it will simultaneously address the problem of poverty. Unfortunately, however, many natural resource management regimes have given rise to conservation - poverty conflicts resulting in further degradation. The appropriate institutional mechanisms that is capable of addressing these twin objectives has remained a contentious issue.

In this regards, Nepal is a country with its mountain range as a part of extension from Pakistan eastward across northern India, and from Nepal and Bhutan to the Myanmar (Burmese) border making it an integral part of the ecology of the south Asian subcontinent. About 20 percent of the total land in Nepal is suitable for cultivation with agriculture and forestry the major economic activity engaging about 65 percent of the total population. The population dynamics within ecological regions indicate a large scale distress migration from the hills to the Terai plains to escape hardships and poverty imposed by eco-systemic and topographical factors (NESAC, 1998). The country is characterized by low per capita income of US $ 322 which is the lowest in the region and 31 percent of them are poor (CBS, 2003; MOF, 2005, 2006).

Agricultural land, forest and water as the major natural resources of Nepal. But, Nepal faced rapid deforestation due to inappropriate forest management policies in the past (Gautam et. al, 2003) Learning from the failure of centralized state management of forests that took place in the late 1960s, Nepal has been an enthusiastic leader in experimenting with participatory system of forest governance (Agrawal et al. 1999; Agrawal and Ostrom, 2001, cited in Nagendra et al, 2005). As a result of this new initiative, particularly the community forestry programme (CFP), the forest coverage increased significantly leading to a wide range of environmental benefit and social capital building among forest user communities in rural Nepal. The CFP basically had an orientation towards protection of forest particularly trees rather than other non-timber forest products (NTFP) and thus, forest rules and regulations were directed towards raising timber densities as a source of future income stream for members. This new resource management regime, after some decades of experience have, however, brought into surface some flaws in attaining social justice, specifically due to its failure to deliver benefits to disadvantaged and marginalized groups of people who depended on extraction of forest product to supplement their income during lean seasons(Adhikari, 2003; Tarnowski, 2002; IFAD, 2003). This has cast doubt on the long term future of this resource regime because the costs and benefits of such practices, obviously, will give rise to the incentives for people towards protecting, or promoting, or destroying the various forms of natural capital in the future (Dasgupta et al, 1997).

Natural resources are the key assets on which the poor build their livelihoods. The rural poor are those with weakest property rights and thus secure rights over land, water, trees and genetic resources are fundamental to reducing poverty (Gregorio et al, 2004). In this regards, the concern on the role of property rights and collective action in natural resource conservation and poverty alleviation has been greatly enhanced during the past two decades. Since the poor are both the victims as well as the potential agents of resource degradation, sustainable environmental protection requires that the poor themselves are made to act as agents of environmental resource regeneration (Parikh, 1998, Angelson and Wunder, 2003). One such paradigm with the poor as the main agent of forest regeneration was the "Leasehold Forestry" (LHF) that was institutionalized in Nepal in the 1990s (Ohler, 2000). The idea of LHF developed in the form of a pilot project entitled the Hills Leasehold Forestry and Forage Development Project (HLFFDP) financed under loan from International Fund for Agriculture development (IFAD), but later on undertaken by the government as a component of the national forest programme due to its far reaching impact. The LHF for the poor specifically aimed at raising the incomes of the families below poverty line through sustainable harvesting of forest based products and to improve the ecological conditions of the hills.

Under a LHF programme, a poor household with less than 0.5 hectare land or an annual per capita income below NRs. 2500 (or US$ 110) at 1993 prices is entitled to receive a certain area of degraded land (around one hectare) which they can use to raise and harvest forest based products for an extended period of 40 years, further extendable to another 40 years (IFAD, 2003, Bhattarai et al., 2004, Gautam et al, 2003). Five to ten identified poor households (HH) are provided leasehold land under group guarantee after formation of leasehold groups. Under LHF, the member are encouraged to cultivate and extract improved breeds of grass, fruit, medicinal herbs, trees etc. but they cannot graze cattle, cultivate cereals and cut standing trees in LHF land. Technical and financial support has been provisioned for the production of forage, livestock improvement and access to institutional credit. Presently, there are 18496 HHs in 2524 LHF groups that cover 11109 hectares of handed over land (MOF, 2005).

The basic difference between LHF and community forestry (CF) deserves attention. The CF is a common property resource (CPR) regime. The ownership is collective among member households traditionally depending on the forest in a geographical location. As a result, extraction of forest products is based on group decision in CF. The priority of CF is generally on conservation and growth or tree stock. In contrast, the LHF is private property regime in a de-facto sense and state property in a de-jure sense. The ownership of leasehold plots legally belong to the identified poor households and the government itself assures guarantee to the member HH for exclusion from the use of the land and its product to others. As a result, the individual households can make decision related to production and extraction from their plots though they may manage the plots in groups to reduce cost of supervision and to reap benefits of scale; The objective of LHF regime is the redistribution of assets through production and utilization of NTFP in an environmentally sustainable manner.

The LHF programme is an innovative property right of outright access to productive resources to the poor and collective action regime. The benefits of well defined property rights are well established in literature while collective actions enable poor households to obtain resources that would not be possible through individual efforts; it acts as an alternative for missing markets (for finance, inputs and outputs) and enhances their bargaining power and access to higher level institutions (Gregorio et al, 2004). The LHF possesses twin characteristic: firstly, it is a land redistribution (land reform) programme that provides the poor with property right on land to work with and; two, it is a special environmental programme aimed at regenerating degraded and ecologically fragile lands. Nepal has about 1.56 million hectares of degraded and scrubland which constitute 10.6 percent of the total land area of the country and this is true for many developing countries (HMGN/MFSC, 2002; Kadekodi, 2004). If proved successful, LHF has an important policy implication of emerging as a new kind of property right regime to address poverty and environmental degradation simultaneously in other countries with similar settings.

The LHF as a new forest management regime has been claimed to be quite successful in regenerating degraded forest land and improving the ecological condition of the programme areas of Nepal. Some general studies of the contribution on household income through LHF based activities have also come forth. After more than a decades experience, LHF has become mature enough deserving a evidence based, in-depth economic analysis of its impact on poverty alleviation among participating LHF HH.

B. Study Goals
   The overall study goal is to examine through evidence how far the LHF programme has been successful in reducing poverty incidence among participating households.

The specific research questions are
   a. What changes in socio-economic dimensions has been brought about by LHF among member households?

   b. To what extent has the LHF contributed to reduce poverty incidence among LHF households?

   c. What are the socio-economic factors determining benefit flow from LHF to the member households?

The specific research objectives of this study are to:
(i)   analyze the socio-economic characteristics of LHF households and changes in its dimensions (including access to physical, human, natural, social and financial assets necessary for livelihood) brought about after participation in LHF;
(ii)   examine to what extent has the LHF resource regime contributed to reduce poverty incidence among LHF households;
(iii)   Analyze the contribution of various inputs used in LHF and other socio-economic-access variables in LHF output

C. Literature Review

Global population growth and consequent human activities have put a burgeoning pressure on the natural environment and resource availability both at the present and for the future. After Hardin's (1968) seminal work depicting the gloomy future of the "Commons," a large number of insights have been added to the management of natural resources that exist as open access, common property (CPR), private and state ownership or their combinations (Gregorio et al, 2004). "Property rights" has emerged as the most determining factor for optimal and sustainable management in the discourses in natural resource management (NRM; Ostrom 2000; Gregorio et al, 2004)

Property right is the claim over future income stream from an asset (Heltberg, 2001). The 1970s and the 1980s witnessed a major turning point in the property right regime with increased faith on people as the true and only reliable agents of natural resource conservation at the policy level in the developing countries. The change in the orientation was basically due to the realization that the costs and benefits of a resource regime obviously, give rise to the incentives for people (communities) towards protecting, or promoting, or destroying these resources (Dasgupta et al, 1997). Though there are a number of general frameworks of natural resource and social development pathways, there are no unique models that are efficient, given the diverse socio-economic and institutional settings that exist among various resource based communities (Oakerson, 1992; Heltberg, 2001).

