

## WATERSHED MANAGEMENT IN NEPAL

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### Introduction

Ecological degradation has been increasing in Nepal to the point where it has been estimated that over 240 million m<sup>3</sup> of topsoil is being eroded annually from the hills of Nepal to the Bay of Bengal. According to a nationwide inventory of watershed conditions, 13 per cent of Nepal's land area (18,300km<sup>2</sup>) have deteriorated seriously and 10,000km<sup>2</sup> are devoid of sufficient vegetation and are in danger of desertification (Nelson et al. 1980).

There has been a decline both in quality and quantity of forest cover. For fuelwood alone, the estimated annual yield is 6.9 million m<sup>3</sup> while the annual demand is estimated at about 9.9 million m<sup>3</sup> (HMG 1984).

About 22 per cent of the total land area is being used for cultivation (ADB 1982). The cropped area has increased by 10.6 per cent during the period of 1971 to 1981, but yields have declined. Compared to the per unit area of cultivable land, Nepal has the highest livestock population density in the world and this is putting added pressure on land use.

Because of the growing population and also the influx of tourists in the Mountains, there is a severe energy shortage and the forests near settlements are being depleted and are even disappearing, in the search for additional cultivable lands. Out of fifteen mountain districts, watershed conditions are very poor in one (Mustang); marginal in two; fairly good in five, and good in seven. Productivity of land is not subject to significant disturbances. Overall productivity of land is not impaired except in localised pockets near settlements. Soil breakage and movement indicate that meadows on glacial valley slopes in parts of the main Himalayan chain have been overgrazed.

In the Hill areas, 42 per cent is forest land (APROSC 1984) and although there has been no drastic reduction in the number of trees, the quality has declined. Out of 39 hill districts, watershed conditions in five are very poor; five are marginal; ten are fairly good; and two are good. Annual erosion rates are very high for grazed land, followed by scrub land and terraced land (Flemming 1978). The soil loss of overgrazed land can be as high as 34t/ha (Pereira 1980). This erosion has led to frequent downstream flooding and has also been exacerbated by lack of attention being paid to the fragile slopes in the construction of roads and other soil disturbing civil works.

The steep hills of Nepal support approximately 60 per cent of the country's livestock population, which is increasing year by year. This extreme pressure has led to the destruction of the fodder resource base, and therefore a reduction in the productivity of the animals. The hill area is dominated by small, fragmented farms with average land holdings of 0.5 ha, 60 per cent of which produce below their subsistence level. The need to expand will result in the cultivation of marginal land which is presently supplying other basic needs such as fodder and fuel.

With the control of malaria in the *Terai*, massive spontaneous migration from the hills has continued since the mid-1950's. About 100,000ha of good commercial forests have been lost to meet the ever increasing demand for agricultural land. The total area of the *Terai* forest is now estimated at 1.4 million ha. At the present rate of conversion, commercial and other accessible forests in the *Terai* may disappear within 25 years.

The shrinking of available fodder resources and increasing livestock population in the *Terai* is not as acute as in the Hills. Nevertheless, inadequate water management of irrigated land and the untrained diversion of water from the streams are causing erosion and loss of soil fertility.

### **Programmes and Policies**

Planning and forest conservation and management only emerged in 1956, with the introduction of the First Five-Year Plan. The second plan, 1962-65, concentrated on scientific methods of data collection, inventory, and other information concerning existing natural resources. Emphasis was put on research in the agricultural sector.

Between 1965 and 1985, there have been four more five-year plans. The first of these fixed output for the production of food grains and cash crops. Forest management plans and the development of medicinal plant cultivation were also initiated.

Despite recognition of the importance of natural resources, no significant programmes for conservation as such, were included in these plans until 1974, when what is now the Department of Soil Conservation and Watershed Management, was established. The Institute of Forestry was also set up, in order to build up the required manpower for natural resource management and conservation.

The priority in the plan period 1975-80, was to create an awareness of the need for soil conservation and watershed management, both at the national and international levels. Programmes in this field were designed and implemented in several watershed areas of Nepal. The plan also conceived of the need to treat agriculture as the lead sector, to upgrade the socioeconomic condition of the local people, and to develop irrigation practices in all areas.

The Sixth Five-Year Plan (1980-85) gave top priority to environment protection. It provided off-farm employment opportunities to reduce the pressure on natural resources, and regulations were formulated to control the environmental degradation likely to be caused by the development of physical infrastructures. Conservation and development of forest resources by means of local community involvement was highlighted; at the same time, emphasis was put on making the people self-sufficient in food production, and on increasing the production of exportable commodities. The National Council for the Conservation of Renewable Natural Resources was established to coordinate the agencies responsible for the conservation of natural resources.

The main objectives of the Seventh Five-Year Plan (1985-90), are to upgrade water resources, to develop agricultural and forest produce, and to maintain a balanced environment through the conservation and improvement of natural resources. Community involvement in projects will be stressed.

Watershed management programmes in Nepal can be grouped into the following:



- o projects being implemented within defined watershed boundaries, to ensure maximum supplies of good quality water, and to prevent and control erosion and sediment discharges;
- o forest, soil conservation, and watershed management activities, a component of multifaceted Integrated Rural Development Projects;
- o sectoral projects designed to address sectoral issues such as forestry management, agricultural development, and livestock management; and
- o those initiated to support other programmes by generating data; land use information, extension techniques, and conservation education materials.

The ministries of Forest and Soil Conservation, Agriculture, and Water Resources, as well as various university units are involved in research related to environmental management. Under the ministry involved in research and training are the departments of Medicinal Plants, National Parks and Wildlife Conservation, and Watershed Management.

## Conclusions

Research studies, trials, and experiments, adopted so far by the agencies responsible for conservation tasks, are mostly based on ad hoc assumptions and are largely limited to curative operations in fields such as agroforestry, planting techniques, seed production, soil and forest mapping, wildlife, ecology and land biomass, land capability studies, and pasture and range management. The studies are modest compared to the extent of ecological degradation. They should be focussed on conservation management and production aspects, and conclusions should be easily communicable, socially acceptable, and economically feasible.

Over the last three decades, several bilateral and international donor agencies have taken a keen interest in the management of natural resources in Nepal. Principal contributions include the establishment of long-range forest policies and legislation; reorganisation of relevant departments in the ministries of forest and agriculture; development of integrated watershed management practices and techniques; the training of technicians in related fields; determination of socioeconomic and institutional mechanisms to promote community participation; development of methods of land resource mapping, inventory, and surveys; and highlighting future research needs. International cooperation and assistance has played a positive role in the promotion of watershed management in Nepal.

Forestry and soil conservation as well as watershed management activities should be implemented in all the districts of Nepal. In the mountain regions, priorities include increasing the productivity of pasture, rangelands, and the community orchards, as well as implementing rehabilitation programmes in eroded areas. Landless and unemployed farmers need to be guided towards employment opportunities.

In the Hills, large-scale afforestation, trail improvement, road slope stabilisation, and terrace improvement are urgently needed. Activities should relate directly or indirectly to the need to increase food and fodder production, and to provide employment opportunities.

The activity recommended for the *Terai* are the planting of grasses or trees along river banks, canal banks, and roadsides, to protect them from erosion and flooding, and also for use as fuel and fodder.