

RESEARCH REPORT SERIES

Number 6

March 1988

FOREST DEGRADATION IN NEPAL: INSTITUTIONAL CONTEXT AND POLICY ALTERNATIVES

Michael B. Wallace

HMG-USAID-GTZ-IDRC-FORD-WINROCK PROJECT
STRENGTHENING INSTITUTIONAL CAPACITY IN THE
FOOD AND AGRICULTURAL SECTOR IN NEPAL

FOREWORD

This Research Report Series is funded through the project, "Strengthening Institutional Capacity in the Food and Agricultural Sector in Nepal," a cooperative effort by the Ministry of Agriculture (MOA) of His Majesty's Government of Nepal and the Winrock International Institute for Agricultural Development. This project has been made possible by substantial financial support from the U.S. Agency for International Development (USAID) and the German Agency for Technical Cooperation (GTZ).

One of the most important activities of this project is funding for problem-oriented research by young professional staff of agricultural agencies of the MOA and related institutions. This research is carried out with the active professional assistance of the Winrock staff.

The purpose of this Research Report Series is to make the results of these research activities available to a larger audience, and to acquaint younger staff and students with advanced methods of research and statistical analysis. It is also hoped that publication of the Series will stimulate discussion among policymakers and thereby assist in the formulation of policies which are suitable to the development of Nepal's agriculture.

The views expressed in this Research Report Series are those of the authors, and do not necessarily reflect the views of their respective parent institutions.

Michael B. Wallace
Series Editor

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FOREST DEGRADATION IN NEPAL:
INSTITUTIONAL CONTEXT AND POLICY ALTERNATIVES

Michael B. Wallace*

ABSTRACT

This paper attempts to place an economic analysis of forest degradation in Nepal within an institutional context. Social institutions--customs, property rights, and more recently formal laws, government agencies, and foreign aid projects--help to balance the demand and supply of forest commodities. These institutions have changed as the population has grown, forest resources have become depleted, and the role of foreign aid has expanded. Prospects for improving the management of forest resources and increasing the production of fodder and fuelwood by returning control of local forests to villages in the context of the community forestry program are assessed. Based on an evaluation of policy alternatives, suggestions are made for increased attention to private incentives for tree planting and local management of the existing forest resource.

Although Nepal's forest is likely to deteriorate further before it improves, the success of some projects and the efforts of some villagers provide hope that the forest can recover. The future of the forest depends on the design and implementation of policies and programs which recognize that villagers' perceptions are the key to rural development, and encourages individuals and communities to act in their own long-term self-interest for everyone's benefit.

Michael B. Wallace is Program Leader, Winrock Institute for Agricultural Development, Kathmandu, Nepal. An early version of this paper was presented at the FAO Expert Consultation on Population and Agricultural and Rural Development: Institutions and Policy, Rome, 29 June - 1 July 1987.

1'

I. CONTEXT OF FORESTRY PROBLEMS

Forest Policy Objectives

Forest policy in Nepal is significantly influenced by economic, social, geographic, climatic, and political factors. Nepal is one of the poorest countries in the world and the prospects for significant conversion from fuelwood to commercial energy sources are dim; regional geographic and climatic differences lead to pronounced differences in local forest resource supply and demand; and the open border with India provides an attractive market for forest products which might otherwise be used by Nepalese citizens.

For Nepal, obvious forest policy goals include efficient production of fuelwood and fodder to meet the basic needs of the growing human and animal populations, and equitable distribution of these forest products to help reduce disparities in living standards. Environmental goals could include the maintenance of sufficient local forest cover to provide water retention capability and reduce erosion. Policy goals might also include the use of the forest as a source of government revenue. Such goals could be pursued through a combination of government forest management, public forest enterprises, and private incentives for local fuelwood and fodder production and marketing.

Among these objectives, Nepal has historically emphasized government revenue and supported public forest enterprises, but the focus of forest policy is changing. Most of the forestry projects currently being implemented by His Majesty's Government (HMG) or through foreign aid projects are attempting to increase fuelwood and fodder production, often in the framework of the relatively recent community forestry legislation. Equitable distribution of increased fuelwood and fodder production is an important objective of community forestry.

Distribution of forest products has received attention primarily through attempts to provide urban (particularly Kathmandu) residents with fuelwood and timber produced in rural areas (particularly the southern plains bordering India). This policy has also had the environmental objective of preserving forest resources near urban areas.

The government has used a variety of sometimes conflicting policy instruments to achieve forest policy objectives. These have at various times included tax assessments to be paid in the form of fuelwood, charcoal, or timber; incentives to convert forest land to agricultural purposes so that state control could be extended and taxes assessed; legislation nationalizing forest lands for the ostensible purpose of improving forest management; fees for collecting and harvesting forest products; and restrictions on forest use. The most recent forest legislation and programs recognize that villagers' participation is the key to development in Nepal, and attempt to encourage and involve villagers in planning as well as implementation of local forest management.

Ecology and Economy

Nepal's forests--once characterized by the proverb, "Hariyo ban Nepalco dhan" ("Green forests are Nepal's wealth")--are disappearing. Villagers cut fuelwood and fodder for cooking and heating and to feed livestock, farmers clear forest land for agriculture, and grazing animals prevent new trees from growing. If current rates of forest depletion continue, Nepal's accessible forest will all be shrub in 35 years (1). This forest depletion, coupled with inherently unstable geology, relatively vertical geography, and the monsoon rainfall pattern, result in high rates of erosion and contribute to declining crop yields.

Nepal is a rectangular country 800 km long and 175 km wide. Geographically, it can be divided into the high Himalayan mountains bordering China, the middle hills, the Kathmandu Valley, and the Tarai plains bordering India (Figure 1). Its population--nearly 90 percent dependent on agriculture--is over 17 million, and grows by more than 2.6 percent each year. Per capita annual income is less than US\$200, and half the people earn less than \$100 (2). Nepal's lack of resources and infrastructure--particularly transportation and communication in the hills--severely limits the prospects for implementing policies designed to significantly improve the economic condition of its rural villagers.

Geology, geography, rainfall. As the Indian subcontinent creeps northward under the Asian land mass, the Himalayan mountains and the hills to the south are pushed upward. This dynamic geology results in a vertical geography (Nepal has the greatest variations in altitude and climate in the smallest area of any country in the world) with rock and soil mantle formations which are inherently unstable and prone to frequent landslides, with substantial natural water runoff. Monsoon rainfall exacerbates this situation: about 80 percent of the rain falls in four months (June-September), when clouds from the Bay of Bengal are blown over the Indian subcontinent by southeast winds, dropping their water on northern India and Nepal when they reach the Himalayas.

As a result of this combination of geologic and climatic forces, natural erosion in Nepal is substantial. A typical hill watershed may have a total sediment contribution of 21 tons/ha/year, or between one and two mm of soil cover per year. However, surface erosion is likely to be less than one-sixth of this total, with most sediment resulting from mass wasting processes (mass wasting is the en masse movement of fractured rock, saprolite and other unconsolidated materials, including soil from a slope, whereas surface erosion is topsoil loss resulting from rainfall or wind erosion) (3). Man's effect on mass wasting is limited, and estimates indicate that at least 75 percent of all landslides in Nepal are natural (4). Erosion may be Nepal's most serious environmental problem, but it is largely outside man's control (5).

Population growth. Nepal's population increased from 9.4 million in 1961 to 11.6 million in 1971 and to 15.0 million in 1981. Growth in the Tarai (4.2 percent per year during 1971-1981) is much higher than in the hills (1.6 percent). Total population, now over 17 million, is increasing at over 2.6 percent per year, and the rate of growth has been rising for 30 years. This leads to growing demands for farmland to grow food; fodder to feed the livestock population which provides manure, milk, and draft power; and fuelwood for cooking, heating, and lighting.

Demands on the Forest: Farmland, Fodder, Fuelwood

Farmland. Although the hills and mountains have more total land per person than the Tarai, cultivated land per person is more evenly distributed, with between four and five people per hectare in all parts of the country except Kathmandu (Table 1). Despite land reform efforts beginning in 1964 which placed limits on land ownership, little land has been redistributed to poor farmers, and land ownership remains significantly skewed. The poorest half of the people, who own an average of barely 0.1 ha per household, now own less than seven percent of the cultivated land, and their position has deteriorated in the last 25 years (6). Even if the population were not increasing, small farmers would need more land in order to grow enough food for their families.

Nepal is falling behind in its attempt to feed its growing population. Total food production has been rising, but this has been achieved by increasing the area of farmland and the number of crops per year, as crop yields have been stagnant. Crop production has not kept pace with population growth, and per capita crop production has declined. From 1961 to 1981, production of major food crops increased by less than 25 percent, from 3.5 to 4.3 million mt (7), while population increased by nearly 60 percent. Yield increases on irrigated land with improved seed have been offset by declining yields resulting from extensive cultivation on steep slopes. As a result, average calorie intake in Nepal may be more than 20 percent below daily requirements (8).

While potential increases in crop yields with improved seeds have been demonstrated throughout Nepal, and the number of crops grown each year can be increased if water is available, some increases in crop production are likely to come from further conversion of forest to farmland, particularly in the Tarai. In the hills, forest was earlier converted to grazing and then to farmland, while in the Tarai people now convert land directly from forest to farmland, and even cultivate land without clearing all the trees. Most cultivable land in the hills has already been converted to farmland, so further increases are likely to come in the Tarai (9). Some experts believe that all the Tarai forest will soon be converted to farmland to feed the growing population.

Fodder. Demand for fodder is probably the greatest pressure on the forest (10). Almost every household in Nepal maintains some animals. Cattle, buffalo, sheep, pigs, goats, and poultry provide manure, milk, meat, wool, draft power, and transportation. The dominant--and state--religion in Nepal is Hinduism, and the cow occupies a sacred position in society, so control of the cattle population is limited. However, while owning cows provides prestige and spiritual merit, economic factors dominate religious sanctions in livestock husbandry decisions (11).

The bovine population in 1962 was 7.7 million (5.7 m cattle and 2.0 m buffalo); by 1981 there were 8.9 million (6.5 m cattle and 2.4 m buffalo), an increase of less than one percent per year. The goat population increased from less than 2.8 to over 3.6 million between 1962 and 1981, an increase of less than 1.5 percent per year. By 1984/85, there were 6.4 m cattle, 2.8 m buffalo, and 4.9 m goats. Per-capita large livestock holdings are decreasing, probably in response to the increased costs of maintaining animals as the forest resource declines, but the goat population is now increasing faster than the human population (12).

One result of the declining forest resource is the increasing preference for buffalo over cattle, and for small ruminants (goats and sheep) over bovines, because buffalo and small ruminants are more efficient than cattle in converting low grade fodder into milk, meat, and energy. Even though religion and national law prohibit cattle slaughter, villagers are finding ways to switch from cattle to buffalo and small ruminants. Buffalo are also preferred over cattle for other reasons: there is no prohibition on slaughter, some ethnic groups eat buffalo meat, and buffalo produce more and richer milk.

Overgrazing by livestock results in the continuing degradation of forests and grasslands. Aside from direct consumption of fodder, grazing animals degrade forest and pasture resources by eating seeds and small tree seedlings, uprooting young grass shoots, and trampling both seedlings and new grass. While fodder consumption does not directly reduce forest area, this may be the main cause of forest degradation leading to increased erosion as a result of depleted ground cover and soil compacting. Goats and sheep--which clip grasses close to the ground--are probably responsible for more overgrazing than cattle and buffalo. Man also over-harvests fodder, and fodder collection often prevents trees from flowering, producing seed, and regenerating.

