Evolution and impacts of community based forest management in the hills of Nepal

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1. Introduction

It has been more than two decades since Nepal formally adopted the concept of participatory forest management through the formulation of *Panchayat* Forest (PF) and *Panchayat* Protected Forest (PPF) Rules in 1978. Since then, there have been a number of changes in forest policy. Community based forest management evolved from limited participation of local agencies in forest management in some areas to being the most prioritized forestry program of the government during the period (Bartlett, 1992; Acharya, 2002). There has been increasing handover of public forestlands to the local communities under the community and leasehold forestry programs implemented by the government with supports from various bilateral and multilateral donor agencies. Several studies have shown that these programs have met with some notable successes in terms of improving the biophysical environment, uplifting rural livelihoods and institutional development, particularly in the Middle Hills where the programs have been extensively implemented (Braney and Yadav, 1996; Collett et al., 1996; Jackson et al., 1998; Sterk, 1998; JTRCF, 2001; Webb and Gautam, 2001; Gautam et al., 2002). Because of these achievements, community based forest management in Nepal, particularly the community forestry program, has been able to draw considerable attention of scholars, development agencies, and environmental activists during the last decade.

All is not green, however, with Nepal's community forestry. For example, there are wide differences in the success of the community forestry program among the *terai*[1], Middle Hills, and high mountain regions (JTRCF, 2001). Studies have also pointed towards some limitations of present model of community forestry as the sole resource management alternative even for the Middle Hills (e.g. Jackson et al., 1993; Gautam, 2002). Several anomalies and misconduct within community FUGs have been reported particularly from the *terai* (Baral and Subedi 2000).

This paper first presents a brief overview of the evolution of community based forest management in Nepal. Impact of the community based forest management on the biophysical environment, changes on the availability of essential forest products to the user households due to changes in forest condition, and adaptation strategies of the households to changing availability of the forest products have been analyzed in a mountain watershed in Central Nepal. We report that the community based forest management programs had several positive impacts on the forest and the people of the study area but the programs also had some limitations and may face challenges ahead. The findings are expected to contribute in the identification of prevailing gaps in forest policies and implementation strategies related to

community based forest management in Nepal and other Asian countries, which can be useful to adapt the existing systems to suite the local contexts for continued benefit of the local people and supporting ecosystems.

2. Evolution of community based forest management in Nepal

Community-based management of forest, in the form of traditional or indigenous systems, has a long history in the hills of Nepal (Arnold and Campbell, 1986; Fisher, 1989; Messerschimdt, 1993). These systems were operational under different types of institutional arrangements at different times and locations. *Talukdari*[2], *kipat*[3], and religious forest management systems are some examples. Some of the rules adopted by these indigenous systems of forest management include harvesting only selected products and species, harvesting according to the condition of product, limiting amount of product, and using social means of monitoring (Arnold and Campbell, 1986). Some types of indigenous forest management systems continue to exist in many places despite a widespread perception that nationalization of forests in 1957 destroyed these systems (Joshi, 1993).

Community forestry as a formal national forest management strategy was conceived in 1976 after the government drafted a national forestry plan in that year. The Plan for the first time recognized the role of local communities and specifically emphasized local participation in forest management (Pokharel, 1997). This change in policy was the result of the government's realization that forests can not be managed without cooperation of local communities (Shrestha, 1996). To implement the concept laid down by the Plan, the Forest Act of 1961[4] was amended in 1977 to define the new categories of forests to be managed by local communities, religious institutions and individuals. Operating rules for PF and PPF were prepared in 1978, which allowed local government units known as *panchayat* to manage barren or degraded lands for forest production. PFs were limited degraded forest areas (about 125 hectares) entrusted to a village *panchayat* for reforestation and use. PPFs were existing forests handed over to a village *panchayat* for protection and proper management under a shareholder arrangement regarding the distribution of income from the sale of forest products. PPFs were limited to about 500 hectares in each *panchayat* (Kanel, 1997). A further provision of leasehold forestry was made in the rules under which limited degraded forest was given to individuals or agencies for reforestation and production of forest products (Wallace, 1981). These amendments in Forest Act and Regulations represent a major shift in

Nepal's forest policy although the partnership between the Forest Department and the *panchayat* was generally not successful (see Pokharel, 1997).

The major thrust to the community forestry program came through the Master Plan for the Forestry Sector of 1989. The Plan recognized community and private forestry as the largest among the six identified primary forestry programs and encouraged transfer of forests to local communities for active management and use. It gave a clear direction to the development of community forestry program by emphasizing the needs for establishing Forest User Groups (FUGs) as the appropriate local institutions responsible for the protection, development, and sustainable utilization of local forests and developing operational management plan by communities as a prerequisite to handing over forests for their use. It also emphasized the need for retraining the entire forestry staff for their new role as advisors and extension workers (HMGN/ADB/FINIDA, 1989). The formulation and implementation of the Master Plan can thus be considered as a turning point in the history of forestry sector policy in Nepal.

The eighth five-year plan (1992-97) strongly supported user group-based community forestry program as recommended by the Master Plan. It also emphasized the need for further intensification of people's participation in forestry management practices by implementing leasehold forestry for environmental conservation and the economic benefit of local people living below the poverty line. These objectives of the leasehold forestry program were to be achieved through intensive management of degraded forest patches including agroforestry and horticultural forestry (HMGN, 1992).

Despite the clear direction provided by the Master Plan, the community forestry program could not gain momentum until the promulgation and enforcement of new forestry legislation (including the Forest Act of 1993 and Forest Rules of 1995) in 1995. This was partly because of lengthy and complicated procedure in handing over of a forest to the local communities. The emphasis of the Master Plan for user group-based forest management could not be materialized during the first few years of its implementation also because it made it impossible to ignore the village *panchayats* in community forestry arrangements until the official ideology in the favor of *panchayat* system collapsed in 1990 (Fisher, 2000).