Apart from the property right debate for sustainable management of natural resources, the world also witnessed significant progress in various aspects of social justice, poverty and deprivation. Greater insights have been added in the dimensions of poverty which is embedded in the definition and measurement of the two interrelated concept of income and deprivation. More advanced tools and indices have been developed particularly by international agencies such as the World Bank, UNDP to cover broader aspects of human welfare that include quantitative or objective as well as qualitative, subjective and non-monetary dimension of poverty (World Bank, UNDP, official websites). The sustainable livelihood approach developed and popularized by DFID has also drawn considerable attention in addressing livelihood and poverty issues worldwide. Categorization of the five forms of livelihood assets provide important guideline for analysis of the impact on poverty and livelihood and enable people to come out of vulnerability contexts (DFID, Official websites). In this regards, all resource management regimes have started to be examined from their impact on poverty and equity as a criteria for success and sustainability.

Natural environment and resources directly affect the lives of the poor in terms of environment and health (including malaria, diarrhea and respiratory diseases), forest cover, soil degradation, water and water quality, fisheries and natural disaster. Among the various resources, forest ranks particularly high due to their wider coverage and livelihood options. Forests play three possible roles in the livelihood of the poor: supporting current consumption; providing valuable safety net from shocks and provide possible pathways from poverty (Cavendish, 2006). In terms of economic functions for the poor, forests help in sustaining consumption, generating cash incomes, provide input

to agriculture and small scale enterprises. The access to forest is embedded in the concept of land right and the most widely agreed upon route to poverty alleviation in poor developing countries. Secure access to land, is central and cross-cutting to overcoming rural poverty. Without secure access to land and other complementary means of production, the rural poor are obliged to adopt survival strategies with short-time horizons often due to circumstances beyond their control or influence, these strategies frequently end up degrading resources and fuelling a downward spiral of poverty (Hardin, 1968).

Access and property right over land and forest resources have remained a very contentious issue in resource scarce countries like Nepal. Property right to land are a crucial factor in shaping productivity, efficiency, and distribution in an agrarian system. In addition, land rights are the salient features of the political economy, distribution and welfare of rural population (Heltberg, 2001). Handing over forest resources to communities started as a new kind of regime oriented to improve livelihood in developing countries after 1970 onwards. As a result, there have been empirical researches indicating substantial biomass production and enhanced local ecology while benefiting the local communities with production of forest products in a sustainable basis(Agrawal, 2001; Jayaswal and Oli, 2003; Baral,2002; Acharya, 2001). In the context of Nepal, however, the CFP has also been criticized for its benefiting the rich rather than the poor, and the poor and the disadvantaged being marginalized from the use rights they had been practicing since generations (Jayaswal and Oli, 2003). It has also been claimed that in course of protecting the community managed forests (CMF), where extraction of forest products is restricted, the fringes of the CMF have been heavily degraded by both the poor and non-poor creating another cycle of ecological problem (Saxena 2002). The LHF programme was thus started to make up for the missing component - the pro-poor property right regime in the management of degraded land.

There are significant instances of CPR being converted into private property in the absence of government monitoring and security of tenure to the poor and needy. Such conversions have mostly ended up in the usurp of land by the elites (Karanth, 1992). In yet another study in Africa, it was observed that privatization had led to increased investment in rangeland improvement but at the same time has led to resource degradation due to increased herd size. At the same time, it has created doubt whether the safetynet provided by common rangeland during shocks would be counterbalanced by benefits from intensification while the long terms impact is yet to be seen (Mugerwa et al, 2006). In contrast to permanent kind of privatization, LHF is a kind of contractual private property right on land intended for environmental regeneration with the final tenure right still secure in the hands of the state. It also possess a characteristics of managed commons as lands are always handed over in groups because individual property rights are cumbersome and hard to enforce, particularly when they are owned by the most vulnerable section of the society (Heltberg, 2001). It deserves particular attention in the case of LHF whether this transfer of property fright over land would be able to secure enough incentive for investment that was missing. In this regards, an earlier project evaluation of LHF in Nepal has already claimed that the poverty impact of the LH land allocation to the households were dependent on three main interconnected factors: the productive potential of the leasehold sites themselves, their location in terms

of markets and communication, and the degree of dynamism and collaboration within the groups (IFAD, 2003).

Regarding the LHF, being a relatively recent experiment, the various aspects of LHF have not been adequately covered both from the theoretical aspect as well as from practical experiences. Based on Indian experience as a secretary of the Ministry of forest and Environment, Saxena (2002), using various land statistics has pointed out the huge potential of degraded land benefiting the local farmers through forward linkage with forest based industries. But its property right transfer is yet to start in India. A study by Ohler (2000) was conducted with a small sample size of 147 HH of the LHF programme in Nepal to assess the effectiveness of the Hill Leasehold Forestry and Fodder Development Programme. The study was a cross sectional analysis with use of mainly of qualitative information. The findings indicated a general positive outcome of the project with improvement in the harvest of fodder and firewood, and income from livestock.

Another study was conducted by Bhattarai et. al (2005) to examine the effectiveness of the programme in enhancing livelihood and equity and it contribution in transforming power and position of the disadvantaged and marginalized section of the community. It was a case study using qualitative tool with focus in one of the programme district covering 10 LHF groups. The study concluded that externally assigned forest use rights was not operational and had led to conflicts in the community. The study has recommended promoting rights of the poor from civil perspectives to enforce programmes targeted towards the poor. Likewise, case studies of nine LHF in western Nepal by Baral and Thapa (2004) identified that the LHF for the poor are a case of well intended interventions leading to unintended consequences. The study has pointed out to sub-optimality in environmental recuperation, potential unsustainability and social inequality. The authors recommends for infusion of community forestry and LHF in a broader framework of poverty alleviation with recognition of the indigenous use right of the communities over local resources. Likewise, a study of institutional sustainability of LHF by Nagendra et. al (2005) among LHF users and other forest users through case studies observed that the success of the LHF depends not only on changed legislation that places a new institution in place but on the interface with existing institutions and the manner in which the interface evolves over time in response to the expectation of local communities.

As a resource regime under private property, the LHF come under the household production system under peasant economies characterized by absence of market or imperfect market. Such households are also termed as functioning under non-separability condition (the HH do not have a separate production and consumption/work function; Sadoulet and de Janvry 1995; Sills et al.2003; Janvry et al, 1991) The production decision related to natural resource extraction is mainly determined by exogenous factors rather than market prices. Sadoulet and de Janvry)1995) rightly note that with no less than a quarter of the world population as small holder farmers supporting their livelihood from forest sources and agriculture output, understanding the determinants of their welfare is of prime concern in any strategy of poverty alleviation.

Thus, a survey of the available literature indicates that LHF is an new kind of regime lacking precedence. Some studies conducted so far are of a case study nature and based on qualitative information. Even in cases of quantitative data, the sample size and

coverage are small and did not focus into economic aspects. The tools used were very elementary and lacked use of conceptual model for analysis and did not address the required intensity of the dimensions of poverty and livelihood improvements. Thus, there is clearly a lacunae in the economic analysis of the various aspects of this resource management system from a economic theoretical and poverty alleviation perspective.

D. Research Methods

1. Hypothesis/ research questions to be tested or answered

Hypothesis 1: Membership in LHF improves access to assets (physical, human, natural, social and financial) for livelihood and consequently per capita income of HHs

Hypothesis 2: The poverty incidence among LHF members with at least five years of participation has declined compared to their initial proportion.

