

RESEARCH NOTE

FOREST RESOURCES OF NEPAL: DESTRUCTION AND ENVIRONMENTAL IMPLICATIONS

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Introduction

Forests have been an important component of the earth's environment ever since this planet cooled down sufficiently to support life. Forest is a very important resource for keeping the environment clean and in a balanced state particularly in a mountainous country like Nepal. As a result of population pressure on the forest resources such as shifting cultivation, over grazing, commercial felling of trees and encroachment for agricultural land, forest resource in Nepal is being depleted to a great extent resulting in severe ecological consequences in the form of soil erosion, land slides and flood hazards (Shrestha 1986: 166). It is obvious that destruction of forests also means, at the same time, the destruction of ecosystem of soils, plant communities and animal communities leading to severe environmental consequences (Martens 1983: 2). In recent years, high rate of population growth leading to consequent pressure upon forests has led to widespread deforestation causing severe environmental problems in Nepal. The main objective of this paper is to analyse environmental impact of deforestation in Nepal. This paper, after throwing light on the brief geographical setting, seeks to analyse the importance and pattern of forest resource use, highlights the present state of the forest and analyses the causes and environmental implications of deforestation in Nepal. The analysis is based on available secondary data.

The kingdom of Nepal, which occupies one third of the Himalayan mountain system, is a land of diversity where the terrain is highly complex and the topography extremely rugged. In Nepal, the largest latitudinal

gradient is found within its territory (from 60 metres in the eastern Tarai to 8848 metres above sea level in the Great Himalaya) within the aerial distance of about 150 km. About 75% of the total land of the kingdom is covered by mountains and hills and the remaining part is covered by plains. The most obvious regional differentiations are the plains (Tarai), the hills (Pahad) and the high mountains (Himal) which form the three broad geographic regions with its own distinctive environment. The above mentioned geographic regions roughly correspond to the altitudinally arranged ecological zones of Nepal.

The topographic extremes of the kingdom of Nepal have resulted in vertical distribution of different climatic regions. In Nepal, within a short aerial-north south distance-of about 150 km, four vertically distributed distinct climatic zones, e.g. tropical, sub-tropical, temperate and tundra can be identified. Broadly speaking, the mean temperature for the whole country is about 16°C. increasing from north to south whereas the average rainfall is 150 cm decreasing from east to west (Gurung, 1968: 4) which shows the common characteristics of temperature and rainfall distribution in Nepal. Because of extreme topography and consequent climatic regions, natural vegetation in Nepal range from the tropical luxuriance in the south to the sub-Alpine vegetation in the north.

Importance and Use of Forests

Forests are renewable natural resources that play an important role in maintaining the hydrological cycle, nutrient cycle and maintain climatic balance (Sharma, et al. 1992: 11). Forest constitutes a major resource base because it plays an important role in protecting top soils against soil erosion and land slides, in producing regular flow of clean water, in reducing danger of flooding by arresting the velocity of rain water through canopy cover, and protecting crops and human settlement against destructive natural hazards (Shrestha. 1986-88). Forests also provide valuable organic matter in the form of leaf litter to agricultural lands, fodder to the livestock and medicinal herbs, wild fruits, timber, fuel wood to human beings. Forests are also sources of different kinds of raw materials for industries. Thus the forest is one of the most important renewable natural resource base closely associated with the daily life of the people which keeps the mountain ecosystem in a balanced state.

Forests in Nepal as stated above, constitute the most important resource upon which almost the entire population in the rural areas depends for their

livelihood. Forests are the main source of fuel wood, building materials, fodder for the animals and raw-materials for different forest based industries. Forests still provide food, fuel, fodder and extra income to the villagers through the sale of firewood, timber, medicinal herbs and charcoal. Due to multifarious utility of forests, there has been an increasing population pressure for sustaining their basic life support system (Shrestha, 1986: 177). In Nepal, particularly in the remote areas, people still enjoy traditional rights to utilize the resource through encroachment for agricultural land, grazing animals, cutting wood for timber and fuel purposes. Apart from fuel, fodder and timber, forests have been utilized for fencing, making different kinds of agricultural tools and for other local development and construction purposes such as school and public buildings, bridges etc. In course of fulfilling the basic needs of the people through different uses, forests are being depleted to a large extent leading to environmental consequences.

