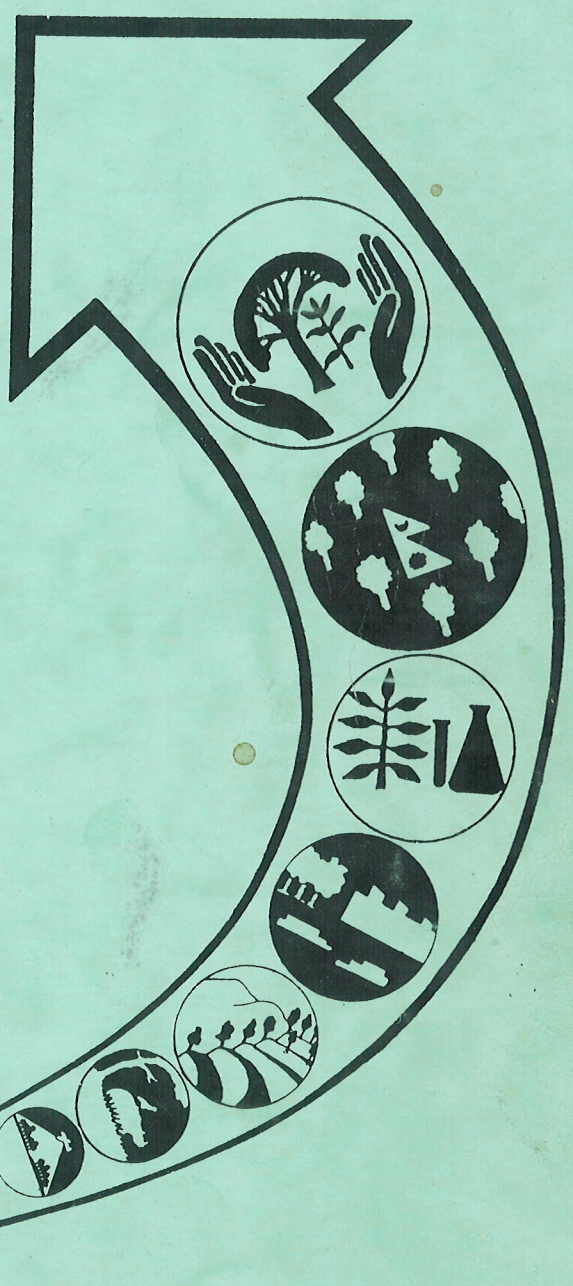
MASTER PLAN FOR THE FORESTRY SECTOR NEPAL



SUMMARY OF THE PROGRAMMES

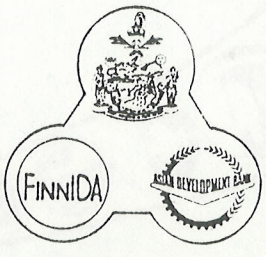
FINNIDA

ASIAN DEVELOPMENT BANK

HIS MAJESTY'S GOVERNMENT OF NEPAL
MINISTRY OF FORESTS AND SOIL CONSERVATION

MASTER PLAN FOR THE FORESTRY SECTOR NEPAL

SUMMARY OF THE PROGRAMMES



Prepared by the
Master Plan for the Forestry Sector Project
of HMGN/ADB/FINNIDA
with Jaakko Pöyry Oy/Madecor consultancy

Kathmandu, December 1988

F O R E W O R D

More than a decade ago, concerned authorities recognized the need for a comprehensive master plan to guide forestry development in Nepal. This recognition led to the preparation of the National Forestry Plan of 1976, which listed the major constraints and proposed policies to tackle them. The idea of preparing a forestry master plan, which would be updated on a regular basis, was brought up in a donors' meeting in Kathmandu in 1984. Consequently, HMGN started the Master Plan for the Forestry Sector Project (MPFSP) in January 1986 with financial support from FINNIDA and ADB. The highlights and programmes of the Master Plan were presented to the Local Aid Group in May 1988. During that meeting, donors indicated their support to programmes of interest to them. Suggestions were also given to improve the Master Plan. These have been taken into consideration in the final version of the Master Plan which was accepted by HMGN in April 1989.

The Master Plan is a tool aimed at charting the desired direction that the forestry sector should take. Moreover, as master planning is a periodic process, the current plan will be a good model for charting necessary changes of direction in the future. Thus, the sector's development will always be deliberate, planned, and therefore consistent with the sector's long-term goals.

The complete Master Plan for the Forestry Sector in Nepal includes all forestry-related activities in the country during the period of 1986 to 2010. More than 2300 pages are needed to describe it fully. The plan proper consists of a set of planning documents which includes a Main Report and an Executive Summary, ten subsectoral plans, and a supporting report on the country's background.

The Main Report is aimed at providing the national authorities with a view of the forestry sector priorities and of the necessary development framework, from the Nepalese perspective. It is a digest of the various Master Plan documents and should be a useful study material for donor agencies and other parties who are interested in supporting the Master Plan implementation.

The sub-sectoral reports cover more in detail the status assessment, identification of problems, justification of remedies and formulation of all twelve development programmes, of which six are primary and six are supporting programmes. Each of them also details the activities and respective costs, financial plans, and assessment of economic, socio-economic, financial, and environmental impacts of the programme.

The MFSC is cognizant of the complexity of these reports. We at the MFSC are aware that not everybody is in a position or has the time to go over the details included in these documents. It

is in this regard that the "Summary of the Programmes" has been prepared and compiled as a separate document. This compilation therefore, is primarily designed for busy readers. We believe that this will pave the way into deeper examination and understanding of the Master Plan reports and programmes.

In this document, digested material was first prepared as background papers for the Donors' Meeting held in August 1989. All these papers are compiled and presented in the following sequence:

- The Master Plan programmes and impacts
- The new forestry sector policy and legal institutional reforms
- Economic strategies and investment requirements of the Master Plan programmes.
- Community and private forestry, and national and leasehold forestry
- Wood-based industries
- Medicinal and aromatic plants and other minor forest products
- Conservation of ecosystems and genetic resources
- Soil conservation and watershed management
- Research and extension
- Resources information and planning assistance
- Monitoring and evaluation
- Human resources

The Master Plan for the Forestry Sector in Nepal has been a truly multilateral cooperative endeavour of HMGN officials, the principal donors (ADB and FINNIDA), and several other agencies.

On behalf of HMGN, we therefore wish to express our humble gratitude to all parties concerned, for their true and sincere assistance and cooperation.

BIRENDRA N. KHUNJELI
Secretary, MFSC

THE MASTER PLAN PROGRAMMES AND IMPACTS [1]

Introduction

Nepal's forestry sector plays a central role in the economic and social life of the rural people. The share of agriculture, fishery, and forestry in the Gross Domestic Product is about sixty percent, of which about a quarter is estimated to be forestry's contribution. Fodder from forest land provides more than forty percent of livestock nutrition. Forest litter and dung are relied upon to enrich farm soils. The country's main energy resource, covering seventy-five percent of total energy used, is fuelwood from forests, shrublands, and lands adjacent to farms. Forest watersheds are the main source of the water that is needed for energy, irrigation, and household supplies.

Employment provided by the sector is equivalent to about 1.36 million full-time jobs, although most of it is in non-monetary occupations, like fuelwood and fodder collection.

National parks and wildlife reserves are important as reservoirs of genetic resources. In this respect, Nepal has successfully established a network of protected areas that are representative of a wide range of Himalayan ecosystems. These protected areas also play a major part in the tourist industry, a fast growing sector of the economy, by promoting the country as an attractive destination.

These important contributions of the forestry sector are being eroded by forest degradation and destruction. Increasing numbers of people, their demands for fuelwood and timber, the maintenance of large numbers of livestock, and the scarcity of agricultural land, have put increasing pressure on the forest resources. The process has a natural tendency to accelerate, as increasing exploitation eats into the productive resource base. The decline of the forests has in turn created environmental problems such as accelerated soil erosion and downstream sedimentation, and losses in agricultural productivity.

The forest resources and their degradation

Nepal has 5.5 million hectares of natural forests, 37% of its land area of 14.7 million hectares. In addition, there are 0.71 million hectares of shrubland (5%), 1.75 million hectares of grassland (12%), and 0.60 million hectares (4%) of tree-covered land adjacent to farms. There are 3.05 million hectares of cultivated land (21%). The rest is taken up by settlements, rocky areas, perennial ice and snow, lakes, and rivers (21%).

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[1] Paper presented by R. B. Bista, MFSC Chief Planning Officer, during the Donors Meeting on the Master Plan for the Forestry Sector held on 30 August 1989 at Kathmandu, Nepal.

About 59% of the natural forests are broadleaved stands, 17% conifer stands, and 24% mixed stands. The most common species are sal (Shorea robusta), chir pine (Pinus roxburghii), blue pine (Pinus wallichiana), fir (Abies spp.), and oak (Quercus spp.).

Only 11% of the natural forests are in the Terai and High Himal zones combined. The rest are fairly evenly distributed among the Siwaliks, Middle Mountains, and High Mountains. However, the Terai has made major contributions of wood supplies, which have reached urban centres like Kathmandu, because of their accessibility. Much of these contributions is in the nature of salvage fellings and is unsustainable.

Two tell-tale signs of forest degradation have been noted: only 15% of the forested land carries dense forests (or more than 70% crown coverage), and only 1% carries predominantly young regeneration or pole sized trees. The average growing stock is now less than 100 m^3/ha, a very low figure. Heavy exploitation has reduced the growing stock in the Middle Mountains more than in the other zones.

The area of natural forests was reduced by about 570,000 ha between 1964 and 1985. Much of the reduction has been in the sal forests of the Terai. Reforestation has been on a relatively small scale; during the same period there were only 47,300 ha of new government plantations and 21,900 ha of community plantations, and much of this area is not fully stocked.

If the forests were all accessible, they could fully provide the people's basic needs at a sustainable rate of harvesting. In fact, the extremely rugged terrain and the lack of roads limit their accessibility. Even in the densely populated Middle Mountains, while the accessible forests are under heavy pressure, only something between forty and seventy percent of sustainable fuelwood supply is being used. The rest is too remote, or is in excess of local demand, and cannot readily be transported to meet needs elsewhere. It is not generally a practicable solution to the present problem to try to improve accessibility.

Inadequacy of "current trends" in forestry

Pressure on the forest resources will intensify as human and livestock populations continue to increase. Efforts are being made to put 1.25 million hectares of forests, including 0.41 million hectares of new plantations and tree farms, under good management, and to have 310,000 households using only fuel-efficient stoves, but even if they succeed, these responses to the problem will still be inadequate.

In the Terai and Middle Mountains, where eighty-five percent of the people live, the fuelwood deficit will grow from the present 2.6 million tonnes to 3.5 million by the year 2000, and the timber

deficit from 0.25 million cubic metres to 1.2 million. At the national level there will be theoretical fodder surpluses, because of real surpluses in the Siwaliks, High Mountains, and High Himal, but in most subregions of the Terai and Middle Mountains, where more than eighty percent of the livestock are raised, there will be deficits. The fodder surpluses, such as they are, however, will decline and turn to deficits by 2010.

On present trends also, 0.6 million hectares of natural forests will be lost during the next twenty-five years, plunging the nation deeper into the vicious cycle characterized by a widening gap between demand and supply, and by the destruction of the supply base in trying to meet the immediate needs.

As the forests decline, various subsectors will have their problems intensified. Forest-based industries will find it even harder to obtain their raw materials, and as a result many will have to close down, putting many people out of work. The production of medicinal and aromatic plants, as well as of other minor forest products, will further decline, likewise cutting off the means of livelihood of many people. The problems of soil and water conservation will get worse. Pressure on national parks and wildlife reserves will intensify.

The conception of the Master Plan

The very survival of the nation depends on putting a stop to forest degradation. The remaining forests must be put under proper management, and forest cover must be restored, where it has been destroyed, on non-agricultural land.

A National Forestry Plan was drawn up in 1976, but within a few years, the need for greater efforts was obvious. The Master Plan for the Forestry Sector was conceived in 1984 during a Local Aid Group Meeting among national authorities and representatives of bilateral and international donors. Started in 1986, the Master Plan for the Forestry Sector Project was to continue the planning work, and support forestry operations with well defined development programmes.

The Master Plan has been drafted, widely disseminated and discussed, and a final version put together over a period of three years, by the combined efforts of His Majesty's Government and donors. Expatriate and Nepalese consultants, counterparts, and upper-level officers of the Ministry of Forests and Soil Conservation, pooling their vast experience, have been active in shaping the Plan. Other forestry-related projects, and the donor agencies that support them, have made important contributions. Two regional workshops enabled the planning team to hear the views of local officials and people's representatives on various issues.

Planning is a continuous process, and the Plan now formulated is not meant to be an all-time guide. The planning capability of

the Ministry of Forests and Soil Conservation has to be developed to continue the master planning process, and to translate the Plan into operational form, along the programme lines that have been established.

Plan objectives

During the planning process, the relevant policies of His Majesty's Government were studied and used as guides; long-term and medium-term objectives were identified and reconciled with immediate and short-term realities; and strategies and implementable programmes were formulated, taking account of existing or anticipated resources and constraints. The Plan has the following objectives:

Long-term

- To meet the people's basic needs for fuelwood, timber, fodder, and other forest products on a sustained basis.
- To contribute to food production through an effective interaction between forestry and farming practices.
- To protect the land against degradation by soil erosion, floods, landslides, desertification, and other effects of ecological imbalance.
- To conserve the ecosystems and genetic resources.
- To contribute to the growth of local and national economies by managing the forest resources and the forest-based industries, and creating opportunities for income generation and employment.

Medium-term

- To promote people's participation in forestry resource development, management, and conservation.
- To develop the legal framework needed to enhance the contribution of individuals, communities, and institutions.
- To strengthen the organizational framework and develop the institutions of the forestry sector to enable them to carry out their allotted tasks.