Fuelwood. Nepal's per capita annual energy consumption--less than 200 kg of oil equivalent--is among the lowest in the world. Fuelwood is the main energy source, and is likely to remain so for the foreseeable future. Domestic use--cooking, heating, and lighting--accounts for 95 percent of all energy consumed in Nepal, and over 78 percent of this is fuelwood (13). For most Nepalese, fuelwood for cooking is their only use of inanimate energy. Nepal's population is growing at over two percent per year. Fuelwood consumption is not growing as fast, because as the forest declines and fuelwood becomes harder to obtain, people switch to other forms of energy such as crop residues in the hills and dungcakes in the Tarai. As forest resources decline and it takes longer to gather the day's firewood, per-capita fuelwood use is probably decreasing (14), but total fuelwood consumption is certainly increasing.

Although earlier estimates of annual per-capita fuelwood use ranged from 0.10 to 6.67 cubic meter (cum) (15), with an average of about 1.0 cum, recent information indicates that national per-capita consumption is now about 0.9 cum (650 kg) (16). However, there is considerable variation in different regions of the country. In the rural hills, consumption ranges from about 0.7 cum in the Central Region to nearly 1.2 cum in the East. Consumption in the rural Tarai ranges from less than 0.6 cum in the Central Region to over 1.4 cum in the Mid West and Far West (17). Urban dwellers use the least of all--less than 0.4 cum. Hill people often consume more than Tarai residents, because they have greater heating requirements, and hill forests are generally still more accessible than Tarai forests. Urban residents consume less than rural villagers because commercial fuels are available and some urban households can afford them.

Transportation cost is the main factor influencing fuelwood cost and thus influencing fuelwood use. In villages, fuelwood cost is often the time it takes to gather wood. Although fees are prescribed by the Ministry of Forests for obtaining wood from the forest, these fees are nominal for fuelwood and are generally not collected. In large towns

there are markets for fuelwood. The Fuelwood Corporation (a government enterprise) and private suppliers sell fuelwood in the larger towns, and in both cases transportation cost is the main factor influencing price.

Substitutes for fuelwood. There are no readily available good substitutes for fuelwood as an energy source, especially in rural areas, but gradual substitution could relieve some pressure on the forest. Hydropower--Nepal's only source of commercial energy--has high construction costs and limited distribution, and will not meet the needs of the rural population in the next 20 years. Biogas is used by some Tarai villagers, but the initial costs are too high for most people, and low winter temperatures in the hills result in inefficient gas production.

In urban areas, people are switching to kerosene, electricity, and LP gas, but these options are possible for only that small fraction of the population which lives in urban areas and can afford to buy these fuels. Fuelwood cost is now so high in Kathmandu that people who can afford the initial investment in a modern stove, and who do not have access to agricultural residues, are switching to other energy sources. Poor people in urban areas are also switching to dung and crop residues.

Alternate sources of energy are not feasible fuelwood substitutes for rural villagers who constitute most of Nepal's population. When fuelwood is no longer available, the rural population will either burn crop residues, depriving animals of one of their main sources of fodder, or will burn animal dung, depriving agricultural crops of an important fertilizer source and the soil of needed organic matter. The only substitute for fuelwood may be increased efficiency in fuelwood use. Unfortunately, improved stoves are being distributed, adopted, and used much more slowly than originally hoped. Increased fuelwood production is the main practical alternative in the near future.

Forest Degradation

Detailed records of forest area and volume are relatively new. Unlike agriculture, the forest has no single harvest each year, so there is no time when production can be easily measured, and fodder and fuelwood use do not mirror forest growth the way food consumption reflects crop production. The harvest of forest products is not recorded by individual villagers or by government officials. Until recently, the forest has not been planted, so the costs and benefits of forest management have not been needed for anyone's accounts. As a result, estimates of forest degradation must rely on limited data.

The first scientific measurement of Nepal's forest resources--often called the 1964 survey--was carried out beginning in 1963 by the Forest Resources Survey Office of the Department of Forests, assisted by the United States Agency for International Development (USAID). This survey was based on aerial photographs taken over a 15-year period--1953 to 1967--and adjusted by strip photographs covering ten percent of the surveyed area. The high Himalayan area--a mostly barren area of three million ha--was not covered at all, and there were gaps in the coverage of the hill region of over one million ha. Total forest area was estimated to be 6.5 million ha, with 5.7 million ha in the hills and 0.8 million ha in the Tarai (18).

The next inventory was carried out beginning in 1977 by the FAO/UNDP Integrated Watershed Management Project in the Department of Soil Conservation and Watershed Management. This inventory, based on 1975 satellite imagery, supplemented by air and ground fieldwork, was carried out mainly to identify the major ecological land units and their watershed conditions. Based on the results of this inventory, the total area of the forest in 1975 was estimated to be 4.1 million ha, with 3.7 million ha in the hills and 0.4 million ha in the Tarai (19).

Unfortunately, these two surveys are not directly comparable, because they used different definitions of forest land. The 1964 survey counted land with more than 10 percent crown cover, while the FAO/UNDP survey included only land with more than 50 percent crown cover.

Air photos from the Land Resources Mapping Project (LRMP) summarized by the Water and Energy Commission Secretariat (WECS) indicate that forest area (excluding the High Himal area) in 1978/79 was 6.1 million ha. The LRMP data provide a much more intensive and complete land use inventory than either the 1964 survey or the FAO/UNDP effort. A comparison of LRMP and FAO/UNDP data for equivalent land types indicates that they agree within two percent. Thus, forest area (more than ten percent crown cover), excluding the High Himal, has declined from 6.5 to 6.1 million ha between 1964/65 and 1978/79 (Table 2). Total forest area has declined from 6.7 to 6.3 million ha. The hills lost less than four percent of its forest area, while the Tarai lost nearly one-fourth (20).

Except for the Tarai, forest area is pretty much what it was 25--or even 100--years ago (21). The forest has been degraded, and area has been lost in valleys and areas where access to inputs or outside employment makes conversion profitable. Only the Tarai has a major area change--otherwise the growing stock is changing but forest area is not. Land suitable for agriculture is being so used--other land remains as forest or shrub, even if it is converted to agriculture for short periods of time. Unfortunately, if unsuitable land is converted to agriculture for a short period of time, it may lose its long-term productive capability. In the Tarai, land converted to agriculture is unlikely to return to forest, even if it is not suited for growing crops.

Precise estimates of the growing stock (volume) of Nepal's forest do not exist. The 1964 survey estimated tree volumes only for the commercial forest, which was nearly three-fourths of the Tarai forest and a little over one-third of the hill forest. Using the assumption that the distribution of stocking classes was the same in the noncommercial forest as in the commercial forest, WECS has calculated total areas by crown cover class. If crown cover is used to measure growing stock, there has been a reduction of 25 percent in 14 years, for an annual average loss of over two percent (22).

Although forest depletion is not new, it is probably only recently that fuelwood and fodder consumption have each exceeded forest growth. In 1964, Nepal's population was 10 million, so fuelwood demand was about 10 million cum per year. Forest area was then 6.7 million ha, growing at a little over 2 cum/ha/yr (23). Thus, annual forest growth in 1964 was well over 13 million cum, sufficient to meet demand. In the past 25 years the population has grown, the forest has shrunk, per-capita use has declined slightly, and now the situation is reversed--annual demand

is over 15 million cum, sustainable supply is less than 7 million cum, and 70 of Nepal's 75 districts have a fuelwood deficit with current forest growth rates (24). Fuelwood demand exceeds forest growth, and forest stock must be reduced to supply energy needs. As this stock dwindles, growth will also decline. Each year more forest stock will have to be cut to meet demand, and the forest resource will dwindle even faster as consumption exceeds growth by greater amounts.

A 1982 study estimated that one hectare of farmland requires 2.8 ha of unmanaged forest to provide sufficient fodder for the mixed farming practiced in the middle hills (25). In 1964, farmland area was about 1.6 million ha, so about 4.5 million ha of forest--less than the existing area--was needed. By 1978/79, cultivated area was nearly 3.0 million ha, requiring over 8.4 million ha of forest, while actual forest area was only 6.3 million ha. However, the total area of forest, shrub, non-cultivated inclusions (small uncultivated areas included in overall farmland statistics), and grasslands is nearly 9 million ha, which could supply sufficient fodder if it were well-managed. The ratio of forest and grassland to farmland in the hills is still well over 3.0 (Table 1).

Estimates of fodder growth rates vary widely (26) depending on tree species, climate, and lopping and grazing practices. Similarly, the amount of fodder a household needs from the forest depends on the availability of crop by-products such as rice straw and maize stover (which in turn depend on landholding size and crop yields). While more research is needed to quantify the fodder demand being met from forest resources in different regions, the loss of crown cover is evidence that fodder demand exceeds supply under current management practices.

Whether compared to fuelwood or fodder needs, current demand for forest products equals or exceeds current demand. In some places farmland demand dominates (27), but overall fodder/fuelwood demand is the primary cause of forest degradation. Local conditions vary from considerable surplus to chronic deficit. Nearly all the fuelwood and fodder deficit is in the Tarai, while in the hills supply and demand are almost equal. Excluding Kathmandu, per capita forest area varies by a factor of more than 70 (from .043 to 3.15 ha), with western and higher districts having more forest than eastern and lower districts (Figure 2).

Calculations of national fuelwood and fodder demand and supply should not ignore trees on private land as a source of forest products. Planting and harvesting of trees on private land varies considerably from area to area depending on current supply of forest products, availability of suitable land, knowledge of tree species, and availability of seedlings. While data are limited, on average about one-fifth of fuelwood and fodder demand is met from private trees, and in some areas as much as half comes from this source (28). This supply can relieve considerable pressure on the forest resource.

The preceding paragraphs illustrate the difficulties involved in making general statements about Nepal's forest. Although earlier fuelwood and fodder requirements were less than forest growth, these demands were not met by uniformly harvesting fuelwood and fodder--needs were met by using forests near villages, so even then deforestation was a problem (29). The use of national average statistics may not be misleading in presenting an overall picture of forest supply and demand, but these

averages aggregate widely varying statistics for different regions, and local data must be used to design policies for particular areas. The forest is a dynamic resource, and private plantings in some areas are having a dramatic impact on the availability of forest products (30).

Hill-Tarai Differences

The hot, flat Tarai--the northern part of India's Gangetic Plain--is almost a different country from the hills and mountains. Its soil is a thick layer of alluvium deposits in contrast to generally shallow hill soils. The Tarai has different forest types, different reasons for deforestation, and thus different forest management problems. Previously a heavily-forested endemic malarial area, the Tarai now absorbs an ever-increasing stream of hill migrants, and by the 1991 census is likely to contain half of Nepal's population. This migration increases pressure on the already limited Tarai forests.

The hills have clusters of trees and clusters of people--there are communities, and community-managed forests. In the Tarai, the division between people and trees is more often linear--villages to the south, and forests to the north bordering the hills. Tarai villages, absorbing an increasing stream of hill migrants, are less stable than those in the hills, and the sense of community is becoming less well-defined.

In the hills the forests are an important source of leaf fodder, commonly collected from the community forest. In the Tarai farmers are using more agricultural residues for fuel and to feed their livestock. In the future, the forest will be a more important source of fuelwood in the hills than in the Tarai: there is less Tarai forest, Tarai villagers have greater access to other energy sources such as kerosene, Tarai land can be more productively used to grow crops, and using dung for fuel affects agricultural output less because chemical fertilizer is more easily available. The relative economics of fuelwood production are less clear-cut: while fuelwood prices are higher in the Tarai, crop productivity is also higher, and current villager practices suggest that it is economical to sell crops and buy fuel. Commercial timber production is more important in the Tarai than in the hills.

