Economics, Poverty and Transparency: Measuring Equity in Forest user Groups

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Abstract

This study aimed to develop an economic methodology, usable by Forest User Groups (FUGs), for increasing equity transparency in community forestry in Nepal. Difficulties in developing a truly participatory approach led to a switch from the use of small key informant groups to the use of a household survey. Although more replicable, cost-effective and reliable for economic data, this reduced FUG ownership and empowerment. A main indicator for inequity was labor collection time: the return per labor day rose with the wealth group, reflecting shorter distances to collect forest products and more on-farm tree resources among the wealthier households. It is suggested that a suitable equity indicator to act as a proxy for the more complex economic indicators, and which could be more easily collected in a participatory way, is the time needed (average hours per day) to collect a bundle of subsistence forest products per unit of household demand (a composite of livestock ownership and household size). A gender-based equity indicator would be the number of female hours per day. Livestock ownership and household size should be a sufficient proxy for use levels.

INTRODUCTION

While community forestry in Nepal has led to a marked improvement in forest condition, the concern is that this has been at the expense of welfare or equity[1] objectives (Branney & Yadav 1998). It was perceived that increased transparency in the distribution of community forest benefits within FUGs could be conducive to discussion of equity issues, and in time to internal changes in management rules and regulations in favor of poorer FUG members. In discussion with secondary stakeholders like the DFID-funded Nepal UK Community Forestry Project (NUKCFP), the initial priority was to develop a participatory and replicable methodology by which the FUGs could themselves make these calculations. A fully participatory approach would be empowering, and more likely to lead to significant equity discussions. This forms the focus of the first phase of the study undertaken in the first quarter of 1999.

At the same time, there was a natural interest of secondary stakeholders (project, donor and government) in the potential of an economic study to increase their understanding of the equity impacts of community forestry. Several studies of community forestry in Nepal have discussed inequity in general terms, but few have tried to quantify it, for example by estimating the benefits to different wealth groups within the FUGs. Indeed there is relatively little quantitative data on community forest production or extraction levels, at least in the NUKCFP project. This is surprising in view of the potential of economic studies to inform project and policy design.

The secondary stakeholder interest became a priority in the second phase of the study due to the increasing government demand for a cost-effective and replicable methodology to start measuring project level equity impacts. An underlying theme in this paper, which is based on two longer reports (Richards *et al*. 1999 & Richards *et al.* 2000), is the trade-off and tensions between these objectives. As a micro-level study,

[1] Here 'equity' is defined as a fair treatment to all users in benefit distribution and decision-making processes according to their contribution to community forest management.

however, this study does not attempt to assess the equity issues stemming from broader policy, social and institutional factors.

PHASE 1 (1999): PROGRESS AND PROBLEMS IN PARTICIPATORY ECONOMIC CALCULATIONS

Methodology Overview

The first phase of the study took place over two fieldwork periods of about five weeks in January and March 1999 and focused on five FUGs in Dhankuta and Terhathum Districts in the Eastern Koshi Hills region of Nepal: Dumre Sanne, Mainhakhop Giddyakhop, Patle Pangsingh, Bhaduare and Chuli Dada FUGs (the latter two in a combined analysis). The methodology evolved through a process of experimentation to assess what was feasible, and was therefore slightly different in each FUG, but involved the following basic steps:

1. A general FUG meeting was held to explain the objectives and introduce the study team.
2. A wealth-ranking exercise was carried out in which the FUG households were divided into three or four stakeholder groups using criteria established by the community – usually a combination of food security and landholding. This resulted in a classification into poorer, mid-wealth and wealthier households; in one case the mid-wealth category was divided into male and female representatives. In two cases, wealth-ranking was carried out by means of a survey prior to the study, and in the other two cases it was carried out as a spontaneous exercise (involving a degree of self-selection) following the general FUG meeting.
3. Participatory Rural Appraisal (PRA)-type exercises were carried out with the wealth-ranked stakeholder groups. The latter were composed of all the people who turned up on the day; the resulting PRA groups varied in size from about 8-20. These exercises included, in different FUGs, participatory mapping of forest product flows before and after the advent of community forestry; ranking and scoring of livelihood activities and forest benefits (including non-market benefits); discussions of the costs of community forestry (or how people felt they had lost out); and labor and activity calendars. This gave the study team a better understanding of the objectives and priorities of the stakeholders, and the role of community forestry in the farming system and household economy. This stage was dropped in the last FUG (Patle Pangsingh) since it was not crucial for the participatory FUG calculations and used up a lot of valuable time – this reflected a constant dilemma as to 'whose' understanding and objectives were of central importance, those of the forest users or those of the project/donor and study team.
4. From each stakeholder group, four key informants were selected based on their interest and numeracy or literacy. These key informants, with the help of facilitators, estimated the collection and labor use levels of each forest product collected – both before and after the advent of community forestry, from the multiple sources of forest products (various community forests, own land and government forest land). This information was transferred onto large sheets of paper. Also at this stage the main variable and fixed costs of production were identified and calculated, including, for example, royalty payments to the FUG, other cash costs (e.g., hired labor to saw timber), tool depreciation costs and the number of obligatory FUG days per household spent on such activities as nursery work, vigilance, weeding, etc.
5. In three of the FUGs, a 'barter game' was carried out with a sub-group of key informants (drawn from all the wealth groups) to estimate the unit values of the forest products. This involved setting up a barter exchange market in which subsistence forest products were exchanged for bags of maize and rice in order to establish barter values. The barter game is a participatory contingent valuation method which has been used in a study of Non-Timber Forest Product (NTFP) extraction in Bolivia (Vallejos

