Measuring forest and user group changes in community forestry: results from the Koshi hills

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This paper summarises the results of a study conducted over the period 1993/94 to 1997/98 to determine changes in forest condition and forest management in community forests (CF) in the four Koshi Hills districts viz. Dhankuta, Sunsari, Sankhuasabha and Bhojpur. The CF activities are supported by the Nepal-UK Community Forestry Project (NUKCFP). Data for the study were collected from a series of sample plots in community and national forest areas with a parallel socio-economic study in 1997 covering those forest user groups (FUGs) where the plots were located. The study showed an overall improvement in community forest condition over the study period. The major changes in forest condition are: increase in the basal area of forest in the most degraded condition; increases in shrub canopy layer (reflecting coppice regrowth); increases in stems/ha especially in the smallest diameter classes and for sal (*Shorea robusta*) and katus-chilaune (*Schima wallichii-Castanopsis spp*) forests. Forest protection and management changes were also observed in levels of grazing and the percentage of FUGs with formal protection systems. There are increased levels of "active" management by FUGs but overall levels of management are still low. Decreased levels of forest product utilisation compared with before hand-over were also found. No correlation could be determined between levels of institutional development/awareness and forest management activity.

Projects need to devise strategies to address the two main issues namely: the lack of information to monitor and assess the impact of changes in forest condition on the livelihood of rural households, especially amongst the poorest groups, and the need to raise the low level of productive use being made of community forest whilst ensuring that equity issues are being addressed.

Keywords: Community forestry, FUG, Biodiversity, *Shorea robusta, Schima wallichii, Castanopsis* spp., *Pinus roxburghii.*

This article focuses on changes occurring in CF condition and forest management practices at the four Koshi hill districts viz. Dhankuta, Sunsari, Sankhuasabha and Bhojpur. Additionally, the information collected during this study is used to analyse (as far as possible) linkages between changes in physical and socio-economic conditions at these sites. The forest resource baseline was originally carried out in 1994 with the objective of providing quantitative information on forest resource condition for comparison with similar data to be collected after a certain period (Branney, 1994).

The present paper attempts to answer the two main questions :

1. how has forest conditions changed over the study period and
2. what are the impacts of any changes on local livelihoods ?

Information on i) forest resource (collected in 1994 and again in 1997) and ii) socio-economy (in 1997-98) were collected through interviews and PRA exercises with FUG members. The changes which had taken place over this period, or since the time of FUG formation were documented.

Methods

In 1994, research plots numbering 288 were established in the 4 Koshi Hills districts. The plots were located in 48 blocks of forest in both CF and national forest (NF). Blocks were selected as far as possible to be relatively uniform areas of natural forest with at least 5 ha in area. Plots sizes of 5 x 10 m and in some cases 10 x 10m were used. There were 30 plots in hill sal forest, 34 plots in katus-chilaune forest, 18 plots in pine (*Pinus roxburghii*) forest and 18 plots in sub-tropical deciduous forest (largely non-sal dominated subtropical deciduous

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forest). Initial attempts were also made to sample a range of forest blocks showing different conditions of degradation. In 1997-8 we reassessed 100 sample of the original 288 plots. Detailed field methodology is given by Branney (1994).

Since the methodology involved the establishment of permanent plots which were relocated and reassessed by the field teams after 3 years, the data from 1994 and 1997 were treated as paired samples. The t-test was used to assess the significance of the mean difference between these paired samples. The hypothesised mean difference was zero - i.e. no change was assumed, and significance was assessed at the 95% level using 2-tailed tests.

Analyses looked at changes in forest according to forest type (as described above) and forest starting condition i.e. in 1994. Starting condition was assessed in terms of basal area according to the following system: Good ($>20m^2$/ha); Average (10-20m^2/ha) and Poor ($<10m^2$/ha). Although it was intended to also compare national forest with community forest (CF) this was not possible since most of the plots originally in national forest had been handed over to FUGs by the end of the study period.