Hypothesis 3: (a) These variables have positive impact on LHF output: HH time allocated in LHF management, quality of the LHF land, number of hard tools endowment and access to training. Likewise, education, male headed household, higher caste status, institutional credit, participation in social organizations have positive impact on LHF output. (b) These variables have negative impact on LHF output: area of private land holding, distance to market, road head and transaction cost

2. Theoretical ideas underlying the study

This study comprises of two components: (i) analysis of the determinants of economic benefits to the LHF HH using a HH production function approach and; (ii) Comparative analysis of poverty among LHF and a non-LHF HH.

(i) Household Production Function Framework

Poverty is mainly a phenomenon of rural areas isolated from mainland economies. Subsistence farming, wage labour in agriculture and dependence on collection of CPRs etc. are the common characteristics of the poor HHs. Successful poverty alleviation necessitates an understanding of the decision process of HHs in such economies characterized by absence or imperfections of markets under various resource endowments conditions(Sadoulet and De Janvry; 1995).

Under perfect market conditions, products and factors are tradable and the opportunity cost of any product or factor held by the HH is reflected in the market price. Under, this condition, separability holds and the producer side of the model can be solved prior to the consumer/worker side (Janvry et al, 1991). Practically however, rural households are located in environments characterized by market imperfections due to wide price bands, high transaction costs etc. With market failures, corresponding goods or factors become non-tradable. Prices are no longer determined by the market but internally to the HH as "Shadow prices". In such a case non-separability exists between production and

consumption decisions and non-separable HH model becomes relevant (Sadoulet and De Janvry; 1995).

The utility maximization of such households are constrained by HH time, agricultural production function, forest sector production function, cash flow etc. Solving the utility maximizing function subject to the constraints by the Lagrangian Multiplier method will lead to introduction of a number of Langrangian multipliers that represent the shadow values for the HH time, agricultural output, forestry output and the budget respectively. Derivation of the first order condition (FOC) related to forestry sector output is enough to indicate that the shadow values which are internal to each household, depends on the full set of exogenous variables. As a result, the HH production and labour time allocation and other decisions related to forest management become dependent of the exogenous variables in the system (Sills et al, 2003; Subhendru et al, 2003). This dependence of production decisions on HH characteristics, preferences and endowments is termed as non-separability in the HH production literature and results whenever key markets are missing or incomplete (Sadoulet and de Janvry 1995; cited in Sills et al). The detail derivation of dependence of production on preferences, technology and input endowments under condition of non-separability has been placed in the annex (Annex A) to maintain flow.

Regarding the linkage between forest resource and poverty, the impact of poverty on degradation is found in the literature, such as (Jodha, 2005; Heltberg, 2001). However a handful literature is available on contribution of forest resources on reducing the poverty. The forest resources are important as input in agriculture and livestock production in the rural economy. This suggests that it may be possible to uplift the people from poverty using forest resources. Though, forest resource have no direct impact on poverty reduction, the channel of the contribution is clear and that may be theoretical as well as policy important. The production function suggests the relation between output and resources or input. For this purpose the HH Household production model suggested by (Subhrendu et al (2003) and Sills et al (2003) has been followed to establish the contribution of LHF in HH production.

The Model:

We use a modified version of Sills et al (2003) and assume that the Output from the LHF (F) is a function of total time allocated to leasehold forestry (T_F ; which depends upon demographic and other socio-economic characteristics of the HH), bio-physical condition of the forest (B), Household's knowledge of forest management and forest product markets (H), endowment of productive assets used in forest management (?). Symbolically,

$$F = f (T_F , B, H, ?)$$

The above functional form can be translated into a regression model with F as a dependent variable and T_F , B, H, and ? as independent variable. It is assumed that T_F , B, H and ? are positively related to F. The Theoretical regression equation in its natural log linear form will be:

$$\ln F = \beta_0 + \beta_1 \ln T_F + \beta_2 \ln B + \beta_3 \ln H + \beta_4 \ln ? + \mu \qquad\qquad (1a)$$

Where, β_s are the elasticity coefficient of LHF production with respect to its determinants. μ is the stochastic error term.

The double log linear equation with LHF income (LHFY) as a depedent variable in its elaborated form and respective dummy variables is given below.

ln LHFY = β_0 + β_1 ln HHSIZE + β_2 ln LABOUR + β_3 ln EDU+ β_4 CASTE + β_5 GENDERHHH + +β_6 LITHHH + β_7 MEMBER+β_8TRAIN+β_9 ln PCI + lnβ_{10} FOODSUF + β_{11} ln HHTIME + β_{12} ln PRIVLAND + β_{13} ln LHFLAND + β_{14} ln QUALLHF + β_{15} ln LARGERUM + β_{16} ln SMALLRUM β_{17} ln ASSET + β_{18} ln DISTROAD + β_{19} ln DISTMARKET +β_{20} ln INSTCREDIT ....(1b)

LHFY is in gross value of output from LHF. The relevant variables and their specifications are given in Table 1 below.

(ii) Poverty Analysis Framework

There are several dimensions of poverty such as the income poverty, capability poverty and poverty based on vulnerability and livelihood. Though consumption data are more reliable than income data for poverty analysis, consumption data are difficult to collect and lack reliability unless robust methods are used under strict supervision. Resorting to income data becomes the only option in the face of these difficulties (World Bank, 2006). Among the income/consumption poverty indicators, Foster Greer Thorbecke (FGT) class of poverty indices are most common due to the simplicity of ideas inherent in them.

The Foster Greer Thorbecke (FGT) class of poverty measures are defined as

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

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 = 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
   a = 1, Pa will be equal to normalized poverty gap
   a = 2, Pa will be equal to the squared normalized poverty gap ratio

(Maltsoglou and Taniguchi, 2004)

Regarding the poverty line income, a number of poverty line incomes are in use. They are the poverty line adopted by the local governments based on the minimum cost of living and have been estimated differently for different physical regions. The other poverty line

income are "1$ a day" and "2 $ a day" criteria used in international comparisions (ADB, 2004).

The present study aims to analyze the change in poverty status among HHs after participation in LHF groups. This necessitates the availability of a baseline income data. It is found to be mandatory for the LHF group to prepare an Operational Plan (OP) and submit it to the Department of Forestry before legal document of LHF plots ownership are handed to the LHF HH. This document contains data on HH structure, land and livestock possession, months of food sufficiency, sources of income by importance category. But it does not provide income data for HHs. As a solution to this problem, we have the information that these HH were identified as poor by the community through Participatory Rural Appraisal (PRA) at the time of membership based on criteria of HHs with less than 0.5 hectare land or an annual per capita income below NRs. 2500 or US $ 110 at 1993 prices (IFAD, 2003). We, therefore, consider all participating LHF HH as living under poverty at the time of LHF group formation.

Once we have this provision for baseline information and present HH income obtained through primary data collection, the head-count index will be calculated using per capita income. This will reveal the change in the poverty status of the LHF HH members. This approach will be complemented by data collection from a control (comparision) group. For this purpose, incomes and other variables of LHF HH will be compared with a control(comparision group). The control group will comprise of HH who were eligible but did/could not join the LHF due to various reasons at the time LHF groups were formed. Their selection will be made by local communities from adjoining settlements based on participatory rural appraisal (PRA) technique, the technique that was used at the time of group formation.

The poverty gap and severity will be estimated for both the case and control groups. The capability poverty and change in vulnerability in terms of months of food security will be examined mainly based on the variables available in the OP. The study will be further enriched with equity analysis using per capita income quintile groups and LHF incomes.

