

The Forestry Sector of Nepal : Deforestation, Degradation and Development Efforts

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NATURAL REGIONS, LAND USE, AND FORESTRY IN NEPAL

This section briefly describes the physical division of the country, land use pattern, importance of forest sector in the Nepalese economy, and the problems of deforestation and forest degradation.

NATURAL REGIONS OF NEPAL

The total area of Nepal is 14748.4 thousand hectares, total cultivated land is about 2968 thousand hectares and population about 18.9 million, (thus population density per hectare of total area is 1.3 persons and per hectare of cultivated land is 6.3 persons). Nepal is comprised of more than 6000 rivers and rivulets, originating either from snow capped Himalayas, Mahabharat or Siwalik (Churiya) ranges. The country is divided into three ecological regions, namely, Terai, Hills and Mountains accounting for 14 percent, 43 percent and 43 percent of the total area. These regions differ not only in topography, climate, soil and resource endowment but also in demographic and socio-cultural aspects.

The Terai is a narrow belt stretching 800 km in length and up to 50 km in width and is situated at elevations ranging from 60 m along the Indian border to 330 m near the Siwalik foothills. The climate is subtropical with average rainfall of about 1600 mm per year concentrated during the monsoon. Normal maximum temperature rises about 40°C during summer and ranges between 7°C to 23°C during winter. The region is endowed with the best soil in the country (alluvial with medium to better fertility), four major river systems flowing down the Himalayas into the Ganges, and about 41.6 percent of the country's cultivated land. However, this region has to shoulder the burden of indigenous population growth and net migrated population from the north (i.e., the Hills) and the south (i.e. from across the Indian border). Therefore, the Terai is inhabited by more than 46 percent of the total population which is higher than its share in cultivated land and more than three times its share in the total area. By the year 2001 A.D. the percentage share of the Terai is expected to rise to 50.2 percent according to Central Bureau of Statistics (1986) estimate. The current estimate of its population density is 4 persons per hectare of total area and 7 persons per hectare of cultivated land.

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The Hills consists of Middle Mountains and Siwaliks and form the largest of the three ecological regions and reaches in elevation up to 3000 m. This region consists of relatively small hills, many valleys embracing numerous fast running rivers and streams, and deep gorges. The difficult topography and widely scattered settlement make transport and communication a big problem in the Hills. The normal maximum summer temperature is 27°C while winter temperature normally ranges between freezing to 12°C. The soils are of low to medium fertility, are erosion-prone and unable to retain high-intensity precipitation, except in the valleys. The hills slopes are traditionally farmed by terrace farming method, (which are constrained by limited supply of inputs due to poor accessibility and only superficial attention paid by the center of economic and political power in the country so far). The Hills currently account for 49.9 percent of cultivated land but less than 46 percent of the total population. By the year 2001 the share of the Hills in total population is expected to drop to 44.2 percent. The estimated density per hectare of area and cultivated land are respectively 1.4 and 5.9 persons.

The Mountain region consists of high Himal and high mountains and shares almost equal area with the Hills. This region comprises the highest mountain range in the world characterized by snowy peaks, steep slopes and narrow valleys. But vast region consists of only 8.5 percent of cultivated land and about 8 percent of population (which is less than one-fifth its share in total area). By the year 2001 this region is expected to have only 5.7 percent of the total population, according to CBS estimate of 1986. Population density per hectare of area and cultivated land are 0.2 persons and 6.0 persons, at present.

LAND USE PATTERN

The land use pattern of a country is a reflection of the land forms of various regions, population growth, migration and status of agriculture. Almost three-fourths of Nepal's land area falls within the highlands (72.5 percent area above 3000 m. elevation), 58.8 percent of land surface is steep to very steep (exceeding even 35 degrees), another 21.7 percent land surface has moderate to steep slope (exceeding 20 degrees) and land with gentle and very gentle slope constitutes only 18.2 percent (Kanting Earth Sciences; 1986b: 45-94). Mainly because of this, only about 20 percent of total area is cultivated (59.5 percent of the Terai, 23.4 percent of the Hills, and 4 percent of the Mountains). Non-cultivated agricultural land is 6.7 percent of land and grazing land is 11.9 percent (4.0 percent for the Terai, 4.9 percent for the Hills and 22.1 percent for the Mountain) (World Bank, 1990:8). The large share of grazing land for the Mountain areas is indicative of the fact that livestock grazing is the main agricultural activity in this region. Forest land for the country is estimated to be 38.1 percent but not all forest land is forested; or under tree cover. The land resource mapping project overestimates forest area because it defines forest land as that with at least 10 percent crown cover which is too low according to FAD (US AID, 1986:3). Forest land exceeding 70 percent crown cover is only 15.3 percent. On the other hand, over a quarter of land designated as forest land is heavily degraded, with only 10 to 24 percent crown cover

(Kenting Earth Sciences, 1986a). It was estimated from Land Resource Mapping data of 1979 that Terai forests had only 64 percent Crown Cover, Siwaliks had 54 percent crown cover and High-middle mountains only 41 percent Crown Cover.