The current forestry legislation strongly supports the Master Plan policy of user group-based forest management. The forest hand over procedure has been simplified by authorizing the local district forest officer to hand over any part of a national forest to the local FUG for management and use as a community forest. The Forest Act of 1993 identifies community FUG as a semi-autonomous local entity that can price, sell and transport surplus

forest products independently anywhere within the country. The income generated can be used by the FUG in any community development activities after setting aside 25 percent of the income for forest development. The response to these positive changes in legislation has been encouraging in the favor of community based forest management. The community forestry program has been dramatically expanded in terms of both spatial coverage and number of forests handed over to local communities. Records available at the forest department show that a total of 12,924 registered FUGs, including 1,450,527 households, already existed in the country (as of 9 December 2003) managing 1,042,385 hectares of designated community forestland (about 18% of the country's forested area), mostly in the Middle Hills. Many community FUGs have now moved into intensive forest management for the purpose of producing surplus for sales (JTRCF 2001).

The government has made some changes in forest policy recently. According to these policy amendments, a FUG is required to share 40 percent of its income generated from the sell of surplus forest products for commercial use with the national and local governments (i.e. the Village Development Committee and District Development Committee). Another important component of the new policy includes a collaborative management of contiguous large blocks of forests in the *terai* and iner-terai as national forest while setting aside barren lands, shrublands, and isolated forest patches for handing over as community forests. The Forest Department also issued a Circular in September 2000 prohibiting the extraction of any forest product from a community forest, even for meeting subsistence needs, unless a forest resource inventory and assessment of annual increment has been made. These changes in forest policy have met with intense opposition from the Federation of Community Forest Users in Nepal. It is not quite clear why the government, after having met with certain degree of successes from the community forestry program, came up with these new policy provisions. Whatever be the reason behind, the new policy is likely to destroy the mutual trust and collaboration between communities and the forest bureaucracy that has been built up after more than two decades of the implementation of the community forestry program.

3. Impact of community based forestry on forest and the local people

With the objective of understanding whether, and if yes how, the implementation of community based forest management policy had impacts on the condition of the resource and availability of essential forest products for the local people, a case study was conducted in a 153 km^2 watershed in central Nepal, using a combination of research methods and

techniques. The hypothesis was that implementation of community based forest management strategy (including community forestry and leasehold forestry) has improved forest condition and availability of forest products to the user households.

3.1 Study area

The study was conducted in Upper Roshi watershed located within Kabhrepalanchok district in the Middle Hills of Nepal (Figure 1). The watershed is reasonably representative of the Middle Hills in terms of its topography, climate, forest types and cover, local economy, and forest use. This is one of the pioneer areas for implementing the government-sponsored community forestry program in Nepal with continuous donor support since 1978. Leasehold forestry is another form of community based forest management program implemented by the government since 1992. According to the records available in local district forest office, a total of 2135 hectares public forest land in the watershed was being managed by 63 FUGs consisting of 6808 households under the community forestry program by the end of 2000. Another 110 hectares of degraded forest was managed by small local group of people living below the poverty line under the leasehold forestry program.

3.2 Methods

The study used a multi-scale and integrated approach of data collection and analysis. The trends of changes in forest cover and other major land cover/land uses in between 1976 and 2000 and relationships between forest cover change and governance arrangement was analyzed at the watershed level using remote sensing and geographic information systems (GIS) technologies. Three satellite images including a Landsat Multi-spectral Scanner satellite image from 1976, a Landsat Thematic Mapper satellite image from 1989 and an Indian Remote Sensing satellite image from 2000 (IRS-1C, LISS-III) served as the main data sources. Black-and-white aerial photographs of 1:50000 scale, topographic maps, and some primary data were also used. Important steps involved in mapping land cover/land use types and detection of changes in forest cover over the period have been shown in Figure 2.

The study identified three major types of forests in the study area based on the governance arrangements including the community forests, semi-government forests, and government forests. Community forests, as defined in this study, include formally registered community forests and leasehold forests managed by local user groups formed under the

community forestry and leasehold forestry policies of the national government. Forested areas that were legally under the authority of the district forest office but with *de facto* control and claim of ownership by local communities and/or municipalities have been defined as semi-government forests. Those local collective efforts in the semi-government forests had received informal recognition by the concerned government authorities. Forested areas under the direct control of the district forest office and without any form of collective action by the local people have been considered as the government forests.

Continuing the investigation on the role of governing institutions in determining forest condition, we further analyzed the relationship between forest governance arrangement and biological condition of eight forests within the watershed. Homogeneity in ecological condition across sites and ease of identifying forest users and patterns of forest use were the criteria used in site selection. Six of the selected forests were community forests and the remaining two were semi-government forests. Primary data from those sites were collected using International Forestry Resources and Institution (IFRI) research protocols (see IFRI, 2001 for details) and household surveys at some sites. The association of local forest governance arrangement with forest condition was analyzed using statistical tests. Four dependent variables including basal area of trees, density of trees, density of saplings plus shrubs, and richness of plant species were chosen to represent forest condition in the analysis. The significance of difference in mean plot values of the dependent variables between the two groups of forest (community and semi-government) was analyzed using a t-test or its non-parametric equivalent depending upon the nature of distribution of the variable values across the forest plots.

Effects of changes in forest condition on the availability of four essential forest products (firewood, timber/poles, fodder and leaf litter) and adaptation strategies of the households to the changing availability of the forest products were analyzed using primary data/information collected through semi-structured interviews with 106 household heads selected randomly from 16 forest user groups within the watershed. The household selection process is presented in Appendix 1.

3.3 Results and discussion

Changes in forest cover

The results show that forest (both broadleaf and conifer) area in the watershed increased and upland agriculture and grassland areas declined continuously in between 1976 and 2000.

Shrublands decreased during the first period (1976-1989) but increased during the second period (1989-2000), while lowland agricultural area expanded during the first period, but the trend was reversed during the second period (Table 1; Figure 3).

Further investigation on changes in forested area of the watershed (forest plus shrublands) revealed that of the total 6658.2 ha. of forest and shrub area in 1976, 64.3 percent remained unchanged, 12.6 percent improved (shublands in 1976 converted to forest in 2000), 4.1 percent deteriorated (forest in 1976 converted to shrublands in 2000) and 19.1 percent lost to other use in between 1976 and 2000. The high loss of forested area to other use was, however, compensated by gain from the other use and there was an overall 7.6 percent net gain in forested area during the period.