These regional differences have resulted in a different history of forest management and use in the Tarai than in the hills, and imply that different strategies are needed to manage these forests in the future.

Notes to Chapter I

- (1) Author's calculation based on Nield 1985.
- (2) In 1976/77, 50 percent of the population earned less than US\$60 (NPC 1978). A more recent calculation indicates that 40 percent of the population earns less than US\$90 (NPC 1986).
- (3) Carson 1985, p.1.
- (4) Laban 1979.
- (5) "Rainfall induced topsoil erosion is greatly increased by man; better land management could reduce this form of erosion significantly. Mass wasting processes are not usually directly related to man's activities... intervention by man to reduce wasting can be very expensive with less clear cut results." (Carson 1985, p.35)

- (6) According to Agricultural Census data, in 1962 households having less than 0.5 ha were 63 percent of the population and owned 12 percent of the land; by 1981 these households were 58 percent of the population but they owned less than 7 percent of the land.
- (7) DFAMS 1983.
- (8) FAO September 1984, p.35.
- (9) See Mahat 1985 for a history of forest land conversion in an area northeast of Kathmandu.
- (10) Wyatt-Smith 1982; Mahat 1985, p.333.
- (11) Rough calculations in Shrestha and Evans (1984) indicate that owning livestock in the middle hills has a benefit-cost ratio of about 1.3:1. This calculation does not value manure or impute an opportunity cost for land used to maintain livestock.
- (12) CBS undated; CBS 1985; MFSC April 1987.
- (13) WEC 1988, p.66.
- (14) Shrestha October 1984; Mahat 1985, p.334.
- (15) Donovan 1980.
- (16) WEC 1988.
- (17) WEC 1988.
- (18) WEC March 1986, p.27.
- (19) Nelson et al. 1980.
- (20) Nield 1985; WEC January 1987, p.62.
- (21) Mahat 1985, p.4; see references in Gilmour August 1987, pp.2-3.
- (22) Nield 1985, p.23; WEC January 1987, p.62.
- (23) 1964 estimates for hill commercial coniferous species ranged from 0.92 to 2.32 percent of the growing stock per year, and implied an average growth rate of 1.45 percent per year, or 2.1 cum/ha/yr for all forest given the density of the forest then (FSRO 1973).
- (24) WEC January 1987, p.104.
- (25) Wyatt-Smith 1982. This study estimated that one ha of agricultural land requires 0.24-0.48 ha for fuelwood, and 0.32 ha for timber. These calculations assumed that forest growth is 5-10 cum/ha/yr for fuelwood and 5 cum/ha/yr for timber, and that only 50 percent of fuelwood needs come from the forest. Using a rate of 2 cum/ha/yr--consistent with current degraded forest condition--fuelwood and timber needs per ha of farmland are 2.4 ha and 1.6 ha respectively.
- (26) Hopkins 1983 estimates that yields can range from 1000 kg/ha/yr to 7000 kg/ha/yr.
- (27) D. Bajracharya 1980.
- (28) Wyatt-Smith 1982; WEC 1988, p.21; Mahat 1985, p.237; Condori 1985, p.9; see Gilmour August 1987 for a description of changes in tree cover on private land.
- (29) Ives 1987, p.196 provides a description of the "nibble effect."
An FAO forestry expert reported in 1954:
"Deforestation is the rule, particularly in heavily populated areas where more cropland, grazing land, lumber and fuelwood are needed. Such deforestation frequently assumes disastrous proportions; the shortage of timber results in the use of manure for fuel, so that the unmanured land becomes impoverished, yields shrink, and erosion reduces the cultivable area. All of this forms a vicious circle that it appears difficult to break without a radical change in all such practices." (Robbe 1954)
- (30) See Gilmour August 1987.

Figure 1. Physiographic Map of Nepal by District

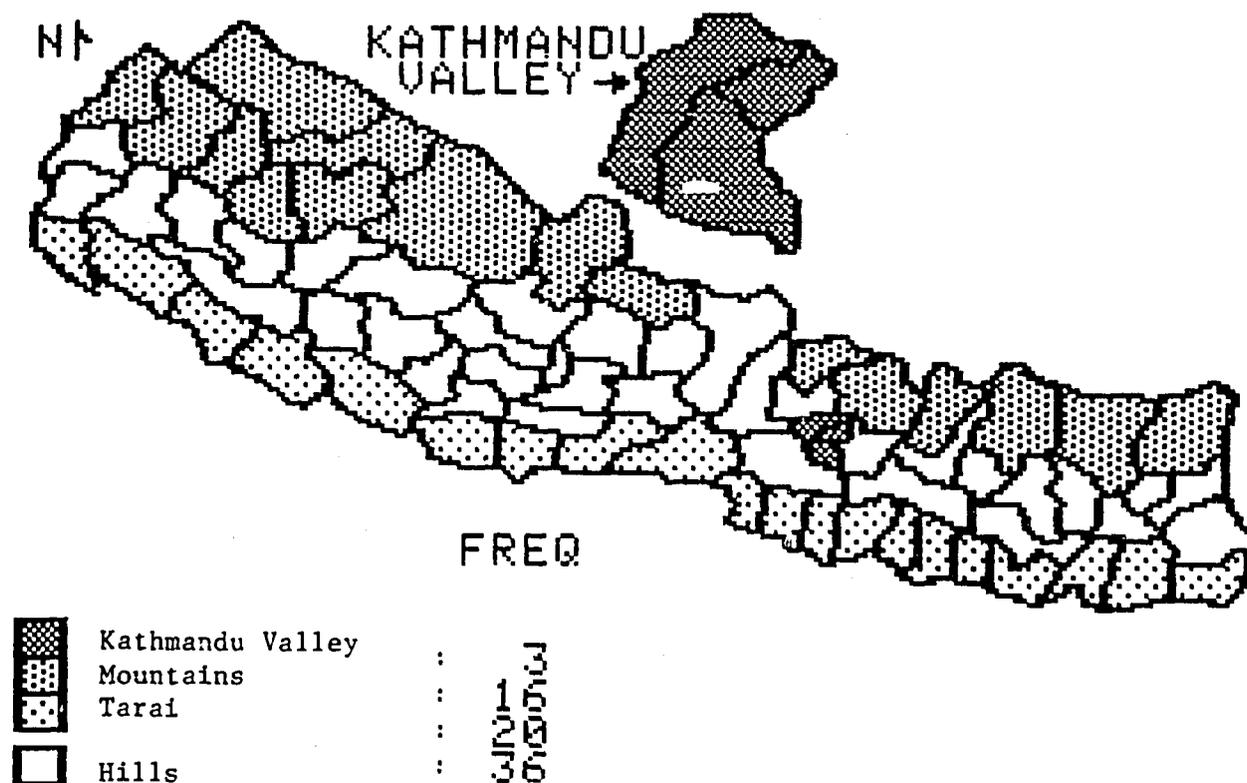


Figure 2. Per Capita Forest and Shrub Area by District, 1978/79 (ha)

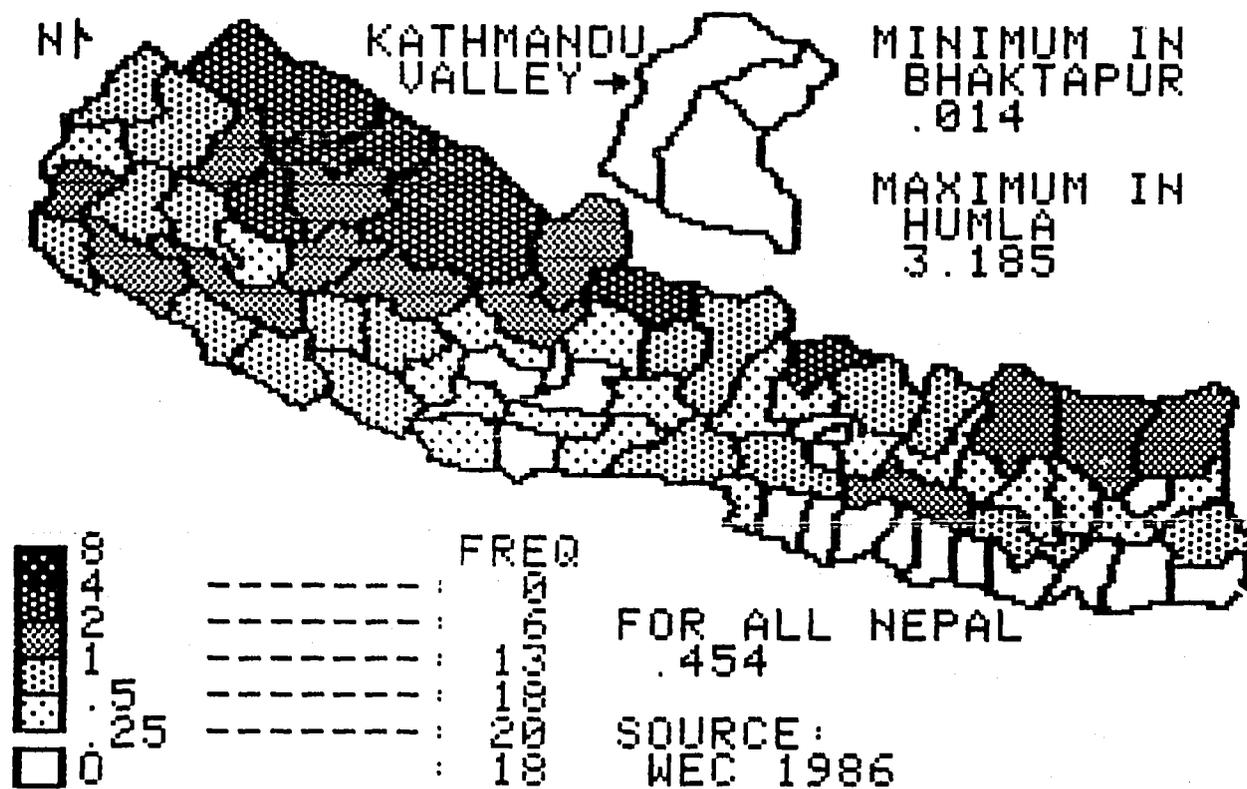


Table 1. People (000) and Land (000 ha) in Nepal, 1978/79

	Population (1978/79)	Land Classification*						Total
		Cult	NCulIn	Grass	Forest	Shrub	Other	
Mountain	1243	276	149	1137	1266	222	2136	5186
Hills	6102	1238	666	545	2767	412	431	6060
Kathmandu	719	40	12	0	26	10	4	92
Tarai	5797	1414	160	74	1557	45	159	3410
Nepal	13861	2968	987	1757	5617	690	2729	14748
Land per Capita (ha)								
Mountain		0.22	0.12	0.91	1.02	0.18	1.72	4.17
Hills		0.20	0.11	0.09	0.45	0.07	0.07	0.99
Kathmandu		0.06	0.02	0.00	0.04	0.01	0.01	0.13
Tarai		0.24	0.03	0.01	0.27	0.01	0.03	0.59
Nepal		0.21	0.07	0.13	0.41	0.05	0.20	1.06

*Cult=cultivated land; NCulIn=non-cultivated inclusions, areas included with mapped cultivated land in units too small to map separately; Grass=grassland; Forest=land at least ten percent covered by forest. Source: Land Resources Mapping Project (LRMP) data, based on 1978/79 photos and reported in WEC March 1986. Population estimated from census data. Regions in Table 1 are defined by district boundaries and do not correspond to physiographic regions of Table 2.