The land use pattern in Nepal by Physiographic region is shown in Table 1.

Table 1
Land Use in Nepal by Physiographic Region (1000 ha.)

Use Region	Culti- vated	Non-Cul- tivated inclusion	Grass land	Forest Land	Shrub Land	Other Land	Total
High Himal	7.8	1.9	884.2	155.2	66.6	2233.9	3349.6
High Mtn.	244.4	147.2	509.9	1631.5	181.3	244.7	2959.0
Middle Mtn.	1222.5	665.4	292.6	1794.1	409.3	60.6	4444.5
Siwaliks	258.8	55.3	20.7	1444.7	31.3	70.3	1885.1
Terai	1234.6	117.1	49.7	591.3	1.4	116.1	2110.2
Total	2968.1	986.9	1757.1	5616.8	689.9	2729.6	14748.4
Percent	20.1	6.7	11.9	38.1	4.7	18.5	100.0

Source: Adapted from Kenting Earth Services, 1986a, pp. 46-94.

THE FOREST SECTOR IN NEPAL

Agriculture contributes about 56 percent of total GDP of which 10 to 15 percent of GDP is contributed by the Forestry Sector only. Employment provided by the forestry sector is about 1.4 million full time jobs of which four-fifths are, however, in non-monetary occupation such as fuelwood and fodder collection (IDS/FAO, 1990). Forests are the source of almost 90 percent of rural household energy needs and in the Hills provide about 85 percent of livestock fodder converted to animal manure which is the basic source of fertilizer for Hill farming (World Bank, 1990). Apart from the above mentioned benefits, forests are vital for the control of flood and land slides, for the maintenance of ecological balance and for forest based industries. National forests are also the main elements of national parks and wildlife reserves and can play an important role in attracting tourists and generating much needed foreign currency earnings.

In Nepal, almost every known forest type, with the exception of equatorial tropical rain forest, is found because of an equally wide range of climatic and topographic conditions. Forests above 2600 m. consist mainly of evergreen conifers oaks, and Rhododendron with juniper and birch at higher altitudes. Much of this forest is over-mature and not easily accessible. In the hills and foothills Fir Rhododendron and oak predominate at higher altitude giving way to Chirpine, Prunus,

Castanopsis, Schima Wallichii and Alnus at medium elevation, and ultimately at lower elevation to Sal (Shorea Robusta), a hard wood.

Stainton (1972) identified about 35 types of forests in Nepal varying from alpine to tropical vegetation. However, four major forest zones are typically identified in Nepal as follows:

Up to 300 m. above sea level - Tropical and subtropical forests

Up to 301 - 800 m. - Subtropical and riverine forests

Up to 801 - 2000 m.- Subtropical and sub-temperate hill forests

Above 2000 m.- Temperate and Alpine forests.

Due to its altitudinal and climatic variations, the river system and vegetation types, Nepal also has a very large and varied plant and animal life. Eastern Nepal shares some of the wildlife characteristics of Southeast Asia, while the drier Western section has animals also found in Kashmir (India) and middle east. In Nepal more than 100 species of mammals and 850 birds have been recorded. There are about, 10 thousand plant species in Nepal of which over 6 thousand species have been identified. The main wild animals in subtropical low land area are Tiger, Elephant, One-horned Rhinoceros, Black Buck, Spotted Deer, Swamp Deer etc. As one goes up in temperate climate the main animals are Musk Deer, Snow Leopard, Redpanda, Yak etc. and many spectacular birds. Out of these 20 animals and 4 birds are officially protected by law (Joshi, 1989).

DEFORESTATION AND DEGRADATION

Nepal's forests have been exploited in a variety of ways during the past several centuries (Mahat et. al., 1986a and Wallaca, 1988). Degradation of the high altitude forests had not occurred until very recently because of low population pressure and inaccessibility. Only recently these forests are being encroached due to heavy loss of forests in the middle hills and the increase in tourism. In the middle hills, forests have been degraded mainly due to consumption by the local communities. During the 18th and 19th centuries, however, the hill forests were cleared also for agriculture with the government's desire to extend territorial control and revenue from land. Many authors have claimed that heavy deforestation had already occurred more than a century ago, largely due to the land use and taxation policies of the time. In recent decades the pressure on the hill forests is not only due to encroachment of agriculture but also due to increasing demands of fuelwood and fodder inputs to the Hills Village Farming System (ERL, 1989, Mahat et. al., 1986a).