Programmes

Twelve programmes have been formulated to meet the above long-term and medium-term objectives:

Primary programmes

- **Community and private forestry**, aimed at developing and managing forest resources through the active participation of individual people and communities to meet their basic needs.

- **National and leasehold forestry**, aimed at developing and managing national forests through government agencies or private sector lessees, complementing community and private forestry.

- **Wood-based industries**, aimed at facilitating the conversion of wood into commodities needed by the people, and contributing to economic development through industrialization.

- **Medicinal and aromatic plants and other minor forest products**, aimed at increasing the supply of medicinal and aromatic plants and other minor forest products, and facilitating their conversion into useful commodities and their distribution to local and foreign markets.

- **Soil conservation and watershed management**, aimed at protecting the land against degradation and conserving its value through the mobilization of national and local resources.

- **Conservation of ecosystems and genetic resources**, aimed at protecting special areas for their ecosystem and genetic resource value, as well as for the provision of amenities, and promoting in-situ and ex-situ conservation of plant and animal genetic resources.

Supportive programmes

- **Policy and legal reform**, aimed at developing the policy and legal framework to facilitate and enhance the contribution of individual people, communities, and institutions to forest resource development, management, and conservation.

- **Institutional reform**, aimed at strengthening the organizational framework in the sector for more efficient and effective development programme implementation.

- **Human resources**, aimed at developing the capability of the human resources in the sector for implementing forestry development programmes and operations.

- **Research and extension**, aimed at strengthening research and development, as well as the extension and public information capability of the forestry sector, and promoting the utilization of the results of research.

- **Resources information and planning assistance**, aimed at developing within the Ministry of Forests and Soil Conservation a forest resources information system and capability for surveys, inventories, and other information generating activities, and for using management information in long-term and operational planning by the government and private sectors.

- **Monitoring and evaluation**, aimed at institutionalizing a system for monitoring forestry development operations and

their impacts, and for processing monitoring data into information to guide the development process.

Cost of forestry sector development under the Plan

The cost of all programmes combined is about 1.74 billion US dollars for the twenty-one-year period from the last year of the Seventh Five-Year Plan to the end of the Eleventh Five-Year Plan, in terms of constant late-1988 prices. The investment plan calls for the government, private sector, and external assistance to take up this total cost in three almost equal shares. In real terms, the rate of increase in investment required from the government is only slightly higher under the Plan than in earlier years. Proper allocation among the programmes is important.

A large part of the cost to be borne by the private sector is the cost of collecting forest products. The share of the private sector is expected to increase sharply towards the end of the plan period as production from managed natural forests and plantations comes on stream.

External assistance will be relatively more during the early, heavy development phase of the plan period, decreasing later as the results of development begin to operate.

Impacts

The economic, socio-economic, and environmental impacts that have been projected as the result of implementing the Master Plan programmes are:

- Sustainable fuelwood production will steadily increase, and will be greater than what it would be on current trends by 17% in 2000-01, and by 34% in 2010-11.

- Sustainable timber production will steadily increase, and will be greater than what it would be on current trends by 20% in 2000-01, and by 57% in 2010-11.

- Fodder production from forest lands and tree farms will steadily increase, and will be greater than what it would be on current trends by 14% in 2000-01, and by 39% in 2010-11.

- The estimated increase in fuelwood, timber, and fodder production in 2010-11 alone will mean an increase in income of Rs 23,900 million at current prices.

- Employment in the forestry sector will be equivalent to 2.5 million man-years of full-time jobs in 2010-11, or 47% more than it would be on current trends.

- The development programmes proposed will only have marginal effect on agricultural land use and on the area of agricultural land per capita.

- The development programmes proposed will also have minimal effects on the agricultural land ownership structure. However, if we consider the government lands that are to be put under the control of the rural people, who are the beneficiaries of the community forestry and private forestry programmes, an additional 1.8 million hectares of land, or 0.09 hectare per capita, will be under their management and control in 2010-11.

- A better quality of life for the rural people, especially the lower income groups, will result from the increased availability of forest products and better amenities from the protected areas.

- Substantial positive impacts on the environment are expected. Forest cover will be restored on degraded areas; exploitation of the natural forests will be controlled by the local people for their own benefit, and these forests brought under management; soil conservation will be promoted; the network of national parks and wildlife reserves will be protected and maintained; conservation of plant and animal genetic resources will be promoted; and the people will be made aware of the need to balance their needs for forest produce against the ability of the ecosystem to supply these needs. Possible negative impacts from the development of forest industries are relatively unimportant, and proposals are being made to minimize them.

Economic viability

The forest establishment and management schemes proposed are all economically viable. A better resource allocation mechanism will ensure that soil conservation structures are applied only on those areas where the economic benefits will cover their cost.

An economic internal rate of return has been estimated, but only those programmes which deal with the production of fuelwood, timber, and fodder have been considered. Supportive programmes such as human resources development, forest resource information, management planning, research and development, and forestry extension were all included in the costing. The analysis was carried out in terms of 1988 constant border prices. The rate of return resulting from the implementation of these programmes is 36%. Costs would have to increase by more than 2.5 times, or benefits drop to less than 40% of their estimated value, for the rate of return to fall to 12%.

Implementation

The Master Plan represents a determined move towards developing the forestry sector. The problems and prospects facing the sector have been analysed; objectives have been clarified; a comprehensive set of programmes to meet the objectives has been formulated; and the efforts and resources needed to implement the programmes have been assessed.

A draft Master Plan was presented to the donor community in May 1988. The different countries and international agencies endorsed the programme approach adopted in the Plan, and pledged their support for the implementation of its different programmes. Most of the funds which are required for this purpose for the coming five-year plan period are already in the pipeline. Further efforts are being exerted to cover the remaining financing gap. To pave the way for the successful implementation of the Plan, His Majesty's Government of Nepal has taken the following steps:

- The forestry sector policy has been approved by HMG in April 1989.

- In conformity with the forestry sector policy, the present forestry legislation is being reformed.

- Organizational reform in MFSC has been implemented. **His Majesty the King** himself conducted the proceedings which led to this reorganization.

- A programme to strengthen institutions has been prepared, approved, and set for implementation in mid-1989. The programme, which will be funded by FINNIDA, will cover in-service training, forest resources information systems, and monitoring and evaluation, as well as providing the Ministry of Forests and Soil Conservation with long-term advisory services in accordance with the "lead agency" concept envisaged by the Ministry of Finance. Likewise USAID will also provide support in strengthening the planning function of MFSC.

- The Master Plan project has been extended into an implementation phase with ADB-FINNIDA support, to strengthen the planning capability of the ministry and provide continuity to the master planning effort.

- On-going projects are being reformulated to fit into the Master Plan framework. New projects are being prepared to cover the different programmes of the Master Plan.

- This Donors Meeting is being convened to apprise the donor community of the progress of the Master Plan and the development efforts in the forestry sector.

In the next few months, regional workshops will be conducted to present the Master Plan to field staff of the Ministry of Forests and Soil Conservation, local leaders, and non-governmental organizations, to apprise them of the development thrusts and efforts in the forestry sector, and to gather useful feedback needed to review present legislation and rules and to implement the Master Plan. A public information campaign will be organized through the different media. Planning workshops will be conducted in all regions to strengthen the capability of district forest officers, soil conservation officers, and other forestry field staff to plan and implement field level projects and activities concerning the programmes of the Master Plan.

THE NEW FORESTRY SECTOR POLICY AND LEGAL AND INSTITUTIONAL REFORMS [1]

Introduction

Heavy pressure is being exerted on the forests of Nepal by the increasing population. The people depend on them for firewood, as well as for constructional timber and other forest products. They also use them for grazing and fodder collection to maintain a large number of livestock, which are essential for supplying manure for agricultural crops. As a result of this pressure, the forests have been reduced in area and depleted of trees. In turn, it has become increasingly difficult for the people to meet their basic needs for forest products. Pressure on the remaining forests is further intensified, creating a vicious cycle and aggravating the already serious problems of environmental deterioration and declining farm yields on the scarce agricultural land.

The previously planned and ongoing efforts, if carried out successfully, will increase supply of forest products, but demand will grow even faster, because of the increasing population. In practice, if nothing more is done to increase supply, the deficits will be met by overcutting. In some areas the result will be that the forests will disappear.

Deficits in neighbouring subregions cannot generally be met by transport from the excess supply areas, because of the lack of roads - except in the Terai. Demand for processed wood products and other forest produce will continue to increase as higher living standards are attained, and as the population continues to grow.

Current forest policy and legislation

The National Planning Commission has incorporated the policies of the National Forestry Plan of 1976 into the Seventh Five-Year Plan, and has developed them further. The present policy objectives are to meet the people's needs for forest products, including timber, fuelwood, fodder, etc.; to maintain or restore the ecological balance through programmes of reforestation and watershed management; and to derive maximum economic gains from forest products, for example by promoting the export of medicinal herbs.

Analysis of the current forestry-related policies and legislation

Because of the long tradition of five-year plans, a policy formulation mechanism is already available. However, there are excessive delays in translating policies to legislation and then to operational rules and administrative orders.

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[1] Paper presented by B. P. Kayastha, MFSC Additional Secretary, during the Donors Meeting on the Master Plan for the Forestry Sector held on 30 August 1989 at Kathmandu, Nepal.

The policy of decentralization means that national forestry institutions must concentrate on supporting local development efforts. The Department of Forests has initiated a campaign to involve people in forest management based on panchayats. Progress has been promising but not fast enough. This policy document seeks more effective means to attain the goals.

The present ecological and land-use policies are well intentioned, but tend to be authoritarian and lack appropriate institutions and mechanisms for their implementation. They need to be simplified and brought into line with other policies. Land reform, including the termination of dual ownership, needs to be put into effect. This would lead to more intensive use of arable land and thereby reduce pressure on marginal and forest land.

Forestry and agricultural policies are insufficiently coordinated. There is no government agency that is solely responsible for fodder supply or the development of fodder sources nationwide.

The existing forestry legislation was formulated to resolve the problems of the past, related to protection, rather than the present and future needs for better management and increased production. As a result, the current legislation does not fully accord with the spirit of the new forest policy, which has been arrived at through the master planning process. This weakness is particularly conspicuous in the case of community forestry. Policy is now very clearly in favour of true "people's participation" but the prevailing legislation is the Forest Act of 1961, whose original spirit aimed at preventing the common man from entering the forest at all. However, the various implementing rules that have been based on the Act since 1977 have been formulated in the modern spirit of allowing people to develop the resource to meet their needs.

The Forest Protection Special Act of 1968 and the Forest Products (Sale and Distribution) Rules of 1971 continue to strictly regulate people's rights to forest products.

The Panchayat Forest Rules and Panchayat Protected Rules of 1977 allow communities to manage barren or degraded lands for forest production. The Rules need to be improved to promote true community forestry effectively, in the spirit of decentralization.

The Leased Forest Rules of 1978, which was recently revised, allow only barren or very degraded areas to be leased. Such a principle may encourage the cutting of trees so that the area can be claimed for leasing. However, these rules have not yet been applied on any significant scale.

The Private Forest Rules of 1984 entitle owners of private forests to a free supply of planting materials, and technical assistance from forest officials, provided the forest is duly registered.

The National Parks and Wildlife Conservation Act of 1973 defines a National Park, and provides for three other kinds of reserves: Strict Nature Reserves, Wildlife Sanctuaries, and Hunting Reserves. Entry to a park or reserve is restricted, and there is a list of prohibited activities. Much of the Act and its Rules is concerned with protection of wildlife and controls on hunting, although special rules can also be made in relation to particular National Parks.

The Soil and Watershed Conservation Act 1982 empowers HMG to declare any area to be a Protected Watershed Area. In such areas measures may be taken for afforestation and forest protection, and official permission is required before cutting trees, plants, or other forest products. Land use, including cultivation and the planting of trees, may also be the subject of official controls. This Act has not been applied yet but two nationally important watersheds are under consideration to be made Protected Watershed Areas.

The Land Act of 1963 has an indirect negative impact on forestry development, because land is defined to be government land if it includes forests, which then may encourage people to cut trees so that the land can be unambiguously claimed as private.

The Pasture Land Nationalization Act of 1974, which is applied selectively, vests the ownership of all pasture lands in the government. The local village panchayat is required to "protect and improve" pasture lands and "must not use the land for any other purpose".

Nepal's planning process represents a novel compromise in an attempt to combine local participation in development planning with national strategy, coordination and budgetary control. The Decentralization Act, 1982, requires each village panchayat to draw up a village development plan. Village plans are used as the basis for district plans. The National Planning Commission is responsible for ensuring administrative coordination in district plan formulation. There are also provisions for district development plans to be adjusted where necessary, to ensure consistency with national policies and guidelines.

Development imperatives

Long-term development can be politically, socially, economically, and ecologically sustainable in Nepal only if it caters adequately to the following imperatives:

- Satisfaction of basic needs

  Peace and security, which are preconditions for national development, can be maintained only if the basic minimum needs of the people are satisfied.

- Sustainable utilization of the forest resources

  The forest resources can contribute to the nation in perpetuity only if they are conserved, wisely managed and used, maintaining their productive capacity. Protection and management of the forests is essential to protect the watersheds, prevent soil erosion, conserve flora, fauna, and genetic resources, and provide a sustained supply of forest products.

- Participation in decision making, and sharing of benefits

  The immense energies and resources of the people can be released and mobilized into constructive management work through such programmes as community forestry. When the decision-making power is brought to the level of the users who most depend on the forest resource, the decisions have a good chance of being implemented. The real users and decision makers can be motivated to rationalize their forest use only if they themselves benefit from their improved management and harvesting methods and their afforestation efforts.