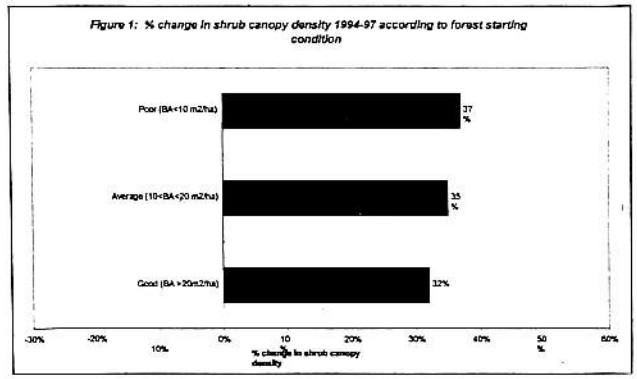
Results

Forest Condition

No significant overall change in regeneration between 1994 and 1997 (all plots in CF) were observed. A significant increase in shrub canopy density (of about 35%) between 1994 and 1997 for most forest types and conditions (except pine forest) were found (Figure 1). Shrub canopy density is improving whilst numbers of shrubs remains constant, therefore shrubs must be growing larger rather than increasing in number.

Stem count

A significant overall increase of 51% in the number of stems per ha in community forest between 1994 and 1997 (all forest types and conditions) were found. This increase is almost entirely accounted for by increased numbers of stems in the two smallest diameter classes (0-5 cm and 5-10 cm). No significant changes were found in numbers of stems per ha in larger (> 10 cm dbh) size classes. There was visual evidence of tree harvesting taking place in some plots. The increased number of stems in small dbh classes could be attributed to movement of coppice stems originally recorded as regeneration (< 0.5 m or shrubs < 3.0 m) into these smallest classes.