Associations of forest cover change and present condition with governance

A GIS overlay of the polygon theme showing location and extent of changes in forest cover with the polygon theme of forest governance arrangement showed that the proportional net improvement as well as gain to the forested area in between 1976 and 2000 was highest in the semi-government forests followed by the community forests (Table 2). The government forests, which were located mostly in the southern high mountains (comprising around 50 percent of the total forested area), remained relatively stable during the period although deterioration was substantially higher compared to the improvement in elevations above 2300 m (Gautam, 2002).

The finding that forest regeneration was higher in the semi-government forests compared to the community forests indicates less importance of legal transfer of resource ownership for successful forest conservation at the local level when the collective efforts of local users and their *de facto* rules have received informal recognition by the concerned government authorities. In fact, the community forests and some of the semi-government forests in the study area were quite similar in terms of forest use pattern and monitoring systems. The two groups of forests, however, differ in terms of forest maintenance activities. Silvicultural treatments such as bush clearing, thinning, pruning and enrichment plantation were regularly being done in most of the community forests but not in the semi-government forests. Another notable difference between the two forest types in this watershed was the involvement of local municipalities in forest conservation in most of the semi-government forests. When viewed from this point of view, the finding of this study indicates that a joint effort by forest user groups and local agencies improves the prospects for successful forest

conservation at the local level particularly in urban and semi-urban areas (see also Webb and Khurshid, 2000).

The relatively stable condition of the government forests was because of the general remoteness of these forests from the settlements and lower extraction pressure compared to other forests, rather than effective monitoring or enforcement by the forestry staff. Interviews with the local forestry staff and the local people revealed that forested areas under the direct control of district forest office were virtually open access as the forestry staff members have been mostly engaged in community forestry activities after the implementation of community forestry program in the district.

The results show that the community forestry and leasehold forestry programs were unsuccessful at reaching more than 50 percent of the total forest area, most of which was located in southern high mountains. This remained the situation despite favorable policy and continuous donor support for more than two decades for the implementation of the community forestry program. A major challenge to extending community forestry in the southern mountains is the difficulty in identifying traditional users and their use patterns (prerequisites for community forest hand over). The general remoteness of the forests and difficult topography with steep slopes are other limitations for the villagers in managing these forests as community forests. The District Forest Office has committed its limited human and financial resources to the implementation of community forestry and leasehold forestry programs, rather than management of forests under its direct control. Due to absence of monitoring and management, the high elevation forests, which generally have higher commercial and biological values compared to low elevation forests (Jackson et al., 1993; Dinerstein, 1998), have started deteriorating rapidly in recent years (field observation by APG). Deteriorating trends of those forests was also evident from substantial (45%) increase in shrub area of the watershed in between 1989 and 2000 as found in this study and higher rates of forest deterioration compared to improvements above 2,300 m (Gautam 2002).

The results of the analysis on the relationship between forest governance arrangement and biological condition of the forests show that the density of saplings plus shrubs and average richness of plant species per plot were significantly higher in the group of community forests compared to the semi-government forests. The group of community forests also had higher average density of trees compared to the semi-government forests although this difference was not statistically significant. The two groups of forests had similar average basal area of trees (Table 3).

The differences in species richness and the density of saplings and shrubs between the community and semi-government forests might have resulted from species manipulation by user groups through silvicultural treatments such as bush clearing, thinning, pruning and enrichment plantation in the process of forest management plan implementation. Bush clearing, which was being done regularly in most of the community forests may also have created favorable condition for the germination of tree seeds and growth of seedlings thus contributing to the increase in number of smaller individuals in community forests compared to the semi-government forests. The same did not happen in semi-government forests because of the absence of officially approved forest management plan and lack of technical support from the forestry staff required for implementing such forest maintenance activities.

As the community forests and semi-government forests included in this study are located in very similar ecological and socioeconomic settings, the findings of the second analysis presented above suggest a relative superiority of local institutions in the community forests compared to the semi-government forests. This conclusion is based on the assumption that the initial conditions (at the commencement of community based management) of the community and semi-government forests included in this study were similar. The absence of time series data on biological condition of those forests did not allow for quantitative detection and comparison of over time changes between the two groups of forests.

Changes in forest products availability and adaptation by forest-dependent households

The ease with which the four main forest products were available to the households at present (i.e. 2001) and 20 years ago varied with the type of product. Fodder and timber were ranked by majority of the respondents as the scarcest forest products, both at present as well as 20 years ago. Leaf litter was the only product available now to the majority of households relatively easily. Availability of firewood was intermediate (Table 4).

The availability of the forest products to the households during the two periods was compared statistically using Wilcoxon Signed Ranks test[5]. The results show that the availability of leaf litter and firewood increased significantly at present compared to the availability twenty years ago while availability of fodder (including leaf fodder and grasses) decreased significantly during the same period. Availability of timber and poles increased only marginally at present compared to the availability 20 years earlier (Table 5).

According to the respondents, though getting fodder and timber was difficult in both the periods, the reasons leading to these difficulties were different. Twenty years ago, most of the forests were in degraded condition and were not able to produce required products.

Although the condition of many of the forests has improved now, there has not been a concomitant increase in the availability of timber and fodder to the user households because of the restrictions imposed by the user groups themselves on the harvest of these products. The respondents' perceptions were supported by observations in the field and informal interviews with FUG leaders. For example, eight of the sixteen interviewed community forests had good stocking of timber trees. However, limited harvesting of timber for subsistence use was being allowed by FUGs from only three forests. Similarly, while about half of the user groups had good stocking of fodder trees in their forests, none of them allowed harvesting of leaf fodder (pers. obs.). Since grazing and harvesting of leaf fodder from community forests was banned by the respective FUGs, grass collected occasionally was the only fodder that was available from the forests to the user households (Gautam, 2002).

Our experience and the interviews with the users indicate that the local FUGs in the study area (and the hills in general) have generally adopted protection-oriented and rigid rules to prevent the harvesting of timber and leaf fodder after they took over the forest from the government. This may be due to a limited knowledge about actual yields and responses of forest to intervention and a result of the concern of the user groups about the risk of degrading the forest. It may, however, also indicate a change in the community forest management objectives of the FUGs from the initial objective of meeting subsistence requirements towards timber production for commercial purposes at present.