Exploitation of Terai for commercial purposes began during the Rana regime. When timber was exported and lands were granted in the form of Birta. Since then, and especially after mid 1950s, Terai forests have been heavily cleared for resettlement, raw materials for industries and legal and illegal export of forest products to India. The maximum destruction of forest took place in 1979/80, the year of the referendum when 2144 thousand cubic ft. of log timber, 1170 thousand cubic ft. of sawn timber, and 3126 thousand quintals of fuelwood were sold. After the referendum these annual amount have declined but are still from being sustainable.

It is generally agreed that the point of departure of heavy deforestation in modern times is the nationalization of forests in 1957 which the rural people considered as an appropriation of their property rights. The act of 1957 created a conflict between the parochial interests of villagers and national interest at large (Mahat et. al., 1986 and Bajracharya, 1983). Following the nationalization of forests, Nepal passed a number of laws regarding forest management. But these have been counter productive because the government had neither the technical capability nor the manpower to manage forests on a wide scale, especially in the hills.

There are various conflicting reports of deforestation in Nepal in recent decades. For example a recent newspaper report claims that satellite photos and ground surveys show Nepal's mountains may have more trees today than 30 years ago (Drogin, 1990). Compared the results of the 1964 and 1979 surveys in order to estimate changes in forest areas of crown cover. The rate of change of forest area in the high and middle mountains was found to be negligible. The Siwaliks lost 15 percent, Terai 24 percent and whole Nepal (excluding high Himal) only 5 percent of forest area between 1964/65 and 1978/79. Therefore, Wallace (1988) remarks, "Except for the Terai, forest areas is pretty much what it was 25 or even 100 years ago. The forest has been lost in valleys and areas where access to inputs or outside employment makes conversion profitable."

However, the area of forest as defined in these surveys does not given an indication of the degrading quality or density of the forest stock (ERL, 1989). It is true that forest area has significantly declined only in Terai but the hill forests too are heavily degraded. Even the comparative analysis of 1964/65 and 1978/79 figures for the proportion of forest area in different forest density classes, measured by percentage crown cover, shows a significant deterioration in forest quality.

As Table 2 shows between 1964/65 and 1978/79 the percentage of forest of greater than 70 percent crown cover in the middle hills has fallen from 40 percent to only 13 percent. An even more dramatic decline is seen in the Siwaliks. In the Terai, the reduction has not been so dramatic because the principal change has been the outright clearance rather than gradual degradation of forest. Thus, it is clear that Terai forests have been heavily cleared while Siwaliks and middle hills forests have been heavily degraded in recent decades.

Such deforestation (in Terai) and degradation (in Hills) continued, is estimated to cause total disappearance of all accessible forests in Nepal before the end of this century (World Bank, 1978). At present, the degradation and depletion of forests of Nepal are causing accelerated soil erosion, damaging hydrological changes in the land due to reduced water infiltration rates and increased run-off, and reduction in the supply of plant nutrients to croplands. There are controversies, however, regarding the degree of such damages caused of deforestation and forest degradation.

Table 2
Percentage of Forest Area in Forest Density Categories,
1964/65 and 1978/79

Region	Year	Percentage Crown Cover			Total
		10-40	40-70	70-100	
Middle/high mountains	1964/65	18	42	40	100
	1978/79	35	52	13	100
Siwaliks	1964/65	17	42	41	100
	1978/79	11	77	12	100
Terai	1964/65	16	40	44	100
	1978/79	7	56	37	100

Source: WECS, 1986, High Himal excluded.

Some author estimate that rates of soil erosion increase from 8 to 20 mt/ha/year when well managed forests are converted to shrubland. In case of Nepal about 240 million cubic meters of soil are lost to the sea through four major rivers and over 6000 tributaries. This rate is increasing every year due to continued depletion and degradation of forests. Nautiyal and Babor have outlined the effects of deforestation in the hills on the lowland flooding and sedimentation problems as, "with the depletion of the forests in the Himalayas, many previously perennial hill streams are now dry for much of the year. Increased flooding during the rainy season and extended periods of drought are afflicting the northern plains. The once dense forests of the Himalayas helped maintain a shallow layer of topsoil by increasing its water retention capacity and reducing surface runoff and soil erosion." However, the link between deforestation and changes in water regime is difficult to establish due to dearth of sound scientific experiments in the Himalayan region. Gilmour et. al. addressed this issue in their study of a typical Middle Hills region and came up with the following conclusions:

- a. Forestation of heavily grazed grasslands can lead to significant increases in surface soil infiltration capacity as measured by near-saturated hydraulic conductivity. (Hence deforestation will lead to opposite situation).
- b. It is likely to take several decades after initial forestation and protection before the changes in soil conditions approach those of near-natural forest. (But heavy deforestation and degradation will not take decades to have impact).
- c. The increases in surface infiltration rate which can accompany forestation are likely to have no significant effect (however) on the incidence of downstream flooding.