In addition, since we are interested in analyzing the impact of LHF on poverty among participating HHs, a functional model can be used to explain the relationship between per capita income (PCI) of the HH members and income from LHF controlling for other sources (agriculture, wage earning, remittance income etc), HH characteristics and other variables. Based on economic theory, we assume that the per capita income is a positive function of income from LHF (PCL), agriculture and livestock (A), wage earning(W), other income including remittance(O) earning and are conditioned by other socio-economic and other characteristics of the HH(F). Symbolically,

$$PCI = f (L, A, W, O, F)$$

Accordingly, we can transform it into a double log regression model with the total per capita income (PCI) as a dependent variable and sources of HH income and other socio-economic and market access as explanatory variables. The regression equation in its log linear form with stochastic error term will be:

$$\ln PCI = \beta_0 + \beta_1 \ln L + \beta_2 \ln A + \beta_3 \ln W + \beta_4 \ln F + \mu \qquad (2a)$$

Where, β_s are the elasticity coefficient of PCI production with respect to its determinants. μ is the stochastic error term. The double log linear equation with per capita income (PCI) as a depedent variable in its elaborated form and appropriate dummy variables is given below.

$$\ln PCI = \beta_0 + \beta_1 \ln HHSIZE + \beta_2 \ln LABOUR + \beta_3 \ln EDU + \beta_4 CASTE + \beta_5$$
$$GENDERHHH + \beta_6 LITHHH + \beta_7 MEMBER + \beta_8 TRAIN + \beta_9 \ln LHF\ INCOM +$$
$$+\beta_{10} \ln AGRIINCOM \ln\beta_{11} + \beta_{12} \ln WAGEINCOM + \beta_{13} \ln OTHERINCOM +$$
$$\ln\beta_{14} FOODSUF + \beta_{15} \ln HHTIME + \beta_{16} \ln PRIVLAND + \beta_{17} \ln LHFLAND + \beta_{18}$$
$$\ln QUALLHF + \beta_{19} \ln LARGERUM + \beta_{20} \ln SMALLRUM + \beta_{21} \ln ASSET + \beta_{22} \ln$$
$$DISTROAD + \beta_{23} \ln DISTMARKET + \beta_{24} \ln INSTCREDIT\ .....\ldots..(2b)$$

The description and specification of the relevant variables is given in Table 1. Below.

This regression model will be run separately for case HH and control HH groups. Possibility of using other regression models such as the logit/probit/tobit model will be explored in course of additional literature review.

Descriptions of Explanatory Variables used in Eqn (1) and (2)

Variables	Description
HHSIZE	Number of members in the HH
LABOUR	1for each HH member between age 15 and 59; (10 years> age <15years) = 0.5 ; >60 years =0.5
EDU	Mean years of schooling of HH members>5 year
CASTE	Lower caste dummy for untouchable (Dalit=1, 0 otherwise)
GENDERHHH	Gender dummy for HH head, (if male =1, 0 otherwise)
LITHHH	Literacy dummy of HH head, (if male =1, 0 otherwise)
MEMBER	Dummy for membership of HH member in income generation/saving group, (if member =1, 0 otherwise)
TRAIN	Dummy for training received (if trained =1, 0 otherwise)
PCI	Per capita income of HH
FOODSUF	Months of food sufficiency
HHTIME	Average household time allocated in LHF per day
PRIVLAND	Area of private land
LHFLAND	Area of LHF land
QUALLHF	Bio-physical state of LHF land, good =3, medium =2, poor = 1
LARGERUM	Number of large ruminant (cow, bull, buffalo)
SMALLRUM	Number of small ruminant (goat, sheep, pig)
ASSET	Value of hard tools used in forest management
DISTROAD	Distance to the nearest motorable roadhead
DISTMARKET	Distance to the nearest market
INSTCREDIT	Institutional credit access dummy (if obtained institutional credit =1, 0 otherwise)

LHFINCOM	Total value of output from LHF sources(in gross value terms)
AGRIINCOM	HH income from Agriculture and livstock(in gross value terms)
WAGEINCOM	HH income from wage/salary earning(in gross value terms)
OTHERINCOM	HH income from other sources (remittance etc)

3. A description of the study site

The study will be conducted in two of the ten districts in the mid-hills of Nepal which have the largest number of LHF groups and more than five years of LHF experience. The selection of the district meeting this criteria will be based on recent information from the Leasehold Forestry Division of the Ministry of Forests, Kathmandu. Effort will be made to cover different agro-climatic zones. More than five years of LHF practice has been selected as a criteria in consideration with the period necessary for adequate biomass growth and its consequent benefits flow to the LHF HH.

4. Variables to be measured

The socio-economic variables that will be used in the study are caste/ethnicity, HH size, educational status, gender and education of HH head, physical facilities (roofing, toilet availability, means of HH lighting), area of privately owned land, rented in lands, LHF land, units of large ruminants, units of small ruminants, months of food sufficiency, incomes from various sources etc. The variables related to LHF comprises of HH time allocated to work in the LHF plot by different members, output from the LHF, productive assets used in LHF and their values, the physical quality (grading) of leasehold land, access to irrigation facility and transaction cost related to LHF. The variables related to transaction costs are: number of meetings held in a year, average duration of the meetings, participants in the meeting (Male/Female), the number of times LHF member HH visit the Department of Forest in a year, and expenditures incurred in the visits. The physical/ technological variables constitute of time taken to travel to market centre and nearest road head. Other variables include membership of the HH in income generation/saving groups, other social organizations, availability of institutional credit and technical support etc. Among the above variables, value of the LHF products and other sources of HH income will be the outcome variable related to poverty analysis.

5. Data to be used and Collection Methods

The study will be based on primary as well as secondary data. The Operational Plan (OP) document of LHF groups will be the main sources of secondary information. The OP document of the LHF groups which are obligatory before handing over LHF land to the groups are available with the LHF group as well as the concerned District Forest Office. This information will be copied in a similar format from the DFO/ LHF group. The OP document has record for the following information for each LHF member HH.
(a) HH composition by sex and educational status
(b) Land ownership by category based on productivity
(c) Size of livestock holding by category
(d) Sources of income in order of importance
(e) HH food sufficiency by months

(f)   Change in membership status by reason (if any)

Next, primary cross sectional data will be collected from the LHF HH through structured interview schedule administered at the household level. The questionnaire will be first pre-tested in a non-sample district. Since the present study is based on a comparative analysis between HH who have participated in LHF (the case group) and those who have not (control or comparision group), the same set of questionnaire will be administered to the control group too.

Qualitative information for greater insights will be obtained through focus group discussions (FGDs) with the institution that coordinates LHF at the district level, government forest official, district level leadership of community forestry, supporting agencies and other stake holders and key informants in the community before finalization of the study protocol. This will contribute to incorporate any missing aspects that are important from LHF perspective. FGDs at local level will also be conducted with key informants to cover other socio-economic issues for greater insights.

The sampling unit will be the LHF user groups while the LHF households (HH) serve as source of information. For this purpose, the selected two sample districts will be further divided into various clusters based on climato-ecologic zones and ethnic compositions in consultation with the District Forest Office. Simple random sampling will be used to identify the LHF groups in the selected regions. According to LHF rules, each LHF group consist of five to ten HHs. All the members HH in the selected group will be the units of information collection. To make the sample size large enough for statistical analysis purpose, the sample size has been proposed to consist of 350-400 LHF households in two districts.

Regarding the comparision (control group), a list of HH who were eligible but did/could not join the LHF due to various reasons at the time LHF groups were formed will be obtained from the same or adjoining communities using the PRA technique in the communities. This was the same technique used in the identification of HH for LHF group when LHF groups were formed. About 100-150 households will be selected as control group to ensure adequate number for application of robust statistical tools.