State of the Forests

Reliable and authentic data on forest coverage and its distribution is still lacking in Nepal. In this situation it is very difficult to assess the actual coverage and extent of forests in Nepal. Time series data pertaining to comparable parameters are nonexistent. Estimates of the area under forest and standing volume of trees are at best based on gross assumption (Bajracharya and Gurung, 1992: 7). Robbe (1954) an U.N. expert on forestry estimated the total land under forest in Nepal to be 33%. After Robbe, the Forest Resource Survey of 1964 based on vertical aerial photographs taken during 1963-64 estimated the area under forest to be 45.47% of the total land area (Sharma and Amatya, 1978). After a decade, Task Force on Landuse and erosion Control committee was formed by National Planning Commission in 1974. The Task Force report estimated the forest coverage to be 34% of the total land area (National Planning Commission, 1974). Likewise the Energy Research and Development Group (ERDG) in 1976 estimated 29.9% of the total area under forest (ERDG, 1976: 115). According to the Sixth Plan (1980-85) the total area under forest was 29% (National Planning Commission, 1980). The statistics on forest cover as estimated in the Sixth Plan was based on the report on the inventory of the Watershed Condition (Nelson et al., 1980), which was based on 1975 Landsat 2 imageries considering forest having 50% or more crown cover (Coalition Nepal, 1992: 5). The Seventh Plan

(1985-90) reveals that the forest area in Nepal was 37.6% (National Planning Commission, 1985: 181). If we compare the figure for forest coverage as mentioned in the Sixth Plan and Seventh Plan, one can very clearly visualize that there has been an increase in the area of forest by 8.6% in Nepal. The figure on forest coverage as mentioned in the Seventh Plan was based on the preliminary estimate made by Land Resource Mapping Project (LRMP). If we rely on LRMP statistics, the data on forest coverage as mentioned in the Sixth Plan was under estimated. The LRMP (1986) calculations were based on aerial photographs and on the definition of forest having 10% crown cover (Coalition Nepal 1992: 5).

Adjusting the LRMP data the Master Plan for the Forestry Sector (1988) has mentioned the area under forest to be 6.2 million hectares (42% of the total land area) on the basis of the definition of forests having 10% crown cover. When the definition of forest having 40% crown cover or more is adopted, the forest area becomes 4.1 million hectares or 28% of the total area (Coalition Nepal 1992: 5). According to the Ministry of Forest and Soil Conservation HMG/Nepal, four hundred thousand hectares of forest were destroyed in the Tarai and Inner Tarai region between 1964 and 1979, and additional one hundred and sixty thousand hectares of forests were destroyed between 1979 and 1985. With the destruction of 0.56 million hectares of natural forests, the total forest area in Nepal has been reduced to four million hectares or about 27% of the total land area of Nepal (The Rising Nepal, 1992). It has been estimated that the desirable area of forest for a mountainous country like Nepal should be about 60% (Sharma et al. 1992: 72) in order to keep the environment in a balanced state. Furthermore, it has been estimated the 10-15 hectares of forests are required to maintain one hectare of agricultural land on a sustainable basis (Sharma et al. 1992: 74 citing Ramana, 1989). Because of rapid population growth (2.1 percent per annum 1981-91) in Nepal and thereby leading to intense pressure on forest for fuel, fodder, timber and agricultural land and increasing demand for raw materials for forest based industries, the forests of Nepal are getting depleted every year. The intensity of deforestation in several parts of the country has considerably disturbed the ecological balance (Shrestha, 1993: 34). Moreover, the declining area of the forests in Nepal is reflected in progressively increasing soil erosion, flood hazards, droughts and declining productivity leading to environmental consequences. (Sharma and Manandhar 1981: 85).