- d. The increase in surface infiltration rate which can accompany forestation could have a major impact in reducing surface sheet and gully erosion because of the reduction in surface runoff from high-intensity short-term rainfall events.

Thus, from their findings, although the authors deny significant relationship between deforestation and major downstream effects on the Ganges Plain, yet they accept the significant impact on local flooding and local hydraulic systems.

DEMAND AND SUPPLY OF MAJOR FOREST PRODUCTS

The most important reason for deforestation apart from agricultural encroachment in Nepal is the heavy dependence of growing rural population on fuelwood, fodder, logs and poles from the forest at rates which increasingly exceed the sustainable supply of these products. The Master Plan (1988) estimated that biomass, including fuelwood, agricultural residues, and animal dung provide 94 percent of total energy consumption, coal and petroleum products provide about five percent, while no more than 1 percent comes in the form of electricity. This is an ironical and deplorable situation in a country with fast depleting and degrading forests, virtually no mineral sources of energy but one of the highest per capita energy consumption is estimated to be only about 485 kg. of coal equivalent the estimated share of fuelwood as 75.8 percent, of agricultural residue as 11 percent and of animal wastes as 8.4 percent (Economic Survey, 1989-90) show both the heavy pressure on forests and misuse of farm wastes which could be alternatively used for improving soil fertility. A recent estimate for rural hills of Nepal by IDS (1990) is per capita household energy requirement equivalent to 683.5 kg. of fuelwood per year of which 96 percent comes from firewood and twigs, mostly collected from nearby forests shrubs and private trees. Note that 1 kg. firewood is equivalent to 16.7 M. Joules of energy and 1 kg. Twig Bushes is equivalent to 15.1 M. Joules, according to WECS conversion table. For the rural hills area the share of firewood alone is about 80 percent in total household energy requirement. On the other hand, total hydroelectricity generated so far is only about 237.8 megawatts which is less than 0.3 percent of the total potential (estimated as 83,000 megawatts). Moreover, even this meagre hydroelectric generation mainly serves the urban centers of the country.

The estimates for fuelwood and timber demand per capita revolve around 1 cubic meter per capita per year according to which about 19 million cubic meter of fuelwood and timber demand can be a conservative estimate for the present. About 3/4ths of this is estimated to come from forests and the rest from trees scattered over private land. In addition, there is another wood stream which is for industrial purposes. Most of this industrial wood comes from the 591000 hectares of natural hardwood forest in the Terai (which is about 10 percent of total forested land). It is estimated that this wood flow (mostly for urban population) is currently running at about 0.3 million cubic meter per year (USAID, 1986).

The Master Plan (1988) estimated that by 1990-91 the total biomass fuel demand including tree stems, branches, twigs, agricultural residues, and animal dung will exceed supply by 2964 thousand tonnes per year (about 70 percent in central and Eastern Development Regions), this biomass fuel deficit is expected to increase to 3051 thousand tonnes by the end of this century which will be met by overcutting accessible forests where they still exist, by burning more agricultural residues and dung as in Terai (instead of using for animals and soil), and by reducing consumption. In addition the estimated timber demand for 1990/91 is 1510 thousand cubic meter which exceeds estimated supply by 496 thousand cubic meters. This deficit is expected to grow to 1151 thousand cubic meters per year by the end of this century. Thus, if current trend continues this deficit of timber supply will also perhaps be met by overcutting accessible forests where they exist and/or by reducing consumption.

Livestock rearing is a major economic activity in the rural areas and accounts for over 25 percent of the household incomes in the rural hills. On average a typical rural hills household contains 4.9 livestock units (LU). The current estimate of total livestock unit in the country according to Master Plan (1988) is about 9.9 million. If the IDS estimate of LU per household is used, this estimate has to be revised upwards. A best guess would be 10 to 12 million LUs in the country at present. Thus, the total digestible nutrient (TDN) requirement at present is estimated to be between 6.5 to 7.8 million tonnes per year. The Master Plan estimate of total fodder supply for 1990/91 is only 6.7 million tonnes per year. Thus, an aggregate deficit of fodder supply seems more likely to have already started which is expected to be increasingly severe for western and mid-western Terai and middle mountains in the coming years. According to IDS (1990) estimates, the leaf fodder obtained from forest comprises about 21 percent of total fodder supply in the hills. Residues from arable farming, feed from fodder trees, and pasture land meet only about half of the feed requirements of the livestock population in the hills. The rest has to come from forest grazing, or from fodder trees and grass cut in forest areas. Considering the carrying capacity of the open grassland and forest in the hills, this situation indicates serious overstocking with the negative impact on forest lands.