et al. 1996). The trick is to make the trading as realistic as possible, e.g. by using actual products or items representing them.

6. In one of the FUGs (Patle Pangsingh), the key informant groups calculated gross income (the value of production without deducting costs), costs and the gross margin[2] (gross income less variable costs) using large sheets of paper and a system of stones to represent numbers. Pictures and physical objects were used to represent the forest products. But due to the time this took, only the value of the main community forest source was calculated. In the other three cases, the data were taken away by the research team for processing by computer and later returned to the FUG in as participatory a form as possible.
7. A general discussion was held of the calculations presented by each of the key informant groups.
8. The data was then analysed from the project perspective – particularly in terms of the economic and equity impacts of community forestry.

Problems Encountered with the Participatory Economic Methodology

While the methodology appeared to generate considerable interest (probably most in the case of Patle Pangsingh where the most participatory approach was taken), a number of major limitations were also revealed. The most serious of these were:

The time required. One should not underestimate the time it takes to do a truly participatory economic calculation, and the relationship between time and attention span. Even in the so-called slack season there is always something to do, particularly for women who are the primary forest users. Attention falls as time, and the concern to get on with other tasks, increases. Truly participatory approaches are expensive for local people, even if they are not for researchers. Economic calculations are not as straightforward as some might think, and involve a series of steps. For example, it is not just a case of finding the average amount of a product collected per collecting household; this has to be multiplied by the proportion of collecting households in the stakeholder group. Labor time and weighting varies for each forest product source according to who in the family does the collecting, the time of year and what else they do on their journey to or from the source. The calculation of animal grazing value is particularly complex. We concluded that two separate half days was the maximum people could reasonably be expected to give to such an exercise. Obviously the task would have been much easier had there been FUG records of production, costs, sales, etc.

Literacy and numeracy levels. The majority of people were non-numerate or literate, and this proportion increased in the poorer stakeholder groups. In spite of the creative use of physical objects, stones, pictures, using fake money, etc., it proved difficult to maintain the interest of these participants.

Overestimation of quantities. Triangulation revealed that key informants tended to over-estimate forest product collection. One reason for this is that in a group situation, even when it is quite small, there may be a tendency for people 'not' to state production or extraction levels below what others say, and perhaps also a tendency to agree with what the first person says (possibly to get the exercise over with quicker). One of the facilitators felt there was a tendency for them to express their annual collection levels more in terms of what they wanted to consume rather than what they actually collected. The other main worry was how representative four people were of a larger stakeholder group with considerable variation in collection levels and even in the range of products collected. A further point is that more homogeneous data might have

[2] The gross margin was preferred to net income since it is much easier to calculate in a participatory manner, for example it involves recalling cash costs whereas net income would require estimating such costs as depreciation and maintenance of tools, interest on circulating capital, etc. Also the gross margin can be conveniently expressed in terms of the return to scarce factors of production, most obviously labor, land and capital, and so is better for understanding household economy decision-making rationale.

emerged had the stakeholder groups been based on '*toles*' (hamlets, several of which make up a FUG) which are defined more on caste and ethnic lines (P. Branney, personal communication).

Multiple product sources. FUG members often belong to several FUGs, as well as obtaining tree products from private land and national forest areas. Equity in a community forestry context needs to be viewed in terms of the relative dependence on community forest sources, as opposed to other sources of tree products, and in terms of overall use levels and the labor cost of obtaining the required consumption or subsistence level of forest products. The opportunity cost of forest product collection for family welfare depends on how long women (in particular) spend collecting forest products. This cost naturally falls as the proportion of forest products collected from private forestland rises. Therefore any equity indicator needs to take account of the labor cost of collecting from 'all' forest product sources, which as already mentioned involves a lot of calculations. In the case of Patle Pangsingh, the data were only collected for one community forest, which was probably misleading in terms of equity.

The high cost of outside facilitation. In the first phase, three economists were present most of the time – one to work with each stakeholder group. Participatory economic calculations are not as easy as might be supposed, and it is not certain that they could be effectively facilitated without serious errors by a forest ranger or equivalent. There are clearly serious doubts about the costs and replicability of such an approach.