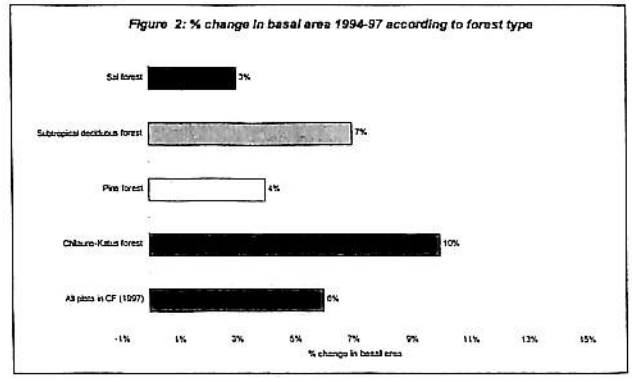


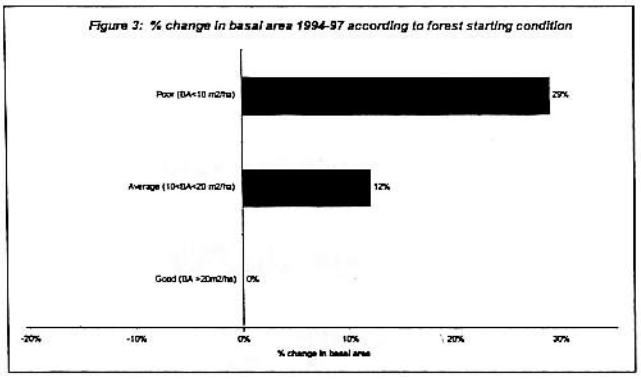
Tree canopy density

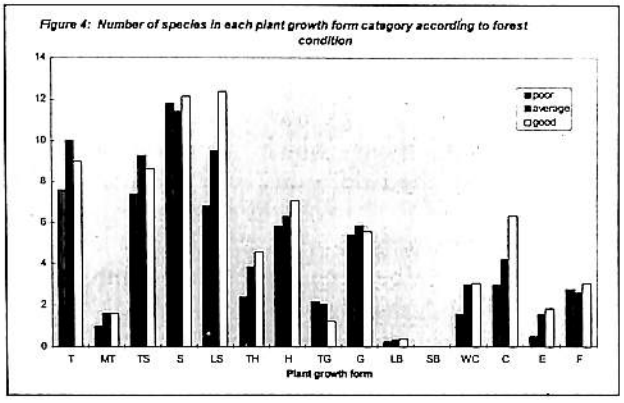
A significant overall decrease in canopy density of 9% was found between 1994 and 1997 (for all CF plots combined). This decrease is almost entirely due to a significant decrease of 21% in the canopy density of sal forest. Other forest types showed no significant change. Forest in average and good condition showed a tendency for the canopy density to decrease.

Basal area

Katus-chilaune forest showed a significant increase in basal area of 10% between 1994 and 1997. Other forest types did not change significantly although the tendency was for basal area to increase (Figure 2). The basal area of forest in poor starting condition increased significantly by 29% (from 5.3-6.9 m^2/ha) between 1994 and 1997. Forests in average and good condition showed no significant change (Figure 3).







Leaf litter

There appears to be a deterioration in leaf litter condition recorded from plots in CF between 1994 and 1997. Fifty seven percent of plots showed no change in leaf litter condition over the study period

Biodiversity

A simple system for assessing numbers of species in each plant growth form category was used[2]. Using this, there is little difference between the four main forest types in the total number of plant species recorded. The number of plant species in most plant growth form categories is greater in good condition forest than in poor condition forest (Figure 4). There is an increase in the number of species recorded from most plant form categories between 1994 and 1997 from plots in CF (Figure 5). This increase is most marked in the number of shrub species (tall shrubs; shrubs; and low shrubs).

Forest Protection

There is a decrease in the percentage of plots with evidence of grazing (from 94% to 71%) in community forest compared with national forest in 1994. Between 1994-97, there does not seem to be any significant change in the level of grazing. FUGs seem to be allowing grazing to take place at a more or less constant level of about 70% of their CF area. Little can be deduced about the intensity of this level of grazing except that it is not hindering forest improvement. Fire incidence appears to be less in CF than in NF (in 1994). The incidence of illicit harvesting of forest products appears to be effectively curbed by FUGs in their CFs.

Twenty six percent of FUGs have a formal protection system using watchers as a method of implementing forest protection. However, the majority of FUGs appear to be protecting their forest effectively without a formal system.

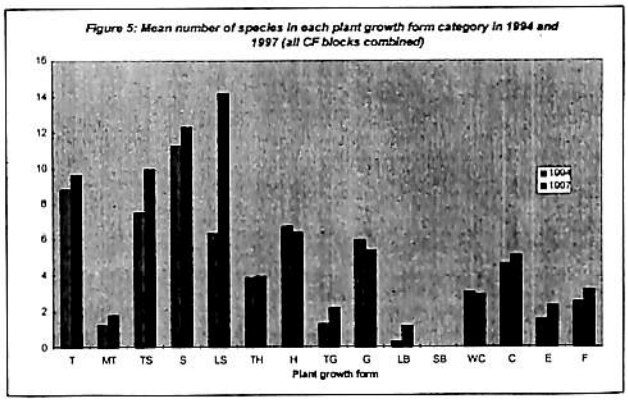
Forest management

There are fewer plots in CF in 1997 than in 1994 where no forest management is taking place (43% compared with 67%). The percentage of plots where "active" forest management is taking place increased from 3% to 19% between 1994 and 1997. Note that forest management is defined as a low level of harvesting (mostly dry branches and twigs) whilst "active" forest management is defined as systematic harvesting of green woody material. Only 13% of FUGs are not carrying out any forest management activities in 1997 although not all these are "actively" managing their forest.