Table 2. Forest and Shrub Land Area, 1964/65 and 1978/79 (000 ha)

Physiographic Region	1964/65	1978/79	Area Change	Percent Change	Annual % Change
High and Middle Mtn					
Forest Area	3943.8	4016.1	72.3*	1.8	0.1
Crown Cover	2222.6	1652.0	-570.6	-25.7	-2.1
Siwaliks					
Forest Area	1739.3	1475.9	-263.4	-15.1	-1.2
Crown Cover	1068.8	796.9	-271.9	-25.4	-2.1
All Hills					
Forest Area	5683.1	5492.0	-191.1	-3.4	-0.2
Crown Cover	3291.4	2448.9	-842.5	-25.6	-2.1
Tarai					
Forest Area	783.8	592.9	-190.9	-24.4	-2.0
Crown Cover	496.3	376.7	-119.6	-24.1	-2.0
Nepal					
Forest Area	6466.9	6084.9	-382.0	-5.9	-0.4
Crown Cover	3787.7	2825.6	-962.1	-25.4	-2.1

Excludes High Himal area (221.8 ha of forest and shrub in 1978/79).

*Not statistically significant in the original study.

Source: WEC January 1987, p.62.

II. HISTORY OF FOREST MANAGEMENT

Centralization and Decentralization

Before the mid-1700s, modern Nepal was divided into many principalities. During 1768-69, Prithvi Narayan Shah, ruler of the principality of Gorkha, conquered the Kathmandu Valley and provided the foundation for modern Nepal. In 1846 political power passed from the Shah dynasty to Jang Bahadur Rana, an ambitious military commander. The monarchy's powers were exercised by hereditary Rana prime ministers until 1951, when this autocracy was overthrown and the Shah king's power restored.

King Tribhuvan's rule from 1951 to 1955 was characterized mainly by internal power struggles. His son, King Mahendra, who ruled until 1972, experimented briefly with a multiparty system, and promulgated a new constitution in 1962 making the crown the prime source of authority. This constitution created a tiered "partyless" panchayat system, with eligibility for national office dependent on victory in lower elections.

Mahendra's son, King Birendra, has ruled since 1972. In May 1980, when a referendum was held to determine whether to retain the partyless panchayat system or permit political groups to operate openly in competition, the panchayat system was retained by a small margin. A 1980 constitutional amendment provides for direct election to the national panchayat on the basis of universal adult franchise. The Decentralization Act of 1982 provides for development planning and implementation authority to gradually devolve to village and district organizations. Implementation of this act is still in its infancy, partly as a result of minimal transportation and communication facilities.

There has been a trend toward centralized institutions beginning with Nepal's unification in the mid-1700s. In some respects this culminated with King Mahendra's reign, as there have been formal moves toward decentralization beginning in the late 1970s, motivated partly by the realization that people's participation is essential for the development process. However, the general trend of central government has been to increase its scope of activities and authority as Nepal develops. The growing number of government projects and officials throughout Nepal is evidence of the central government's expanding role. While the government sometimes uses force to underline its authority, it has also been assisted by better--though still minimal and in many places virtually non-existent--communication and transportation facilities. Central government influence has also been broadened by the use of Nepali--first language of only half the population--in schools and the mass media.

The Nepalese population does not always actively support the government as a source of development in Nepal. Villagers' faith in official institutions is hardly robust, and the typical villager's view of the government is one of corrupt politicians and inefficient bureaucrats. While individual officials sometimes manage to keep Nepal's best interests at heart, the government bureaucracy as a whole provides few incentives for efficiency or entrepreneurship.

These overall trends of centralization and decentralization are mirrored in the social institutions--particularly the laws and official government programs--related to forest management.

Before 1957: Traditional Forest Management

Early land ownership accounts usually do not mention forest lands. There are no estimates based on land survey records, and Nepalese land tenure expert Mahesh Regmi claims that "there is no concrete evidence" concerning the overall division of forest ownership before 1957 (31).

The two formal systems of land tenure before 1957 were Raikar (state landlordism and its derivatives: Birta--land granted to individuals as a favor and for specific jobs (including considerable forest); Guthi--trust land assigned to religious and philanthropic institutions; Jagir--land assigned to government employees) and Kipat (communal ownership). Distinctions between Raikar and Kipat were abolished in 1968, and there are now three types of land: private holdings; institutional holdings for religious or charitable purposes; and state lands.

Whatever the legal status of the forest, the state exercised little control over forest use before 1957. The government encouraged individuals to convert forest land to agriculture as a means of extending state control over territory and increasing state revenue through land taxes. The government's interest in the forest was limited to insuring that the royal household was supplied with fuelwood and charcoal, and that there was enough timber for construction projects. Institutional forest management focussed on utilization of Tarai forests to collect revenue. Little attention was paid to hill forests (32).

As a result of limited state regulation, local villagers controlled forest use. Some forest was privately owned, and some communal ownership was formally recognized. Kipat communal ownership had legal standing before Nepal was unified in the 1700s. Community control of forest use was practiced by the mountain-dwelling Sherpas, who appointed local forest guards each year (33). Elites may have benefitted disproportionately from unequal distribution of the benefits of local management, but at least villagers considered nearby forests their responsibility.

With a smaller population and a larger forest resource before 1957, net forest growth was probably greater than fodder and fuelwood demand, even though forest land was also being converted to farmland. Thus, there was no need to enforce formal property rights and regulate forest use, because the supply of forest resources was plentiful relative to demand for these resources. Enforcement of formal property rights to provide incentives for resource management is generally needed only when the supply of a resource is scarce relative to demand.

While formal property rights may not have been needed in the past to control consumption, because resource supply then exceeded demand, this lack of property rights led to under-investment. Property rights are useful to control future as well as current consumption, and to encourage current investment to provide for future consumption. Lack of property rights meant that no consumer had any incentive to think about future consumption and invest in the forest. In economic terms, supply exceeded demand at any price in the past, so no one invested in the forest, even though they might have accurately predicted that future demand would exceed supply at a positive price, as is now the case. (Open access affects both dynamic and static externalities--there is an infinite discount rate as well as disregard for current external costs.)

From 1957 to 1977: Government Control

In 1957 the Private Forests (Nationalization) Act placed ownership of all forests in His Majesty's Government. The act's purpose is stated in its preamble:

Forests constitute an important part of the national wealth ... it is expedient to prevent the destruction of national wealth and to nationalize private forests for their adequate protection, so as to ensure the welfare of the country and the people ... (34)

This act did not affect orchards or small plots of planted trees.

Unfortunately, the government was not prepared to assume the technical and administrative responsibilities of forest ownership. There was no survey of the forest area, and no demarcation indicating the boundaries of the forest. As a result, the government did not know how much area was legally under its authority. In addition, there was insufficient manpower to oversee the forests, and trained forest officers were often reluctant to be posted in the hills because living conditions there were primitive. At the time of nationalization there were no forest administrative divisions in the hills, and fewer than ten professional forest officers in government service.

Local village reaction to nationalization varied widely. In many areas the lack of forest officials meant that people were unaware that the forest had been nationalized. Even today in many areas actual tree cutters are uninformed about forestry legislation. In such villages nationalization and subsequent legislation has had little or no direct effect on the use of forest resources.

In areas with access to more information, and where the cadastral survey was registering private land, villagers reacted negatively to nationalization. They believed that their traditional rights of access and use had been curtailed, and local responsibility for forest protection diminished. Restrictions on forest use were not accompanied by a system for distributing forest products or managing the forest resource. Where there were no proper land records, there was an incentive to destroy the forest so that land could be claimed as private property after it was cultivated. Where forest demarcation had begun, irregularities in the forest boundary provided an incentive to convert land to private ownership. In both cases forest lands were cleared and converted to agriculture to prevent the government from assuming ownership.

In the Tarai, where there were more forest officials and monitoring forest use is easier, nationalization may have slowed the conversion of forest to farmland. However, the official policy which resettled hill villagers on Tarai forest lands and the tolerance of unofficial Tarai forest encroachment (which continues today) probably offset this effect.

The conventional wisdom has been that inadequate government control and adverse local reaction to nationalization resulted in Nepal's forests being converted from common property with well-defined use traditions to an open access resource without such restraints on use. However, more recent evidence indicates that local management systems have developed in some areas when the forest resource has been in short

supply (35). Such management typically restricted forest use to insure that demand and supply were kept in approximate balance. These systems have been based on local control of the forest, and developed mainly in areas with strong village leadership. Where the supply of forest products has been adequate, such management systems have not developed.

Where the forest is an open access resource, it has been overused and degraded; where it is viewed as community property, it has been conserved and maintained. The effect of these differing perceptions depends on the relative magnitudes of demand and supply. The empirical question is thus to determine where demand exceeds supply, and what forest management systems are needed to bring these forces into balance.

Between 1957 and 1977, several laws were passed defining government authority over the forest, and regulating use of this resource. The 1961 Forest Act was the first comprehensive forest legislation in Nepal's history. This act was an effort by the Nepal government to solidify its claim to ownership which had been formally established when the forests were nationalized in 1957. It was an attempt to institute better management of the forest by simply prohibiting destructive activities. However, again because of inadequate forestry administration, this act was not enforced, and it was largely unknown by villagers.

The 1967 Forest Protection (Special Arrangements) Act prohibited damaging or removing forest products without official permission. Damaging or removing forest boundary markers, and uprooting or damaging saplings planted in reforestation programs were specifically prohibited. This act has not had much effect on the forest. Most of the boundary is not demarcated, so there are few markers to damage or remove. Reforestation has been limited, and destruction of saplings planted in reforestation programs has never been a main cause of deforestation.

The 1970 Forest Products (Sale and Distribution) Rules established a system of permits and prices for forest products. Like other forest legislation, these rules are often not enforced. When they are enforced, forestry officials often become the effective owners of the forests, taking personal payments in exchange for formal permits or informal permission to cut or collect fuelwood or fodder. As with most arrangements of this sort, prices depends on individuals and circumstances. There have been many allegations that permits to cut thousands of hectares of forest in the eastern Tarai were sold at a premium to finance the panchayat side of the 1980 referendum. In many places there is now a well-defined hierarchy beginning with local forest guards which receives and transmits extra-legal payments to use the forest (36).

The 1976 National Forestry Plan--which is only a plan suggested by the staff of the Department of Forestry, not a plan adopted as official government policy--belatedly stated:

The tradition of using and managing the forests under ad hoc directions and circulars continued within Nepal [in the 1960s and 1970s] even though the Forest Department had been established in 1942. As a result, the scientific and orderly management of forests did not eventuate. The Forest Department had been ignoring the forests in the Hills regions and this has led to the deterioration of the watersheds which are now in very poor condition. Even

in the Tarai, the forests have severely deteriorated because of the continued sporadic felling of trees by the timber merchants as well as the local people ...

A cursory review makes clear that both forests and forestry are in a critical situation. The time is long overdue to create an effective organization in order to muster public support and participation, as well as institute scientific management of forests in the best interests of Nepal and Nepalese society. (37)

A former forestry official summarized the problem: "The roots of the problem lay in the lack of both an adequate policy framework and institutional foundations for forest conservation and management, reflected in poor definition and classification of various land use categories. In the face of these inadequacies most officers involved in actual forest management became timid and even demoralized." (38)

Since 1977: Community Forestry

Legislation adopted in the late 1970s defined new categories of forests to be managed by local communities, religious institutions, and individuals. If these rules are widely implemented, local villagers could have formal responsibility for managing more than 2.5 million ha--over two-fifths--of existing forests.

Panchayat Forests are degraded forest areas entrusted to a village panchayat for reforestation in the interest of the village community. Panchayat Protected Forests are forests entrusted to a local panchayat for protection and proper management. Religious Forests are forests entrusted to religious institutions for protection and management. Leasehold Forests are degraded forests entrusted to individuals or agencies for reforestation and production of forest products.