Causes of Deforestation

Deforestation is a common phenomena in Nepal. The intensity and seriousness of the problem of deforestation had been noticed as early as 1954 (Robbe 1954). The members of Japanese scientific expeditions noted the phenomena of depletion of forest resources with specific reference to the hill areas in 1956 (Kawakita 1956) and by Hagen in 1961 (Hagen 1961). As a result of accelerating demographic pressure for fulfilling their basic needs the forest resources are getting depleted resulting in severe ecological consequences leading to threatening of the very existence of man himself. The intensity and magnitude of the problem was not that serious until 1957. The enactment of the nationalization of the private forest in 1957 was a landmark in rapid deforestation in Nepal. After nationalization of the forests the villagers reacted negatively, believing that their traditional rights of access and use of forests had been curtailed. As there were no land records, villagers had a strong incentive to destroy the forest so that the land could be claimed as private property after it was cleared and cultivated (Wallace 1983: 24). Migration of population from the hills to the entire Tarai region is a common phenomena which is also responsible for widespread deforestation in the Tarai. Environmental degradation and poverty in the hills are the push factors whereas eradication of malaria in the mid fifties and better economic opportunities in the Tarai are the pull factors of migration of population from the hills to the entire Tarai and Inner Tarai region in the early sixties. Because of uncontrolled migration from the hills throughout the Tarai and inner Tarai, heavy deforestation took place leading to severe depletion of valuable forest resources of the Tarai. It has been estimated that four hundred thousand hectares of forests were destroyed in the Tarai and Inner Tarai between 1964 and 1979. Likewise, planned resettlement programme launched by His Majesty's Government further led to deforestation in the Tarai region.

Increasing deforestation is the direct result of fast rate of population growth, on the one hand, and its varied and multifarious uses to sustain human life in subsistence economy prevailing over the country on the other. Almost all the rural people particularly in the hills and mountains of Nepal depend on forest resources—firewood for fuel, timber for construction purposes, and fodder to feed the animals. Thus the causes for deforestation are well known and the principal cause has been the people and the livestock, leading to enhanced requirement of farmland, timber and fuelwood and grazing respectively. The farmers keep livestock for manure, draught

power and for extra income. Huge quantities of vegetation are consumed by the livestock, either by roaming in the forests or stall fed in the villages. It is estimated that cattle overgraze the land by factor of nine, tearing up grass, crippling trees and eating seedlings before they can grow (Lean, 1983). This has led to negative impact upon regeneration of the forest area. With the increasing number of population and livestock causing ever rising demands per capita, the forests have been irrationally exploited to fulfill the demands. Forest fire is also one of the main causes of deforestation in Nepal. During the dry season (May-June) burning of forests and grassland is commonly used (Bajracharya 1983: 237) to stimulate early growth of grass for animals to graze. This is a forest devastating practice which leads to loss of mulch and exposes top soil to erosion.

Wood is the main source of fuel in rural Nepal. Fuelwood supplies 85% of Nepal's total energy needs (Malla and Shrestha 1983: 90). Each citizen consumes an average of 600 kg. of fuel wood per year. But the country's forests grow only around 80 kg. per person per year (Anker, 1981: 92). In this context Mauch, who conducted research work on fuel wood requirements in the eastern hills of Nepal, states that the consumption of forest products in the region is estimated to be higher than the forest reproduction rate by a ratio of about 3:1, and concludes that if the present rate of forest use persists, within 3 to 4 decades the remaining forests will be depleted (Mauch 1976: 127).

Because of lack of employment opportunities other than the subsistence agriculture, the people of the rural areas are forced to engage in deforestation activities such as charcoal making, sale of firewood, slash and burn agriculture, over grazing by animals, and unscientific exploitation of the medicinal herbs, specially rhizomes of the herbal plants (Shrestha 1986: 187). These activities coupled with food scarcity as in indirect cause have further led to deforestation to compensate for the declining land productivity on the one hand and the ever rising population and consequent demands for more food on the other. It can be further emphasized that deforestation in Nepal has been a continuing process to mainly due to the extension of agricultural land into what used to be forest (Bajracharya 1983: 228). This very process of deforestation for the occupancy of agricultural land is much in evidence in the hills of Nepal. Furthermore, the practice of slash and burn agriculture in the remote hills has also led to serious deforestation problems.