The decrease in fodder availability from the forests is also attributable to the fact that either part or all of many of the forests are pine plantations, which sustain low levels of fodder species. Pines, which have no value for fodder and are poor firewood, were actively promoted in the study area as species of choice in government plantations during 1970s and 1980s, without giving due considerations to diverse product requirements of the local people. Most of these plantations were later handed over to FUGs as community forests (Gautam and Webb, 2001).

The data suggest that even for products that had been increasingly available to the households over the last 20 years, there were large differences between supply of the products from forests and households' subsistence requirements. When asked whether the quantity of forest products available from the community forest was sufficient to meet their household needs, 70 percent of the respondents said that the quantity of firewood available was insufficient and 46 percent said leaf litter was insufficient to them (Gautam, 2002). For majority of the respondents, who could not fulfill their household needs from the community

forest, private land was the most important alternative source for fulfilling the deficit amount of forest products (Table 6).

The results presented above indicate that in addition to community forests private sources of forest products are making a substantial contribution to the rural livelihoods of community and leasehold forestry users in the study area. The findings also show that use of substitute fuel and fodder is becoming common for many households who have opportunities of getting those substitutes and can afford to buy them. The two most common fuel substitutes, according to the respondents, were sawdust from local sawmills followed by kerosene oil. Dried paddy-straw bought mainly from neighboring areas of Bhaktapur district was the most common product used as substitute for green fodder.

The increasingly important role of private forestry in the watershed is not surprise considering the fact that there had been two- to three-fold increase in tree cover on *bari* terraces of Kabhrepalanchok district in between 1964 and 1988 (Carter and Gilmour, 1989), and that trend is expected to have continued after 1988 as well. Whether the community forestry program influenced to the planting of trees on private land is not clear. The change in dependency towards private resources is important for meeting increasing demand and reducing the pressure on forestland. There is, however, a concern that increasing dependency of land-rich farmers on private resources may favor the present protectionist approach in community forest management, which could lead to marginalization of poorer members of the user group who do not have sufficient private land to grow trees and also can not afford for alternatives. If this happens, the poorer members will be forced to buy trees from their land-rich neighbors, or illegally extract forest products from the community or government forests to meet their subsistence requirements.

4. Conclusions and policy implications

Forest policy in Nepal evolved continuously in favor of community based forest management over the last two and half decades. This change in forest management from fully centralized control of the resource towards more participatory approach had many positive impacts on the forest and the local people as evidenced by the findings of the case study presented in this chapter. Forest cover in the study area increased after the implementation of the community forestry and the leasehold forestry programs and the biological condition of the community-managed forests was improving. One important development in the institutional front over the last two decades was that the concept of the FUG as responsible local organization

entrusted to manage and use forests has been strongly embedded within the institutional structure of the national forest governance system.

The positive changes in forest cover and condition provide some evidences of ecological sustainability of the resource, and the findings also signify to some extent the success of forest conservation efforts by local communities and the agencies involved. The results thus provide evidences for a relative superiority of community based forest governance in the hills compared to complete government control of the resource.

The results of this study also point towards some limitations of the present models of community based forest management systems as the sole resource management alternatives for all the accessible forests in the hills as envisaged by the Master Plan. Some of the issues surrounding community forestry and leasehold forestry programs, challenges likely to be faced by these programs in near future, and their implications for forest policy can be summarized as follows.

Coordination between a FUG and local municipality

The existing forest policy and forestry legislation of Nepal recognize the user groups formed under the community forestry program as autonomous local entities responsible for the management and use of local forests. The relationship of a FUG with other local agencies (e.g. Village Development Committee or municipality) has not been specified in the Master Plan as well as in the current forestry legislation. The finding of this study that proportionately highest level of forest improvement and gain took place in semi-government forests, however, indicates that a joint effort by forest user groups and local agencies improves the prospects for successful forest conservation at the local level, particularly in urban and semi-urban areas. The results thus provide a basis for questioning the appropriateness of existing policy, especially when viewed in the context of existing conflict between the Forest Act of 1993 and the Local Governance Act of 1997.

Tenure and forest condition

The findings of this study that forest improvement and gain was higher in the semi-government forests compared to the formal community forests indicate that formal handover of forest ownership is not a major factor determining successful forest conservation at the local level when the rights to organize and manage forests for the community benefits have been recognized (even informally) by concerned authorities. In other words, *de facto* rules are more important than *de jure* rules in our study area and this may be applicable to other local

settings. The findings that the community forests were generally better in biological conditions compared to the semi-government forests, however, do not fully support the above conclusion and indicates the relative superiority of institutional arrangements in community forests compared to the semi-government forests. The inconsistencies in the findings from the two analyses indicate that the outcomes from local forest management initiatives may be more dependent on the local institutional arrangement that regulate forest use and maintenance of the resource than on type of property right arrangements.

Passive approach to the management of community forests

The results of this study show that the community forests were not able to meet substantial proportion of the users' forestry related household requirements, particularly for fodder and timber, despite a general improvement in forest condition over the last few decades. One of the reasons leading to these situations was a passive (i.e. protection-oriented) approach adopted by most of the FUGs in the management of community forests. According to Arnold (1998), such a conservative approach in the management of community forests is common in the Middle Hills of Nepal. There could be several reasons leading to the adoption of the protectionist approach in community forest management by FUGs but their concern over the risk of degrading the resource may be the most important factor contributing to this approach. The decrease in fodder availability from the forests is also most probably attributable to the fact that many community forests in the study area are pine plantations that sustain low levels of fodder species.

The protectionist approach of community forest management has not only affected the general availability of products to the user households but it is also speculated to have serious equity implications for community forest management. The negative effects arising from such an approach are found to be more direct to the poorer users, particularly land-poor households, because there will be less opportunity for private forestry to supplement restricted/protected community forest products (Gautam et al., 2002). Moreover, lack of disposable income will prevent a household from purchasing the required product from a secondary source. A protectionist approach of forest management by the FUGs thus might further marginalize more forest-dependent households without providing them alternatives. This may eventually result in inequity within communities and could also be a potential threat to the long-term sustainability of the community forestry program. Lack of timber availability resulting from a protectionist approach by the FUGs may also place the remaining national forest areas (i.e. open-access forest) under increasing extraction pressure as communities seek

out alternative sites for timber collection. In this context, optimum utilization of the community forests with due consideration to the requirements of poorer and disadvantaged households is one of the key issues that needs consideration in the management of community forests in future. This could possibly be achieved through effective trainings and extension activities that increase confidence of the FUGs on yield-based active forest management.