- Socio-economic growth

  The multitudinous contributions from the forestry sector must be channelled in ways which provide maximum benefits to both the local and the national economies. Special attention must be paid to the poorest segments of society.

Objectives of the forestry sector as bases for policies

Long-term objectives

- To meet the people's basic needs for fuelwood, fodder, timber, and other forest products, on a sustained basis.

- To contribute to food production through an effective interaction between forestry and farming practices.

- To protect the land against environmental degradation by soil erosion, floods, landslides, desertification, and other effects of ecological disturbance.

- To conserve the ecosystems and genetic resources.

- To contribute to the growth of local and national economies by developing forest management and forest-based industries, and creating opportunities for income generation and employment.

Medium-term objectives

- To promote people's participation in forestry resource development, management, and conservation.

- To develop the legal framework needed to enhance the contribution of individuals, communities, and institutions to forest resource development, management, and conservation.

- To strengthen the organizational framework and develop the institutions of the forestry sector to enable them to carry out their missions.

New forestry sector policy

His Majesty's Government has recently approved a new forestry sector policy to guide the legal, institutional, and operational development of the forestry sector. The policy statements are as follows:

Production and utilization

The forest resources of Nepal will be managed and utilized so as to give priority to the products that can best contribute to the basic needs of the people. The priority products are fuelwood for cooking, fodder for domestic animals, timber for housing, and medicinal plants for health.

Forests near villages will be managed with the people's participation. The primary task of the government field staff will be to assist and advise people in their efforts to manage and utilize the forests on a sustained yield basis. The present uncontrolled use of forest produce will be gradually eliminated by promoting the establishment of permanent users as managers of the forest resource. The ancient right to collect fuelwood and fodder free of charge will be regulated by people's own decisions and management plans.

Wood supply to urban areas with cash economies will be intensified by promotion of wood production on farms and in commercial plantations, especially in suitable parts of the Terai.

Conservation of ecosystems and genetic resources

Land and forest resources will be managed and utilized on a long-term basis, according to their ecological capability, so as to conserve the forests, soil, water, flora, fauna, and scenic beauty. Representative examples of ecosystems unique to Nepal and areas of special scientific, scenic, and recreational or cultural values will be protected. Maintenance of the ecological and environmental balance and of biological diversity is needed for the sustained well-being of the nation. Therefore, evaluation of environmental impacts will be required when implementing development programmes. Although the national interest may require restrictions that conflict with private local interests when protected areas are being established and managed, any adverse effects on the local people will be minimized and compensated.

Tourism that affects protected areas will be regulated and kept within the carrying capacity of the local ecosystems.

Social aspects of land use

The principles of the decentralization policy will be applied in the forestry sector by community forestry, which will have priority among other forest management strategies. Priority will be given to poorer communities, or to the poorer people in a community.

If the availability of forest land exceeds the needs of the local communities, the excess will be allocated for forest management in the following priority sequence: people living below the poverty line, small farmers, and forest-based industries.

In general, no more forest land will be released for cultivation. However, forest land may be allocated for agricultural or other uses in very exceptional circumstances, by decisions taken at cabinet level.

Emphasis will be given in the multiple utilization of land for integrated farming systems, by strengthening research, extension, agroforestry, and other activities related to this policy.

The role of the private sector

Establishment of private forests on leased and private lands will be promoted to the extent that is socially acceptable.

The parastatals will be required to compete with private enterprise on an equal footing, and if they cannot do so successfully they will be dismantled. The government will lease or sell land for growing raw materials on a scale which will eventually satisfy, under proper management, a substantial part of the requirements of an enterprise. New forest-based industries will be established only if their plans for the production and acquisition of raw materials are acceptable to the Ministry of Forests and Soil Conservation.

Classification of the forests and protected areas

For conservation and management purposes, and taking into consideration land ownership, forests and protected areas will be classified as:

- National forests. All forests except those designated otherwise.

- Community forests. Forests entrusted to panchayats and further to user groups.

    - Panchayat forests. Any government forest land, devoid of trees or in which only scattered trees or shrubby vegetation is left, which HMG has notified for forest development through reforestation by users' groups recognized by the panchayat.

- Panchayat protected forests. Any government forest which HMG has notified for management and conservation by users' groups recognized by the panchayat.

- Private forests. Forests or trees raised and managed on privately owned land.

- Leased forests. Forests on land that has been leased by central or local agencies of the government, panchayats, or private owners to individuals, cooperatives, institutions or commercial firms.

- Religious forests. Forests belonging to religious institutions under the Guthi Act.

- Conservation areas. Land such as national parks, reserves, protected areas, or other categories gazetted under the forestry sector legislation.

- Protected watersheds. Any land in public or private ownership designated as protected watershed under the Soil and Watershed Conservation Act.

Strategies

The complexity of the forestry sector calls for a holistic approach to translating this policy into administrative and management actions. The issues are multidimensional and interrelated, and require a mix of strategies. Although strategies are normally selected to complement each other, in some cases they may compete. In these situations guidance must come from the policy statements, which should help the national leaders to orchestrate the development efforts of the forestry sector.

The mix of strategies included in the new forestry sector policy includes:

- Strategies for production and utilization emphasizing on the reduction of consumption using more efficient stoves and house construction design, and the use of alternate engery sources; increased production of fuelwood, fodder, and timber mainly through community forestry, the promotion of private and leasehold forestry, and the intensive management of existing accessible forests; effective harvesting and distribution of wood and other forest products; and improved pasture and livestock management.

- Strategies for conservation of ecosystems and genetic resources with emphasis on legal and institutional improvements, and public education and extension in nature conservation and forestry.

- Strategies for social sustainability adhering to the decentralization policy, by entrusting the protection and management

of forests to the users, and providing livelihood to poor and landless people in forestry-related activities.

- Strategies to promote private involvement in forestry development both in forest production and industries development.

- Strategies for policy implementation by directing the human resources of the Ministry of Forests and Soil Conservation to priority areas; improvement of the policy, legal, and institutional framework; training sufficient, motivated and competent manpower; prioritizing the development programmes and observing the priorities set; and activating the participation of people and non-governmental organizations in forestry work.

Programmes to implement the forestry sector policy

MFSC is responsible for monitoring the application of this policy. It will report to the National Planning Commission, in connection with the preparation of annual plans, on how the policies have been applied in the field, and about how any problems are being tackled. A complete, updated policy statement will be presented in each five-year plan.

Policy coordination between subsectors is the responsibility of HMG, and especially of the National Planning Commission. MFSC will initiate any necessary changes in legislation, and implement them in the field. The Master Plan for the Forestry Sector will be continuously updated to provide a holistic framework for systematic development.

The master plan has identified six primary and six supportive development programmes to implement the new forest policy:

Primary development programmes

- Community and private forestry
- National and leasehold forestry
- Wood-based industries
- Medicinal and aromatic plants and other minor forest products
- Soil conservation and watershed management
- Conservation of ecosystems and genetic resources

Supportive development programmes

- Policy and legal reform
- Institutional reform
- Human resources
- Research and extension
- Resources information and planning assistance
- Monitoring and evaluation

Policy and legal reform

To provide long-term legal support to the various development programmes, policy and legal reform with the following features will be pursued:

- Forestry legislation will facilitate the introduction of socially and economically sustainable community forestry. Decision-making and benefit-sharing mechanisms will incorporate the interests of the real primary users, such as women and woodcutters, in accordance with the government's "basic needs" and decentralization policies.

- The application of law enforcement to forest protection will be clearly defined, and limited to areas of priority national interest, such as national parks and wildlife reserves, soil and watershed conservation areas, and national forests of special importance.

- Forest-based raw materials for industries will be produced by involving industries in decision-making, investment, and management.

- Parastatals will be provided with appropriate roles that will enhance their social and economic contributions to the country.

- District Forest Offices will take over the implementation of development programmes in the field, such as those involving protection, management, administration, production, supply of forest-based raw materials, and assisting communities and private entities in forestry matters.

- The responsibilities of the forestry sector in regard to pasture development will be unambiguously defined.

- Forestry legislation will be publicized to make it effective.

Institutional reform

The master plan process assumed that once a new national forestry sector policy had been agreed, and appropriate new legislation passed, an institutional reform could be undertaken. However, the highest authorities decided that the most obvious shortcomings in the organizational structure should be eliminated without delay. Therefore the ministry prepared a proposal for reorganization which was accepted by the government in September 1988. In the new structure, special attention has been given to avoiding duplication of work; to orienting the working procedures towards meeting the objectives; to clearly outlining the role, responsibilities and authorities of the staff; and to eliminating opportunities for shifting responsibility from the officer in charge to other levels.

The main points of the recent reform are:

- There will be posts for two Additional Secretaries in the ministry. One will look after the functional divisions: training, extension and communication, monitoring and evaluation, and forest survey and statistics. The other will look after the four departments.

- Forest resources information and statistics will be moved to ministerial level and computerized.

- Monitoring and evaluation of the performance and programme implementation of the departments and parastatals will also be ministerial functions.

- A training division will coordinate all in-service training.

- Temporary staff employed by foreign aid projects will be made permanent.

- Technical personnel attached to the ministry who have not been promoted for 8 years will be automatically promoted.

- The "Chief Conservator of Forests" will be styled "Director General". "District Forest Controllers" will become "District Forest Officers".

- The 222 range offices will be converted into Forest Area Service Centres, and 453 more centres will be established in accordance with the decentralization policy. Field level staff will become extension agents.

- In the Department of Forests there will be appropriate divisions and sections to promote community forestry, private forestry, and leasehold forestry, and improved cooking stoves will be promoted in all 75 districts.

- The Department of Medicinal Plants will be renamed the Department of Forestry and Plant Research, which will cover all applied research in the forestry sector. The research and soil survey sections of the Forest Survey and Research Office will be upgraded to become a division under the department.

- The Department of Soil Conservation and Watershed Management will operate on a project basis, without regional directorates. The department will implement watershed management projects of national and district importance with a core of permanent experts and with temporary staff appointed for project periods. The department will be equipped to assess the ambient level of pollution in the Kathmandu Valley and should set acceptable limits.

- The National Commission for Conservation of Natural Resources will be revamped in order to play an effective role in watershed management and environmental protection.

- The Department of National Parks and Wildlife Conservation should submit proposals for rations and uniforms for its

staff. Provision should be made for exchanges of staff between the department and the Department of Forests.

- Armed forest guards should have uniforms. They should be recruited from the Royal Nepal Army.

The present reform has been successful in effective utilization of the senior staff, such as Additional Secretaries; in defining for the first time the principal rights and responsibilities of key officials, a necessary move towards professional personnel management; in regrouping of some supportive functions at ministerial level; in giving the departments equal ranking status; in emphasizing the need to increase manpower at field level, and reversing the previous tendency to increase the number of central level posts; and in reducing non-technical posts by 5%.

There is a positive atmosphere in the country in regard to all development efforts. Simultaneously, increasing awareness of the seriousness of the forestry problems and of the organizational shortcomings in the ministry have created additional pressure inside and outside the ministry for measures to be taken. In response, this reform was started precipitately by the ministry. Although a good start has been made, there is obviously a need to continue the organizational development effort more systematically, recognizing that further rationalization is needed.

In a broad view the objectives of continuing reform are to provide effective institutional structures for policy implementation; to define the distribution of institutional, organizational and individual responsibilities; and to establish or restructure appropriate organizations for effective implementation of the development programmes.

The salient features of the continuing reform are to:

- Continue the process of strengthening the ministry as the primary implementing agency within the forestry sector.

- Find an appropriate place for law-enforcement as a complementary strategy in forest, soil and wildlife conservation.

- Define the proper role for the forestry sector parastatals by carefully identifying what have been their positive contributions as well as their adverse effects on the national development strategy. Special attention needs to be given to their socio-economic obligations.

- Develop mechanisms to integrate project inputs with the work of the permanent implementing organizations, without establishing separate project entities.

- Review the coordination arrangements between the ministry and other government agencies. Special attention needs to be paid to distribution of responsibilities in the areas of forage development, alternate energy, research, environment, land allocation, and forest utilization.

- Consider the need for and the possible structure of a new environmental authority, which would be responsible for coordination and surveillance of all efforts to improve the environmental status of the country, in response to both national and international concern.

A long-term organizational model has been proposed in the Master Plan as a guide in implementing both the organizational reforms that have been initiated and any subsequent changes. Further improvements are needed in:

- Refining the mandates of different organizational units.
- Rational distribution and management of departments, divisions and sections in relation to the new forestry sector policy and the revised legislation.
- Monitoring the growth in numbers of workers employed.
- Further strengthening of staff functions at ministerial level to plan, promote, coordinate and monitor field activities. The emphasis should not be on increasing the number of posts but on training the personnel.
- Completing and simplifying the job descriptions.
- Defining the role of the rangers and other field staff of the ministry in law enforcement versus their role as the people's advisers.
- Clarifying the position of the Regional Forestry Directoriates in the command line.
- Strengthening support for community oriented development activities.
- Developing a unit in the Department of Forests to be responsible for the development of alternate energy sources to fuelwood.
- Giving the District Forestry Offices full control over harvesting in addition to their present functions, in order to give them unambiguous responsibility for the development of forest resources in their districts, and organizational means to promote leasehold and other private forestry.
- Integrating the ministry's field operations whenever feasible, to rationalize and economize them.
- Strengthening and coordinating research and development to support priority activities in the field.
- Systematically allocating manpower and financial resources to the programmes and geographical areas that have priority. The productive programmes and the heavily populated deficit areas need early action.

- Developing a permanent organizational structure for the Department of Soil Conservation and Watershed Management to enable it to expand its activities effectively.

While moving towards the long-term organizational model, the following principles will be observed:

- The ministry will be organized and manned in such a way that it will facilitate the attainment the forestry sector objectives by implementing the development programmes.