THE VICIOUS CIRCLE OF POVERTY AND ENVIRONMENTAL DEGRADATION IN THE HILLS OF NEPAL

This section outlines the process of interrelations of the poverty of hill people, population pressure, mismanagement of land and forest resources and environmental degradation. It is argued that environmental degradation is both a contributing cause of poverty, and is aggravated by it (World Bank, 1989: 37-38). Poverty and environmental degradation together constitute a vicious circle or a whirlpool entrapping the Hill people of Nepal. As noted by Eckholm, this vicious circle is reinforced by the growth of population in the context of a traditional agrarian technology by forcing farmers onto ever steeper slopes and toward farther and farther forest areas in search of fodder and fuelwood, thus surrounding villages with a widening circle of denuded hill sides (Eckholm, 1976:

77). Eckholm has also suggested that "Ecological deterioration is to a great extent the result of economic, social and political inadequacies it is also, and with a growing force, a principal cause of poverty (Eckholm, 1978:21). Similarly Seddon, sees the possibility of the vicious circle as a systematic feature of the progressive impoverishment and vulnerability of the Nepalese economy and ecosystem and remarks that in Nepal, as in many other countries where environmental deterioration appears grave, it is the small peasants and nearlandless who are most vulnerable to the extreme physical events such as landslides, as well as to the less dramatic but equally crippling slow deterioration of their means of subsistence (Seddon, 1987:111).

Some of the processes involved are briefly outlined below:

- (a) Less and less dung and compost are available as forest cover is reduced which in turn implies poorer maintenance of soil fertility, reduced fertility, reduced production, reduced agricultural residue, further expansion to marginal land by clearing forests and so on. In some areas dung is also used for fuel which implies more dependence on fuelwood as dung supply is reduced. Simultaneously, the depletion of grazing land leads to poorer quality animals which yield less in products and labour value. In response larger number of lower quality animals are kept, aggravating the over-grazing problem.
- (b) Environmental decline also increases the time spent (specially of women) on fuel and water collection, thus reducing the time for other household and productive activities. Moreover, children (especially daughters) have less time for education, families curtail cooking time (affecting nutrition level) and water shortages increase sanitation related health problems such as parasite infestations and diarrhoeal diseases. The cumulative impact of all these phenomena is increasing poverty.
- (c) Among other factors, ignorance, lack of education, lack of employment opportunities for women (which lowers the opportunity cost of having babies) and prevalence of child labour lead to population growth which increases pressure on an already intensively used land resource base, compelling farmers to expand cultivation into marginal lands due to lack of off-farm employment opportunities. As pressure is mounting for bringing more land into cultivation, farmers are moving into the steeper land which so far had served as grazing land or existed as forest land. This process is reinforced by diminishing loss of top soil and increasing livestock pressure. As a result, forest cover has seriously deteriorated contributing to further decline in fertility of farm lands.
- (d) This vicious circle generated by population growth and inappropriate land use practices has also resulted in the exodus of hills people towards the Terai which is itself constrained by limited agricultural land, increasing urbanization and resettlements, degrading natural resources (especially forests), and diminishing prospects of new employment generation.

- (e) Of course, it is true that in the hills, natural forces are far more stronger in contributing to erosion, rock and land slides, mass wasting, river-bank cutting and gullying. It is argued by some authors (Laban, 1979) that many landslides, possibly 70 percent would have occurred in the Himalayas even if man had never lived here. Yet the imbalance between population and available resources has accelerated the phenomenon. The human factors contributing to erosion and land slides, free overgrazing of grass land and shrubs, lopping off of tree branches for fodder and cutting down of trees for fuelwood, logs and poles. The removal of the forest and the layer of decomposing leaves causes less water being soaked in the soil, greater surface run-off and washing away of fertile top soil. Besides, the overgrazing and repeated burning expose the surface of the soil so that falling rain loosens soil particles and moves them down slope. Moreover, the repeated trampling by domestic animals have compacted the soil so that water runs off even more quickly and causes gullies to form. But above all, expansion of farming on to unsuitable and unstable land (e.g. steep slopes, shallow soils and places overlying unsuitable rock formations) starts or aggravates soil erosion and landslides. These human factors in turn are the results more of poverty and struggle for immediate survival than of ignorance and stupidity. This is not to say, however, that education and awareness building have no importance. But educational level and farming technology too are related to economic status of the people. Thus, economic poverty is the parent, as well as the child of environmental poverty in the Hills of Nepal.