6. Methods of Data Analysis
All the quantitative data collected in the field will be entered in the SPSS statistical package. As mentioned earlier, the secondary data collected from the operational plans of the LHF that will serve as baseline data will be coded and entered in computer. Likewise, the primary data collected will be cleaned and edited and computer entered. Analysis will be conducted for simple descriptives for the variables by district, ethnic groups, income groups etc.   The change in the socio-economic variables will be examined using the baseline and recent cross sectional data. The income from forest and all other sources will be calculated to obtain HH income and per capita incomes. This will be income in the gross sense. Since all the LHF HH are poor HHs, by government definition, we assume them with per capita income below poverty line initially at the time of group formation as discussed in the theoretical framework (section 5).   The change in poverty incidence after more than 5 years of LHF participation will be examined using recent per capita income obtained from HH income data collected through questionnaire survey. The

poverty incidence will be measured using different criteria such as the criteria set by the government of Nepal for the study districts; US $ 1 per day; and US$ 2 per day. The head count index, poverty gap and severity indices will be estimated and presented for comparision of both the case and control groups. Regression analysis will be conducted using SPSS and STRATA statistical package and results interpreted with reference to relevant theories and similar studies. Possibility of using other regression models to enhance further understanding through logit/probit/tobit model will be explored in course of additional literature review.

7. A matrix showing the link between each proposed hypothesis, research design, data variables and data sources

Matrix Showing Links Between, Objectives, Hypothesis, Indicators and Sources of Data

Objectives	Hypothesis	Indicators	Sources of Data Primary Sources (PS) and Secondary Sources (SS)
Objective 1: Analyze the socio-economic characteristics of LHF households and changes in its dimensions (including access to physical, human, natural, social and financial assets necessary for livelihood) after participation in LHF;	**Hypothesis 1:** Membership in LHF improves access to assets (physical, human, natural, social and financial) for livelihood and consequently per capita income of HHs (use of available baseline data as a reference point for socio-economic variables).	- HH size (M/F)	PS and SS
		- Age structure of HH members	PS
		- Years of schooling of age>5	PS and SS
		- Literacy status of HH head (Y/N)	PS
		- Area of Agriculture land owned	PS and SS
		- Area of land rented in	PS
		- Category of self owned land	PS and SS
		- Roofing/lighting source of House	PS
		- Availability of Latrine	PS
		- Months of food sufficiency	PS and SS
		- Large ruminant units	PS and SS
		- Small ruminant units	PS and SS
		- Units of fodder, firewood and other products extracted	PS
		- Time allocated to LHF management per week	PS
		- Borrowed institutional credit (Y/N)	PS
		- Technical Training/assistance obtained	PS
		- Nature of products (for market vs. subsistence)	PS
		- Unit of production (individual/group)	PS
		- Membership in savings group	PS
		- Membership in other social institutions	PS
		- Distance to the nearest road head	PS
		- Distance to the nearest market centre	PS
		- Market wage rate(Fe/Male)	PS
		- Frequency of Market visit	PS
		- HH income from	
		• from wages and salary	PS
		• agriculture crops	PS
		• Remittance earnings	PS
		• sales of LHF products	PS

		• Other sources	PS

Objective 2: examine to what extent has the LHF resource regime contributed to reduce poverty incidence among LHF households;	**Hypothesis 2:** The poverty incidence among LHF members with at least five years of participation has declined compared to their initial proportion .	- HH size
		- HH income from
		  • Wages and salary
		  • Agriculture crops/livestock
		  • Remittance earnings
		  • Value of LHF products
		  • Other sources
			PS
			
			PS
			PS
			PS
			PS
			PS

Objective 3 Analyze contribution of various inputs used in LHF and other socio-economic- access variables in LHF output	**Hypothesis 3:** (a) These variables have positive impact on LHF output: HH time allocated in LHF management, better bio-physical condition of the LHF land, number of hard tools endowment and access to training. education, male headed household, higher caste status, institutional credit, participation in social organizations (b) These variables have negative impact on output: area of private land holding, distance to market, road head and transaction costs	- HH time allocated in LHF management
		- Quality of LHF land
		- Number of hard tools endowment
		- Access to training.
		- Education
		- Male headed household
		- Higher caste status
		- Institutional credit
		- Participation in social organizations
		- Area of private land holding
		- Distance to market
		- Road head
		- Variables related to transaction costs
		  • Number of meetings of LHF group in a year
		  • Average time spent in each LHF group meeting (Fe/Male)
		  • Number of institutional visits related to LHF in a year
		  • Average time per visit
		  • Average amount spent per visit
			PS
			PS
			PS
			PS
			PS
			PS
			PS and SS
			PS
			PS
			PS
			PS
			PS
			
			PS
			
			PS
			
			PS
			PS
			PS

E. Results and Dissemination
1. Expected Results
As a demand side initiative by the LHF lessee themselves for their economic upliftment, it is expected that the socio-economic indicators at present will have improved compared to the base-line situation. It is also expected that the contribution of the LHF products on HH income and Per-capita income will be proportionately higher than that of other common property forest dependent HHs in Nepal due to institutional simplicity and unrestrained extraction right granted to LHF HH. An analysis of the contribution of LHF among more forest dependent LHF member households will give an even better picture. The analysis of per capita income of HH will provide the present incidence of poverty among LHF HHs and is expected to decline.   This will indicate the extent of success of LHF in benefiting the poor and uplifting them from poverty. The regression analysis will

indicate what socio-economic variables including transaction cost have a major role in determining the income from LHF sources.

2. Any local, regional or national policy implication

Nepal has significant amount of degraded land and scrubland. Land-degradation in the hills and mountain has severe impacts on people living in foothills and plains in the Terai. Every year, numerous human life and property worth millions of dollars is lost in Nepal due to ecological disasters. One of the main reasons behind degradation of shrub and scrubland is the absence of well defined property rights. Though such lands are providing some livelihood to local poor population, such lands are long awaiting sustainable utilization through investment of capital and human labour. The utilization of these lands will improve the ecological condition on the one hand while improving the economic status of the poverty ridden local population.

Some CF have introduced the concept of providing some patches of land within CF land to identified poor families. This has improved the economic status of the poor households (IFAD, 2006). Success story of LHF will contribute to institutionalize the concept of LHF as a component in the CF. It is important to note that the sustainability of LHF has also been threatened by its conflict with CF where management of CFs are dominated by local elites and high caste users while LHF are owned by weak and marginalized low caste households (IFAD, 2003; IFAD 2006)

The rapidly expanding LHF programme in recent years suggest that demand for such land is increasing because of the increased access of the poor on natural resource, particularly land. But since these poor HH are provided with degraded land initially, the overall success of the programme depends upon whether LHF programme has been integrated with other programmes that improves the access of the poor HH in credit, insurance for further income generation. The findings is expected to provide planners and policy makers with valuable insights for improving and restructuring this programme with other supportive activities (for instance, credit, livestock improvement, more productive NTFP farming etc) towards desired goals to establish LHF as a successful concept in CPR regime.

G. Timeline.

The tentative time estimated for the study is 18 months and is subject to slight changes. The field work will be most appropriate during the dry seasons (November-May) due to road access availability.

Activities/Months	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Review of literature and preliminary field visit	█	█	█															
Pre-testing and finalization of study protocol				█														
Field Visit / Data Collection					█	█	█	█										
Data cleaning editing, and data entry									█	█								
Analysis of data											█	█						
Preparation of draft paper													█	█	█	█		
Submission of finalized paper																	█	█

H. Bibliography

Acharya, K.P. (2001), Managing Forests in Community Forestry in Nepal. *Banko Jankari*, 11(2):3-7 DFRS, MOF, HMG/Nepal.

ADB, (2004), Key Indicators (2004), Poverty in Asia: measurement Estimates, Prospects, Asian Development Bank

Adhikari, B. (2003), *Property Rights and Natural Resources: Socio economic Heterogeneity and Distributional Implications of Common Property management.* SANDEE Working Paper No. 1-03, South Asia Network for Development and Environment Economics.

Agrawal A. (2001), Common Property Institutions and Sustainable Governance of Resources. *World Development* 29 (10).