PRA-type problems. These include a number of problems commonly encountered in PRA-type work, e.g. bias caused by dominant individuals; people dropping in and out; interference by outsiders to the group calculations; difficulties and sensitivities with wealth-ranking, etc.

PHASE 2 (2000): COMBINING TRADITIONAL AND PARTICIPATORY ECONOMIC METHODS

Methodology Overview

As mentioned above, the second phase study was greatly influenced by the need for a baseline methodology for monitoring equity impacts, as well as the above problems. Therefore a quite different approach was adopted for Baisekham FUG. Composed of about 90 households, Baisekham FUG was located in Dhankuta District approximately one and a quarter hour's walk from the main Dhankuta-Dharan road. Table 1 provides information about the six community forests sourced by different Baisekham FUG members.

Table 1. Basic information on community forests sourced by Baisekham FUG members

Community forest	Area (ha)	Households using the forest	Year established	Forest type
Baisekham	61.6	91	1990	*Chir* pine (*Pinus roxburghii*)
Rudra Bari	249.78	168	1995	*Chir* pine
Kaliban	145.18	138	1995	*Chir* pine
Kalimati	2.96	34	1994	Broadleaf/*Chir* pine
Patle Sanne	147.1	287	1994	Broadleaf/*Chir* pine
Dumre Sanne	128.2	164	1993	*Chir* pine

Source: NUKCFP Dhankuta 1998

The first main difference was to use a household survey focusing on forest product extraction and labor use, rather than the key informant approach. This made it easier to differentiate the products collected and labor time involved in collection from the multiple sources, and removed the 'group' problem of over-estimation. At about 30-40 minutes per household, the survey was much less time-consuming for local people.

A survey form was designed and pre-tested with members of Dumre Sanne FUG. On the basis of the pre-test it was considerably modified. Rather than getting respondents to recall total annual collection, they

were asked how much they collected (from each source) per week or per month in each main season (principally the dry and rainy season). For products not collected annually, like timber and large poles for construction, the quantity consumed over the last 10 years was elicited and an annual average calculated. Considerable thought was also given to making the data collection and report-back processes as logical and participatory as possible given the obvious need for computer processing of the survey data.

The following methodological steps were followed in the case of Baisekham FUG:

1. In a preliminary visit, wealth ranking was carried out with a few key informants (the chairman and a few members of the FUG committee). Four stakeholder groups in the FUG were defined according to food security: very poor, poor, mid-wealth and richer. At this stage, a list of forest products was developed to be used as a checklist for the household survey enumerators, and the multiple forest sources clarified. Different Baisekham FUG members obtained products from six community forests as well as national forest land and trees on private land.
2. A sample of 10 households from each stakeholder group was made. These were initially selected randomly, but due to time constraints the most accessible households in each stakeholder group, or those where the main female forest product collector happened to be at home, were surveyed.
3. The survey form was tested and enumerators trained. Following some dropouts, the core enumerator team consisted of two members of an Non-government Organization (NGO), which supports community forestry in Nepal, called the Federation of Community Forest Users of Nepal (FECOFUN) and a forest ranger.
4. A general meeting was held with FUG members to present the objectives, make introductions, etc.
5. A general discussion was held with the members of the largest stakeholder group present (the poor household group) to estimate the level of cash costs; the number of FUG workdays per household; and unit values or prices of forest products.
6. A household survey of 34 households was carried out, after rejecting some forms due to enumerator problems. This left seven households in the very poor group, 10 in the poor group, 10 in the mid-wealth group and seven in the richer household group. (The statistical survey methodology will need refining in the next iteration of this methodology).
7. The data were processed using Excel, and average household product collection levels, values, labor inputs and gross margins were calculated.
8. The data were given back to the stakeholder groups in a participatory report-back exercise (as described below).
9. The spreadsheet data were refined and further analysis carried out, including triangulation and sensitivity analysis.

The data report-back exercise

The data report-back exercise was based on five logical steps or questions:

- What and how much do we collect?
- What is it worth? (unit value and gross income calculation)
- What are our cash costs?
- How much time does it take to collect?
- What is the return to our labor efforts?

For each stakeholder group, four large data sheets were prepared. The intention was to return the data in a semi-processed form, getting a couple of people from the stakeholder group to finish off the calculations and explain what they were doing to the wider group. The sheets and steps were as follows:

Forest production and gross income (Sheet 1): A table with pictures of all the forest products collected (or animal grazing type) in the left hand column. The next columns presented the average annual household collection levels from all community forests combined, private trees and government forest land, followed

by a column with total production, all derived from the survey. Finally, two blank columns had unit values and gross income as the headings. It was explained how the unit values were estimated. These were entered by a numerate stakeholder group member. The gross incomes were then worked out by calculator either by another numerate member of the group or by the facilitator (if necessary), who called out the numbers for an FUG member to enter on the sheet.

Cash costs (Sheet 2): A similar table was prepared with the forest products illustrated down the left hand side, with columns showing unit cash costs of production for FUG payments and other variable costs. The stakeholder group representative(s) were involved in clarifying and adding up the costs to find the total cash cost for each forest product.