THE GOVERNMENT'S POLICY AND FORESTRY-PROJECTS IN NEPAL

This section briefly summarizes the past and present policies of the government related to forests and forestry in Nepal and also highlights the common features of the various forestry projects being implemented in the country.

The Government's Strategy for Forestry Development

It took about 20 years for the government of Nepal to realize the counter-productive nature of the nationalization act of 1957. Only after the resource deterioration was out of control, local needs were increasingly unfulfilled, the surviving forest based industries were under-supplied and most of the accessible forests became exposed, naked and eroded, the government realized that the involvement of the local community in the conservation and development of natural resources is the only effective solution to the growing crisis. This realization led to the formulation of a National Forestry Plan in 1976 which stressed the need to initiate a community forestry program to meet local demand for fuelwood, fodder and other forest products by involving local people in the protection and management of forests. In 1978, the government introduced a radically new legislation whose objective was to return (gradually) the ownership and management responsibility of forests to villagers living nearby (or the actual users).

The Sixth Five Year Plan (1980/85) gave priority to community forestry development and afforestation in the hills, to develop projects which emphasize people's participation in the protection and development of forests and to develop projects which increase the availability of forest products. The estimate is that during the Sixth Plan period 11.68 million saplings were planted in 37 thousand hectares and 14.71 thousand km. of forest fencing was completed under the forest development program. Though the achievements were encouraging relative to set targets, the progress cannot be considered remarkable against the prevailing problems. Since the programs were not formulated in accordance with the actual need, the gap between demand and supply became wider. The Seventh Plan (1985/90) realized that small scale efforts would not solve this critical situation, and that if afforestation is not carried out on a war-footing the situation will turn from bad to worse. Therefore the Seventh Plan emphasized the protection and improvement of the forest estate and protection of the environment, especially watersheds. Special emphasis was given to community involvement in the achievement of these objectives. More precisely the government planned to intensify the level of people's participation in the management, conservation and utilization of the forest resources, to encourage the establishment of private nurseries and plantations, to implement small scale soil conservation works in erosion-prone areas, to develop and provide improved stoves and to strengthen the capabilities of the Community Forestry and Afforestation Division to provide support to all other projects with a Community Forestry Component. In 1981 a high level body the 'National Commission for the Conservation of Natural Resources (NCCNR)' - was formed to coordinate all the ministries and departments involved in restoring and improving the quality of environment and in rational use and management of natural resources.

With the financial support from FINNIDA and ADB the government of Nepal completed the formulation of a Master Plan for the Forestry Sector of Nepal in 1988 with the following strategy:

- a. Phased handling-over of all accessible hill forests to the communities which are willing and able to manage them;
- b. Entrusting the task of protecting and managing the forest to User Groups, who would receive the revenue arising from the forest and spend on forest improvement;
- c. Formulation of management plans and simple management agreements to regulate harvesting, management, and reforestation;
- d. Exercise of daily management decisions by Users' Committees, of which at least one-third of the members should be women; and
- e. Retraining of Ministry of Forests and Soil Conservation Staff for their new role as advisors and extensionists.

While the Master Plan was being prepared, other relevant exercises were also being carried out. The first was the National Land Use Planning Project funded by the Asian Development Bank. The second was the National Conservation Strategy for Nepal prepared by HMG/N in collaboration with IUCN. The third was "A Study of Feasible Policies, Institutions and Investment Activities in Nepal with Special Emphasis on the Hill" supported by the ODA and the World Bank. However, the Master Plan does not seem to have taken the advantage of these recent reports and findings. Moreover, the Master Plan ignores the basic cause of forest depletion, i.e. land hunger, and adopts highly ambitious development targets.

Table 3 below shows the various land use policies adopted in the last three five year plans. Unfortunately the government of Nepal has not been able to guide the sectoral master plans (including agriculture and forestry) according to the land use policies announced in the different plans. This is because the government has been unable to clarify and reconcile those policies and to develop a long-term perspective on land use simultaneously for development and environmental protection.

Forestry Projects in Nepal

At present there are 12 externally assisted projects providing support for community forestry related development activities in Nepal. The development works undertaken by these projects cover 68 of the 75 districts of the country with the main emphasis of field activities being put on plantation, and to a lesser extent, an improved forest management practices. The total area of plantation by these projects was targetted over 15,000 hectare for the year 1987/88. Some of these projects also provide training, planning, research and infrastructure development activities, thus contributing to the availability of better trained manpower. The Community Forestry Development and Training Project (CFDTP) of HMG/N/IDA and its technical assistance component in the Community Forestry Development Project (CFDP) supported by UNDP/FAO is the largest community forestry project in terms of regional coverage of 29 hill districts. A cost-benefit evaluation of this project was recently performed which found the economic IRR to be about 21 percent even without including indirect benefits like erosion control and employment generation (IDS, 1990 and Guru Gharana and Sharma, 1990).