The findings of this research also point towards the necessity of further research to investigate the impacts of the changes in forest product availability on different socioeconomic groups within the user groups. Private forests constitute an important source of subsistence products in the study area but how private forestry is emerging to cope with the challenges arising from changing dependencies of rural households between community, government and private resources is not properly known. This is thus another important area to be addressed by future research.

Limitation of the present community forestry

The findings indicate that the community forestry and leasehold forestry programs along with the informal local arrangements played important roles in improving forest condition in some parts of the watershed. However, the existing models of the programs were unsuccessful at reaching more than 50 % of the total forest area, most of which was located in southern high mountains. One of the major factors responsible for this outcome could be the inability of the existing community-based forest management policy and operational procedures to acknowledge the high difference in biophysical, socioeconomic, and demographic conditions between the lower hills and the elevated mountains in the southern part of the watershed. Such a situation exists in other parts of the Middle Hills as well. This gap in forest policy has raised concern over the future of high elevation forests which have extensive coverage in the Middle Hills as a whole but remain largely open access. Although more research is needed before making any recommendation on appropriate governance regime for the high elevation forests of the Middle Hills, the findings of this study reinforce our conclusion that existing policy needs to be revised to make it more flexible to contextual factors, and to not adhere to a ‘blueprint’ approach in the implementation of the community forestry policy.

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References

Acharya, K. P., 2002. Twenty-four years of community forestry in Nepal. *International Forestry Review* 4(2): 149-156.

Arnold, J. E. M., 1998. Managing Forests as Common Property. FAO Forestry Paper 136. Food and Agriculture Organization of the United Nations, Rome, Italy.

Arnold, J. E. M. and Campbell, J. G., 1986. Collective management of hill forests in Nepal: The Community Forestry Development Project. *In*: Proceedings of the Conference on Common Property Resource Management, National Research Council, National Academy Press, Washington DC.

Baral, J. C. and Subedi, B. R., 2000. Some community forestry issues in the terai, Nepal: where do we go from here? *Forest, Trees and People Newsletter* 42:20-25.

Bartlett, A. G., 1992. A review of community forestry advances in Nepal. *Commonwealth Forestry Review* 71(2): 95-100.

Branney, P. and Yadav, K. P., 1998. Changes in Community Forest Condition and Management 1994-1998: Analysis of Information from the Forest Resource Assessment Study and Socioeconomic Study in the Koshi Hills. Nepal-UK Community Forestry Project, Coordinator's Office, Kathmandu, Nepal.

Carter, A. S. and Gilmour, D. A., 1989. Increase in tree cover on private farmland in central Nepal. *Mountain Research and Development* 9(4), 381-391.

[CPFD] Community and Private Forest Division, 2000. Guideline for Inventory of Community Forests. Department of Forest, CPFD, Kathmandu, Nepal.

Collett, G., Chhetri, R., Jackson, W.J., and Shepherd, 1996. Nepal Australia Community

Forestry Project Socio-economic Impact Study. ANUTECH Pty Ltd, Canbera, Australia.

Dinerstein, E., 1998. A biodiversity assessment and gap analysis of the Himalayas. In: Report on the International Meeting on Himalaya Ecoregional Co-operation, February 16-18, 1998 held in Kathmandu, Nepal. The United Nations Development Program.

Fisher, R. J., 1989. Indigenous Systems of Common Property Forest Management in Nepal. Working Paper No.18. Environmental and Policy Institute, East-West Center 1777, East-West Road, Honolulu, Hawaii.

Fox, J., Krummel, J., Yarnasarn, S., Ekasingh, M., Podger, N., 1995. Land use and landscape dynamics in Northern Thailand: Assessing change in three upland watersheds. *Ambio* 24: 328-334.

Gautam, A. P., 2002. Forest Land Use Dynamics and Community-Based Institutions in a Mountain Watershed in Nepal: Implications for Forest Governance and Management. Ph.D. dissertation, Asian Institute of Technology, Thailand.

Gautam, A. P. and Webb, E. L., 2001. Species diversity and forest structure of pine plantations in the Middle Hills of Nepal. *Banko Jankari* 11(2): 13-21.

Gautam, A. P., Webb, E. L. and Eiumnoh, A., 2002. GIS assessment of land use-land cover changes associated with community forestry implementation in the Middle Hills of Nepal. *Mountain Research and Development* 22(1): 63-69.

Gautam, A. P, Webb, E. L. and Shivakoti, G. P., 2002. Local participants' perceptions about socio-economic and environmental impacts of community forestry in the Middle Hills of Nepal. *Asia Pacific Journal of Rural Development* 12(2): 60-81.

[HMGN] His Majesty's Government of Nepal, 1992. The Eighth Plan (1992-1997; unofficial translation). HMGN, National Planning Commission, Kathmandu.

[HMGN] His Majesty's Government of Nepal, 1993. *Forest Act 1993* (official translation). HMGN, Ministry of Forests and Soil Conservation, Kathmandu.

[HMGN] His Majesty's Government of Nepal, 1995. *Forest Regulation, 1995* (official translation). HMGN, Ministry of Forest and Soil Conservation, Kathmandu.

[HMGN] His Majesty's Government of Nepal, 1997. Local Governance Act. HMGN, Ministry of Local Development, Kathmandu.

[HMGN] His Majesty's Government of Nepal, 2000. Revised Forestry Sector Policy. HMGN, Ministry of Forests and Soil Conservation, Kathmandu.

HMGN/ADB/FINNIDA, 1989. Master Plan for the Forestry Sector, Nepal: Forestry Sector Policy. HMGN, Ministry of Forests and Soil Conservation, Kathmandu.

Hobley, M., 1990. Social Reality, Social Forestry: The Case of Two Nepalese Panchayats. Ph.D. dissertation. The Australian National University, Canberra.

[IFRI] International Forestry Resources and Institutions, 2001. IFRI Research Program Field Manual Version 10.0. Center for the Study of Institutions, Population, and Environmental Change, Indiana University, USA.