Before the abolition of the provision of commercial exploitation, contract and auctioning of the forests, wanton deforestation took place everywhere. But at present such devastating practices have been legally prohibited. Furthermore, over the years, mainly due to development activities such as construction of roads and extension of high power transmission lines have also led to serious deforestation along the alignments. In course of construction of roads and high power transmission lines, large number of trees were cut for melting tar and for the personal use of the workers as fuel and timber for temporary sheds. This has put a heavy burden on the surrounding forests along the sides of the roads.

Development of industries and tourism have also negatively impacted on the forests of Nepal. In the historical past, there were some traditional iron and copper mining and smelting industries in the hills of Nepal. But those activities have ceased since the last few generations because of the shortage of fuel resources. While those industries were in operation they were responsible for heavy destruction of the forests for making wood charcoal for fuel purposes (Acharya 1976: 73). Similarly, the establishment of an intensive carpet industry in the Solu valley (Eastern Nepal Himalaya) implied even more dramatic consequences. The dying process of wool requires a lot of firewood. This led to wide destruction of forests near the settlement in less than 15 years (Schild 1976: 8). In recent years, the soaring number of tourists and mountaineers in Nepal is damaging the ecology of the Himalayas. The heavy influx of trekkers and mountaineers in the Himalayas have created a booming trade of fire wood for local villagers, and they are depleting forests in the ecologically sensitive areas causing heavy deforestation especially along the trekking routes (Shrestha 1976: 90). One trekker-with his party of porters, kitchen help, and guides - consumes as much wood as ten Sherpas, and the impact on the forest is devastating (Bishop 1988: 629). The problems of deforestation have been further aggravated by mushroom growth of the lodges, hotels and restaurants along the trekking routes and in the tourist destination areas which require a huge quantities of timber for construction. Wood planks are also used for roofing the rural house especially in the mountains below timber line. The demand for wood in the rural areas for housing and construction purposes is lower, but it is cut with extremely low effectiveness. For 1m³ of construction wood and shingles about 10-20m³ of timber is cut (Mauch 1976: 125). This has also led to widespread deforestation in the upper hills

and mountains of Nepal. Because of increasing rate of deforestation, Nepal in the recent years is facing severe environmental consequences.

Environmental Implications of Deforestation

Deforestation is a serious problem in Nepal. If the present process of deforestation continues in the years to come it can be predicted that the forest resource base will no longer be able to meet the basic needs like timber for construction, fuelwood for cooking and heating, fodder for livestock and land for cultivation. The deforestation process and expansion of farmland on more and more marginal areas (not based on agricultural capabilities) in the Nepalese hills and mountains have resulted in changing landuse pattern. Over exploitation and mismanagement of the deforested land along the hill slopes have set in the process of environmental degradation in the valleys right upto the Tarai in the form of debris deposition, flood hazards and droughts. Thus, loss of fertile agricultural lands along the valleys in the middle hill region of Nepal has lead to the decrease in agricultural production, forcing the people to occupy more marginal and ecologically sensitive steep hill slopes at the cost of the forest for cultivation leading further to severe environmental degradation (Shrestha 1994: 140).