- The model will take an economic form which can be sustained by the government, while at the same time providing all the basic services in the priority areas.

- Flexibility will be maintained in different organizational applications for different departments and geographic areas. An organization which is tailored to reflect the demand for services can respond most economically to the challenges that will be encountered.

- Functions that support development will be controlled at ministerial level but physically decentralized in the field.

- The same range offices will be responsible for both protection and extension functions.

- In soil and water conservation priority areas, services will be provided by permanent offices of the Department of Soil Conservation and Watershed Management. In less critical areas the District Forestry Offices will be strengthened by soil conservation experts.

- Wildlife management outside protected areas will be the responsibility of the District Forestry Offices. Where necessary they will be strengthened by a wildlife management expert deputed from the nearest park or reserve.

- Armed guards and army personnel will be unambiguously placed under the District Forestry Officers and Wardens by providing clear job descriptions.

- In government forests of a commercial character the entire production function, which includes forest establishment, management and harvesting, will be the responsibility of the District Forestry Offices.

The model can be seen to result from a time-consuming process, already initiated, which involves planned learning, special in-service training, and some structural changes whereby the staff of the ministry are provided with the opportunity to take part in decision making.

ECONOMIC STRATEGIES AND INVESTMENT REQUIREMENTS OF THE MASTER PLAN PROGRAMMES[1]

Introduction

In May 1989, a Local Aid Group Meeting was held to look at the draft long-term plan of the government for the forestry sector. Comments and advice to improve the draft plan were solicited. Support for the implementation of the plan was also sought. The plan and its programme approach were overwhelmingly endorsed by the participants. Over the past year donors came to identify and formulate projects along the programme framework of the Master Plan.

The concerns and support of the donors will go a long way to help Nepal in her battle to put a stop to deforestation, to conserve the gifts of nature bestowed upon the country, and to produce the forest products and amenities that are indispensable for the very existence and continued well-being of the Nepalese people. A growing population with its growing demands has exerted pressure on a fragile environment. Forests have given way to scrubs and farms, as trees were removed for energy and shelter, or defoliated to feed livestock, and valuable genetic resources have gone with the clearing of forests. Precious soil was lost from each rain.

Agenda for action and expectations

The master plan is the first step in the agenda for action to tackle these problems. Through the plan a number of issues and concerns that affect our economic life and well-being are being addressed. Foremost is the meeting of basic needs for forest products, notably fuelwood for energy, timber for shelter, feed for livestock, medicinal plants for drugs, minor forest products for industries, and many others. It is hoped that the country will be able to satisfy her domestic requirements in these products by the turn of the century. Sustaining this over the long term will take longer, since trees and forest plants need a long time to grow and mature. With the satisfaction of domestic needs in these products, precious dollars that will have gone to imports of petroleum, construction materials, food, medicine, and so on will be conserved. In fact, surpluses can be developed, such as in medicinal plants, rosin, and other industrial products based on the forest that can be exported and generate foreign exchange.

The master plan also addresses the issue of the reduction of our consumption of forest products through more efficient practices and the use of alternate products. The promotion of the use of fuel-efficient stoves has continued to be an important component

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[1] Paper presented by Mr. P. P. Dahal, Joint-Secretary, Foreign Aid Division, Ministry of Finance, on 31 August 1989 during the Donors Meeting on the Master Plan for the Forestry Sector at Kathmandu, Nepal.

accompanying community forestry. The Ministry of Forests and Soil Conservation has recently been given the mandate over the development of alternate energy, particularly at the household level, in view of the demands placed upon the forests for fuelwood.

The expansion of livelihood opportunities and the promotion of gainful occupation are the natural by-product of forest development and management and the setting up of local industries to manufacture furniture, handicrafts, and other wood products; drugs, essential oils and other products from plants; and improved stoves, biogas plants, and similar items for energy. The master plan has estimated that the country generates an equivalent about 1.3 million full-time jobs for these activities annually. This will increase by half a million jobs by the turn of the century, and by over a million jobs by the end of the planning period, if the master plan programmes are fully implemented.

The conservation of Himalayan ecosystems and flora and fauna in the national parks and reserves is an indispensable element of the country's tourism efforts. These natural resources are valuable assets in attracting tourists to the country.

The soil conservation and watershed management efforts serve to save valuable infrastructures from damage and farms from being eaten away by the rivers, to maintain agricultural productivity, and to keep water flowing to supply households, farms, power-generating plants, and industries.

Master plan programmes

These various concerns are addressed in the six primary programmes of the master plan, namely: community and private forestry, national and leasehold forestry, wood-based industries, medicinal plants and other minor forest products, conservation of ecosystems and genetic resources, and soil conservation and watershed management.

To ensure that the primary programmes are effectively implemented, six supportive programmes have been formulated in the master plan. These are the various institutional development functions to improve the capability and productivity of the various forestry institutions. These supportive programmes include policy and legal reform, institutional reform, human resources development, research and extension, resource information and planning assistance, and monitoring and evaluation.

Details on the primary and supportive programmes are covered in the other papers for presentation in the Donors Meeting. This paper presents the financial requirements of these programmes and to examine the financing schemes to be adopted to generate the required financing.

Financial requirements of the programmes

The financial requirements for the programmes have been estimated for resource mobilization purposes. These estimates are indicative of the amount of financing that must be generated domestically and through external assistance.

The development programmes will require an expenditure of about Rs 44.2 billion for the 21-year period from 1989-90 to 2009-10. Of this, about Rs 8.3 billion will be needed during the first six years, of which about Rs 4.5 billion will be for investments, about Rs 2.9 billion for recurrent expenditures, and about Rs 0.9 billion for physical contingency. For the 21-year period, about Rs 16.2 billion will be needed for investments, about Rs 22.7 billion for recurrent expenditures, and about Rs 5.3 for physical contingency.

Investments include such items as establishment of community forests, private tree farms, and government or leasehold plantations, production and distribution of improved stoves, setting up of soil conservation measures, development of processing plants and infrastructures, and acquisition of equipment and other facilities. Recurrent costs include maintenance of forests, private trees, stoves, and infrastructures, and the cost of administration. The investment requirement is estimated to grow, level off, and then decrease over the 21-year period. This trend agrees with the notion that as development takes place fuelled by investments, less and less further investment is required. On the other hand recurrent expenditures, which are estimated in this study to include the maintenance and harvesting cost of plantations, are expected to increase as greater and greater impacts of the investments come about.

Almost half of the expenditures during the first six years will be on two programmes: community and private forestry, and national and leasehold forestry. Expenditures on these programmes will increase as the forest and plantation area under management increases, so that during the 21-year period, about two-thirds of the expenditures will be on these programmes.

About nine percent of the expenditures will be for soil conservation and watershed management, and about 3.3% for research and development including information system development, extension, and management planning.

Financing forestry sector development

It has been envisaged that the support needed to give effect to the master plan programmes will come from three main sources: HMG, external assistance, and the people. Support from HMG and

foreign donors has been increasing, but by far the greatest potential lies in the resources of the people. These are not strictly speaking financial resources, but rather manpower that can be represented in terms of its financial value.

Support for the forestry sector up to the start of the planning period

In 1980-81, the first year of the sixth five-year plan period, the ordinary HMG expenditure for forestry was Rs 4.6 million, while the development expenditure was Rs 89.3 million. These rose steadily to Rs 10 million and Rs 365 million, respectively, by 1985-86, the first year of the current five-year plan. However, these 1985-86 figures represent only 4.3% and 8.3% of the total HMG ordinary and development expenditures for economic services, or 0.3% and 5.9% of the grand total of all HMG's ordinary and development expenditures.

The interest of the international community in assisting Nepal to develop its forestry sector has been growing since the early 1970s. There are at present several externally assisted projects providing support for the forestry sector, including five major afforestation projects, fourteen multidisciplinary projects with forestry components, six commercial forestry ventures, and eight resource documentation and planning projects. In addition, fourteen non-governmental organizations with foreign links are operating small forestry projects, while eight research and operational support organizations have foreign funded activities.

In 1980-81, foreign aid disbursement for forestry was Rs 31.8 million. This rose to Rs 93.8 million in 1985-86, of which 45% was in the form of grant and 55% in the form of loan. The 1985-86 foreign aid for forestry, however, represented only 7.2% of the total foreign aid for agriculture, irrigation, and forestry, or 2.7% of the grand total of foreign aid.

People's participation in forestry development programmes has thus far met with mixed success. In the early years of community forestry, it was shown that the people are willing to participate in projects that will benefit them. Subsequently, however, people's participation could be had only through wage payment. More effective policies and programme designs are needed, as proposed by the master plan, to utilize the resources of the people more fully.

Summary of the financing plan

HMG will strive to make a balanced allocation of its funds among the various sectors. To meet the goals set in the master plan, HMG expenditure for the forestry sector will have to increase from Rs 375 million in 1985-86, to an average of Rs 650 million during the ninth five-year plan, and to an average of Rs 996

million during the eleventh five-year plan, in terms of 1988 prices. The rate of increase in budgetary allocation under the plan will only be slightly higher than in earlier years in real terms.

Apart from financial considerations, HMG's role is vital in opening other bottlenecks which are not costly but may block otherwise smooth implementation of development programmes; that is especially so in areas such as policy, legislation, organizations and human resources.

HMG is expected to shoulder thirty-four percent of the cost of the action programmes during the last year of the current plan and through the eighth five-year plan period. Its share for the 21-year period will also be about thirty-four percent.

The interest of the international community in the development of Nepal's forestry sector will continue to be fostered. It is envisaged that foreign aid disbursement will grow from Rs 93.8 million in 1985-86 to an average of Rs 755 million during the ninth five-year plan period. From this period onwards, external assistance should decrease, in the expectation that most of the required investments will already be in place, and that most of the subsequent expenditures will be recurrent.

About forty-nine percent of the cost of the action programmes during the last year of the current plan, and through the eighth plan, is expected to be borne by external assistance, and for the 21-year period, about thirty percent.

Success in seeking the participation of the people for the development of the forestry sector is expected to improve with the application of the new forestry sector policy. The cost to be borne by the private sector is expected to increase to an average of Rs 544 million during the ninth five-year plan and to an average of Rs 1398 million during the eleventh five-year plan, most of it as labour in the maintenance and harvesting of natural forests and plantations. About sixteen percent of the cost of the development programmes during the six-year period from 1989-90 to 1994-95 is expected to be borne by the private sector, and thirty-five percent for the entire 21-year period.

Conclusion

The country is now all set to implement the master plan. Indeed to this end quick strides have been made during the past year. The master plan and the new forestry sector policy has been approved by His Majesty's Government, legal reform has been vigorously pursued, reorganization of the implementing agencies has taken place, and staff positions set up in the reorganization plan are gradually being filled as suitable candidates become available. Through the assistance of donors, forestry institutions are being

strengthened in their planning, resource information, research, extension, training, and monitoring functions.

To be sure, the country is only at the starting line and still has a long way towards setting up the machinery for the full implementation of the plan and attaining the goals set in the plan. But the country will persevere towards these goals and with the continued support of the donors, the goals will be attained.

COMMUNITY AND PRIVATE FORESTRY AND NATIONAL AND LEASEHOLD FORESTRY [1]

Introduction

Forests have multiple uses. They may be managed for a single, main use, such as production of timber, protection of soils and watersheds, recreation, or conservation of wildlife. In most cases, however, forests are managed for a mixture of uses. In the case of Nepal, they provide the main bulk of household energy needs; a substantial proportion of the feed and bedding for livestock; timber for houses, furniture, and implements; organic nutrients for farms; and many other products and services. Among these, fuelwood, timber, and fodder are by far the main ones.

Heavy pressure is being exerted on the forests of Nepal by the increasing population. As a result of this pressure, the forests have been reduced in area and depleted of trees. In turn, it has become increasingly difficult for the people to meet their basic needs for forest products. Pressure on the remaining forests is being further intensified, creating a vicious cycle and aggravating the already serious problems of environmental deterioration and declining farm yields on the scarce agricultural land.

Background of forest management in Nepal

During the last fifty years, forest management in Nepal has gone through three phases. The first phase can be characterized as management by local people of forests near their villages, to meet household needs for fuelwood, poles, construction timber, fodder, and other forest products. It was a common practice for communities to pay watchers to guard the forests. The people could generally obtain enough forest products for their needs. In the Terai commercial extraction of timber was practiced in the name of management.

The second phase was characterized by a reduction of the forest area, and degradation of the remaining stands. The decline began slowly, and then rapidly accelerated in the early fifties. The nationalization of the forests followed with the passage of the Private Forest Nationalization Act in 1957. The preamble of the act states that forests are an important part of the national wealth, and that it is necessary to nationalize them in order to protect, manage, and utilize them so that they may not be depleted. While the objective of the act was noble, in many instances its effects were opposite to what was intended. The act allowed private ownership of up to 1.25 ha of forests in the hills or 3.5 ha in the Terai, but nevertheless it caused the conversion of some forests to farms, to prevent their being taken over by the government. Also, forests virtually became nobody's property, since the government had no resources to protect them effectively, let alone

[1] Paper presented by I. S. Thapa, Director General of the Department of Forests, on 31 August 1989 during the Donors Meeting on the Master Plan for the Forestry Sector at Kathmandu, Nepal.

manage them. With the increase in population and demand for forest products, the forests, particularly those in the hills, were put under heavy pressure. In the Terai, the situation was no better. With the eradication of malaria, people from the hills migrated to the plains and converted large tracts of forests into settlements and farms.