Jackson, W. J., Nurse, M. C., and Chhetri, R. B., 1993. High altitude forests in the Middle Hills: can they be managed as community forests? *Banko Janakari* 4(1): 20-23.

Jackson, W. J., Tamrakar, R. M., Hunt, S., and Shepherd, K. R., 1998. Land-use changes in two Middle Hill districts of Nepal. *Mountain Research and Development* 18(3): 193-212.

Joshi, A. L., 1993. Effects on administration of changed forest policies in Nepal. In: *Policy and Legislation in Community Forestry*. Proceedings of a Workshop held in Bangkok, Jan 27-29. Regional community Forestry Training Center, Bangkok.

[JTRCF] Joint Technical Review of Community Forestry, 2001. JTRCF: Report of the Joint Technical Review Committee. Ministry of Forest and Soil Conservation, Kathmandu, Nepal.

Kammerbauer, J. and Ardon, C., 1999. Land use dynamics and landscape change pattern in a typical watershed in the hillside region of central Honduras. *Agriculture, Ecosystems and Environment* 75: 93-100.

Kanel, K. R., 1997. Community forestry: implications for watershed management. In: Khenmark, C., Thaiuts, B., Puangchit, L., Thammincha, S. (Eds.). Proceedings of the FORTROP'96: Tropical Forestry in the 21st Century, 25-28 November 1996. Kasetsart University, Bangkok, Thailand.

Messerschmidt, D. A., 1993. Linking indigenous knowledge to create co-management in community forest development policy. In: Warner, K. and Wood, H. (Eds.), Policy and Legislation in Community Forestry. Proceedings of a workshop held in Bangkok, Jan 27-29. Regional Community Forestry Training Center, Bangkok.

Ostrom, E., 1990. Governing the Commons: the Evolution of Institutions for Collective Action. Cambridge University Press, Cambridge.

Pokharel, B. K., 1997. Foresters and Villagers in Contention and Compact. Ph.D. dissertation. University of East Anglia, Norwich, UK.

Schreier, H., Brown, S., Schmidt, M., Shah, P., Shrestha, B., Nakarmi, G., Subba, K. and Wymann, S., 1994. Gaining forest but losing ground: A GIS evaluation in a Himalayan watershed. *Environmental Management* 18(1): 139-150.

Shrestha, K. B., 1996. Community Forestry in Nepal: An Overview of Conflicts. Nepal Madhyasthata Samuha. Discussion Paper Series No. MNR 96/2, ICIMOD, Kathmandu, Nepal.

Singh, H. B., and Kafle, G., 2000. Community forestry implementation: emerging institutional linkages. In: Enters, T., Durst, P. B., and Victor, M. (Eds.), Decentralization and Devolution of Forest management in Asia and the Pacific. RECOFTC Report No. 18 and RAP Publication 2000/1. Bangkok, Thailand.

Sterk, A., 1998. Leasing Degraded Forest Land: an Innovative Way to Integrate Forest and Livestock Development in Nepal. Food and Agriculture Organization of the United Nations, Regional Office for Asia and the Pacific, Bangkok, Thailand.

Virgo, K. J. and Subba K. J., 1994. Land-use change between 1978 and 1990 in Dhankuta District, Koshi Hills, Eastern Nepal. *Mountain Research and Development* 14: 159-170.

Wallace, M. B., 1981. Solving Common-Property Resource Problems: Deforestation in Nepal. Ph.D. thesis, Harvard University, Cambridge, Massachusetts.

Webb, E. L. and Gautam, A. P., 2001. Effects of community forest management on the structure and diversity of a successional broadleaf forest in Nepal. *International Forestry Review* 3(2): 146-157.

Webb, E. L. and Khurshid, M., 2000. Divergent destinies among pine forests in Northern Pakistan: linking ecosystem characteristics with community self-governance and local institutions. *International Journal of Sustainable Development and World Ecology* 7:44-45.

Notes

[1] Low flat land in the southern part of the country.

[2] *Talukdars* were local headmen during the period of rules by the *Ranas* who had the responsibility of regulating forest use.

[3] A form of land tenure in which land was regarded as the common property of the local ethnic group and was managed from within the ethnic tribal's organization (Fisher, 1989).

[4] The first comprehensive forestry legislation promulgated after the nationalization of forests in 1957. The Act divided forests into different categories and strengthened the role of forest department in forest conservation.

[5] This test makes no assumptions about the shapes of the distributions of the two variables and takes into account information about the magnitude of differences within pairs and gives more weight to pairs that show large differences than to pairs that show small differences.

Table 1: Percent of watershed area covered by different land cover types during the three periods and changes. The total watershed area is 15335 hectares.

Land use class	Percent cover			Percent change in cover		
	1976	1989	2000	1976 - 1989	1989 -2000	1976 -2000
Broadleaf forest	31.1	32.4	33.2	+4.1	+2.6	+6.8
Conifer forest	3.7	5.3	6.7	+44.2	+26.4	+82.2
Shrublands	8.6	4.6	6.7	-46.1	+45.0	-21.8
Grasslands	3.1	1.5	1.3	-49.8	-16.7	-58.2
Lowland agriculture	10.3	13.2	11.9	+28.2	-9.4	+16.2
Upland agriculture and other	43.2	42.9	40.0	-0.7	-6.7	-7.4

Table 2: Changes in forested area in between 1976 and 2000 within the geographical spaces that were under the three governance arrangements in 2000

Governance type	Forested area in 1976 (ha.)	Percent of forested area in 1976 compared to the area in 2000				
		Unchanged	Improved	Deteriorated	Lost to other use	Gained from other use
Community	1516.1	62.3	28.4	2.1	7.2	28.8
Semi-government	327.9	45.3	37.5	0.9	16.2	39.3
Government	3433.6	82.7	5.4	3.7	8.2	10.7

Table 3: Comparison of average values of selected dependent variables between the community and semi-government forests and significance of differences (2-tailed, 0.05 levels) between the two values. N denotes the number of forest plots.