Labor days (Sheet 3): The same format was followed with forest products in the left hand column, and three columns showing the female, male and child labor days for each forest product reported from the survey. Below this was a line for obligatory FUG labor days (nursery work, weeding, etc.). The gender balance of this was discussed and an average number of FUG labor days entered. Total female, male and child days were then computed.

Data summary (Sheet 4): This was a simpler table consisting of several rows, with the numerate stakeholder members making the calculations from Sheets 1-3 as follows:

- Gross income (from Sheet 1)
- Total cash costs (from Sheet 2)
- 'Net value' (more easily understood than the term 'gross margin') per household (although fixed costs were not deducted)
- Total labor days (from Sheet 3)
- Gross margin per person day (child hours were weighted as 0.5)

FUG discussion: a discussion was then held between the four stakeholder groups. All the data sheets were left with the FUG for further internal discussions. It was not decided at this stage whether further facilitation of this process was necessary.

RESULTS OF THE ECONOMIC ANALYSIS OF BAISEKHAM FUG

Unit Values or Prices

The unit values were first discussed with the poor household stakeholder group, composed on the day mainly of women. The value of each product was found in terms of 1 kg bags of maize, as in the barter game approach. The 'richer' household group was then asked for their cash Willingness To Pay (WTP) for forest products, e.g., how much would you be prepared to pay for an adult-sized headload of grass in (a) the dry season and (b) the wet season? The barter values were much higher than the WTP values (Table 2).

Table 2. Unit values recorded in Baisekham FUG

Product	Unit	Barter values (poor group) NRs./unit	WTP in cash (rich group) NRs./unit	Unit values used NRs./unit
Ground grass	Bhari	50	20	30
Tree fodder	Bhari	50	15	25
Bedding litter	Bhari	25	5	10
Dry firewood	Bhari	50	15	25
Green firewood	Bhari	30	10	20
Thatch grass	Bhari	50	50	50
Grass for rope (babio)	Bhari	-	60	60
Plates for leaves	Bhari	50	30	40
White/red clay	Bhari	40	25	30

Timber[1]	Cubic feet	96	60	96
Large poles[1]	Pole	300	200	200
Small poles	Pole	30	25	30
Plough (exc. yoke/shaft)	Plough	50	50	50

[1]*Varies by species*

The lower cash WTP values can be partly explained by the fact that scarcity of cash income in these communities constrains how much people would be willing to pay for a product, as opposed to bags of maize which are not scarce since they are produced in the communities. Secondly, the 'use value' of a commodity, which includes 'consumer surplus' (the additional satisfaction gained by the consumer over and above the market price of an item), is higher than the cash or kind market 'exchange value'. Although people were being asked for the exchange value, they may have been replying more in terms of the use value when using the barter or exchange-value approach. It is probable that for the poor stakeholder group, the use value was considerably in excess of the exchange value.

Therefore it might reasonably be concluded that the WTP cash value represents the lower bound of the likely true values, whereas the barter values might represent the higher bound. The actual values (shown in the last column of Table 2) used were based partly on the average of the two methods, but also on judgement by the research team with the benefit of additional data (e.g., a 1998 survey of community forestry in Lalitpur District found a mean price of NRs. 22 per *bhari* or headload of ground grass (Sharma 1999). While theoretically the true value of a forest product can be different for different households and in different villages, according to variations in supply and demand (including income and preferences), it is unwise in an economic study to use different values or prices in similar areas, since this complicates comparative analysis, and at the end of the day it is difficult to be certain about the precision of willingness to pay responses. As is widely recognized, appropriate valuation is as much an art as a science.

The value of animal grazing was particularly problematic. In the Baisekham FUG case, when asked the fodder or grass substitution value of a grazing day, unrealistically high values were volunteered by respondents whether in an individual or PRA setting. A more empirical approach was therefore followed. From a survey of buffalo feeding practices in the Koshi hills, Gatenby *et al.* (1989) recorded that for each additional hour of grazing, a buffalo needs (on average) 1.3 kg less fodder. In 5-6 hours of grazing, the saving would be about 7 kg according to this estimate, or about a quarter of a *bhari* of grass. Thus a buffalo-grazing day was valued at a quarter of a *bhari* of grass, in this case NRs.7.50 per day. Young animal grazing days were converted to adult equivalents in the calculations. For cattle, oxen and goats the grazing day equivalents were based on discussions with key informants of the amounts consumed relative to a buffalo.