Operating rules for Panchayat Forests, Panchayat Protected Forests, and Leasehold Forests were promulgated in 1978 (and amended in 1980). Panchayat Forest Rules limit these forests to about 125 ha in each panchayat. Government assistance is provided to encourage village forest investment. The government provides land and seedlings, and in return for labor, the village panchayat receives all income from the sale of forest products. These sales are restricted to insure that local villagers benefit, and to insure that the forest is maintained in a productive condition. It is left to village panchayats to provide incentives for individuals to plant and maintain the Panchayat Forest.

Panchayat Protected Forests are limited to about 500 ha in each panchayat. Rules for these forests provide an incentive for communities to maintain existing forests through a shareholder arrangement, with the village panchayat receiving three-fourths of the income from the sale of forest products. Otherwise, this arrangement is like Panchayat Forests.

One problem with existing forestry legislation is that the income from Panchayat Forests and Panchayat Protected Forests is not received directly by the villages. Rather, these proceeds are supposed to be forwarded to the central government which then makes a grant back to the villages. Lack of faith in this disbursement process has prevented many villages from moving ahead with this aspect of community forestry.

Leasehold Forest Rules place limits on the size of these forests, varying from 2.5 ha for individuals in the Kathmandu Valley to 68 ha for institutions in the Tarai. These rules are the furthest step toward private ownership of forest land. However, except for a few isolated cases, the government has yet to implement these rules.

These rules represent a major change in Nepal's forest policy. The government has formally recognized that it cannot effectively manage the forests, and that the best solution is to return formal control to local communities. Government ownership has proved virtually impossible to implement, and it has had adverse consequences besides. Local ownership of part of the forest by village communities is seen as the remedy.

However, the potential effect and the outcome to date of the new forest policy are quite different. This policy is being implemented by the Ministry of Forests and Soil Conservation (MFSC), which is still constrained by the lack of trained technical and administrative personnel, and has a history of uneven forest management. The MFSC--like most government agencies--is hampered by the lack of an effective incentive system (low pay, inadequate and uneven recognition of outstanding service) to encourage officials to function effectively. Community control of forests is being realized primarily through foreign aid projects.

Relative to its initial targets, the community forestry program has been more successful in producing and distributing seedlings than at planting Panchayat Forests or designating Panchayat Protected Forests.

Unfortunately, community forestry projects by themselves cannot be a solution to Nepal's accelerating rural energy crisis. Though the potential impact of community forestry is great, and actual efforts of the Ministry of Forests and foreign aid projects are on a scale never before attempted, these programs will not solve the problem of deforestation. Their results cannot even keep pace with the incremental fuelwood demands of the growing population. Under current forestry projects, there simply is not enough increased production from newly planted forest or existing forest converted to improved management to provide the fuelwood and fodder needs of the increasing population.

To help assess future policy alternatives in the context of community forestry, the next section presents a conceptual economic model of forest degradation in Nepal and analyzes its key characteristics.

Notes to Chapter II

- (31) Personal communication, Mahesh C. Regmi, August 1980.
- (32) M.K. Bajracharya 1986, p.52.
- (33) Furer-Haimendorf 1979.
- (34) Regmi Research 1978.
- (35) Gilmour April 1987.
- (36) While much of the evidence is anecdotal, the cases before various Forest Consolidation Commissions are illustrative. See Rising Nepal, November 28, 1987.
- (37) NAFF 1979.
- (38) Mahat 1985, p.198.

III. KEY ECONOMIC AND INSTITUTIONAL CHARACTERISTICS

Economic Characteristics

This section presents an economic model which can be applied to the problem of forest depletion in Nepal and analyzes four key characteristics of this model (39). First, some of Nepal's forest is in practice an open access resource. As a result, villagers consume too much of the forest resource and invest too little in it. Second, external environmental effects result from forest depletion. These external effects also lead to over-consumption and under-investment. Third, demand for the forest resource is inelastic and increasing. Inelastic demand means that the welfare losses associated with over-consumption are minimal, but the welfare losses of under-investment are considerable. Increasing demand means that these welfare losses are increasing. Fourth, the open border with India provides an incentive to export forest products and limits the scope for independent policy implementation.

Open access resource: over-consumption and under-investment. Hardin provided the classic statement of the problem of overuse of open access resources in his "The Tragedy of the Commons" (40). Runge showed that mutual assurance regarding consumption can limit the detrimental effects associated with multiple users (41), and Bromley distinguished between common property regimes--where many people enjoy consumption rights and concomitant obligations--and open access regimes--where many people have consumption privileges without concomitant obligations (42).

Nepal's forest resource has sometimes (and at some places) been managed as a common property regime, and sometimes as an open access regime. Where local villagers have perceived benefit in providing mutual assurance with respect to restraints on forest use, this resource has been managed as common property, and conserved. Where villagers have believed that the government was likely to claim the forest, it has been viewed as an open access resource, and overused. In the latter case, villagers have either claimed it for themselves as private property by clearing the trees and planting crops, or simply by cutting the trees for fuel and fodder without regard for the future productive capacity of the forest. Villagers' perceptions about their role in managing the forest are thus the key to improving the quality of this resource.

Under-investment is probably the greatest of managing Nepal's forest as an open access resource. Without assurance with respect to reaping the benefits of investments in maintaining or improving the forest's productive capacity, no one will make these investments, particularly because the payoff period is longer than for alternative agricultural investments. Lack of assurance leads to inadequate tree planting and too little stall feeding (as opposed to open grazing) of livestock.

Villagers are not using much uncultivated private land for forestry because it is cheaper to gather fuelwood and fodder in the open access forest than to invest in trees on private land. However, someone who owned part of the forest could exclude others and claim the benefits of improved forest management, and it would become profitable to plant and manage trees. This would also make it profitable for others to plant trees on their own private land, because the previously (privately, not socially) cheaper alternative would have been eliminated.

External environmental effects. When consuming a commodity imposes costs on people other than consumers, these external effects lead to inefficient consumption decisions, and market-determined consumption will be more than socially desirable. Erosion is the largest external cost of deforestation, and protection against erosion is the most important benefit which is foregone as a result of its external character.

However, most of Nepal's erosion is not caused by overuse of forest resources resulting from the external costs and benefits associated with consuming this resource. Most of Nepal's erosion is the result of mass wasting processes which are beyond man's control, so erosion control is generally not a sufficient justification for tree planting. However, rainfall-induced topsoil erosion is significantly influenced by man's activities, and the local loss of soil fertility and crop production potential resulting from this erosion can be substantial. Reducing topsoil erosion is technically easy, so more emphasis should be placed on this aspect of forest management.

Inelastic, increasing demand. Nepal's population is growing, and the demand for fuelwood increases as the population increases. At current income and price levels, the demand for fuelwood is both income and price-inelastic. Income elasticity of demand is low because fuelwood is used mostly for essential purposes such as cooking and heating. Price elasticity is low because in most (rural) areas fuelwood is (and will remain) cheaper and more readily available than other sources of energy.

Inelastic demand means that price policies, either for fuelwood or its substitutes, will have little effect on fuelwood consumption unless the government somehow radically alters prices. The exception to this may be in urban areas where the population can afford substitutes, which are more readily available than in rural areas. Increasing demand means that solutions must be found which address not just the level of demand today, but which meet the problems posed by even higher demand tomorrow.

The open border. Nepal's northern border with the Tibetan region of China is primarily defined by the Himalayan mountains--traversable by only a few mountain passes, and thus limiting overland commerce. In contrast, its southern border with India is flat and open--unpatrolled paddy fields, where Nepalese and Indian citizens freely come and go.

As a result of the open border, monitoring trade in commodities is difficult. Fertilizer and foodgrain flow freely in response to cross-border price differences, and forest products are not exempt from market forces, as the long tradition of timber and fuelwood export and smuggling indicates. Both forest officials and private individuals are involved in illegal cutting and smuggling activities (43).

Although timber export has been banned since 1985/86, unofficial trade is likely to equal earlier official trade, or Rs.25-100 million annually. There are anecdotal reports of an active trade in small poles using bicycles for transport to India. Informal export licenses in the form of monthly payments of rice and rupees for bicycle-loads and head-loads to local forest guards are common in some areas. If Nepal wants to limit the export of forest products or other essential commodities, policies should attempt to maintain Nepalese prices (especially those involving government trade) slightly higher than prices in India.

Conceptual Solutions

Just as there is no one single cause of deforestation, there is no single practical solution. However, an examination of conceptual solutions may help in the design of practical policy alternatives.

All the problems associated with open access regimes and external effects can be solved by unified resource management. Overall unified management may not be practically possible, so second-best solutions must be considered. Local unified management, institutions which mimic private ownership incentives, taxes or quotas on resource use, subsidies for fuelwood substitutes, investment subsidies, and direct government investment are possible alternatives to overall unified management.

In Nepal, formal taxes or quotas on forest use are not a practical way to dramatically affect forest use. The cost of effectively administering taxes or quotas in Nepal's hill forests is prohibitively high, so these options will not be considered here. The current community forestry program includes a variety of unified local management options--government control, community control, and private ownership--as well as subsidies for substitutes in the form of improved stoves, investment subsidies in the form of low-cost (or free) seedlings, and direct government investment in the establishment of plantation forests.

Efficiency objectives of unified local management are achieved by eliminating the open access character of a resource and internalizing external costs and benefits associated with its use. However, achieving efficiency objectives does not guarantee that equity objectives will also be reached. Conserving the forest resource, increasing the production of fuelwood and fodder, and reducing erosion are all important, but equally important is insuring that poor Nepalese villagers share some of these gains. Access is by definition restricted when a resource is converted from open access to unified management, and it is likely that poor people's access will be restricted more than rich people's (44).

Practical policy alternatives in Nepal include those defined under the community forestry program, and additional incentives for private forestry activities. After discussing the institutional environment in which community forestry operates, the next sections of this paper assess the original potential, current progress, and future prospects of community forestry, keeping in mind the efficiency objective of increasing fuelwood and fodder production and the equity objective of insuring that poor people have access to this increased production. The political consequences of community forestry alternatives are also described.

Institutional Environment

Laws and plans. In addition to the forestry legislation discussed above, the national Five-Year Plans include development of forest resources. In the first three national plans (1957-1970), high priority was given to infrastructure development activities such as boundary demarcation, construction of fire lines and forest roads and buildings, and training of technical personnel. The Fourth Five-Year Plan stressed the development of the survey and management aspects of forestry, but little implementation of management plans occurred. The Fifth Five-Year Plan emphasized the importance of forest with respect to social, eco-

conomic, and environmental aspects. In the Sixth Plan, planning was reoriented to include people's participation in forest management (45). Fuelwood is now listed as the third minimum basic need of the people. The Seventh Plan (1985-1990) states:

Forest is another of our national resources, and its development is necessary for the overall development of the country. Through the effective conservation and utilization of this resource we can fulfill a number of multi-faceted economic necessities of the nation--fuelwood to cook food; charcoal and raw materials to keep the industries running; timbers to build houses; fodder for animal husbandry; herbs to manufacture medicine; national parks for the development of tourism; soil conservation to maintain and keep up the fertility of land and to prevent disastrous floods and landslides. What we need now, however, is to make a Herculean effort to grapple with the problems arising out of the indiscriminate destruction of our forest resources. (46)

As is the case with many national plans, rhetoric and reality differ. The Sixth Five-Year Plan had a target of planting nearly 43,000 ha of trees, and over 37,000 ha were planted. However, the Seventh Plan notes that 10,000 ha must be planted each year if the problem of deforestation is to be solved. The afforestation target for the Seventh Plan is 175,000 ha--five times the actual achievement during the Sixth Plan. For comparison, the loss of crown cover from 1964/65 to 1978/79 was more than 68,000 ha each year, nearly twice the afforestation target (47).