The National Forestry Plan of 1976 marks the beginning of the third phase. It recognized the critical forestry situation and laid down as objectives for forest management the restoration of the balance of nature, economic mobilization, practice of scientific management, development of technology, and promotion of public cooperation. While the plan was only partly implemented, the fact of its formulation, and the acceleration of reforestation efforts, supported both by local resources and foreign assistance, show that there was growing awareness of the dire state of the forests, and of concern to develop and manage them for the needs of the people.

The birth of community forestry also characterizes the third phase. But in the course of widely implementing the programme, true community forestry was lost as villagers were motivated to participate and fulfil programme targets not by needs and desire but by the payment of wages. Learning from this experience, community forestry is now being redirected closely towards the original concept of more rural institution building, greater self-reliance, a freer hand in forest management, and less subsidy.

An important premise of the master plan is that greater efforts are necessary in this phase of forest management in Nepal, to reverse the decline of the forests and to produce more wood and fodder to meet people's needs through sustainable means. **His Majesty the King** himself has mandated the meeting of basic needs by the year 2000 and has ordered that all development efforts should focus on fulfilling this objective.

The objectives of introducing improved management of the forest resources are therefore:

- To meet people's needs for fuelwood, fodder, timber, and other forest products.

- To support other sectors such as agriculture, health, and energy in meeting people's basic needs for food, water, herbs, and energy.

- to conserve and maintain a safe and wholesome natural environment.

To meet these objectives, the resources that can be mobilized include existing forest land; a wide variety of indigenous tree species, as well as some exotic species that grow well; a body of forest management knowledge and experience that is being enriched by a growing research and development capability; human resources; a limited network of infrastructures; and finances, that can be generated locally or externally.

Current trends and development strategies

Demand and supply of main forest products

That a concerted effort is necessary to avert a worsening forestry crises has been demonstrated in the Master Plan's projections on forest products demand and supply on current trends. Pressure on the forest resources is expected to intensify as human and livestock populations continue to increase. Even if the country were successful in establishing 400,000 hectares of plantations and tree farms, putting 850,000 hectares of existing forests under intensive management, and getting 310,000 households to use only fuel efficient stoves in the next two decades, these already lofty feats if fulfilled would still be inadequate.

In the Terai and Middle Mountains, where 85% of the people live, the fuelwood deficit would grow from the present 2.6 million tonnes to 3.5 million by the year 2000, while the timber deficit would grow from 0.25 million to 1.2 million cubic metres. Deficits in fodder supply would continue to trouble the farmers. As a result about 600,000 hectares of natural forests would be lost.

Demand and supply balance, major forest products

Region	Biomass fuel balance ('000 t)				Timber balance ('000 m^3)				Fodder balance ('000 m^3)			
	1985-86	1990-91	2000-01	2010-11	1985-86	1990-91	2000-01	2010-11	1985-86	1990-91	2000-01	2010-11
Far Westrn	30	-16	195	821	-6	-27	-44	62	68	15	-99	-275
Mid-Westrn	-38	-132	-49	470	-7	-42	-101	-8	80	13	-131	-330
Western	-440	-760	-1064	-747	-36	-63	-228	-227	-100	-64	64	160
Central	-978	-1109	-1107	-566	-170	-261	-474	-383	185	86	-80	-296
Eastern	-678	-947	-1026	-1406	-29	-103	-304	-482	264	311	451	524
Nepal	-2104	-2964	-3051	-1428	-248	-496	-1151	-1038	497	361	205	-218

Master Plan strategies

It is therefore necessary for the country to use all available resources to operationalize a set of forest development and management strategies. The Master Plan defines two sets, referred to as the "optimistic target" and "moderate target" strategies. Both sets of strategies call for attaining higher levels of performance than have been attained before. The targets set are based on perceived needs, but they are not unrealistic. They can be attained, but not if past practices are to be the basis. Attaining the targets calls for total commitment in mobilizing resources and eliminating impediments.

Under the moderate target strategy which the Master Plan proposes to adopt, it is envisaged that reforestation of open land would be further accelerated to establish at least a quarter of a million hectares of new plantations by 2010 A.D.; the growing stock of over half a million hectares of degraded forests and shrublands would be enriched and protected, and their harvest regulated; over a million hectares of natural forests would be placed under management to attain high and sustained production; and planting of trees

on non-cultivated private lands would be encouraged as much as possible, thereby creating a third of a million hectares of so-called "private tree farms". In addition to activities to increase supply, the demand for fuelwood would be reduced by the widespread introduction of fuel-saving measures and alternative energy sources such as biogas plants. The targets under this strategy provide bases for determining the level of investments and other resources that will have to be generated through the efforts of the centre. It should be understood, however, that Master Plan implementation will require further planning at operational levels with targets that are demand-driven rather than imposed from the centre.

To put this strategy into effect, it is necessary to harness the full participation of the people by transferring to them the right to manage forests, by extension work and communication, and by the provision of technical and material assistance. It is also necessary to reorient forestry officials to new roles and responsibilities in supporting the people's efforts; to adapt forestry policies, legislation, and operational guidelines so that they are designed to encourage people's participation; to conduct research and to develop and disseminate improved techniques for establishing and managing forests; and to mobilize the necessary finances.

Some issues related to the supply of main forest products

The Master Plan analyses have shown that it is possible to meet the needs of the people for the major forest products on a sustained basis through concerted efforts to put the identified strategies into effect. Attaining the given targets is certainly not an easy task. Various resources have to be fully mobilized in a coordinated and timely way. A few particular points are worth stressing.

The objective of meeting people's needs must be approached from two sides: reducing demand and increasing supply. Two strategies to reduce the demand for fuel were considered in the analyses: promoting the use of fuel-efficient stoves, and promoting the use of alternate energy such as biogas. The Ministry of Forests and Soil Conservation has recently been mandated to handle these concerns.

Forestry is closely linked to other sectors that use land for production, such as agriculture and livestock. Pressure on the forest is basically a problem of scarcity, both of land for cultivation and other uses, and products like fuelwood and fodder. Forestry problems cannot be solved without due consideration to its mutual dependence on other sectors. The inter-sectoral gap must be bridged by close coordination in planning and plan implementation at all levels. One example of cooperation is allowing the livestock sector to use forest land solely for feed production. A properly chosen piece of forest land will produce more biomass if managed solely for feed than if managed for both wood and fodder, while a forest tree which is not lopped for fodder will grow more and better quality wood. The long-term goal should be for the livestock sector to depend less and less on the forest, until it finally becomes fully self-sufficient.

Supplies can only be increased by improving the productivity of existing forests and developing more forests on degraded areas. In this connection, the country has realized that it should not rely on national forests alone, but should mobilize human resources in rural communities to develop and manage community forests. As has been shown in early community forestry experiences, the people can be effective custodians of the forest. Constraints that limit the effectiveness of the people's custodianship are mainly institutional; they can be eliminated over time through institution-building programmes.

Reducing demand, managing natural forests, and establishing new forests on degraded land by national and local endeavour require important supportive activities. These include policy and legal reform; strengthening of forestry institutions through organizational reform and staff reorientation and training; research and development on forest establishment, management, and utilization technology; and extension. A favourable atmosphere has to be developed by the active pursuit of these supportive activities, before any headway can be made towards attaining the basic targets.

The macro-level master plan serves a special purpose as a tool for generating resources for appropriately-designed programmes, after the problems have been identified, the current situation and trends projected, the strategies formulated, and the needed policy shifts identified and initiated. Targets set in the master plan provide basis for identifying and quantifying the resources that will have to be generated.

Programme implementation in the field requires planning at that level. As previously emphasized, field targets and operations will have to be based on needs or demands that are identified locally, rather than imposed from a central plan. On the other hand, centrally planned and initiated operations insure that needed resources and institutional support will be available at the time required to assist field operations.

Community and Private Forestry Programme

All accessible hill forests in the highly populated mountainous regions of Nepal are being used by the local people for their daily needs. To manage these forests through the existing government institutions has been proven to be impractical. It is extremely difficult, if not impossible, to control their use by the local people. The productivity of these accessible forests can be improved and maintained only by handing them over to the community for management on a sustainable basis.

With this realization, a major shift in the forest policy took place in the late seventies in Nepal. The Community Forestry Development Project was started in 1979-80 with financial assistance of the World Bank and technical assistance of UNDP/FAO. Since then, community forestry has become a part of almost all forestry projects. Australian aid in Nepal has played a leading role to

develop and consolidate the idea of community forestry. Swiss and German assistance, as well as all integrated rural development projects, have incorporated this component in their programme of development.

Community and private forestry aims to meet the demand for fuelwood, timber, and fodder through the active participation of individuals and communities in developing and managing forest resources. A two-pronged approach is adopted to meet the people's needs for the main forest products, namely: reduction of demand for forest products by cutting down wastage; and increasing production by proper management and protection of forests. A massive programme on extension and education to promote the use of fuel-efficient stoves and to develop fuelwood substitutes like biogas is well within the scope of community and private forestry.

The main components of the programme are:

- Management of natural forests and enrichment planting of degraded forests, both as community forests.

- Establishment and management of community forests in open and degraded areas.

- Distribution of seedlings, initially at a subsidized rate, but later through private commercial nurseries, to encourage the establishment of private tree farms.

- Encouraging the use of fuel-efficient stoves or fuelwood substitutes like biogas by supporting their development, production, and distribution.

These activities need to be supported by a host of other activities and programmes such as updating of legislation, strengthening of forestry organizations, reorienting and retraining of forestry professionals to their new roles, research and development, planning assistance, and monitoring and evaluation.

Principal physical targets of the community and private forestry programme

	Unit	1990-91	1995-96	2000-01	2005-06	2010-11
Output targets:*						
Fuelwood production	'000 t_3	6848	7679	8520	9731	11257
Timber production	'000 m^3	941	1073	1238	1574	2343
Fodder production	'000 t	3354	3613	4003	4569	5492
Required inputs:**						
Panchayat Forest established	'000 ha	22.7	55.3	89.4	121.5	150.5
Panchayat Protected Forest under mgmt.						
10% enrichment	'000 ha	21.7	60.6	117.3	170.3	218.2
5% enrichment	'000 ha	9.3	30.6	64.0	96.9	129.7
No enrichment	'000 ha	3.5	117.5	278.9	516.3	787.2
Private tree farms established	'000 ha	48.1	104.0	167.9	241.7	325.0
Fuel-efficient stoves distributed	'000	134.7	303.1	488.4	786.9	1267.6

*Output for the year, includes output from unmanaged natural forests.
**Cumulative accomplishment from 1985-86.

National and Leasehold Forestry Programme

In a mountainous country with fragile ecosystem like Nepal, management of national production forests to support urban and wood deficit areas has a big scope. While community forestry spreads at a modest rate, the national forest that does not come under community forestry should not be left unprotected from haphazard exploitation. Rather it should be put under management. Forest land can also be leased to industries for the production of raw materials. National and leasehold forestry can therefore be an effective complement to community and private forestry.

National and leasehold forestry aims to develop and manage the national forests through government agencies or private sector lessees, and complement community and private forestry as a means to increase the supply of forest products.

Huge resources would be required to put all accessible national forests under management, which may not be feasible. Management should therefore be undertaken initially on a pilot scale. All the districts have prepared "District Working Schemes" which can be the basis for initiating the national and leasehold forestry programme. These management schemes have been approved by His Majesty's Government, but they need to be refined and developed further. This activity can be a major undertaking of the programme in order to meet the needs of the growing population of the country. In the case of leasehold forests, the lessees will be responsible for development and management of forests under the supervision of the Department of Forests. Under the programme, the direct beneficiaries will be the local people and/or communities in the hills, but in the Terai, products will also be supplied to wood-deficit areas and industries.

The main components of the programme are:

- Forest land classification study.
- Establishment and management of national production forests in suitable places, to supply wood to urban and wood-deficit areas.
- Leasing of forest land that is available and suitable for industrial plantations.
- Trial planting and, where trials are successful, larger-scale plantations on degraded lands.
- Silviculture and yield regulation in natural forests.

The programme needs to be backed technically, operationally, and through legal reforms by supportive programmes, as well.

Principal physical targets of national and leasehold forestry

	Unit	1990-91	1995-96	2000-01	2005-06	2010-11
Output targets:*						
Fuelwood production	'000 t	832	1509	2330	3460	5033
Timber production	'000 m^3	103	231	403	664	1136
Fodder production	'000 t	484	521	557	575	584
Required inputs:**						
Forest plantations	'000 ha	11.4	35.5	70.4	87.3	94.1
Managed nat.forests:						
10% enrichment	'000 ha	9.5	31.6	77.9	107.4	115.4
5% enrichment	'000 ha	3.7	11.4	20.0	23.6	27.3
No enrichment	'000 ha	1.3	44.7	96.1	187.7	285.5
Area under mgmt.	'000 ha	25.9	123.2	264.4	406.0	522.3

*Output for the year, includes output from unmanaged natural forests which will be retained as national forests.
**Cumulative from 1985-86.

Costs and financing of the programmes

Only the two primary development programmes - community and private forestry, and national and leasehold forestry - are costed. Supportive activities are costed in their respective programmes. Development costs are based on the forest development goals given under the moderate target scenario. The budget of the department is carried by the two programmes, since it is mainly responsible for overseeing these programmes. For the purpose of partitioning the department's budget between the two programmes, the average of annual ratios of the estimated development costs of the two programmes are used as bases. Staffing of the department is assumed to develop from the present pattern to the recently approved pattern, and finally to the target pattern given in the institutional development plan.