Production or Collection Levels of Tree or Forest Products

An attempt was made to check or triangulate the collection levels recorded in the survey. For example, the per capita consumption levels of fuel wood from the four stakeholder groups recorded in the survey were:

- Very poor group: 597 kg
- Poor group: 613 kg
- Mid-wealth group: 750 kg
- Richer group: 1013 kg

How do these figures compare with other estimates? Various studies report an average annual per capita consumption of firewood in rural Nepal of about 700 kg: a World Bank (1989) study reported 708 kg; Thapa (1989) reported a figure of 640 kg for the Middle hills; and Sharma (1999) recorded 703 kg in another survey. Our figures seem within a reasonable range of likely consumption, although the estimate for the richer households appears high. But this could indicate that richer households use more firewood per person than poorer households. One reason could be that they eat more and can better afford to keep the fire

stoked up in winter months. An alternative explanation was that the survey form did not adequately distinguish the different types of fuel wood: there are different Nepalese words for branches (usually harvested green); twigs; residues from fodder branches fed to livestock; and other bits and pieces collected around the holding (P. Branney, personal communication). The Malla *et al.* (2003), which distinguished these four categories, as opposed to the two categories distinguished here (green and dry fuel wood), found little difference in fuel wood consumption by wealth category.

We also tried to check whether the collection levels of grass and fodder, combined with the number of grazing days, seemed reasonable when compared to Total Digestible Nutrient (TDN) consumed per Livestock Unit (LU). The final line in Table 3 can be compared with the TDN requirements of an adult female buffalo (=1 LU). According to the Forestry Sector Master Plan (HMGN/ADB/FINNIDA 1988) this is 1013 kg TDN per buffalo. Given that ruminants obtain much of their food from crop residues and other sources, a range of 865-1319 kg per LU appears excessive. It is also odd that TDN consumption per LU falls as the wealth category rises, although a possible explanation of this could be that with fewer animals which are relatively very important for family nutrition, and a lower opportunity cost of labor (due to fewer alternatives), poorer households spent more time per LU collecting grass and fodder.

Table 3. Estimated livestock consumption of forest products in kg TDN equivalent

Indicators of Livestock consumption of forest products	Wealth rank			
	Very poor	Poor	Mid-wealth	Richer
Average Livestock Units (LU) per household	2.4	2.8	6.4	7.3
Bharis of grass per household (HH)	296	252	453	643
Kg grass per LU[1]	3700	2700	2123	2642
Bharis fodder per HH	187	156	265	437
Kg fodder per LU[2]	1169	836	621	898
No. cattle/oxen grazing days per HH	708	761	1461	1386
No. buffalo grazing days per HH	0	54	149	0
No. goat grazing days per HH	378	324	1903	1882
No. cattle grazing days in kg TDN equivalent[3]	743	800	1534	1455
No. buffalo grazing days in kg TDN equivalent[3]	0	81	224	0
No. goat grazing days in kg TDN equivalent[3]	85	73	428	423
Grass in kg TDN equivalent per LU[3]	740	540	425	528
Fodder in kg TDN equivalent per LU[3]	234	167	124	180
No. animal grazing days in kg TDN equiv. Per LU[3]	345	341	342	257
Total Kg TDN equivalent forest products per LU[3]	1319	1048	891	865

[1]Assumes an average of 30 kg grass per *bhari*

[2] Assumes an average of 30 kg fodder per *bhari*, and 50% of this is digestible, resulting in 15 kg leaf matter per *bhari*.

[3] Assumes green matter is 50% of Dry Matter (DM) and DM is 40% of TDN. Thus the conversion factor to find the approximate kg TDN equivalent of 1 kg of grass or fodder is 0.2 (=0.5*0.4).

However the calculations are subject to some major assumptions with a limited empirical basis. First, average *bhari* weight could be much less than 30 kg of grass or fodder, for example by allowing for the effect of children's *bharis*. Second, the assumption was made that half the fodder weight collected was edible; this could be less. Third, the conversion from green matter to TDN was subject to wide variation. Fourth, animals do not eat all the food they are given, and wastage can be considerable.

Another problem with the survey was that it proved difficult to reliably quantify resin collection levels and labor requirements, partly due to the problems of multiple-purpose journeys. For example, resin collectors gather other products or work in the fields after checking resin levels or they may collect it at the end of the farming day (the same problem of over-estimation of labor time can occur with the collection of forest products). It was reported that seven FUG members collected resin; only two of these were included in the sample survey. In this case it was decided not to process the survey data; for the future it is suggested that a key informant approach be adopted for specialist products like resin. This would involve an in-depth discussion with a group of resin collectors to work out realistic production, labor input and cost parameters.