The Structural Adjustment Program of His Majesty's Government (HMG), supported by the World Bank and the International Monetary Fund (IMF), includes pending legislation allowing user groups to retain all of the proceeds from Panchayat Protected Forest activities, and clarifying the legal status of forest user groups, particularly with respect to their contractual authority. These changes should provide additional incentives for villages to improve the management of local forests. HMG has also issued instructions eliminating previous constraints related to the transport and sale of trees from private land.

The Forestry Sector Master Plan is now being developed with funding from the Asian Development Bank and Finnish technical assistance. This is the most comprehensive planning exercise yet undertaken for forestry. Following discussion and review of the draft plan by senior government officials and donor agencies, the final version is expected to be ready by late 1988. Policy changes which have been suggested for incorporation in the Master Plan include: the Department of Forests transfer most of the hill forest to local panchayats; the national forest in the Tarai be clearly designated for scientific and intensive management; the distinction between Panchayat Forest and Panchayat Protected Forest be eliminated; and that the proceeds from these community forestry activities be retained by local villages rather than being sent to the central government and returned later. The success of this plan will depend on strong government commitment to implement its recommendations.

Government agencies. The Ministry of Forests and Soil Conservation (MFSC)--originally the Ministry of Forests--was formally established in 1958. This Ministry has a history of corruption and a mediocre record of managing Nepal's forest resources. This record is best examined by

describing the activities of MFSC agencies. Many agencies were established by foreign aid projects, and foreign aid has recently financed between 25 and 50 percent of the development budget in forestry. On the other side of the ledger, forest revenue has not been more than three percent of the HMG budget since 1974/75 (Table 3).

Planting is carried out by the Department of Forests (DOF), the Afforestation Division (AD), and the Department of Soil Conservation and Watershed Management (DSCWM), and the Forest Products Development Board (FPDB). The DOF was established in 1942 to manage Nepal's Tarai forests, the AD was originally created in 1966 to carry out afforestation in Kathmandu, and the DSCWM was established in 1974 to protect watershed areas of Nepal's rivers, control floods and landslides, and promote conservation. Much of the work of these agencies is carried out through foreign aid projects. The DOF has been mainly concerned with licensing and organizing timber sales from Tarai forests, and has had only a small program of afforestation. The accomplishments of the AD are minimal compared to the efforts which are needed--in Kathmandu, where more planting per capita has been done than anywhere else (not always successful), total afforestation supply can supply less than one-tenth of people's fuelwood needs, even after fuelwood trucked in from the Tarai is taken into account. Much DSCWM work is curative rather than preventive, and its overall effect on the forest has been minimal.

An adequate wood harvesting system has not been developed. Trees are often felled and left on the ground until they are unusable as timber or fuelwood, and sometimes do not reach market at all. Bans on the export of timber sometimes result in the use of high-grade timber species for fuelwood, with substantial losses in value.

Harvesting is done by the Timber Corporation of Nepal (TCN), Fuelwood Corporation, and by the Forest Products Development Board (FPDB) as an initial step toward plantation establishment. The TCN began in 1955 as a USAID-assisted sawmill project, and the Fuelwood Corporation was originally established as the Fuel Committee in 1962 to ensure a regular supply of firewood for Kathmandu at fair prices. The FPDB was established in 1976 to make forest products available to consumers and help build forest processing plants. While the Fuelwood Corporation is probably slowing the destruction of the hill forests surrounding Kathmandu, it is supplying about half of the wood burned in Kathmandu, and much of this is purchased by brick factories (48). The TCN has been more concerned with consuming the Tarai forest than with replenishing it, and recent plantation efforts do not match logging activities (49).

Malaria eradication in the Tarai, beginning in 1958 with assistance from USAID and WHO, has resulted in an ever-increasing stream of migrants from the hills to the now-habitable Tarai. Growing population pressure and scarcity of agricultural land have put HMG under increasing pressure to convert forest land into agricultural settlements. To control forest encroachment and deforestation by settling families in designated areas, the Nepal Resettlement Company was formed in 1964, and the Resettlement Department was established in 1968. Migrants come looking for land, and they destroy the forest where they settle. About all the Resettlement Company and Resettlement Department have been able to do is provide some order for the settlements of some of the migrants. This is often done by simply granting the migrants legal title to the

encroached forest land they are already cultivating, thus formally acknowledging that the land will never again be used for forestry.

The agencies within the Ministry of Forests are not coordinated. The most obvious example of this is the simultaneous existence of the Fuelwood Corporation, the Timber Corporation, and the Forest Products Development Board, whose operations overlap considerably. A recommendation to merge these three organizations several years ago has not been implemented. Neither the Fuelwood Corporation nor TCN have planting programs of any significance, and their harvesting activities are unrelated--both technically and geographically--to reforestation efforts by planting agencies. As a result, the Ministry of Forests has often contributed to deforestation rather than helping to solve this problem.

If the actual current government policy is only to slow down deforestation, then current policy may be succeeding. However, if the objective is to reverse the trend of the depletion of the forest stock, additional efforts are needed. This will require either a considerable addition to the ranks and motivation government forestry officials posted in remote areas, or a significant change of perception on the part of Nepal's rural villagers. Neither of these changes will happen quickly. As Nepal is an example of what Bromley calls "government attenuation"--a well-developed sophisticated government at the national level (in the capital) and little government elsewhere (50)--the prospects for significant improvements in government forest management in the near future unfortunately seem slim. While the lack of developed government outside of Kathmandu may provide a relatively clean slate for molding government forest management agencies, "getting institutions right" is difficult when institutional experience is limited.

Decisionmaking authority. The perceived locus of decisionmaking power with respect to forest resources has changed. Before 1957, local powerful individuals and community groups controlled the use of forest resources. After 1957, in locations where the prospect of government intervention seemed real, individuals began converting forest into private property, often by converting it into agricultural land. Sometimes this made ecological sense, sometimes not. Where cultivation was not sustainable, erosion increased, and much of this land has now returned to lower-grade forest. Where the prospect of government intervention seemed low, traditional management practices continued. These practices were effective in areas where a local leader saw the need to preserve this resource, and poor in areas where no such perception existed.

Formal decisionmaking is now often seen to be in the hands of the government and perhaps expatriates working on foreign aid projects. However, actual daily forest management decisions are still taken by the villagers, especially the women who are primarily responsible for gathering fuelwood and fodder. There has been shift in the formally perceived locus of decisionmaking power and authority, but not a similar shift in actual decisionmaking in most villages.

As a result, in areas where government officials have assumed forest management roles formerly filled by local authorities, it may not be realistic to assume that a return to community management of forests is possible. Community management requires trust in local authorities, and without strong local leaders this may not be possible.

The primary motivation behind practices related to land management generally and forest management specifically has been (and still is) the survival instinct. The forest has been sustained by historically low population pressure, and by the fact that agriculture cannot be sustained where soils are shallow and erosion is high. As the population has increased, tomorrow's forest has taken a backseat to today's fuelwood. A poor villager worried about cooking today's meals is unlikely to devote much energy to preserving tomorrow's natural resource.

The community forestry legislation is designed to return control of village forests to local communities. Progress so far is mixed. In a few communities where strong local leadership is committed to forest management, the program is a qualified success; in most villages nothing has been done. In areas where even after nationalization the government exercised little control, introducing community forestry has been seen as the beginning of (unwanted outside) government control. In other areas community forestry has meant "local elite" forestry (51).

Foreign aid. External development assistance plays a key role in increasing the scope of government influence in the average villager's life. Since 1951, when Nepal was opened to the outside world, foreign aid has grown at a rapid pace. India and the U.S. were early providers of aid, and now over 35 countries provide some form of economic assistance. Foreign aid now funds about half of the national development budget. Agriculture, irrigation, and forest projects have traditionally claimed the largest share of foreign aid commitments, but the power sector has recently moved into the top position. Foreign assistance comes mainly in the form of grants and loans to carry out development projects designed with expatriate assistance, and these projects are sometimes the first evidence of government activity in remote villages.

Foreign aid is a two-way street. There must be willing recipients and well as willing donors to formalize aid agreements. While Nepal has certainly agreed to all of the foreign aid that has been provided, all too often there has been a reluctance to refuse aid, even if it has been inappropriate to Nepal's needs. Nepalese officials have felt themselves to be in a weak position vis-a-vis foreign donors, and too many aid agreements are undoubtedly characterized by the phrase reportedly uttered by a high official about to sign one agreement: "Yes, we both agree that this is what you [the foreign donor] want."

Foreign aid has played a large role in forestry in Nepal since J.V. Collier, a British forestry expert from the Indian Forest Service, came as an advisor in 1925. Collier was called to Nepal to advise on the utilization of the Tarai forests--in particular the export of sal wood for the Indian railways--and he under took intensive felling of the Tarai forests. "The result of such over-felling was a general impoverishment of such forests in loggable wood and intensive deforestation in the Morang area for a pitifully insignificant immediate return." (52)

Since then, foreign-aided forestry projects in Nepal have had mixed results (53). On the one hand, early foreign advisors generally encouraged consumption of the forest resource without much concern for investment in replenishing this resource. On the other hand, many of the agencies in the Ministry of Forests were established with foreign assistance, foreign advisors were later among the first to become alarmed at

the serious consequences of deforestation, and community forestry legislation was influenced by the planning of the World Bank-funded Community Forestry Development and Training Project. Foreign donors are providing most of the financial and technical resources for implementing this community forestry policy. The Asian Development Bank is providing substantial support for the Forestry Sector Master Plan.

While conceptually the new community-oriented forestry legislation and the proliferation of foreign-assisted forestry projects since 1980 may have quite different implications, they have been introduced more or less simultaneously, simply because community forestry has been implemented primarily in areas where foreign assistance is available. As a result the effects of these two institutional changes are intermingled.

The long-term nature of forestry management distinguishes forest development from other foreign aid projects. Expatriates cannot simply prepare a forest for harvest and simply hand it to a community. While foreign-aided projects can benefit in design and implementation from foreign experts' experience and training, inappropriate ideas can be incorporated into projects in Nepal. Expatriates' conceptual and technical expertise is sometimes insufficiently adapted to local conditions, and important factors may be ignored. A notable example is the Nepal Coppice Reforestation Project, motivated by U.S. political interests, which was originally designed to import millions (far more than could be used) of poplar cuttings (a fast-growing tree with limited use in Nepal's middle hills) at high cost (refrigerated air freight) for planting in Solukhumbu (an inappropriate location for this tree).

Foreigners, who are immune from some of the social and political forces constraining Nepalese policymakers, can (and sometimes do) make statements that government officials cannot. It can only be hoped that Nepalese decisionmakers will have the good sense to embrace the enlightened and reject the ridiculous from among the expatriate exhortations.

Notes to Chapter III

- (39) See Ives 1987 for a critique of the "Theory of Himalayan Environmental Degradation."
- (40) Hardin 1968.
- (41) Runge 1981.
- (42) Bromley 1986.
- (43) Rising Nepal, November 28, 1987.
- (44) Hobley 1987, pp.9-11.
- (45) See M.K. Bajracharya 1986, pp.52-85.
- (46) NPC June 1985, p.83.
- (47) Nield 1985, p.22.
- (48) Kernan et al. 1986, p.16.
- (49) Carter 1987, p.82.
- (50) Bromley 1979.
- (51) King et al. 1988.
- (52) Robbe p.4.
- (53) See M.K. Bajracharya 1986 for details of the history of expatriate involvement in forestry in Nepal.