Estimated programme cost and financing plan (Rs million)

Programme/Source of financing	7FYP 1989-90	8FYP 1990-95	9FYP 1995-2000	10FYP 2000-05	11FYP 2005-10	Total
Community and private forestry	329.6	2611.7	4076.8	5775.3	7811.1	20604.4
HMG	147.1	853.8	1155.6	1397.0	1583.4	5136.9
Private sector	41.7	959.6	2164.6	3605.7	5468.0	12239.5
External assistance	140.8	798.3	756.6	772.6	759.7	3228.0
National and leasehold forestry	113.6	971.4	1765.3	2626.3	3475.2	8951.7
HMG	65.1	456.4	796.4	1357.3	1962.2	4637.3
Private sector	0.0	21.1	222.7	758.6	1283.6	2286.0
External assistance	48.5	493.9	746.2	510.4	229.4	2028.4

The Community and Private Forestry Programme will cost about Rs 21.0 billion at constant 1988 prices over the next 21 years. About 34% of the cost covers the investment items and their corresponding contingencies, recurrent costs take up the remaining 66% of the total cost. About 92% of the total cost is local cost. For the first six years of the programme, it is estimated that the government, the private sector, and external assistance will have almost equal share of the total cost. The share of the private

sector consists mainly of labour, put up through people's participation. The government's share consist mainly of the administrative cost of the department. Over the 21-year period, the share of the private sector is estimated to grow to 58%, as plantation maintenance and harvesting costs take up a large portion of the total cost. The share of the government will be about 24% for the 21-year period; external assistance, about 18%.

The National and Leasehold Forestry Programme will cost about Rs 9.1 billion at constant 1988 prices over the next 21 years. Investment items and their corresponding contingencies take up 22% of the total cost. Recurrent costs take up the remaining 78%. About 92% of the total cost is local cost. Over the 21-year period, it is estimated that the government will shoulder 51% of the cost, mainly to cover the cost of developing and managing national forests and also part of the administrative cost of the department. The estimated share of private sector lessees is about 25% of the total cost. The rest of the financial requirement of about 24% of the total cost is estimated to be met through external assistance.

Economic viability

The financial and economic viability of programme components dealing with forest development and management were analysed by comparing the incremental costs and benefits associated with the programme component with the costs and benefits of the alternative in which the programme component is not implemented.

The Financial Rates of Return for forest plantation development on degraded land are relatively low, e.g. 11.1% for national forest in mountain areas. However, from the point of view of the participating community, when subsidies are provided, these are acceptable. For instance, when seedlings and technical supervision are provided free of charge, the Financial Rate of Return for plantation development in mountain areas is 14.8%, or 37.7% when the costs for the first two years are subsidized. For the Terai, the rate of return is high even without subsidy, because yields of the species to be planted are high.

The Economic Rates of Return are quite high considering the low estimated shadow wage rates. For forest management activities the rates of return are very high, since the resources are already there, and with additional inputs, yields can be significantly increased.

An Economic Rate of Return has been estimated for the two programmes, which deal with the production of fuelwood, fodder, and timber, including supportive programmes such as human resources development, resource information system development, management planning, research and development, and forestry extension. The over-all rate of return is estimated to be about 36%.

Impacts

Some of the impacts expected from the programmes are:

- Sustainable fuelwood production will steadily increase, and will be greater than what it would be on current trends by 17% in 2000-01, and by 34% in 2010-11.

- Sustainable timber production will steadily increase, and will be greater than what it would be on current trends by 20% in 2000-01, and by 57% in 2010-11.

- Fodder production from forest lands and tree farms will steadily increase, and will be greater than what it would be on current trends by 14% in 2000-01, and by 39% in 2010-11.

- The estimated increases in fuelwood, timber, and fodder production in 2010-11 alone will mean an increase in income of Rs 23,900 million at current prices.

- Employment in the forestry sector will be equivalent to 2.5 million man-years of full-time jobs in 2010-11, or 47% more than it would be on current trends.

- The development programmes proposed will only have marginal effect on agricultural land use and agricultural land per capita.

- The development programmes proposed will also have minimal effects on the land ownership structure. However, if we consider the government forest lands put under the control of the rural people, who are the beneficiaries of the community forestry and leasehold forestry programmes, an additional 1.8 million ha of land or 0.09 ha per capita will be under their management and control in 2010-11.

- A better quality of life for the rural people will result from the increased availability of forest products.

- The two programmes are directed towards developing the forest resources and arresting their overcutting to meet the needs for forest products; consequently the implementation of the programmes will have substantial positive impact on the natural environment. Negative impacts, if any, are negligible and will possibly occur over a short duration only, for example when the soil is disturbed when prepared for or during the planting of seedlings, or when the crown canopy is reduced by silvicultural operations.

WOOD-BASED INDUSTRIES [1]

Introduction

Nepal's forest-based industries use both wood and non-wood forest products. Hand-made paper production and wooden handicrafts, for example, are cottage industries. Some industries are based on "minor forest products" such as resin, cane, and seeds. Wood-based industries is the subject of this report, while medicinal and aromatic plants and other minor forest products are presented in a separate report.

The large-scale commercial exploitation of Nepal's forests began in 1924, when sleepers from the Terai sal forests were exported to India. However, the first mechanized wood-based industry, in the form of a match factory, was established only in 1938. Successive five-year plans have emphasized the development of industries based on indigenous materials; the speeding up of industrial development; the contribution of forests to the country's economic, social, and industrial development; and the export of forest products only in processed or semi-processed forms. However, the wood-based industries have not advanced much, because of a number of constraints.

Objectives

This paper summarizes the wood-based industries report of the Master Plan, which is aimed at assessing the present and future availability of wood as a raw material for the wood-based industries; reviewing the status of the wood-based industries; identifying the major constraints on the development of this subsector; defining development objectives for the subsector; and presenting strategies and a development programme to attain these objectives.

Wood raw material resources

The forest resources of Nepal is on a decline. Between 1964 and 1979 almost 400,000 hectares of forests were lost in the Terai and dun valleys mainly to settlements and farms. Between 1979 and 1985, another 160,000 hectares were lost, much of them in the Terai, although heavy overcutting of accessible forests for fuelwood and fodder occurred in the Middle Mountains. Nepal's natural forests are estimated to have declined to 5.4 million hectares in 1986. Of these, only 4.0 million hectares have crown coverage of 40% or more.

Sustainable wood supply has been defined as the stem and branch growth plus mortality. Because of the high demand for

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[1] Paper presented by S. K. Dhungel, Officer of the Forest Management and Utilization Division of the Department of Forests, on 31 August 1989 during the Donors Meeting on the Master Plan for the Forestry Sector at Kathmandu, Nepal.

fuelwood, only a small proportion of the stem growth is used as timber. Indeed, in much of the Terai fuelwood is so scarce that there is strong pressure to use all available wood for this purpose.

The annual sustainable wood supply from forests and shrublands which are accessible is about 10.5 million m^3. The annual requirement for fuelwood is already 11.5 million m^3. The annual requirement for timber is about 1.1 million m^3, although the actual industrial consumption for lumber, matches, and plywood has been only about 167,000 m^3. Industrial consumption is on the decline because of timber scarcity which has forced many mills to close down.

All the wood-based industries, except some private sawmills, have an annual raw material quota issued by the Department of Forests at the time the mill was established. It is generally understood that the quota corresponds to the rated capacity of the mill. In spite of the quotas having been granted, the mills periodically suffered from timber shortage due to limited annual allocations. Timber shortage was reportedly the biggest reason for the low utilization of the industry's capacity.

In 1986-87 all timber harvesting was transferred to three "parastatals": the Forest Products Development Board (FPDB), the Timber Corporation of Nepal (TCN), and the Fuelwood Corporation, the latter two of which have recently been combined into one corporation, TCN. This transfer has worsened the timber supply situation still more, because the mills now have to buy their logs from the wood depots of the parastatals which are unable to maintain a reliable supply. This is exceptionally difficult for such industries as plywood and matches, which require fresh logs of particular species in stated lengths.

The uncertainty of the wood supply can be regarded as the major bottleneck to the development of wood-based industries because understandably nobody wants to invest in upgrading or enlargement of facilities unless there is an assured long-term wood supply for the mill.

Status and prospects of wood-based industries

Timber harvesting

In Nepal, there are two streams of harvested wood. It is consumed mainly in the villages as poles, squared timber, or fuelwood. The harvesting techniques are crude, using manual cutting tools and human porterage, but they are appropriate to the conditions. The other stream is through authorized contractors to sawmills and other wood-processing mills. The harvesting techniques are labour-intensive and only slightly more mechanized than those used by the villagers. Hand saws and axes are used for felling, delimbing, and crosscutting; power saws are not common. Bullock carts are used to bring the logs to depots, from where they are loaded manually onto trucks that take them to the mill. There are

no industries being planned that would require large volumes of logs over short periods. It is therefore unlikely that the timber harvesting techniques will change much, except for the introduction of better hand tools.

Sawmilling and wood seasoning

Just as there are two streams of logs, there are also two streams of sawnwood in Nepal. The bigger one is in rural consumption, where sawnwood is produced by simple hand sawing or pit sawing. There are no statistics available on this production, but it is estimated that 86% of all timber consumption takes place outside industrial units.

Nepal's sawmilling industry supplies the towns with sawnwood for construction and for furniture and joinery products. The present urban demand is 78,000 m^3/year. On the assumption that urban sawnwood demand for housing, furniture, and implements grows at the same rate as total timber demand, and that sawnwood needs for development projects grow from 10% in 1985 to 20% in 2010, 263,000 m^3 will be needed by 2000 and 438,000 m^3 by 2010. Even if per capita sawnwood consumption remains at the present level, 160,000 m^3 of sawn-wood will be needed by 2000 and 238,000 m^3 by 2010.

Industrial sawmilling is done by TCN and private sawmills. There are 42 TCN sawmills all over the Eastern and Western Terai, and 208 private sawmills, half of which are in the Far West. However, only 17 TCN sawmills and 41 private sawmills are operating; the rest are closed down mainly because of the lack of raw materials. The sawmills are all technically similar, consisting of a horizontal band saw with a very simple carriage and a vertical band saw for resawing. Power is supplied by electricity or a diesel engine.

The TCN sawmills have been operating recently at only 60% of their capacity; private mills at 67%. Assuming that half (104) of the closed sawmills can be reopened, and that the sawmills can utilize 80% percent of their capacity, the potential output is about 244,000 m^3/year, or four times the present output. This production level will be sufficient to meet sawnwood requirements up to 2010, if the per capita sawnwood consumption does not increase, but most mills will need to be renovated, as they are already aging. Some will have to be relocated closer to the raw material source.

Production from TCN and private sawmills averaged 60,300 m^3 in 1982-86, while seasoning and furniture plants with sawing equipment produced another 4900 m^3. The deficit of sawnwood was therefore 12,800 m^3 or 16% of demand.

The lack of raw materials is the biggest constraint on the development of the industry. Private sawmills are licensed without being given timber quotas, and are dependent on parastatals for their log supply.

Seasoned sawnwood has amounted to about 5% of total sawnwood production. Assuming that per capita sawnwood demand and the share taken by seasoned sawnwood remain at their present levels, the demand for seasoned wood is estimated from 3,900 m^3 in 1985-86 to 8,000 m^3 in 2000-01 and 11,900 m^3 in 2010-11.

There are six sawmills with kiln-drying facilities, but only four are operating. The annual output of the four operating seasoning plants has been 3400 m^3. If the other two plants, which have been closed down, are started up again, capacity will be 6970 m^3, which can meet the forecast demand up to 1995. More plants are needed, with the aim of doubling capacity by 2010. The new plants should be located at sawmills that have secured timber supplies.

Furniture

The present annual expenditure on furniture in urban areas has been estimated at Rs 24.35 per capita. At a constant per capita rate and considering the growth in urban population, the projected demand for furniture in urban areas is expected to grow from Rs 29 million in 1985-86 to Rs 60 million in 2000-01 and Rs 89 million in 2010-11. Wooden furniture accounts for 69% of demand.

Nepal's furniture industry includes 12 factories, hundreds of small workshops, and thousands of individual carpenters. To meet future demand, there is room for additional modern factories, but these will have to secure raw materials from the parastatals. Existing factories are already unable to operate at full capacity because of the lack of raw materials. While furniture has export potential, since its value added could overcome the high transport cost, there are problems that would have to be solved in raw material supply, product quality, suitable designs, and knowledge of export markets.

Parquet

Nepal has one specialized plant producing parquet, although two furniture makers also produce it. Plant capacity is about 40,000 m^2, although production has varied from 16,000 to 20,000 m^2, of which 60-70% was exported to India. Local demand for parquet could increase from 4800 m^2 in 1985-86 to 15,000 in 2010-11, but growth of this industry will depend on its success in exporting to India and neighbouring countries.

Plywood

Nepal has two plywood mills with a total annual production capacity of 2500 m^3 or 623,000 m^2. Annual production averaged only 1290 m^3 or 321,000 m^2 in 1982-86, mainly because of the shortage of peelable timber. The scarcity of raw material eventually forced the closure of these mills. Plywood consumption was 893,000 m^2 in 1983. At five percent annual growth, consumption is estimated to have been one million m^2 in 1985-86, two million in 2000-01, and 3.3 million in 2010-11. There is sufficient demand to encourage the local plywood industry to expand. One to three new mills with a total capacity of 11,000 m^3/year could be established, since the

country imports plywood from India to cover two-thirds of local demand. However, a demand for more plywood logs would put more pressure on the reduced forest resources, and make it more difficult to meet people's needs and to protect the environment, so that the alternative of easing plywood importation rules will have to be considered.

Veneer

Eight mills have been producing veneer for tea chests. Their total annual production capacity was 3.8 million m^2, but production in 1982-86 was estimated to be only a third of capacity because of problems in obtaining raw material. All of the production was exported to India. Veneer manufacture consumes raw material that could be used for local plywood production to reduce imports. As a way of rationalizing wood allocation, the veneer mills were closed recently as a way to rationalize the use of scarce raw material.