Analysis of Equity Indicators

Use levels of forest resources

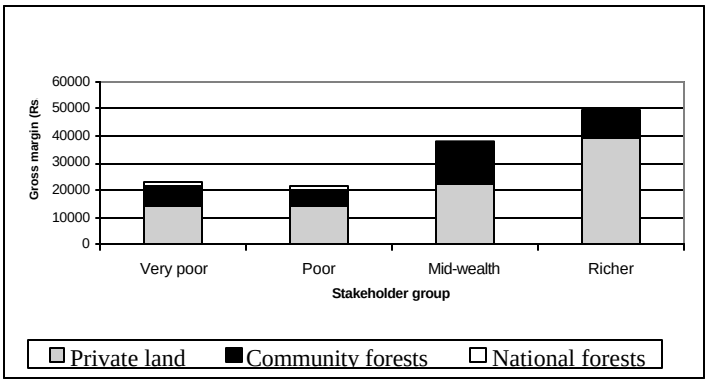
Table 4 and Figure 1 indicate a highly skewed distribution of benefits from forest or tree resources. The gross margin per capita from all forest resources in richer households was double that of poor and very poor households according to the survey data, with little difference between poor and very poor households. This was largely due to differences in the number of livestock and level of on-farm tree resources. In Baisekham FUG, the only forest product sold for cash was resin, leaving landless or land-poor households with no other tree-based cash options to alleviate their poverty. The mid-wealth category had the highest use level of community forest resources (as measured by the gross margin per household from community forests), over double that of the poor and poorest households. This was also higher than the richer households, since the latter had more on-farm tree resources to feed their livestock.

Table 4. Use levels of forest resources

Indicators	Very poor Households	Poor Households	Mid-wealth Households	Richer Households
Gross margin per HH from all forest resources: NRs.	22,925	21,394	38,156	49,310
Gross margin per capita all forest resources: NRs.	3,639	3,753	5,611	7,505
Gross margin per HH from community forests: NRs.	7,024	5,751	14,856	9,608
Gross margin per capita from community forests: NRs.	1,115	1,009	2,606	1,456
% gross margin from community forests	31%	27%	39%	19%
Household size	6.3	5.7	5.7	6.6
No. livestock units per HH	2.4	2.8	6.4	7.3

Note: Gross margin = gross income minus variable costs

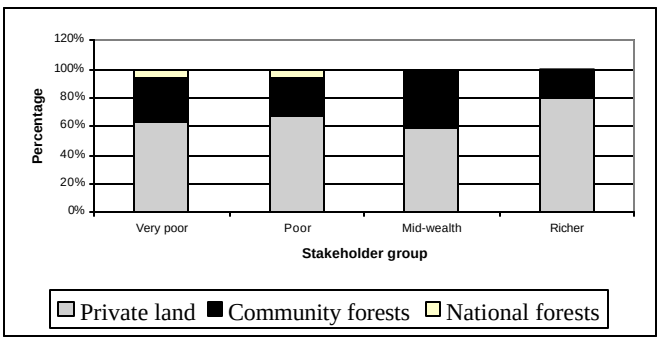
Figure 1. Gross margin per household by forest source



Dependency on community forest resources

A surprising result of the survey was the relatively low dependence on community forestry as shown by the percentage of the forest gross margin from community forests. Figure 2 shows that richer households sourced almost 80% of the gross income of their tree products from private land, and even the very poor group obtained 60% from their own trees. One explanation is that the community forests accessed were primarily *chir* pine (*Pinus roxburghii*) forests, which are less productive for grass, fodder and grazing than broadleaved forests. Therefore there was a greater reliance on private land for livestock-related forest products for all households.

Figure 2. % gross margin per household by forest source



An interesting observation is that it was the mid-wealth (rather than the poorest) households who were most dependent on community forests, as well as having the highest community forest use levels. The mid-wealth group had a relatively high number of livestock per household (although not as high as the richer group), but less private land than richer households for feed and bedding. More predictably, reliance on government forests fell as wealth increased. Poorer households tended to have a higher dependence on government forests and lower use and dependency levels of community forest resources, although the lowest dependency was by the richer group. While this analysis implies that the poorest groups have lost out from the tenure change from government to community forestry, this is misleading in the sense that in the absence of community forestry the government forest resource was a degrading open access resource, and therefore the poor's livelihood benefits would anyway have declined over time (as discussed in Richards *et al.* 1999). Community forestry at least means that livelihood benefits have the potential to be sustained. The poor may also have indirectly benefited from institutional changes accompanying community forestry.

The return to labor and gender-based indicators of equity

Arguably the most important indicator of equity is the return to labor. The big loss for poor households in the switch from government to community forest tenure was the loss of unlimited access to forest products and grazing in nearby forest areas. While open access conditions prevailed, the lack of private tree resources was less problematic. However it became serious when access was regulated and costed (through FUG levies), and household members, especially women, had to go further a field. The importance of the gross margin per labor day is that it takes account of distance. This time or distance may have a high opportunity cost for family welfare or poverty alleviation. Time spent collecting forest products can be time lost from more productive or income generating activities (if these exist), or time spent looking after the children (although it could also be partly social time spent with other women).