Angelson A. and Wunder S (2003), Exploring the Forest- Poverty Link: Key Concepts, Issues and Research Implications. Centre for International Forestry Research (CIFOR)

Baral, J.C. (2002). Tenure: the Entry Point for Appropriate Forestry Intervention in Nepal's Forestry Sector. *Banko Jankari.* 12 (2):3-11. DFRS, MOF, HMG/Nepal.

Bhattarai B, Ojha H.R and Wollny C (2004) Deutscher Tropentag, Berlin, Innovative Policy Options for Poverty Alleviation in Nepal
http://www.tropentag.de/2004/abstracts/links/Bhattarai_9nNzMdH3.pdf

Cavendish, W, (2006) How Do Forests Support, Insure and Improve the Livelihoods of Rural Poor? A research Note.
http://www.cifor.cgiar.org/pen/pubs/cavendish.pdf

CBS. (2003). Population Monograph of Nepal, Central Bureau of Statistics

Dasgupta P and Maler K.G, 1997, The Environment and Emerging Development Issues.

Gautam, M.K., Roberts, E.H., Singh, B. (2003). *Community Based Leasehold Approach and Agroforestry Technology for Restoring Degraded Hill Forests and Improving Rural Livelihoood in Nepal.* Paper Presented at Rural Livelihoods, Forest and Biodiversity Conference , 19-23 May Bonn, Germany

Gregorio M.D, Hagedorn K, Kirk, M. Korf, B, Mckarthy N, Dick R.M. Swallow B (2004) Property Rights, Collective Actionsand Poverty: The Role of

Institutions for Poverty Reduction , Paper Presented at the Tenth Biennial Conference of the International Association for the Study of Common Property (IASCP), Oaxaca Mexico, 9-13 August

Hardin G. (1968) "The Tragedy of Commons"*Science* Vol 62 pp 1243-48

Heltberg, R, (2001) "Determinants and Impact of Local Institutions for Common Resource Management." *Environment and Development Economics* 6: 183-208

HMGN/MFSC (2002). *Nepal Biodiversity Strategy.* His Majesty's Government of Nepal, Ministry of Forest and Soil Conservation, Supported by Global Environment Facility and UNDP

IFAD. (2006). *Innovations for Pro-poor Community Forestry*, Livelihood and Forestry Programme, International Fund for Agricultural Development http://www.lfp.org.np/pdfs/Land%20allocation%20Paper.pdf#search=%2 2Community%20Forest%20Land%20Allocation%2C%20Livelihood%20 and%20forestry%20programme%22 viewed on 1Sept, 2006

IFAD (2003). Hills Leasehold Forestry and Forage Development Project: Interim Evaluation. International Fund for Agriculture Development Website: evaluation@ifad.org

Janvry A.D, Fafchamps M and Sadoulet E (1991). Peasant Household Behavious With Missing Market: Some Paradoxes . The Economic Journal 101

Jayaswal, M.L. and Oli, K.P. (2003). *Revenue Generation from Community Forestry and its Impact on Protected Areas in Nepal*. Paper presented at the Vth World Parks Congress: Sustainable Finance Stream September 2003, Durban, South Africa

Jodha, N.S. (2005). "Adaptation Strategies Against Growing Environmental and Social Vulnerabilities in Mountain Areas." *Himalayan Journal of Sciences* 3 (5). www. himjsci.com

Jodha, N.S. (1999). Poverty Debate in India: A Minority View Revisited, *Economic and Political Weekly*, July 31

Jodha, N.S. (1990). Rural Common Property Resources: Contributions and Crisis. *Economic and Political Weekly*, June 30.

Kadekodi, G (2004). Common Property Resource Management: Reflections on Theory and the Indian Experience. Oxford University Press. New Delhi

Karanth G.K (1992) Privatization of Common Property Resources, Economic and Political Weekly, August 1-8

Kisamba–Mugerwa, W, Pender, J, Kato E, (2006) Impacts of Individualization of Land Tenure on Livestock and Rangeland Management in Southwestern Uganda Paper to be presented at the 11th Biennial Conference of the International Association for the Study of Common Property June 19-23, 2006 in Bali, Indonesia
http://www.ifpri.org/divs/eptd/ws/papers/eptws10.pdf

Lutz, W., Prskawetz A. and Sanderson, W.C. (2002) Population and Environment: Methods of Analysis, Population and Development Review, A supplement to Volume 28.

Maltsoglou, I. and Taniguchi Kiyoshi, 2004, *Poverty, Livestock and Household Typologies in Nepal*, ESA Working Paper No. 04-15, Agriculture and Development Economics Division, The food and Agriculture Organization of the United Nations.

MOF. (2006). Economic Survey 2006, Ministry of Finance, Government of Nepal

MOF. (2005). Economic Survey 2005, Ministry of Finance, Government of Nepal

Nagendra, H, Karna B and Karmacharya M (2005). Examining Institutional Change: Social Conflicts in Nepal's Leasehold Forestry Programme, Conservation and Society, 3 (1)
http://www.conservationandsociety.org/cs-3-1_5_enagendraetal.pdf

NESAC. (1998). *Nepal Human Development Report 1998*. Nepal South Asia Centre, Kathmandu

NPC. (2002). The Tenth Plan, National Planning Commission, HMG/Nepal

Oakerson, R.J, Analyzing the Commons: A Framework, in D.W. Bromley (ed) Making the Commons Work: Theory , Practice and Policy, San Fransisco, ICS Press

Ohler, M.J. (2000). The Impact of Leasehold Forestry on Livelihood and Environment. Food and Agriculture Organization of the United Nations

Ostrom, E. (1995). The Institutional Analysis and Development Framework: An Application to the Study of Common-Pool Resources in Sub-Saharan Africa. Paper, Bloomington, Indiana: Workshop in Political Theory and Policy Analysis, Indiana University, October 10, 1995.

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

Ostrom, E. (2000). "Collective Action and the Evolution of Social Norms." *Journal of Economic Perspectives*, 11(2).

Parikh,R.F. (1998). *Poverty and Environment: Turning the Poor into Agents of Environmental Regeneration*, Working Paper Series WP 1 Social Development and Poverty Elimination Division, UNDP http://www.undp.org/poverty/publications/wkpaper/wp1/parikh-rf.PDF

Pattnayak S.K, Sills E.O, Mehta A.K and Kramar R.A (2003), Local Uses of Parks : Uncovering Patterns of Household Production from Forests in Siberut, Indonesia Conservation and Society 1,2

Sadoulet E and A. De Janvry (1995), Quantitative Development Policy Analysis. John Hopkins University Press, Baltimore.

Saxena N.C. (2000). *Participatory Issues in Joint Forest Management in India.* Lovraj Kumar Memorial Lecture Series, Wasteland News, November 1999-January 2002.

Sills E.O, Lele, S., Homes T.P. , Pattanayak S.K. (2003). Non Timber Forest Products in the Rural Household Economy, Sills and abt (eds), Forests in a Market Economy. Kulwer Academic Publishers, printed in Netherlands.

Tarnowski, C.B. (2002). *Forest Places. Political Space: The Social Implications of Community Forestry in Nepal.* Unpublished PhD Dissertation, The University of Georgia

UNDP (2006). *Tracking the MDGs:Targets & Indicators*. United Nations Development Programme
World Bank: http://www.worldbank.org/poverty/).