Dependent variable	Community (N=161)	Semi-government (N=70)	P value	Stat. test
Basal Area of trees (m^2/ha)	7.3	7.4	.777	Mann-Whitney
Density of trees (number/ha)	414	398	.785	Mann-Whitney
Density of saplings plus shrubs (number/ha)	2477	1415	.018	Mann-Whitney
Richness of plant species (number of species/plot)	11.7	10.4	.006	t

Table 4: Percent respondents ranking the availability of essential forest products at present (A) and 20 years ago (B).

Product	Firewood		Fodder		Timber and poles		Leaf litter	
	A	B	A	B	A	B	A	B
N	101	87	95	84	106	92	95	84
Easily available	3.0	11.5	0.0	7.1	0.0	0.0	22.1	13.1
Available	44.6	20.7	10.5	30.9	10.4	10.9	52.6	20.2
Hardly available	46.5	41.4	12.7	28.6	15.1	14.1	15.8	36.9
Not available	5.9	26.4	76.8	33.4	74.5	75.0	9.5	29.8

Table 5: Percent of responses indicating increases or decreases in the availability of main forest products at present (i.e. 2001) compared to the availability 20 years ago.

Product	N	Increased	Decreased	Remained the same	Assy. Sig. (2-tailed)
Firewood	87	51.7	21.8	26.4	.018
Fodder	84	7.1	56.0	36.9	.000
Timber and poles	92	26.1	21.7	52.2	.744
Leaf litter	84	57.1	9.5	33.3	.000

Table 6: Percentage of the respondents who had insufficient supply of forest products from the community forests citing the most important alternative source for meeting the deficit

Product	N	Government forests	Own private land	Buy from others and market	Use substitute
Firewood	71	12.7	52.1	5.6	29.6
Fodder	83	9.6	55.4	2.4	32.5
Timber and poles	92	15.2	45.7	39.1	0.0

Figure 1: Location of the Upper Roshi watershed within Kabhrepalanchok District, Nepal.

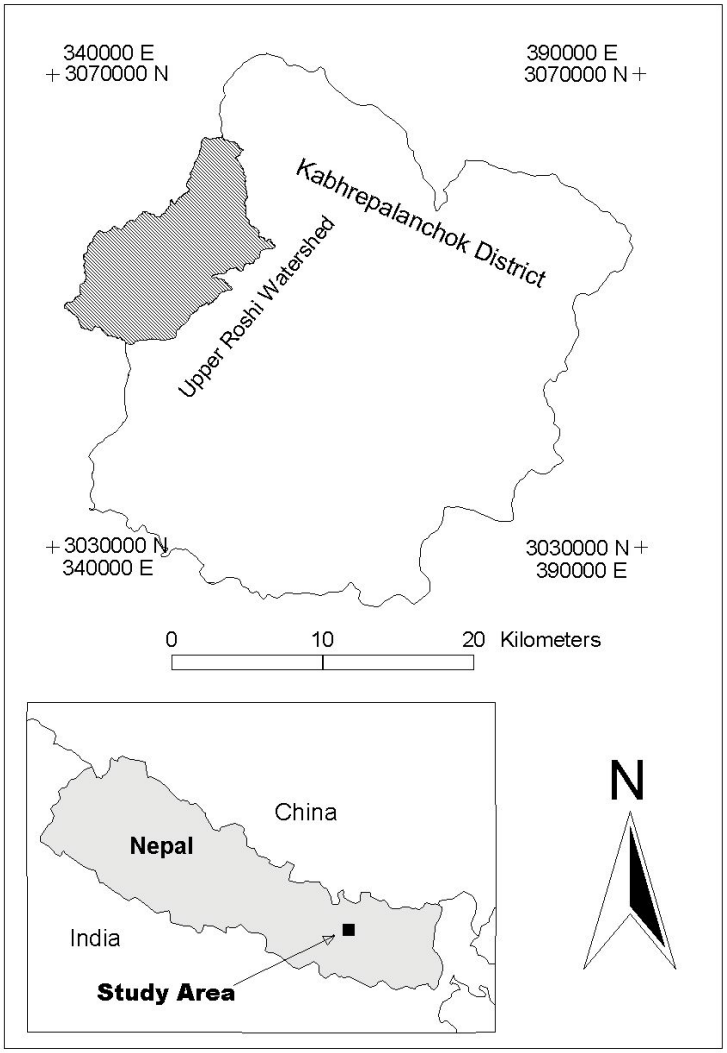


Figure 2: A simplified procedure used in land use mapping and changes detection.