Table 3. Ministry of Forests Finances (Rs. million)

	74/5	75/6	76/7	77/8	78/9	79/0	80/1	81/2	82/3	83/4	84/5	85/6
Expenditure												
Regular	5	5	9	4	4	4	5	5	7	8	9	10
Development	24	37	45	76	67	94	89	185	228	235	290	365
Total	29	42	54	80	71	99	94	191	235	243	299	375
Sources												
Domestic	NA	33	44	55	61	67	62	120	142	142	163	281
Foreign	NA	10	10	25	9	31	32	71	93	101	136	94
Grant	NA	9	5	3	5	26	21	18	44	54	73	42
Loan	NA	0	6	21	4	6	10	52	49	47	63	51
Forest Rev	45	24	44	64	83	87	91	114	54	61	91	117
HMG Budget	1514	1913	2330	2675	3021	3471	4092	5361	6979	7437	8395	9797

Source: Ministry of Finance 1987.

IV. PRACTICAL POLICY ALTERNATIVES

Although problems associated with Nepal's forest resources cannot be divorced from interrelated problems of farmland and livestock, practical alternatives must be formulated in terms of policy instruments available in the forestry sector itself. There are a variety of possibilities: government control, community forestry, private forests, and more efficient use of fuelwood and fodder resources.

A successful forest policy must be dynamic, because Nepal's population is growing and moving, and the forest resource is changing; it must be flexible, and allow for new lessons to be incorporated as more experience is gained. It should be simple, realizing that Nepal's bureaucratic institutions and local village organizations are ill-equipped to manage complex directives.

Few local institutions and little formal control were needed to manage Nepal's forests in an era of low demand (small population) and high supply (large forest). Demand and supply are more evenly matched now, with shortages in most districts, and institutions (whether formal or informal) and management control are needed.

Government Control

Regardless of how quickly community forestry moves ahead, most of Nepal's forest will probably remain under the formal control of the Ministry of Forests and Soil Conservation (MFSC). Complete government management responsibility for all forests was envisioned when the forests were nationalized in 1957. Even though more than 30 years have passed since nationalization, and government forest management has not been effective, particularly in the hills, it is useful to examine the prerequisites for effective management by the MFSC.

First, adequate trained manpower is needed. Forestry officials must have the ability to plan for villagers' needs. Second, this manpower must be motivated and willing to live in remote areas. Unfortunately, most trained people are not willing to live in remote areas, or even outside Kathmandu--they want the conveniences of urban life. Third, forestry officials must view the forest as a community resource to be managed for local villager benefits, not as the government's (or the government officials') private property to be exploited. While the forest has been a significant source of government revenue in the past, its relative importance has declined in recent years as available timber for export has declined, and as the government has realized that the most important use of this resource is to meet local forest-based needs.

The forestry staff must be trusted by villagers. This trust is lacking as a result of inefficiency and corruption at nearly all levels of government, and will be difficult to engender. Strong central leadership will be needed to improve the efficiency of the government bureaucracy, and dedicated local government officials will be essential for the success of this effort.

Even if every panchayat took full advantage of current PF and PPF legislation, over half the existing forest would remain under government control. Some forest officials believe it is best for the government to

improve its management of the remaining few large tracts of forests (particularly the coniferous belt in the high mountains, the chir pine area in the Mid West and Far West, and the remaining forest in the foothills of the Siwaliks bordering the Tarai) and hand over formal management authority for the scattered forest plots (most forest in the middle hills) which can best be managed by local villagers on a user-group basis. Others believe that all forest should be handed over to local villagers, and that the Department of Forests should become a professional extension service responding to villagers' requests for information and technical assistance.

Community Forestry

Community forestry is seen by many officials as the key to solving Nepal's forestry problems. Whether the forest is legally national or village property makes less difference than local perceptions of responsibility for and participation in forest management. Government forest which is viewed as community property will be more carefully managed than Panchayat Forest which is seen as belonging to the government (54).

There are both social and economic prerequisites for effective management by local communities. Mutual assurance regarding consumption and investment behavior vis-a-vis the forest resource is needed to minimize the incentive to cheat on community agreements. Local cooperation is essential for successful community forestry.

There must be enough forest or potential forest land in the community to supply all local forest needs. If enough forest land is not available, the community--or the individuals in the community--must have the legal authority to buy forest products from other communities. If there is surplus forest production available, the community must have the legal right to sell these products to other communities/individuals. While there is currently no prohibition on such purchases or sales, a well-developed system for certifying legal harvesting and transport of community forest products is lacking.

District and local forest officials must be willing and able to hand over formal forest management authority to communities. While villagers do not have to be skilled long-term technical planners, they must be able to see that their own long-term self-interest lies in managing the forest more effectively. They must also know their rights and responsibilities related to community forestry, so an increased extension effort is needed. Forest officials must be willing to provide technical assistance, and villagers must be willing to ask for help. Ideally, the Department of Forests would be like an extension service, providing technical advice and inputs to villagers as they manage the forest. This may imply a reorientation of Department of Forests procedures and personnel, and have implications for organizational management and training as well.

As most current afforestation efforts being carried out by the government are through development projects designed to implement the community forestry legislation, a review of the original potential and current progress of community forestry is useful.

Potential and progress: are they enough? The typical panchayat's population consumes about 4000 cum of fuelwood per year, while the panchayat's forests produce only 2500 cum per year (55). If a panchayat took full advantage of Panchayat Forest (PF) and Panchayat Protected Forest (PPF) legislation (assuming suitable land is available), 125 ha of new forest would be planted, and management of 500 ha of existing forest would improve.

There is still insufficient experience with community forestry to accurately predict how fast forest yields will actually increase, and what magnitude of gain can be expected on a wide scale. There are wide variations in estimates and expectations of fuelwood yield increases, and little information on joint production of fuelwood and fodder. While fuelwood yields of 10 cum/ha/yr have been reported, 5 cum/ha/yr on well-managed forest land in conjunction with fodder production is probably more realistic as an overall average (56). If new PF can produce 5 cum/ha/yr, and yields on existing PPF can be raised from 2 to 5 cum/ha/yr, a community might increase local fuelwood production by 2125 cum (625 cum per year from PF and 1500 cum per year from PPF), nearly doubling current production. This, combined with trees on private land, could meet current fuelwood and fodder needs in many areas.

This is not sufficient to reverse the ongoing decline in the forest resource. Growing new trees and improving management of the existing forest both take time, so villagers cannot expect to harvest these increased yields immediately. The typical panchayat must achieve the increased production mentioned above in less than six years simply to keep pace with the increased demands of its growing population (57). Community forestry, as currently defined, can just barely be a solution for the near future, but only if everything works right everywhere.

Hill and Tarai villages have wide variations in existing forest resources. The hills have a lot of relatively sparse forest, while the Tarai has a little dense forest, mostly in the west (58). While it may be easier for hill villages to allocate land for community forestry, there is less incentive for them to do so because fuelwood and fodder are often not yet perceived as being in short supply.

Unfortunately and perhaps realistically, national forestry targets are much less than the legal limits of community forestry. The Seventh Plan target is 175,000 ha of planted forest during the period 1985-1990 (59). This will not even keep pace with forest degradation if current rates of depletion (over 50,000 ha/yr of crown cover) continue on the remaining forests (60). If this target is achieved and trees produced fuelwood immediately, 875,000 cum/yr (175,000 ha x 5 cum/ha/yr) of fuelwood would be produced. While this would more than compensate for the loss of 500,000 cum/yr from 250,000 ha of crown cover lost, this is less than six percent of current annual fuelwood demand, and less than the increase in demand resulting from three years' population growth.

Targets for planting trees (and installing improved stoves) are not reflected in actual project planning targets. The Seventh Five-Year plan targets exceed the sum of the targets indicated in project implementation documents, and there is no obvious mechanism for bridging the gap between individual project targets and overall national objectives.

Progress achieved to date in the community forestry projects is significant when compared to previous efforts to control forest use. Community forestry legislation has been implemented in some fashion in most of Nepal's 55 hill and 20 Tarai districts. Management plans have been prepared for some existing national forests and for forests to be managed by local communities. Panchayat Forests and Panchayat Protected Forests have been formally handed over to some local communities for protection and proper management. Nurseries have been constructed and are producing seedlings for distribution in excess of project targets.

Unfortunately, overall progress on important project components--planting Panchayat Forests, implementing management plans for Panchayat Forests and Panchayat Protected Forests, and improving the management of existing national forests--is dramatically behind schedule. More importantly, progress is not keeping pace with population growth and the demand for forest resources. While the Seventh Plan reports that over 37,000 ha of trees were planted during 1980-1985, and the Forestry Research and Information Centre indicates that nearly 52,000 ha were planted and almost 41,000 ha of PF and PPF were established (61), over 250,000 ha of crown cover were lost during that period. This suggests that the rate of deforestation is being slowed by more than one-third, but the trend is not being reversed.

The community forestry program now being implemented by foreign-aided and government projects cannot provide fuelwood even for population increases, let alone reverse the trend of forest depletion. While individual projects sometimes do much better than assessments based on national data, these achievements are often the result of a combination of favorable local circumstances and intensive foreign financial and technical inputs which cannot be replicated on a wide scale (62).

Bureaucratic requirements also constrain implementation. One example is the requirement that community forestry committees be formed and management plans approved before local forests are handed over to village communities. There is considerable evidence of water users' groups being formally organized and functioning for decades in Nepal, but the historically relative abundance of forest and the consequent lack of any need to coordinate use of this resource among consumers indicates that past forest "users groups" were mostly limited to fuelwood gathering traditions in areas where fuelwood was scarce, such as those practiced by the Sherpas. Communities have not customarily used formal committees created by or for government agencies, or written plans conforming to technical guidelines, to manage local resources. As a result, this aspect of community forestry has proceeded slowly.

The Community Forestry Development Project recently conducted four studies on (A) procedures for handing forests to panchayats and constraints on successful tree establishment; (B) management plan preparation and implementation; (C) interaction between livestock and forests; and (D) institutional and organizational problems connected with decentralization. Study A recommended that forest committees be given legal status, that all income generated from PPF be directly deposited in panchayat funds, and that no ceiling should be set for PF. Study B suggested that management and utilization plans be made as simple as possible, with no management plans needed for forest areas of less than 5 ha, and that the forest management unit should usually be

the panchayat. Study C noted that livestock grazing is a significant cause of seedling mortality in PF and PPF, and the most important cause of seedling mortality for private planting, and recommended that single-animal draft power technology or animal sharing be encouraged to help reduce the number of animals needed for crop cultivation. Study D noted that community-initiated forestry projects are simpler and more effective than government-operated efforts, and recommended that user groups be the medium for forestry development within the framework of District Development Plans (63). The impact of these studies will depend on strong government commitment to implement their recommendations.

The qualities noted above about the Tarai and hills (the hills have interspersed groups of people and trees, while the Tarai has less stable communities and a linear forest boundary) imply different strategies for forest management. In the hills, community forestry is probably the best practical solution, while in the Tarai private and lease forestry may offer the best prospect of solving the energy problem.

Although the potential and progress of the community forestry program to date are not sufficient to solve Nepal's rural energy crisis, increased fuelwood production can (and must be) a large part of the solution to that problem. It is estimated that over three million ha of forest and shrub land are accessible (64). If this can all be turned over to villagers and managed so that it produces 5 cum/ha/yr, the fuelwood crisis could be solved. Forest policymakers must determine if this is a realistic solution--can villagers manage over 3 million ha of forest and produce at least 5 cum/ha/yr?

Planting new vs. managing old. Forest regeneration can often be accomplished by simply leaving the forest alone--by keeping people and animals out. Managing existing trees is also a more cost-effective way of increasing fuelwood and fodder production than planting new ones.