3. Financial Information

A. Research Expenses
1. Research Travel
   Collection of study material and preliminary field visit (10days*6000) = 60,000

2. Field Work (Field allowance including transportation)
   Pre-testing field visit (5 days* 6000)   = 30,000
   Final Field Visit (100 days*6000)   = 600,000

3. Research Supplies
   Study material photocopies, printing of draft and final protocols   = 40,000
   Stationeries, printing ink, printing paper etc   = 25,000

4. Research Assistant
   Research Assistant
   (Deskwork and data entry: 6 months*15,000)   = 90,000
   Research Assistant
   (Fieldwork) (90 days* 2* 600)   = 108,000

5. Others
   Institutional Overhead (10% to Tribhuvan University)   = 95300

   Total   = 1048300

B. Dissemination Expenses
   Dissemination Expenses (tentative)   = 50,000

   Grand Total   **NRs. 1098300.00 (US$ 14644)**

(Note US$ 1= NRs. 75)

4. Bibliographical Information
A. Researcher's education, experience and accomplishment relevant to the Project

I am a lecturer in Economics in Tribhuvan University with my Masters Degree (MA in Economics) from Tribhuvan University in 1989. I have been teaching public economics and Development Economics for the last 15 years. Presently, I am also enrolled as a PhD student in Tribhuvan University. My topic of PhD is related to Common Property Resource with focus on Leasehold Forestry and its impact on poverty alleviation. Thus my present proposal coincides with my PhD topic. I feel that the quality of my PhD thesis will be greatly enhanced through interaction with experts that SANDEE provides its research fellows, if I have the opportunity to undertake this proposed study. For this reason the proposed study is of great significance to me. I had a three week Environmental Economics (EE) Training provided by SANDEE that encouraged me to come in this field. In addition, there is a scarcity of manpower related to environmental economics in Tribhuvan University due to which no Environmental Economics courses are taught at the Master's level. My endeavour is to promote EE course in my institution as a faculty trained in that discipline.

I have a paper published on environmental economics in a peer reviewed journal published in Nepal. A paper that was accepted for presentation in the 3rd World Congress of Environmental and Resource Economists but could not be presented due to funding for travel. I am approaching international journal for its publication. Earlier I had worked in the area of Health economics too.

B. Researcher's Bio-data

BISHNU P. SHARMA

Current Position:
Lecturer in Economics
Department of Economics
Patan Multiple Campus
T.U. Nepal

Contact Address:
Panch-Ghumti Marga, Block No. 203, Maijubahal, Chabahil,
 Kathmandu, Nepal
Tel: 00977-1-5526394 (Office)
    : 00977-1-4473449 (Residence)
Email: bisunita@wlink.com.np

Nationality: Nepali
Academic Background:
1989- M A. in Economics, Tribhuvan University, Kirtipur, Nepal
1985- B. A. in Economics and English, Tribhuvan University, Nepal

1983- I. Sc. in Biology, Tribhuvan University, Nepal
 Professional Experiences:
Teaching:
1990-   Assistant Lecturer of Economics, Birendra Multiple Campus TU, Chitwan
             (Teaching Development Economics to Post Graduate classes and Supervise MA
             Dissertation)
1998-   Lecturer of Economics, Patan Multiple Campus, Patan
             (Teaching Public Economics to Post Graduate classes, and Supervise MA
             Dissertation)

Research Experiences:
PRINCIPAL INVESTIGATOR
*   Public-Private-NGO Partnership In Health Services: Review, Assessment And
           Recommendations From A Focused Study In The Central Region Of Nepal,
           (May- Nov, 2003) NHRC, (Major responsibilities: Develop methodology,
           supervision of data collection in the filed, data analysis and report writing)

*   An impact Evaluation of the Kamaiya (Bonded Labour) out of School Program,
           Five Districts of Far Western Region, UNICEF Nepal, July-August, 1999,
           (Major Responsibilities: developing methodology , supervision of data
           collection, focus group discussions using PRA method in the field, data analysis
           and report writing)

CO EXPERT:
*   A Study on Socio-economic Determinants and Economic Burden of Japanese
           Encephalitis in Kailali District of Nepal funded by Rockfeller Foundation, (Aug
           2001 – Sep 2002), (Major Responsibilities: develop methodology , supervision
           of data collection in the field, data analysis and report writing)

CO INVESTIGATOR
*   Public Health Facility Efficiency Survey, Nepal Health Economics Association,
           (March- August, 2004); major responsibility: data analysis and report writing

SOCIAL-SCIENTIST:
*   Access to Information, Prevention and Therapy of Kala-azar and its Economic
           Impact on the Households in Nepal, Nepal Health Economics Association and
           WHO/TDR, Geneva, October 2003 –September,2004   (Major responsibilities:
           Develop methodology, data analysis and report writing)

RESEARCHER:
*   A Study on the Health impact and Economic Cost of Air Pollution (April, 2001
           – Feb 2002), ITDG, Nepal (Major responsibilities: Develop methodology,
           supervision of data collection in the field)
*   A study on Present Position of Foreign Labor in Nepal,   Department of
           Economics, Patan Multiple Campus for National Planning Commission, 2000

(Major Responsibilities: involved in developing methodology, data collection in the field, focus group discussions with trade unions and industry management, data analysis and report writing)

PUBLICATIONS/PAPERS

*   Travel Cost Method: Concept and Uses in the Valuation of Environmental Goods and Services, Economic Journal of Development Issues, Vol 5, No.2 (, July-Dec, 2004), Department of Economics, Patan Multiple Campus, Tribhuvan University Nepal

*   DALY Measurement: Cost Effectiveness Analysis in Health Sector of Nepal, (co-author) Economic Journal of Development Issues, Vol 3, No.2 (, July-Dec, 2002), Department of Economics, Patan Multiple Campus, Tribhuvan University Nepal. No. 1&2
        Economic Impact of Social Values and Institutions in Nepalese Society: A Case of Wage Earners Community in Kathmandu, Economic Journal of Development Issues Vol 4 No.1 , (Jan-June 2003)

*   Burden of Kala-azar on the Local Health System in the Danusha and Mahottari Districts of Nepal, (co-author), Journal of the Institute of Medicine, Institute of Medicine, Tribhuvan University, Nepal, Jan-Mar/Apr-Jun 2001, Vol 23, No. 1&2

**   Nepalese Health Policies: Some Observations from an Economic Development Perspective, (Co-author), Economic Review, Occasional Paper, No. 14, April 2002,   Nepal Rastra (Central) Bank, Nepal

Training / seminars:
2002-   A Three Weeks Course on "ENVIRONMENTAL AND NATURAL RESOURCE ECONOMICS", jointly organized by World Bank Institute(WBI), South Asian Network for Development and Environmental Economics (SANDEE) and Bangladesh Environment Economics and Poverty Program (BEEPP), April 29- May 16, 2002, Dhaka, Bangladesh.

2001   "One week training programme in Econometrics, Centre for Economic Development and Administration, Tribhuvan University and Department of Economics, University of Bergen, Norway

References:
1. Dr. Bishwa Nath Tiwari, Reader, Central Department of Economics, Tribhuvan University, Nepal
2. Prof. Maheswor Man Shrestha, Patan Multiple Campus, Tribhuvan University, Nepal.

Personal Bio-data:
Sex: Male
Date of Birth: Dec 19, 1962
Language: Nepali (Native), English
Marital Status: Married with two sons

Appendix A

The household production function for a utility maximizing HH subject to the various constraints in the context of a rural LHF HH can be written as:

Max U (A_H, M_H, F_H, T_H, F)

s. t.

(1) $T = T_H + T_A + T_F + T_W$
(2) $A = a (T_A, F_A, M_A, ?)$
(3) $F = f (T_F, B, H, ?)$
(4) $F = F_A + F_H + F_M$
(5) $P_A (A-A_H) + P_F . (F- F_H - F_A) + P_{W.} T_W + I = P_M . (M_H + M_A + M_F)$

The household engages in agriculture and livestock raising (A), forest management (F), and wage labour (including remittance). The HH seek to maximize a single utility function which depends upon consumption of agricultural goods (A_H), market goods (M_H), forestry goods (F_H), home time (T_H) with HH utility is conditioned on preferences (F) determined by HH (demographic, socio-economic)characteristics.