The major policies relating to community forestry development are almost the same in all projects. Plantation in degraded forest lands and gradually handing over of forests to communities for proper management is one of the major components of community forestry. Emphasis on private plantation of fodder and fuelwood trees is another component of these projects. Besides, extension and motivational activities are also found in most community forestry projects. However, there are also several divergences in the emphasis and implementation procedure of these projects. Despite the favourable evidence of localized successes of some of these projects, they have not been able to arrest the problem of heavy deforestation and degradation of forests. Some of the major problems with these projects are:

Table 3
Policies Related to Land Use, Nepal

Fifth Plan (1975-80)	Sixth Plan (1980-85)	Seventh Plan (1985-90)
<p>I. Land Use Policy (Chap. VI)</p> <p>1. Mountain Region:</p> <ul style="list-style-type: none"> - Promotion of livestock development. - Intensification of agriculture on cropland. - Wild life conservation and protection. - Encourage tourism. <p>2. Hill Region:</p> <ul style="list-style-type: none"> - Control of extensive cultivation for watershed protection. - Intensive afforestation including tree fruit plantation. - Intensification of agriculture on cropland. <p>3. Terai Region:</p> <ul style="list-style-type: none"> - Resettlement on 62,900 ha. land. - Protection of forest on river banks and Bhavar zone. - Wild life conservation in selected areas. <p>4. Watershed Protection:</p> <ul style="list-style-type: none"> - Emphasis on erosion control of watersheds. - Flood control through afforestation. <p>5. Research:</p> <ul style="list-style-type: none"> - Survey of erosion prone and flood affected areas. <p>II. Population Policy (Chap. IV)</p> <p>4. Population Redistribution</p> <p>Increase (through migration), the density of population in the Terai, specially Western Terai.</p>	<p>I. Environment and Land Use Policy (Chap. XIII)</p> <ol style="list-style-type: none"> 1. Population control. 2. Watershed protection through afforestation and river control. 3. Strengthen organization for soil and water conservation. 4. Survey and extension of areas for endangered animals. 5. Divert manpower to forest and agro-based industries to relieve pressure on cropland and extend forest and pasture on marginal land. 6. Discourage non-agricultural activity in irrigation command area and other agricultural land. 7. Review and revision of rules for rational management of urban land use. 8. Creation of a National Commission on watershed and Environment Management for Coordination. 9. Drafting of laws/regulation regarding water and air pollution. 10. Environmental education. 11. Environmental consideration regarding the implementation of large projects. <p>II. Regional Development Policy (Chap. XI)</p> <ol style="list-style-type: none"> 1. Regional Specialization <ul style="list-style-type: none"> - Livestock development in the mountain region. - Horticulture and cottage industry in the hill region. - Food and cash crops in the Terai. 	<p>I. Environment* and Land Use Policy (Chap. IX)</p> <ol style="list-style-type: none"> 1. Restrict settlement on marginal land. 2. Demarcate cropland and afforest marginal land. 3. Extension of urban and suburban area. 4. Production of fuelwood and fodder in forest area, and agriculture around high-density population area. 5. Plantation of deforested hills including activities to control erosion. 6. Encouragement of scientific management on slopes exceeding 30 degrees to control soil erosion. 7. Afforestation to preserve water resource. 8. Mobilize people's participation for river control. <p>II. Regional Development Policy (Chap. XVII)</p> <ol style="list-style-type: none"> 2. Determination of investment allocation on the basis of proper mobilization of regional and sub-regional resources (through assess of agricultural, forest, land use, livestock, cottage industry and energy sectors). <p>*The Environment section has 10-point policy relating exclusively to environmental protection issues.</p>

Source: National Planning Commission, Plan documents - Fifth, Sixth and Seventh.

- a. Their coverage in terms of total forest land is quite small;
- b. These projects ignore important activities like agro-forestry, pasture development and soil conservation;
- c. Their primary focus is new plantation instead of forest management;
- d. The rate of survival of planted seedlings has been quite low (50 percent to 60 percent in community forests) mainly due to poor quality and small size of seedlings, premature planting, damage caused by grazing animals, plantation of species unsuitable to the local environment, and adoption of less than satisfactory planting methods;
- e. Lack of trained and efficient manpower in adequate number and organizational inefficiency; and
- f. Last but not the least, failure to enlist active participation of local people and forest users in the preparation and implementation of management plans and in plantation and protection. The awareness of local people has not been significantly enhanced as the extension approach is ill-organized, methodologies are underdeveloped, and extension tools are limited. The extension methodologies are usually limited to occasional meetings, group discussions, educational tours of local leaders, and seminars which, however, do not generally include the main target groups. Besides, the motivational skills of field staffs are quite limited.