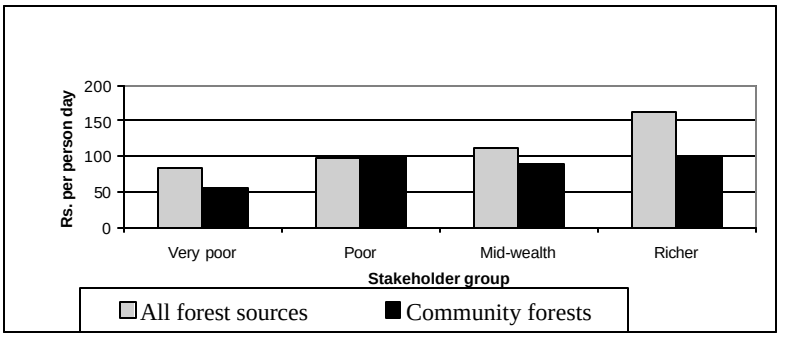
Table 5 and Figure 3 present the returns to labor from all forest sources. It is important to note that a 10-hour day was assumed in these calculations. This is very different from a waged day – normally only 5-6 hours. The labor day calculations include the time spent in obligatory FUG activities like weeding, nursery work, vigilance, etc., as well as the time spent in FUG meetings. Observations from Table 5 and Figure 3 include:

- There appears to be a linear relationship between the wealth ranking and the gross margin per person day in forest product collection (from all sources);
- The very low gross margin per day from community forestry for very poor households reflects longer distances to the community forests and national forests;
- The lower percentage of forest product collection by women in richer households;
- The higher number of women hours per day in the mid-wealth households (see below);
- The higher number of children hours per day from the poorest households (this is probably reflected in a lower school attendance rate).

Table 5. Return to labor and gender-based indicators

	Very poor households	Poor households	Mid-wealth households	Richer households
Gross margin per day (all sources): NRs.	83	97	112	162
Gross margin per day from community forests: NRs	56	102	89	100
Gross margin per female day (all sources): NRs.	77	105	107	169
Gross margin per female day from community forests: NRs.	52	120	84	101
% forest product collection days by women	65	61	62	46
Women: hrs per day collecting forest products	4.8	3.6	5.6	3.8
Children: hrs per day collecting forest products	1.6	0.7	0.8	1.0

Figure 3. Gross margin per person day of labor



Comparison of the Return to Labor with the Opportunity Cost

From key informant discussions, it was revealed that the hired labor rates for farmwork, when it was available, were NRs. 80 for about a six-hour day for men, and NRs. 70 for women, including meals. Off-farm employment rates were about NRs.120 for men, but off-farm work was scarce, especially for women. Key informants said there was no seasonal variation in wage rates. Converting the framework rates to a 10-hour day equates to NRs. 125, but does not take account of reduced labor demand in the winter months. If we assume that the labor opportunity cost for six months is half that in the busier half of the year, a very rough approximation of the labor opportunity cost might be NRs. 80-100 per day. According to these assumptions, the return to labor from forest product collection (all sources) for poor and very poor households was approximately equal to the opportunity cost of labor, but for mid-wealth and especially richer households, it was higher than the opportunity cost (see first row of Table 5).

Sensitivity analysis

In the sensitivity analysis we examined what would happen to the gross margins per household and per female labor day if:
unit values or collection levels were underestimated by 20%;
unit values or collection levels were overestimated by 20%;
labor time or cost was underestimated by 20%;
labor time or cost was overestimated by 20%.

These calculations are summarized in Table 6. This shows that while there was considerable sensitivity in the gross margin to these variations, the main findings of the study were not seriously affected.

Table 6. Sensitivity of gross margin per female day to variations in collection levels, unit values and labor cost

A. From community forests:	Very poor households NRs.	Poor households NRs.	Mid-wealth households NRs.	Richer households NRs.
Baseline gross margin per female day:	52	120	84	101
1. Value/collection over-estimated by 20%	42 63	96 144	67 101	81 122
2. Value/collection under-estimated by 20%	44 65	100 150	70 105	84 127
3. Under-estimation of labor days by 20%				
4. Over-estimation of labor days by 20%				

B. From all forest resources:				
Baseline gross margin per female day:	77	105	107	169
1. Value/collection over-estimated by	61	84	85	135
20%	92	126	128	202
2. Value/collection under-estimated	64	87	89	140
by 20%	96	131	133	211
3. Under-estimation of labor days by 20%				
4. Over-estimation of labor days by 20%				

CONCLUSIONS

The main methodological difference in the Phase 2 study (as compared to the Phase 1 study - Richards *et al.* 1999) was the use of a household survey instead of the key informant group approach. The evidence suggests that the more participatory key informant approach was prone to over-estimation of production and income, while the household survey more reliably captured the inter-household variation in tree product collection and labor use levels; was better able to cope with multiple sources of forest products; and provided more reliable data for FUG equity discussions. A similar conclusion was found in the Malla, et al. (2003): surveys were found to generate good quantitative information on forest product collection levels (P. Branney, personal communication).

But more participatory methods can be cost-effective when there is little inter-household variation, e.g., for establishing unit values and costs, FUG 'obligatory' labor contributions, etc. The Phase 2 methodology was less participatory than originally hoped; but faced with the time demands of economic calculations and low numeracy levels, there is a real dfficulty in retaining people's interest in participatory economic data collection and analysis – this is the 'catch-22' of participatory economic analysis.