Matches

Nepal has fifteen match factories with a total capacity of 1.9 million gross of match boxes and 88.6 billion match splints. Only eight of the factories are operating. Production has averaged about one million gross in 1982-86. All matches produced are used locally. Current demand is about 1.7 million gross and imports fill the gap. Demand is projected to grow to 2.3 million gross in 2000-01 and 2.7 million gross in 2010-11.

Nepal's fifteen match factories are mostly small, labour-intensive, and old-fashioned in production methods, e.g. they dry the splints in the sun and pack the boxes by hand. All are suffering from raw material shortage. Since demand for matches is increasing, the industry has room to double its capacity by 2010. In addition, export to neighbouring countries is promising. The industry can expand if it uses plantations of suitable fast-growing species such as poplars.

Handicrafts

Wooden handicrafts are produced all over the country, as a cottage industry, by traditional techniques. In the Kathmandu Valley alone, there are about 200 entities engaged in handicraft production, requiring annually about 4800 m^3 of sawnwood and producing about Rs 40-50 million worth of goods. About ten percent of the production is exported, the rest is sold locally to tourists and local people.

Wood used in handicraft production is limited to a few preferred hardwood species. Although the required volume is not large, the producers are not obtaining good quality wood on a regular basis. This problem is hampering the export possibilities of the industry.

Some issues related to wood-based industrial development

Although policy statements have been made about the development of wood-based industries in Nepal, implementation has not been satisfactory. A number of constraints limit their growth. These constraints are discussed below, along with other issues related to wood-based industrial development.

Supply and pricing of raw materials

The scarcity of timber and other raw materials has been the most severe constraint. Not a single type of industry can obtain sufficient raw material to operate at full capacity. The development programmes formulated in this plan have therefore duly considered this problem, particularly in relation to rationalizing the allocation of scarce raw materials and to encouraging industries to establish their own plantations.

Wood prices in the country are high not only because of wood scarcity, but also because of the situation whereby industries have to get their supplies through parastatals. The royalties that the parastatals are asked to pay are below the cost needed to put the harvested forest back to productive condition and manage and protect it to the end of the rotation. Private industries should have access to forest products under the same terms as do parastatals. Both should pay economic prices for forest products. The revenue generated should then be put back to develop and manage the forest.

Policy, legislation, and institutional support

The inconsistency and ambiguity of policies, legal provisions, and assignment of institutional responsibilities, are aggravating the raw material problem. There is a need to pinpoint the responsibility for providing a steady supply of raw materials to the industries.

Industrial development particularly in a country like Nepal requires institutional support. FPDB can be an effective institution to backstop wood-based industry development. FPDB should change from being merely a timber harvesting institution to one that can effectively assist industries in conducting studies, finding financing for expansion or modernization, adapting technology, developing trained manpower, and finding markets for products.

Technological development

The technology employed in the wood-based industries is usually obsolete, and the cause of low productivity and wastage of materials. Match factories are still using machinery and technology introduced in the 1930s. Plywood mills do not have veneer-handling equipment to improve recovery. Industrial processing technology can be imported, while indigenous technology can be improved. The need for institutional support in this area has been mentioned. This, along with other concerns, has to be given

adequate attention. No industry will invest in improved technology, however, unless the raw material and other more serious problems are solved first.

Manpower development

The wood-based industries are very short of skilled and semi-skilled manpower. For example, almost all sawmills are operated by non-Nepalese technicians. The manpower situation is aggravated by the reluctance of workers to work in the non-urban areas where such industries are located. Local people will have to be trained and assured of job security and good working conditions.

Improvement of infrastructure

The general infrastructure of the country is not well-developed. Of about 6100 km of roads, only about 2400 km are all-weather, and these are largely concentrated in the Terai. Most of the hill areas are not accessible to vehicles. Electricity supply is limited and often irregular. Communications and various social and financial infrastructures are inadequate to support industrial development. Industries tend to be located where the existing infrastructure is adequate, even if the source of raw material is far away.

Need for more financing

The financial resources of the country are limited and the amount of loans granted to the wood-based industries has been small (about one percent of the manufacturing loans in 1982-86, or less than Rs 400,000 annually). Moreover, small industrial projects have problems in obtaining financing due to the difficulty of preparing sound project proposals acceptable to lending institutions. These institutions also tend to be unfamiliar with the nature of wood-based industries and this increases their reluctance to invest in these industries.

Market development

The small size of the domestic market, the low level of income per capita, and the predominance of a subsistence economy all work against industrial development. On top of this, the open border with India makes it difficult for local products to compete with Indian goods which are often cheaper and of better quality. The land-locked position of the country also severely constrains industrial progress. The transit difficulties and high transport costs not only put industries under constant stress, but also inhibit their capacity to export. Development of market intelligence will at least help to alleviate the situation. Market studies are needed to determine which export products the country should concentrate on.

Research and development

The lack of adequate information and research on forest industries makes it difficult to prepare project proposals, operate

efficiently, or introduce improvements. Knowledge relating to raw material resources, their best utilization, processing techniques, quality improvements, waste-minimization, and cost-minimization is limited. The country does not have to duplicate the research and development work of more advanced countries, but institutional support is needed to screen imported technology and determine its appropriateness to local conditions.

Objectives, goals, and programme for wood-based industries

Objectives

Wood-based industries development is aimed at meeting the people's needs for wood-based products; providing employment opportunities; and contributing to the growth of the local and national economies.

Meeting needs for wood-based products

The present industrial timber use, the forecast demand in 2010, and the forest areas required to satisfy the demand, assuming self-sufficiency in wood-based products, but no exports, are as follows:

Industry	Estimated use in 1982-86	Full quota	Domestic[5] demand in 2010	Required forest area in 2010 (ha)
Sawmilling	128,300	183,200[1]	506,000	100,000 natural 100,000 plantn.
Seasoning	7,300	12,260	) included	
Furniture	1,600	2,340	) above	
Parquet	700	1,800	1,000	-
Plywood	4,200	8,100[2]	38,000	25,000 plantn.
Veneer	8,300	24,790	-	-
Matches	15,000	31,800[3]	25,000	2,000 plantn.
Paper	-	-[4]	430,000[6]	30,000 plantn.
Miscellaneous	1,800	5,260	incld. above	
Total	167,200	269,550	1,000,000	257,000
Total Excl. Paper	167,200	269,550	570,000	227,000

1 At full capacity of the operating sawmills.
2 Actual quota 18,000 m^3/year, but 8,100 m^3/year corresponds to full capacity of the mills.
3 Includes 20,370 m^3/year for the splint factory exporting all of its production.
4 Based on sabai grass and straw.
5 Assuming self-sufficiency in all wood-based products but no exports.
6 All printing and writing papers made of wood, no other paper grades included.

The mills have not been running at full capacity mainly because their timber supplies have not been adequate. If the country aims for self-sufficiency in wood products, demand for timber to meet mill requirements in 2010 will be more than five times the present supply.

Goals

The immediate goal of the wood-based industries development plan is to have a steady, sustained supply of timber to the existing wood-based industries, including private sawmills, from the existing sources. This is essential to the industry for planning its short-term activities in the most economic and rational way. A continuing unsecured and erratic timber supply will kill the industry off, and Nepal will then lose even the limited domestic supply of forest products that it has at present.

The second goal is to increase the industrial timber supply so that the domestic demand for all forest products except paper can be met from Nepal's natural forests and plantations by 2010, giving priority, however, to people's basic needs for food and fuel, and to environmental aspects. The lack of suitable land, after agricultural demands are met, probably makes it inadvisable to build a national paper industry in Nepal. Further, a mill for printing and writing paper would still be small by international standards, even if it supplied the whole need of Nepal, and consequently it would have difficulties in being competitive within the region.

The third goal is to expand the existing industry within the limits of the increasing timber supply, and at the same time to improve the technology employed, so that the industry can compete successfully with imports, especially those coming from India. Expansion of the industry will not only supply the country with the forest products it needs, but it will also create employment opportunities for the growing population and contribute positively to the gross domestic product, using domestic renewable raw materials. The improvement of technology, including increases in mill sizes, will ensure that the Nepalese industry can successfully utilize the expanded raw material base.

Wood-based industries development programme

The components of the programme are:

- Securing and increasing the supply of wood by:
    - Rationalizing the system for allocating wood and other forest-based raw materials. The quota allocation system will be improved based on the sustained yield of existing accessible forests, as well as on economic criteria. Studies will be conducted to analyse the end-use requirements of the various industries with a view to directing the most valuable and scarce materials to the most demanding end-users.
    - Reducing wastage through proper training, standardization, and utilization of residues.
    - Improving the management of natural forests.
    - Establishing industrial plantations.

- Improving and expanding existing industries through:
  - More supportive industrial policies.
  - More detailed studies and planning, taking into account the market potential of each product line, the raw material base now existing or planned to be developed, and the level of technology now available or considered suitable for introduction.
  - Increased financing.
  - Provision of expertise and training to improve production techniques and management capabilities.
- Promoting supplementary foreign trade and developing marketing capability by:
  - Improving marketing skills, setting up market intelligence services, advising on trade policies, and setting up regional treaty on wood products trade.
  - Encouraging export of high value added products.
  - Relaxing import of raw materials and wood products in short supply.
- Developing the Forest Products Development Board from merely being a timber harvesting agency to being one that can effectively backstop wood-based industrial development.

Physical targets and phasing

The principal physical targets of the programme are as follows:

Targets	Unit	7FYP 1989-90	8FYP 1990-95	9FYP 1995-00	10FYP 2000-05	11FYP 2005-10
Plant establishment/ modernization: (based on capacity)						
Sawmills	'000 m^3			220		
Seasoning plants	'000 m^3				12	
Plywood mills	'000 m^3				15	
Match factories	'000 gross				2700	
Furniture plants	'000,000 Rs				60	
Average annual production targets for major products:						
Sawnwood	'000 m^3	89	114	144	178	217
Kiln-dried sawnwood	'000 m^3	4.5	5.7	7.2	8.7	10.7
Plywood	'000 m^3	4.5	5.7	7.3	9.4	11.9
Matches	'000 gross	1801	2020	2232	2433	2612
Furniture	'000,000 Rs	23.0	29.6	37.2	46.2	56.2
Writing paper	'000 t	6.7	16.9	20.7	21.0	21.0

Programme cost and financing

Components

The cost estimates presented in this report are indicative, and reflect the budgetary requirements of FPDB, the main agency responsible for supporting wood-based industries development, and the investment required to expand or establish wood-based industries. The operating costs of these industries are not included in the costing. The cost of developing and managing forest resources, including the timber harvesting, have been included in the "Community and Private Forestry" and "National and Leasehold Forestry" programmes. Research is not budgeted, but some provisions have been made in the wood industries development cost estimates for development work, e.g. for the improvement of industrial productivity.

Industry development costs

Early investments are needed to resolve the raw material problem, start leasehold forest development for industrial purposes, arrange low-cost financing for renovation of the existing wood-based industries, and initiate R & D programmes. More than four million US dollars will be needed annually during the eighth five-year plan. The investment requirements will decline in the ninth and tenth planning periods, but will increase later once the crucial raw-material issue is resolved.

Total cost and financing

The programme is projected to require about Rs 1052 million for FPDB's operations and Rs 1066 million for industry development. For FPDB operations, investment items including capital outlay, technical assistance, and fellowship and training accounts for about 30% of its total cost, with salaries, allowances, and maintenance and operating expenses accounting for the remaining 70%. Foreign cost is projected to be 59% of the total cost.

It is envisaged that HMG will shoulder 35% of the total cost of the programme, mainly the recurrent expenses such as the salaries and operating expenses of FPDB. FPDB as a parastatal will have to finance its operations through income that it will generate, such as from timber sales. It is envisaged that the private sector will put up as equity at least 20% of the investment required for industry development, which comes to about 10% of the total programme cost. External assistance will be sought to cover the rest of the financial requirement, particularly to capitalize industry development.

Benefits and impacts

The benefits of industrial development are well-known. Industries bring livelihood and employment to the people, and satisfy their needs for the products. Production helps to keep prices to desired levels; increase in income brings a better living

standard. Industries enhance the economic development of the locality where they are located, and of the national economy as a whole, through their economic activities and their forward and backward linkages with other sectors.

On the other hand, industrialization results in adverse impacts that affect society and the environment. The development of forest-based industries may contribute to deforestation and environmental degradation, especially if the forest is exploited without regard to its renewal. This is particularly true in developing countries, and even more so along the tropical belt, where countries have been preoccupied with the development of their economies through the exploitation of their natural resources, with little attention paid to forest management and reforestation. The result has been the vast reduction of the area of the tropical forests, with grave environmental consequences shared by people around the globe. The removal of the forest has not only caused environmental distress such as soil erosion, but has eliminated species of plants and animals, many of which have not even been identified, and whose importance to humanity has not yet been discovered.

Nevertheless, society has to produce the goods required by its people, but it should do so by ensuring sustainability of its undertakings. In the forestry sector this means greater attention paid to forest development and management in the course of utilizing the forest for its various products, than has so far been given. As the products of the forest are converted into the goods needed by people, the adverse environmental impacts of the conversion process can be mitigated, those from wood-based industries, by proper plant design and conduct of operations. An adequate part of the investment that goes to a mill or plant must be allocated to pollution control and other operations that will mitigate their adverse impacts. This should be done especially in wood treatment plants, paper mills, and similar plants that produce pollutants in the air, water, and soil. The mill should be of such economic size that pollution control facilities and their operation can be afforded.

MEDICINAL AND AROMATIC PLANTS AND OTHER MINOR FOREST PRODUCTS [1]

Introduction

Minor forest products, by the classical definition, are all forest products other than wood, i.e. everything except timber and fuelwood. In Nepal, fodder is not regarded as a minor product, since in much of the country it is, along with wood, a main product of the forests. One of the most important categories of minor forest products in Nepal is "medicinal and aromatic plants".