It is assumed that market exists for agricultural products and forest products and labour but are partial and imperfect. The price of labour is assumed to depend upon the wage rate at alternative employments. The amount of labour is constrained by household time (T) and cash incomes are constrained by agriculture income, forestry income, wage income and other incomes (I) . Constraints also apply to agricultural production and forestry production. It is assumed that the agricultural production is a function of time allocated by HH on agriculture (A_H), farm inputs obtained from forest sources (F_A), market inputs such as chemical fertilizers (M_A) and conditioned by fixed HH production endowments such as land, livestock, agriculture implements and technology (?). Production from forestry is also conditioned by HH production endowments. In addition, it is also conditioned by bio-physical state of the forest land (B) and HH access to knowledge of forest product management (H). The inputs in the forest production are the household time and market inputs such as improved grass seed, saplings etc. forest products are either used for HH consumption, as inputs in agriculture (F_A) or for sale in the market (F_M).

The constraints (3) and (4) can be combined resulting in four constraints before we create a Langrangian function . The Langrangian function thus consists of four Langrangian multiplier (s, ?, µ and ß) or shadow values for HH time, agricultural output, forestry output and the budget respectively:

$L = U (A_H, M_H, F_H, T_H, F) + s\ (T - T_H - T_A - T_F - T_W\ ) + ?\ \{\ a\ (T_A\ , F_A\ , M_A\ , ?\ ) - A\} + \mu\ \{f\ (T_F\ , B, H, M_F\ , ?) - (F_A + F_H + F_M)\}\ + \text{ß}\ \{(P_A\ (A-A_H\ ) + P_F\ .\ (F- F_H\ ) + P_{W.}\ T_W\ + I - P_M\ .\ (M_H\ + M_A + M_F\ )\}$

The 13 choice Variables and four constraints result in 17 first order conditions (FOC). To conserve space only those FOC related to LHF production and consumption decision variables (F_H, T_F , F_A , M_F , F_M , P_F , F) are mentioned below.

$$\frac{\partial L}{\partial T_F} = -\boldsymbol{s} + \boldsymbol{m}\frac{\partial f}{\partial T_F} = 0 \tag{1}$$

$$\frac{\partial L}{\partial F_H} = \frac{\partial U}{\partial F_H} - \boldsymbol{m} = 0 \tag{2}$$

$$\frac{\partial L}{\partial F_A} = \boldsymbol{g}\frac{\partial a}{\partial F_A} = 0 \tag{3}$$

Among the various FOC equations related to the forestry sector, we can rearrange equation (1) and (2) as shown in (8) which indicates that the shadow value of forest output depends upon the exogenous variable representing the endowments available to the HH such as land, livestock, agriculture implements and technology (?). Likewise equation (9) is indicative of the fact that shadow value of time is determined by the shadow value of forest output and the shadow HH utility function. As explained earlier, the HH utility function is conditioned on preferences (F) determined by HH (demographic, socio-economic) characteristics.

$$\frac{\partial L}{\partial F_H} = \frac{\partial U}{\partial F_H} - \boldsymbol{m} = 0 \Rightarrow \boldsymbol{m} = \frac{\partial U}{\partial F_H} \tag{8}$$

$$\frac{\partial L}{\partial T_F} = -\boldsymbol{s} + \boldsymbol{m}\frac{\partial f}{\partial T_F} = 0 \Rightarrow \boldsymbol{s} = \boldsymbol{m}\frac{\partial f}{\partial T_F} \tag{9}$$

Thus, shadow values which are internal to each household, depends on the full set of exogenous variables. As a result, the HH demand for forest products, time allocated to work in management of forest resources are also functions of all exogenous variables in the system (source). This dependence of production decisions on preferences and endowments is termed as nonseparability in the HH production literature and results whenever key markets are missing or incomplete (Sadoulet and de Janvry 1995; Sills et al, 2003).

I. Draft Questionnaire (Preliminary Draft)

Appendix B
Questionnaire for Household Survey

Researcher: Bishnu Prasad Sharma   Interviewer

Date of Interview: Village /Ward:

Name of Household Head: Age………….Caste………

A. Demographic Information
Please read out and fill the following information

S.No.	HH member	Age (year)	Sex (M/F)	Education (No of school years)	Occupation (code)
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

Occupational code :

Agriculture = 1   Business = 2   Service = 3   wage labour = 4

Agriculture + business = 5   Agriculture + service = 6

Agriculture + wage labour = 7   Others (specify) = 10

B.   Land Holding and Tenure
Please read out and fill the following information

Land type	Homestead	Agriculture and LHF land tenure			
		Agricultural land			LHF land
		Self owned	Share cropped	Others	
Irrigated					
Un-irrigated					
Total					

C. Major crops and annual income

Crop	Unit	Total Production	Unit price	Total income
Paddy				
Maize				
Wheat				
Millet				
Barley				
Potato				
Oilseed				
Fruits				
Vegetables				
Others				

D. Livestock Ownership

Category	Units
Buffalo	
Cow	
Bullock	
Goat	
Sheep	
Pigs	
Chicken	
Others (specify)	

E. Income from the sales of livestock products

Product	Unit	Total production	Unit sold	Unit price	Total income
Milk					
Meat					
Egg					
Wool					
Others (specify)					

F. Income from the sales of livestock

Product	Unit sold	Unit price	Total income
Buffalo			
Cow			
Bullock			
Goat			
Sheep			

Pigs			
Chicken			
Others (specify)			

G. Off farm incomes

Sources	No. of HH members involved		Annual income Rs	
	Male	Female	Male	Female
Business				
Service				
Wage labour				
Remittance				
Pension				
Others				

H. Annual Income from forest products from Private/ community forest/ leasehold land/ open access

Product	Units	Private land	Community forest	Leasehold forest	Open access
Firewood					
Tree fodder					
Timber					
Leaf litter					
Thatching grass					
Fruit/nuts					
Medicinal herbs					
Grass					
Grass seeds					
Others (specify)					

I. Time required to collect forest based products from LHF

Forest product	Units	Basis: Day/ week/month /Year	Time taken in hours					
			Before LHF			After LHF		
			Men	Women	Children	Men	Women	Children
Firewood		Week						
Fodder		day						
Leaf litter		day						
Others								

J. Information related to Leasehold Forestry practice

S.No.	Particulars	

1.	Number of years the HH has been a member of LHF (years)	
	Number of HH members in the group (No)	
	Production is done on a group (G) /individual basis (I)	
	Has the HH ever borrowed institutional loans (Y/N)	
	Has the HH ever received technical training (Y/N)	
	What trainings has the HH members received (specify)	
	What is the product the HH has focused on (grass, grass seed, milk, medicinal herbs, others) specify based on priority	
	Are you a member of community forest users group (Y/N)	
	Are you a member of any other social organization (Y/N)	
	Are a member of the savings group (Y/N)	
	Time taken to reach the nearest motorable road head (hrs)	
	Time taken to reach the nearest market centre(hrs)	
	Time taken to reach the district forest office (hrs)	
	Time taken to travel to LHF from home (hrs)	

K. Information related to Physical facilities

S. No.	Particulars	Before LHF	After LHF
	Roofing material (Thatched, Corrugated sheet, tile, Cement)		
	Availability of toilet (Yes/No)		
	Means of Lighting (pine, kerosene, solar, electricity, others)		

L. Information related to Transaction Costs

Particulars	Response
How many times in a year is the LHF Group meeting held (No)	
Who participates in the meeting (male/female/both)	
How much time do you devote (time male/ time female/time both)	
How many times do you travel to district headquarter in context of LHF	
Who participates in the meeting (male/female/both)	
How much time do you devote (time male/ time female/time both)	
How many other times you have to participate in gatherings as a LHF HH	
Who participates in the meeting (male/female/both)	
How much time do you devote (time male/ time female/time both)	
Prevailing daily market wage rate for male	
Prevailing daily market wage rate for female	