In Phase 2 a more pragmatic and cost-effective approach was developed involving the use of key informants or group stakeholder discussions at various stages in the process, and by adopting a semi-participatory report-back approach. The research team felt that the latter was reasonably effective; even if only one or two members of the group followed it completely, they could explain what was happening to the rest of the group. The whole data report-back exercise took about two hours with the stakeholder group calculations being undertaken simultaneously.

It is important to note that we are dealing here with 'cost-effective' memory recall methods in the absence of recorded information like FUG production records. As is well-known memory recall methods are subject to bias and can be unreliable – therefore triangulation is essential. If the budget and time horizon permits, it is clearly preferable to set up a household recording system; for researchers to use 'participant observation' recording methods and to measure or weigh quantities collected; or to carry out multiple visit surveys involving several visits over the year so that seasonal variation is captured (although even then it may be that weather conditions mean it was an untypical year, and questions still need to be asked about 'typical year' production). As also discussed in Richards *et al.* (2003), the ideal is to set up a participatory monitoring system of economic benefits, ideally involving a systematic recording system.

The following principles may be useful for deriving a set of equity indicators for community forestry in Nepal:

a) The real cost for local forest users is the time it takes to collect forest products, and the opportunity cost of that time.

b) As far as possible, equity indicators should be gender-specific, since the opportunity costs in terms of poverty alleviation are higher for women's time. Children's time should not be forgotten: time spent collecting forest products indicates a household economy impediment to school attendance.

c) Economics is useful for equity analysis since it provides a numeraire for making comparative analysis across stakeholder groups consuming different amounts of a range of differentially valued forest products. Gross income or gross margin calculations make it possible to assess the community forest use and dependency levels of different stakeholder groups.

d) Equity indicators need to consider both resource use and dependency levels. Use or consumption levels depend on demand pressures stemming from household size, livestock ownership and cultivated areas; on household labor availability; and on alternative livelihood options. Forest product collection is a low return to labor activity, and thus forest use is likely to be less if there are alternative higher labor return opportunities. These may be from on-farm activities (e.g., paddy rice production) or off-farm employment. Dependency on community forest resources depends on private tree ownership relative to on-farm demand. Dependency of the poor on forest resources can be lower than richer households since the poor often rely more on off-farm livelihood opportunities. There seem therefore to be five main options for poverty alleviation among poor FUG members:
    - Encourage FUGs to modify their management plans or constitutions to allow cash sales of forest products by the poorest, as has happened in some FUGs (e.g., sales of firewood, fodder and/or poles);
    - Help the poorest acquire more livestock and/or land so that they can take advantage of community forest resources;
    - Encourage on-farm planting of fodder trees;
    - Develop NTFP marketing and processing options where feasible;
    - Develop off-farm livelihood and income-generating options.

Given the above, no single equity indicator is sufficient on its own; rather, several indicators are needed to build up a picture of equity in the FUG by taking into account time or distance, gender, dependency and use levels. Possible economic and equity indicators include (for each stakeholder group):

- Gross margin per household and per capita (from community forests and all forest sources);
- % of gross margin from different forest sources;
- Gross margin per person day (all household members and per female day);
- % of collection days by women;
- Mean hours per day spent by women and children collecting forest products;
- Estimated fuelwood consumption (kgs.) per capita.

If a significant proportion of forest products is sold for cash, a further indicator would be the percentage of cash sales in the gross income of each stakeholder group. These indicators should be supplemented by information about the FUG fund and what it is spent on. It is important to note that these indicators can only be properly interpreted by referring to livestock ownership, family size and sources of cash income or off-farm employment. Forest type and area are also important for explaining differences between FUGs (e.g., pine forests are inferior for grass, fodder and grazing, but may provide more cash opportunities from resin and firewood).

An indicator which is more easily measurable than the economic measures, but which would serve as a proxy to the most important of them, is the average time spent per day or per week collecting a bundle of subsistence forest products. In order to allow for different use levels, this should be divided by a composite index representing household demand, composed of household size and the number of livestock units. Larger amounts of time per unit of household demand indicate that household members have to walk further to collect their subsistence forest products. Progress towards increased equity would be indicated by a

gradual reduction in time per unit of household demand. A gender-based equity indicator would be female hours per unit of household demand.

An obvious criticism of these indicators is that they have been defined in a top-down manner; there is a question mark in that it has not been 'negotiated' with the beneficiaries, and therefore there is no ownership of it. One reason is that this study did not have time to investigate the potential for user-defined equity indicators, and which are more likely to be adopted with limited external support Another observation is that the indicator discussion is very 'forest-centric'. Since the poorest stakeholder groups may not be very dependent on forest resources, forest-based indicators need to be complemented by more general indicators like the levels of food security, cash income and diversity.

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