Although managing existing trees is more economic than planting new ones, there are bureaucratic incentives for planting. Planting spends more money than managing; and planted seedlings can be counted, while measuring improved management is difficult (65). Low survival rates for planted seedlings suggest that it is easy to focus on planting targets at the expense of nourishing trees after they are planted.

It would be better to focus on improved management of the existing forest, and on tree survival, than on meeting tree planting targets. Tree planting targets provide more visible goals than insuring seedling survival or increasing production from the existing forest, but Nepal's current need is to shift emphasis from resource creation (such as tree planting) to resource management (such as seedling survival and improved management of existing forests) (66).

Private Ownership

There has been a Green Revolution with high-yielding crop varieties for private farming, but no similar revolution for forestry to improve productivity. While "miracle trees" such as leucaena are fashionable from time to time, they generally are not miracles, and are usually not suitable for everyone. As a result, improved private forest management cannot rely on a simple package of inputs.

Private management of forest resources includes both managing trees on private land and managing trees on government land through leasehold or other contractual arrangements. While it includes the possibility of large commercial plantations in some parts of the Tarai, caring for a few trees near houses and on field bunds in the hills is probably more important as an overall solution for Nepal's energy problem.

There are both efficiency and equity prerequisites for effective management by private owners. For efficient forest management, there must be secure tenure over forest land, access to inputs (seedlings, information about desired/useful species), and the ability to wait for the forest to grow. Secure tenure insures that private owners can capture the future benefits of their current investments, and lowers the discount rate under which private owners make these investment decisions; both slow the rate of forest depletion. Both land tenure and tree tenure must be secure: resource owners (or leaseholders) must be able to harvest and sell the fruits of their labor without difficulty.

For private forestry to work equitably, forest land must be distributed so the previous beneficiaries (some of them landless) of the open access forest regime are not disadvantaged. Current access to the forest provides employment to poor people in many areas, and benefits to them in all areas; if this access is curtailed, even under a management system which increases total forest production, these poor people may be worse off as a result. The present system, which is slowly destroying the forest, is not especially equitable: poor people may be reaping gains now, but this is at the expense of their future welfare. Unequitable production of more fuelwood is better than none, but most planners would trade some efficiency in production for distributional gains.

One disadvantage of securing individual tenure over forest land is the possibility that poor people may lose their forest land through either forced or voluntary sales. If the forest is an open access resource, poor people cannot be individually deprived of their use rights, but if the forest is converted into small plots of private property they can lose these rights one by one.

Privatization is likely to exclude the landless, and even if it is technically possible to divide potential forest land equitably, it is likely that the problem of skewed land distribution (and income) will reappear as some poor people sell land. This highlights the problem of development for people who are extremely poor: their current standard of living may be so low that even large increases in future income will be foregone to purchase small gains in current consumption.

Current regulations limit private forest holdings to small plots of trees and effectively prohibit private forest management on a commercial basis. The Leasehold Forest provisions of the community forestry legislation have not yet been implemented except in a few isolated cases. As a result, there is little incentive for private entrepreneurs to grow trees on their own land or to lease and manage forests on public land.

Because the optimal rotation period for most fuelwood species in Nepal is less than the 30-year maximum lease period, and there are probably not significant economies of scale in planting or harvesting trees--especially in hills where both operations must be done by hand--

the lease forest rules could lead to optimal management of all currently degraded forest land. However, it will be profitable for individuals to lease forests only when there are more markets for fuelwood, and when returns to forest investments are greater than gains in agriculture. In particular, the stipulation that the government reserves the right to fix the lease rate after five years should be replaced with a rate fixed at the beginning of the lease period.

As the Leasehold Forest legislation stands, individuals can obtain leasehold property rights in trees which they plant on degraded land--the land itself remains under government ownership. While this provides an incentive to care for the trees, there is less incentive to manage the land in an environmentally sound fashion. The stipulation that only degraded land can be used for leasehold forestry may lessen interest in participation. Trees grow best under conditions generally not found on degraded land, and establishing trees on degraded land may be expensive.

Recommendations by the USAID Forestry Private Sector Study include: establish the right of private interests to own, manage, and exploit for use or sale forest property and the products thereof; implement procedures for private interests to acquire forest land in freehold or leasehold; abolish permits required for harvesting and transporting forest products from private land; designate, demarcate, and declare areas of national forest for which the Department of Forests will have managerial responsibility; and declare all forest lands not in private, national forest, or reserved ownership as the property and responsibility of the panchayat, ward, or user group within whose boundaries they fall (67). If these recommendations are included in the Forestry Sector Master Plan, a substantial boost could be given to private sector participation in forest development.

There are difficulties with private and leasehold forestry. District Forest Controllers sometimes do not support private and leasehold forestry, because this would reduce their authority and control over forest resources. This may be one explanation of the lack of implementation of leasehold forestry. There may also be competition between leasehold forests and panchayat forests--in many areas there is simply not enough land available for both.

Unfortunately, it may be a sign of villagers' growing dependence on government projects that there seem to be motivation problems related to conditions for designating leasehold forest areas. In theory, an individual leases a plot of land at a nominal rate in order to plant trees and reap the benefits of harvesting fuelwood and fodder. In practice the government may pay lessees during the period when the trees are growing. This changes the character of the program entirely from one which could encourage enterprising individuals to one which simply provides low-paying forest guard employment.

More Efficient Use

Along with returning forest control to local villages, increased fuelwood use efficiency is a goal of most forestry projects through the introduction of improved stoves which might under favorable circumstances reduce household fuelwood consumption by as much as one-half. However, surveys indicate that the average saving in practice is about

30 percent of average household use (68). The advantage of improved stoves is that benefits are realized as soon as villagers adopt them. While stoves are not expensive (Rs.75 to Rs.125 per stove, or between US\$3 and \$5), they are not cheap if fuelwood is free (not purchased). Improved stoves provide financial returns to their owners when fuelwood prices are Rs.0.10 per kg or higher (69).

Improved stoves offer hope for immediate reductions in fuelwood use, but villagers have been much slower than expected to adopt these stoves, and so far they have made little impact on overall fuelwood use. Fewer than 30,000 stoves have been distributed, and it is estimated that only 30 percent of those in urban areas and 10 percent in rural areas are being used (70).

This analysis evaluates fuelwood production from forest management and fuelwood savings from efficient stoves, but does not indicate which policy will be easier to implement. Each improved stove might save 1.5 cum/yr of fuelwood; this is the amount of fuelwood which can be produced on one-quarter ha of well-managed Panchayat Forest (71). Is it easier for the government (or the community) to persuade one family to adopt an efficient stove than it is to maintain a quarter-ha of forest? A Panchayat Forest can be maintained by a few people, but families adopt stoves one by one. On the other hand, once a family is convinced of the advantages of an improved stove--and incurs the costs of buying or building a stove and learning how to use it--the gains are realized far into the future, but a forest requires continual management. Improved stoves also provide immediate benefits, while forests take time to grow.

A mixed strategy is needed, incorporating both improved forest management and efficient stoves. Both can contribute to solving Nepal's energy crisis. Efforts to introduce stoves should be focussed on areas where they are most likely to be effective--in urban areas where fuelwood has a rupee price. Improved stoves do not solve the fodder problem, which is now the greatest pressure on the forest, but stoves can reduce household smoke and decrease the incidence of respiratory disease as well as help solve the fuelwood problem.

Hard Choices Ahead

Hope for Nepal's forests must be based on a realistic assessment of limited possibilities. Community forestry programs as currently defined will not solve Nepal's forest degradation problem and the consequent national energy crisis. These forestry programs are fine as far as they go--they just do not go far enough. These programs should continue, but complementary programs--particularly private and leasehold forestry--should also be encouraged.

Nepal has hard choices ahead. Policymakers must recognize that the hope for solving Nepal's energy crisis lies primarily in providing incentives for villagers to manage local forests. They must move quickly from a technically and bureaucratically dominated view of forest management to a view which recognizes that villagers' perceptions are the key to maintaining and improving the forest resource. In view of the government's previous record and current public image, this will not be easy--but it must be attempted if villagers are to see any improvement in forest management in the near future.

Forestry is at a crossroads. More and more information is becoming available from the many forestry-related projects that have begun in the last ten years. As more experience is gained and information collected, knowledge about the costs and benefits of various aspects of the community forestry program will increase, and redirection may be appropriate. As the years go by, foresters know a little more about which trees to plant, where to plant them, how fast they will grow, who will take care of them, and who will benefit when the trees are harvested. This information must be consciously incorporated into forestry planning efforts.

There are hard choices, but Nepal has potentially productive land, and potentially energetic people. The task ahead is to remove adverse incentives and provide positive encouragement to improve forest management. Villagers depend on local resources and have a long-term interest in preserving the productive capacity of those resources, even though sometimes their actions may seem short-sighted. Policymakers need to define a government role which supports villagers in managing their local resources. "Getting institutions right" is difficult when institutions are limited; but this means that policy instruments are limited, not that improvement is impossible.

Few local institutions and little formal control were needed in an era of low demand (small population) and high supply (large forest). As this situation has changed, institutions must also change. There is hope for better forest management as community forestry moves ahead, and energetic villagers attempt to solve local resource problems. Whether the institutions involved in the promotion of community forestry can adapt to this new situation fast enough to solve the deforestation problem is still an open question.

Experience in the Nepal-Australia Forestry Project area indicates that government, foreign, and private villager efforts can reduce deforestation by about half. While not yet a solution, this does give "every reason to hope that the 'crisis' which is continually forecast may well prove to be far less terminal than many would have us believe." (72)

The overall condition of Nepal's forest is likely to deteriorate further before it improves, simply because new seedlings and improved management do not produce increased yields quickly, and the demands of the growing population continue to rise. On the other hand, the success of some forestry project efforts and the initiative and dedication of some villagers to improving the natural resource base on which their lives depend provide hope that the forest can recover and produce a sustainable supply of fodder and fuelwood. The future of Nepal's forest depends on the ability of villagers, government officials, and expatriate advisors to learn from past successes and failures and design and implement forest policies and programs which recognize that villagers' perceptions are the key to rural development, and encourages individuals and communities to act in their own long-term self-interest by effectively managing the forest for increased production, and by equitably distributing that increased production so everyone benefits.

Notes to Chapter IV

- (54) Hobley 1987, p.5.
- (55) Author's calculation based on WEC January 1987.
- (56) WEC January 1987, pp.8-9. The estimate of 5 cum/ha/yr is higher than the overall potential yield from Nepal's forest used in WEC January 1987.
- (57) With population growing at over 2.6 percent per year, demand will increase from 4000 cum to over 4625 cum--the sum of current (2500 cum) and new (2125 cum) production--in less than six years.
- (58) See WEC January 1987 for district data.
- (59) This includes 65,000 ha to be planted by HMG, and 110,000 ha--65,000 ha PF and PPF, 20,000 ha private planting, 15,000 ha contract planting, and 10,000 ha from distribution of 24 million seedlings--by villagers.
- (60) Over 2 percent decrease per year on 2.8 million ha of crown cover.
- (61) Carter 1987, p.5.
- (62) See Gilmour et al. July 1987, p.11.
- (63) HMG/UNDP/FAO September 1986.
- (64) WEC January 1987.
- (65) See Gilmour et al. July 1987, p.10.
- (66) Gilmour et al. July 1987, p.19.
- (67) Kernan et al. 1986.
- (68) WEC October 1987, p.3.
- (69) WEC October 1987, p.10.
- (70) WEC 1988, p.39; WEC October 1987, p.7.
- (71) The Seventh Plan also indicates that distributing 160,000 stoves will be equivalent to planting 40,000 ha of forest.
- (72) Gilmour August 1987, p.17.

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