Forest product utilisation

Comparing the position in 1997 with that before FUG formation 43% of FUGs are harvesting more timber from their forest, and 14% are harvesting less. Twenty seven percent of FUGs are harvesting more fuelwood from their forest, and 47% are harvesting less whereas 13% of FUGs are harvesting more poles and 40% are harvesting less. No FUGs appear to be harvesting forest products at levels greater than the sustainable productivity level of the forest (based on a visual assessment). Eighty seven percent of FUGs are harvesting fuelwood at a lower level than the productive capacity of the forest This is based on a visual assessment. Forty three percent of FUGs are harvesting timber at a lower level than the productive capacity of the forest (based on a visual assessment)

[2] Figures 4 & 5. T=Tree; MT=Multi-stemmed tree; TS=Tall shrub; S=Shrub; LS=Low shrub; TH=Tall herb; H=Herb; TG=Tall grass; G=Grass; LB=Large bamboo; SB=Small bamboo; WC=Woody climber; C=Climber; E=Epiphyte; F=Fern



Discussions

Changes in forest condition and biodiversity

The study has demonstrated that there are significant changes taking place in forest condition following hand-over to FUGs. Overall indications are that forest condition is improving particularly in relation to the number and growth of young stems. Since three growing seasons is a short period, change in basal area would be expected to be small and difficult to detect. However, the findings do show significant change in basal area in forests which were initially in the poorest condition.

A significant increase in stems 0-5 cm and 5-10 cm dbh for most forest types and conditions implies that if stems are moving into the shrub category from regeneration then a similar number of stems must also be leaving that category.

It has been suggested that the significant increase in shrub canopy density is somehow reducing the possibility of regeneration by seed. However regeneration in 1997 remains high in pine forest and may have even increased. In pine forest there is a tendency for more regeneration, change in shrub canopy density is not significant and changes in numbers of stems per ha in the two smallest dbh classes are also not significant.

The socio-economic study reported that regeneration in CFs had increased whilst the resource assessment part of the study does not appear to support this. This apparent contradiction can be explained because in the field regeneration was specifically defined as stems < 0.5 m in height. In the socio-economic study, the term is used more loosely to include all smaller diameter stems.

Changes in forest management and protection

The study has identified important trends in forest protection and forest management. There is a significant difference in the level of grazing between CF and NF. This is probably a major factor in the changes in forest condition noted i.e. less grazing allows regeneration to grow up into shrubs and small stems. Uncontrolled grazing and harvesting have been stopped in CF. Fire protection, though partially, seems to have followed a similar pattern of improvement since fires are still occurring in CF areas.

Linkages between social and physical characteristics

The socio-economic study covered a range of institutional issues (Thapa, Shrestha and Yadav, 1998) not all of which are discussed here. However the findings of this study particularly concerned with aspects of forest condition and forest management. These are compared here with the findings of the forest resource assessment study in an attempt to derive linkages between forest management and socio economic conditions.

The report on socio-economic study concludes that forest product availability has increased since FUG formation. This is not confirmed by a more critical analysis and interpretation of the same forest baseline data. Most of the FUGs are now actually getting fewer products from CF than they were before hand-over even though the availability of these products (i.e. within their forest) has increased. The apparent contradiction here lies in the use of the word "availability" (i.e. available in the forest), to mean the same as "more utilisation" (i.e. what people are actually getting) when in practice these can be quite different. Both studies confirm that forest condition is improving, however it seems as though this has not yet been translated into an actual increase in the quantities of forest products being harvested.

Poor and disadvantaged households are not benefiting. Since they are dependent on the forest, they may be unable to meet their basic needs unless other sources of forest products are available. Protection and conservative management of forest implies the creation of a forest structure and silvicultural system more suited for timber production than fuelwood under coppice management. Poor people may not have money to purchase sawn timber (traditionally they had been obtaining it, albeit illicitly, free of cost) and it may

not be a priority for them. The point is that there is no single way to manage forest but silvicultural operations need to be determined on the basis of user's needs. Within certain limits forest resources can be manipulated to produce different products - this emphasises the importance of silviculture.