CONCLUSIONS AND RECOMMENDATIONS

1. Although fragile in nature, the Hill environment has the capability of reviving if proper and integrated interventions are made as illustrated by some successful forestry development projects in the hills. Therefore, community forestry development projects in Nepal should continue but these must also be complemented by other programs such as promotion of private and leasehold forestry, agro-forestry, pasture development and erosion control. At the same time, alternative sources of energy such as hydro-power solar power and biogas have to be developed and supplied also to the rural areas so that the heavy dependence on forests for fuelwood is reduced. The demand side intervention can also include fuel-efficient stoves distribution provided the problem of high breakage rate is solved, maintenance is made easier, pot carrying and log sizes can be varied according to household needs and alternative designs are provided to suit local cooking habits and preferences.
2. In case of the hill economy of Nepal, development is not antagonistic to environment (as is generally believed in case of industrialization and urbanization) because poverty is the basic cause of poor land management, and the consequences of poor management is

deepening poverty. However, it should also be pointed out that technological fixes such as "high input" in agriculture and terrace improvement for better land management are peripheral prescriptions. The higher cropping intensity and terrace farming is the elemental device of the poor farmers with poor land quality to deal with adverse slope rather than a result of native ignorance (Gurung, 1987). The main agenda of highland development should include reconciliation of land use conflict, reduction of demographic pressure and development of alternative sources of energy. As people on the frontier the hill people struggle for survival contending both with natural risks and exploitation by the centres of economic and political power. So alleviation of their poverty will require their active participation and will contribute to less damage to the environment and thus minimize risks (Gurung, 1990). Furthermore, it is to be strongly recommended that the poverty alleviation program for the hill people should not only consider agricultural development, but should also emphasize alternative employment opportunities such as small scale industries, construction works and tourism so that the pressure on land and forest for income earning is mitigated. These economic interventions, though indirect, are those which will have sustainable and cumulative positive impact on environment by converting the vicious circle of poverty and environmental degradation to the virtuous circle of prosperity, better land and forest management and environmental protection.

3. Because of disparities in population expansion, regional environmental development planning is needed which incorporates environmental and economic parameters. More specifically, all development works that affect the natural land setting should be carefully planned taking into account the basic land use concepts so that there will be minimum adverse impact on the natural environment. For this sufficient up to date and accurate information have to be collected and disseminated among all concerned agencies and multiple use concept of land and forest resource management should be promoted to meet the increasing demand on these sources. Moreover, natural resources should be managed on a watershed basis to facilitate scientific monitoring and evaluation systems (New ERA, 1990:4). Watersheds should be the "most appropriate" physical unit of environmental analysis because watersheds are realistic divisions or boundaries (HMG/N, Department of Soil Conservation and Watershed Management, EIS Project, 1983).
4. Trekking/tourism, though important for foreign exchange earning, has also led to some forest destruction to meet timber and fuelwood needs and has created the problem of garbage disposal. To check this, trekking permits could be restricted on the basis of carrying capacity of trekking areas following the Annapurna Area Conservation Project as an institutional model which followed a substantial field study and the preparation of a multiple land use plan linking conservation, economic development and nature conservation (New ERA, 1990 and Gurung, 1989).

5. Considerable attention is needed to increase the effectiveness of programs in watershed management. Instead of emphasizing the curative measures after damages have already occurred (which is what the Department of Soil Conservation and Watershed Management is doing hitherto), the emphasis should be on preventive measures for controlling erosion damage by building structures (stream-bank stabilization works, check dams, and gully plugs). Furthermore, private landowners and local communities should also be induced to carry out conservation practices for reducing environmental damage. It is unfortunate that the watershed plans prepared by the related Department of HMG/N lack integrated land use planning which involves grazing land management and agricultural soil and water conservation measures. Besides, vegetative soil and water conservation measures should not be neglected in view of their relatively high cost-effectiveness in an integrated program.
6. Finally, it is to be recommended that more advantage be taken of international experience in natural resource management in the hills and mountain environment. The donor community could also play important role in facilitating and encouraging such an exchange of experience across borders. In case of SAARC countries, this aspect of cooperation needs to be explicitly emphasized because of the fact that environmental degradation in one country (e.g. Nepal) is bound to significantly affect another country (e.g. India and Bangladesh). Particularly in the case of Nepal, India and Bangladesh, the overlapping watershed systems and close proximity make regional cooperation for environmental protection even more important.

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