The destruction process of forest resources in Nepal has resulted in climatic changes leading towards aridity and loss of organic topsoil. It is estimated that every year the monsoon rains wash away more than 12 tones of soil from each acre of the hill side. In the worst areas 80 tones of soil are ripped from each acre (Lean, 1983). The process of soil erosion in turn has lead to sheet and gully erosion, land slides, flood hazards and droughts. The effects are permanent lowering of soil productivity with a high degree of instability and frequent crop failure, changing the hydrological cycle by increasing run off, reducing water retaining capacity of the soil and increasing silt load in the river beds along the valley and plain areas (Shrestha 1983: 97-99). The present pattern of forest resource use in Nepal has led to severe deforestation which has a direct impact upon soil erosion and landslides. Because of alarming rate of deforestation in Nepalese hills and mountains, soils have been eroded in different forms. The soils which are denuded soon become compacted leading to immediate run off causing further massive soil and gully erosion and land slides. The run off water cannot infiltrate into the compact soils, and this causes reduction in ground water table level further leads to drying up of springs and streams which are

important sources of drinking water and irrigation. Furthermore, deforestation leads to loss of bio-diversity which is crucial for sustaining human life and livelihood. In recent years because of uncontrolled deforestation the bio-diversity in Nepal (both the plants and the animals) has been threatened to a large extent leading to severe problems to preserve the dwindling bio-diversity.

Because of widespread deforestation in the watershed of the rivers along the upper hill slopes, the incidence of flooding of swollen rivers flowing down from the hills has been increasing every year. It has been observed that some of the river beds in the Tarai area are rising 15 to 30 cm every year (Rana 1976: 115). This in turn has resulted in changing the course of the rivers causing serious damage to the lives, property and fertile agricultural lands in the Tarai plain. During the third week of July, 1993, heavy downpour severely hit most of the districts of Nepal causing landslides, devastating floods, and untold misery. The severely affected districts were Sarlahi, Makawanpur, Rauthat and Chitwan. By September 10, 1993 about 1157 persons died along with 67374 families and 4,28,851 persons being affected by the floods. Similarly 15,029 houses were completely destroyed, 18,565 were partially damaged and 36,929 hectares of agricultural land were seriously affected or damaged by devastating floods. According to the press release of the Home Ministry, HMG/Nepal, by September 10, 1993 it was estimated that the country's worst flash flood altogether damaged property worth 4.87 billion rupees (International Forum 1993: 3). The tragedy today is that the level of deforestation in Nepal has reached a critical stage as to make the subsistence lifestyle even more miserable. Moreover, further deforestation in the watersheds of different rivers of Nepal will result undesirable environmental consequences. To conclude, uncontrolled deforestation in Nepal will result in undesirable consequences which beyond a certain stage will become very difficult to reverse the deteriorating environment to a balanced state.

Concluding Remarks

Because of increasing population pressure, forest depletion is, on the whole a general phenomena in the country (Shrestha, 1993: 33). In recent years Nepal's forest resources have been seriously threatened. The obvious causes of deforestation are conversion of forest land to agricultural land, shifting cultivation, forest fire, commercial and illegal logging and poaching in the forest and firewood extraction. Deforestation has upset the balance of other

resource bases particularly the land and water resources. This has caused socio-economic and environmental problems in the form of soil erosion gully formation, land slides, flood hazards, siltation in the river beds and valleys, drying up of springs, droughts in the dry season and degradation of the agricultural land. Consequently the food problem has intensified the problem along with the ever increasing population pressure leading further to deforestation. The twin effects of deforestation seem to be adversely influencing the productivity of agricultural land and stability of mountain and hill ecosystem of Nepal (Shrestha and Sharma 1980: 52). To alleviate the problems of deforestation, greater opportunities to earn a living outside agriculture should be made and much emphasis should be laid on the use of alternative energy to relieve the pressure on forest for fuel wood (RECAST 1981) along with drastic population control measures should be adopted to reverse the problem.

For regeneration of the dwindling forests, massive afforestation programmes involving local people in the barren hills and the watershed areas of large hydropower plants and irrigation projects should be encouraged on a war footing. At the same time, one should realize that regeneration of forests would be impossible unless open grazing and over grazing is stopped. Regeneration of the dwindling forests in Nepal is a great and challenging task that the government alone may not be able to carry out without the active cooperation and participation of the local people. This requires the people to realize that they have a close relationship with the forest resources on which they depend for their livelihood. Moreover, it calls for immediate attention of the planners and policy makers for remedial action for the preservation of the dwindling forests of Nepal.

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