There is no clear correlation between the level of activity of FUGs in managing their forest and their level of awareness or institutional development. Some FUGs are managing their CF well, but may have poor levels of participation of users in planning, decision making, implementing and benefit sharing - again the poor and disadvantaged groups may be missing out. Forest management was not significantly correlated with either awareness or institutional development however, the same had been shown by Branney and Yadav (1998).

Gaps in understanding

The study has raised as many questions as it has provided answers. The key question is, what are the impacts of these changes on local livelihoods ? Indications are that there may be some emerging problems resulting from the different patterns of forest management and utilisation but without household level information these cannot be clearly identified. An important assumption (in the project logical framework) is that benefits from community forestry are not captured by elite. However, there are signs emerging this assumption may not hold true. Moreover such these problems may be increasing as FUGs raise their levels of utilisation of forest products and possibly move towards greater levels of commercialisation.

More information is clearly needed to answer some of these questions including:

- Which kind of forest product utilisation is increasing? Who is getting the benefits, and who is losing?
- What forest product utilisation levels have decreased since hand-over? Who is losing, is anyone benefiting?
- What is the best way for FUGs to increase forest product utilisation levels whilst ensuring that issues of equity and levels of participation especially amongst the poorest groups are addressed? What support can be provided to do this?

Somewhat unconnected with the above, are a number of gaps in our understanding of effective means for monitoring biodiversity in CFs - particularly self-monitoring by FUGs themselves. The concept of local people's involvement in biodiversity conservation - especially in development of local biodiversity indicators - emerged from the 1992 Earth Summit in Rio (as part of Agenda 21) to which Nepal is also a signatory. It would be useful to see whether there is any experience of local biodiversity monitoring from Nepal which could be incorporated into the processes of self-monitoring being developed as part of the project.

Impacts due to community forestry compared with other changes

This study has concentrated on looking at changes in CF and within FUGs as though they are a sole result of the activities of NUKCFP and the national community forestry programme. In fact, such cause and effect relationships are not necessarily clear. Many other things are changing in the areas studied such as roads; health; education; agricultural services. All these are also likely to have impacts on local livelihoods, local needs and eventually on forest condition. No attempt has been made to separate out such impacts, but simply to recognise that they do exist - this is the problem of attribution. It is incorrect to say that as a result of community forestry activities, forest condition has improved, but it can be simply stated that forest condition in CF has improved over the period 1994-97.

Impacts of community forestry on household incomes and livelihoods

This is now a critical information need to be addressed. Without such information, we are unable to answer questions concerning the impact of CF and FUG formation on certain household income and livelihood levels especially amongst the poorest in the community. Unfortunately, much information in the past has been collected or summarised at the FUG level rather than the household level making it impossible to determine such impacts.

Until the results of on-going household level studies become available, it is difficult to make recommendations. In principle, if there is an issue of equity within FUGs to be addressed, it is suggested that solutions should come from the poor and disadvantaged households themselves, and not from external preconceptions of their problems. It may be suggested that the poor and most forest dependent households may need to become less forest dependent in order to improve their livelihoods. Therefore once such households have been identified, any support such as income

generation need not necessarily be forest-linked, but could encompass a wider range of strategies. Such support may need to be household-based rather than FUG-based if the problems of inequity (if there are such) are not to be exacerbated.

Improving levels of FUG forest management and utilisation rates

Work is required to develop a solution to the apparent lack of effective FUG forest management and forest product utilisation. It is suggested that the issue of FUG forest management requires more emphasis. Many FUGs are now getting fewer products from their CF than were being obtained from the same forest at the time of hand-over. The impacts of this on poorer households can only be surmised at present, but there is a sense that the pace of support to FUG forest management has not kept up with that to FUG formation.

There is enough evidence that FUGs can develop skills and experience to manage their forests more effectively (some FUGs are already doing this). Recent work in Nepal suggests that support for "participatory action research" may be an effective strategy to tackle this problem (DFID, 1997) but other solutions also exist such as improved technical support from DoF, better information (on offtake rates, growth rates etc.), and more emphasis on the forest planning part of the operational planning process.

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