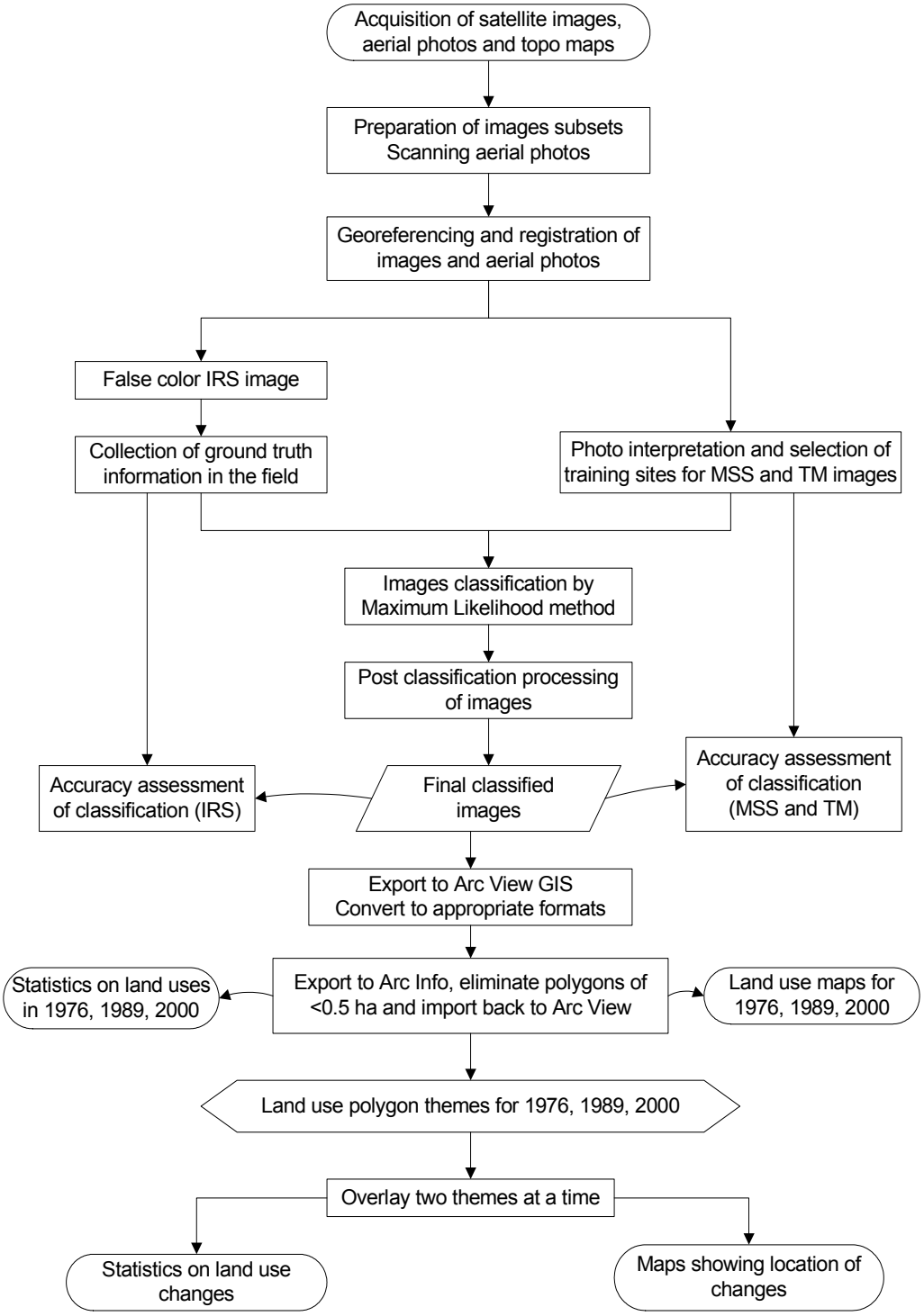
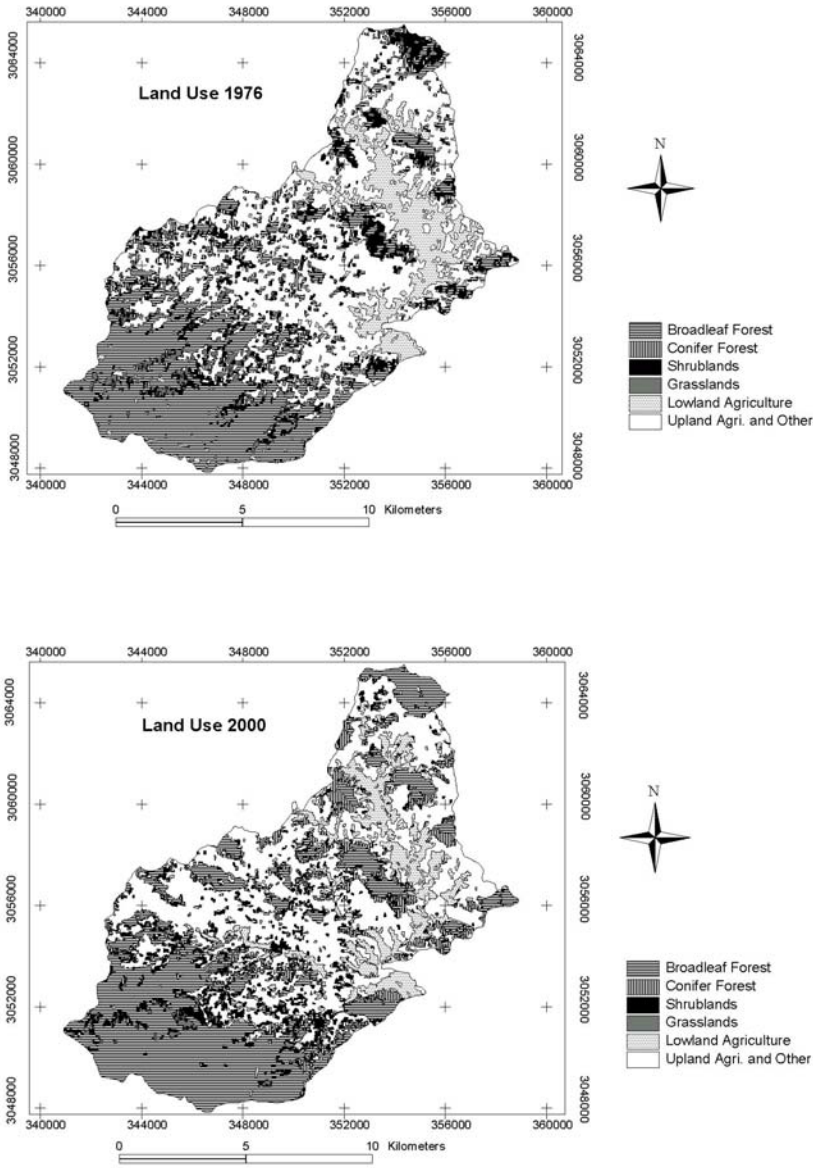


Figure 3: Land use in Upper Roshi Watershed in 1976 (top) and 2000 (bottom).



Appendix 1: Samling procedure involved in the selection of respondents for the household survey.

A list of forest user groups in the watershed was first prepared using the record of formalized community and leasehold forest user groups available in the District Forest Office, Kabhrepalanchok. From the list, 16 (19.7%) of the user groups were selected randomly to include in the survey frame. All the member households from selected user groups formed the population for this purpose. The sample size was then determined by using following equation for sampling developed by Arkin and Colton (1963), for 0.05 probability level, a reliability of ±4 percent, and an expected rate of occurrence of 95 percent.

$n = [NZ^2 p(1-p)]/[Nd^2 + Z^2 p(1-p)]$, where, n = sample size, N = total population (households), p = estimated proportion of the population included, and d = level of precision.

The sample was distributed among the selected forest user groups on proportional basis using the following formula:

$n1 = (N1 * n)/N$, where, n1 is the size of the sub-sample in a particular user group; N1 is the total number of households in that user group; n is the sample size; and N is the total population.

Households from each user group were selected randomly. The interview was open-ended designed to acquire maximum information possible from the respondents.