Minor forest products have not received much special attention in the past. Their significance in the national economy has been little appreciated. Medicinal and aromatic plants are the exceptions; much research has been done on their natural resource base and their utilization, and policies on their development have been given attention in the five-year plans.

Minor forest products tend to be procured by very poor people, in lean seasons, in backward areas, and to have low unit value. The opportunity cost of labour is low, and the collectors, without exception, receive an uneconomic price. Minor forest products can, however, fetch economic prices provided the system of collection and sale is properly organized, and if they are processed and value is added. Even as things are now, they are important sources of cash income to many marginal farmers and forest dwellers.

The Master Plan has selected for study the medicinal and aromatic plants, and five other important minor forest products. In addition, bamboo and cane has been dealt with to a certain extent. A quick enquiry about the organization of collection, processing, and marketing of these selected commodities has revealed the basic problems relating to similar under-utilized national resources, and provided ideas for a comprehensive policy framework and supporting services which will be applicable to most of the other minor products. Other than medicinal and aromatic plants, those selected are lokta paper, pine resin, sal seed, katha, and sabai grass. Lokta is linked to a traditional cottage industry. The other four are linked to industries which add considerable value.

Objectives

This paper summarizes the Master Plan report on medicinal and aromatic plants and other minor forest products, which is aimed at examining the current status of these forest products in Nepal, including their sources, collection system, royalty, processing, and marketing; presenting the constraints that inhibit the development of industries based on these forest products; and

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[1] Paper presented by A. Sheak, General Manager of the Herbs Production and Processing Co. Ltd., on 31 August 1989 during the Donors Meeting on the Master Plan for the Forestry Sector at Kathmandu, Nepal.

presenting strategies and an action programme for the development of selected industries based on these forest products.

Medicinal and aromatic plants

Role in health care

The problem of disease prevention and control is worldwide, but it is more critically felt in the developing countries, where basic health care is deficient. In Nepal, only about twenty percent of the population benefit from modern health services. Most rely on the use of the medicinal plants in which the country's natural vegetation is rich.

The medicinal and aromatic plant resources

The wide range of climatic and vegetational influences makes Nepal floristically very rich. About 5400 species of vascular plants have been enumerated, five percent of which are endemic to the country and thirty percent to the Himalayas.

There are about seven hundred species of medicinal and aromatic plants, comprising about twelve percent of Nepal's vascular flora. They are distributed throughout the country from the Terai to the High Himal zone, with a greater concentration in the tropical and subtropical belts. The central part of the country has more medicinal and aromatic plant species than the eastern or western parts.

Utilization and marketing

Collecting of medicinal and aromatic plants has been going on in Nepal since time immemorial. The forests are still the primary sources of these plants. A small proportion of the plants collected is used locally in the treatment of disease, but most of them (about ninety percent) are sold as crude herbs, mainly for export. The trade in crude herbs goes through four tiers: collectors, local dealers, big dealers, and international trade houses.

Only a nominal royalty used to be charged for the collection of medicinal and aromatic plants, but recently it was increased to ten percent of market price, and more for endangered species.

The bulk of medicinal and aromatic plants harvested in Nepal is exported. It is estimated that about ninety percent of all exports go to India. Because of the open border between India and Nepal and the poor maintenance of records, it is difficult to ascertain the exact figures. However, it is certain that the value of exports has steadily gone down, mainly because of the depletion of the forest resource base, the lack of management, and market fluctuations. Exports in 1974-75 were estimated at Rs 102.6 million. They declined steadily to Rs 44.1 million in 1978-79, and were put at only Rs 13.9 million in 1986-87. The Herbs Production and Processing Co. Ltd. exported Rs 2.9 million worth of processed products in 1986-87, bringing the total export to Rs 16.8 million.

On the other hand, Nepal imported some Rs 10.4 million worth of medicinal and aromatic plant products that year.

Locally, medicinal and aromatic plants are consumed in the preparation of traditional drugs. A small amount is used by research institutions. Commercial production is developing, but the harvest at present depends almost entirely on natural sources, and supply is unable to cope with demand.

Research and development

Organized drug research and development started in 1961 with the creation of the Department of Medicinal Plants. A year after it started, the department established its Royal Botanical Garden, Botanical Survey and Herbarium, Royal Drugs Research Laboratory, and seven herbal farms.

Research and development work has focused on botanical survey and collection, introduction of plants in the botanical garden, phytochemical and biological investigations in the research laboratory, and the cultivation of a number of species in the herbal farms.

A natural extension of the department's activities was research on the aromatic plants and essential oils that are used for cosmetics and perfumes. These activities also led to the passing of the Drug Act and the creation of the Department of Drug Administration and of Royal Drugs Limited, which have since been transferred from MFSC to the Ministry of Health and Ministry of Industry, respectively. The department was recently reorganized together with the research arm of the Forest Survey and Research Office into the Department of Forestry and Plant Research.

Most of the department's infrastructures were developed during the fourth to sixth plan periods. Research and development work done during this time was geared to the development of pharmaceuticals. The department's activities also extended into processing, formulation, and marketing. Its production unit expanded into the Royal Drugs Limited, which now utilizes some of the technology developed in the department on a commercial scale.

In 1980, the Herbs Production and Processing Company Limited was established to commercialize the cultivation and processing technologies that had been developed in the department's herbal farms and pilot plant. The company's activities are in line with a royal directive that requires the processing of herbs before exporting them, and their promotion in the country to improve health services.

Besides the department, other organizations that are involved to some extent in drug development include the Royal Academy of Science and Technology, the botany and chemistry departments of Tribhuvan University, and the Research Centre for Applied Science and Technology. The Department of Ayurveda utilizes many herbs in its ayurvedic practices and in the manufacture of ayurvedic medicines.

Issues related to the development of medicinal and aromatic plants

Several issues related to the development of minor forest products are common to all categories of minor forest products. Those that are particularly relevant to medicinal and aromatic plants are given below:

- The collection of medicinal and aromatic plants is suffering from the over-exploitation and degradation of the forests. Some 250 vascular plants are now on the list of endangered species. Most of the locally important herbs are in short supply. There are only about 136 ha of herbal farms. Resource management planning and organized collection for sustained yield are not practised. There is a need to promote the cultivation of medicinal plants and herbs in plantations, natural forests, and farms.

- The annual funding is not sufficient for the proper development of this subsector. More funds are needed for large-scale plant cultivation and production of raw, semi-processed, and processed products. Before investing in any big-scale development programme, however, a subsectoral economic analysis is needed so that resources will be properly allocated, and non-viable activities excluded.

- In spite of the presence of qualified staff in the medicinal and aromatic plants subsector, there is still a shortage of skilled and well trained staff to implement the proposed programmes. Moreover, training opportunities and incentives are lacking and have to be developed.

- Technology relating to the cultivation and processing of herbs has to be strengthened, and new technology has also to be transferred to the private sector.

- The physical and marketing infrastructures of the herbal farms, as well as the laboratories and production units, have to be developed.

- A strong mechanism will have to be developed to coordinate the research and development efforts of the various agencies engaged in medicinal plants production and utilization.

- Appropriate incentive systems are needed both to encourage greater productivity in research and development and to encourage farmers to participate and increase their production of medicinal plants and herbs.

Other minor forest products

Lokta for hand-made paper

Lokta (Daphne bholua and Daphne papyracea), upon which the hand-made paper industry is based, is a bush growing mainly between

1500 and 3000 m. The growing stock of lokta bark was estimated at about 110,000 t in 1984, but not all of the growing stock is harvestable since the bulk of it is in areas difficult to access. Consequently, over-exploitation has taken place in the lower elevations of the Central and Western Development Regions, while the resource is under-utilized in the other three regions.

Hand-made paper production from the inner bark of the "lokta" shrub is one of the oldest cottage industries of Nepal. There are 44 registered hand-made paper producers, who could produce annually about 300 t if they could utilize their raw material quota of 596 t. This quota is only about 0.5% of the estimated growing stock, and so well within the total production of the forests, but for the problem of accessibility.

A UNICEF study estimated the annual domestic demand for hand-made paper to be about 6.0 million sheets. This does not include the demand by district offices for about 1.4 million sheets. Thus the total identified demand is about 7.4 million sheets corresponding to about 185 t. Other end-uses take up the remaining 115 t. Lokta paper is also exported in small quantities which in 1982-86 averaged about 700,000 Rs worth annually. As the domestic market is limited, greater export efforts are required if production is to be increased.

Collection and cultivation of lokta can provide livelihood and additional income to landless people and marginal farmers if they are organized properly, expanding the efforts of UNICEF more efficiently from the sustained production of raw materials to processing and promotion in the export market.

Rosin and turpentine

Rosin and turpentine are used by a number of industries such as soap, paper, paints, varnishes, rubber, etc. In Nepal, these industries require annually about 1260 t of resin derivatives. At an annual growth rate of five percent, about 6600 t would be needed by 2010-11.

Resin tapping of pine trees has been going on for several decades for domestic use and export. The estimated potential production of pine resin is 21,700 t per year on a sustained yield basis, but the widespread practice of destructive tapping eventually kills the trees and threatens the long-term prospects of the industry. Frequent forest fires have also been killing regeneration, so that the pine forests cannot continue to exist. The forests will have to be properly protected and managed, and the tapping practices improved.

One large and one small resin processing plants have recently been established. There are plans for another large plant and two smaller ones. If these plans materialize, the total annual capacity will be about 9000 t of rosin and 1985 t of turpentine, requiring about 12,000 t of resin.

The total projected capacity of the existing and proposed rosin and turpentine plants would exceed projected local demand. As prospects in the international market are limited by competition from big pulpmills that produce the same materials as by-products, further growth of the industry will depend on finding markets locally and in neighbouring countries and modernizing the conversion process to produce higher derivatives. A Royal directive exists for the development of industrial use of rosin and turpentine derivatives.

Sal seed oil

Sal seed oil is extracted from the seeds of Shorea robusta, and is used in the manufacture of soaps, paints, varnishes, hair oil, lubricants, confectionery, and pharmaceuticals. De-oiled cake is a by-product which is used for feed, fertilizer, or fuel.

The area of sal forests, the resource base of the seed oil extraction industry, is declining, but sustainable production can be increased with more efficient collection. There is scope for value addition by manufacturing cocoa butter substitutes and products based on sal meal. A comprehensive study related to collection, processing, and marketing is needed.

Nepal has seven plants extracting oil from rice bran, boiled rice, mustard seed, and sal seed. Production in 1984-86 averaged about 433,000 litres of sal seed oil and 3500 t of de-oiled cake, although the annual quota of 26,000 t of sal seeds could produce 2.6 million litres. The oil is mainly exported to Japan, Europe, and India. De-oiled cake is either exported to India or used locally as fuel. If the raw material base were utilized as in neighbouring countries with sal forests, 80,000 t per year could easily be collected in Nepal providing Rs 80 million additional cash income to the rural poor.

Katha and cutch

"Katha" is an extract derived from the heartwood of the khair tree (Acacia catechu) and used in the preparation of "pan", a popular chewing material. A by-product of katha production is cutch, which is used in tanning, dyeing, and as a lubricant in oil-well drilling.

Nepal has six modern katha plants. These plants, along with six small-scale plants which were closed recently, are capable of producing 1300 t/year of katha and 2200 t/year of cutch, but actual annual production has been only about 650 t of katha and 700 t of cutch. Nearly all of the production has been exported to India and other South Asian countries.

The future of the country's six katha plants will depend on the availability of khair, a rapidly vanishing riverine tree. The sustainable annual yield of khair from Terai forests has decreased from 26,000 m^3 in 1979 to about 8400 m^3 at present, while the total annual quota of the six plants is almost 38,000 m^3. As khair is a slow-growing species, nothing can be done quickly to increase

supplies. A reduction in the capacity of some of the plants is needed, in order to limit khair harvests to sustainable quantities. The industry should also be encouraged to plant khair, even although its rotation is long.

Sabai grass for paper making

Industrial paper manufacture is new in Nepal. The Bhrikuti Paper Mill, a government mill with 10 t/day capacity, and the Everest Paper Mill, a private mill with 30 t/day capacity, both started operating only in 1986. Two small mills, one making strawboard and the other using waste paper, had a combined output of 30 t/day in 1986.

None of the mills is based on wood; their raw materials are sabai grass and straw. The mills have been unable to get a sufficient supply of sabai grass. In the past, supplies came from the plains around Nepalgunj and adjoining hills. Now they come only from the foothills. Some 3000 t were collected at Nepalgunj and the adjoining district of Banke. Ten years ago the amount collected in these areas was twice as much. Also, straw has other uses such as fuel and fodder, and only a limited supply is available for the mills. In the case of the Everest Paper Mill, the raw material has therefore been augmented by waste paper from Kathmandu or from India.

Bamboo and cane

Bamboo and cane have a long history as raw materials for a multitude of household and other articles. There are hundreds of small-scale bamboo and cane workshops in the country. A few are registered companies operating in urban areas.

There are no recent statistics on the value of bamboo and cane production. The Industrial Service Centre estimated that the production of bamboo and cane furniture in the Kathmandu Valley was worth about Rs 700,000 in 1980-81. Bamboo and cane products are popular, but the lack of raw material is limiting the development of this industry.

The habitat of commercially exploitable bamboos and canes has been reduced to the brink of disappearance. The government has paid some attention to the problem through the conduct of specialized research; plantation development has been encouraged by the supply of bamboo seedlings, although the propagation of bamboo is difficult. With the decline of the types of forest in which canes grow, the supply of cane will continue to be a problem.

Issues related to the development of minor forest products

Lack of an integrated approach

The entire subsector of minor forest products, whether linked to the public sector or other organized industries, or to private trade, has not received the benefit of an integrated approach. The

economic plight of the primary producers, conservation of the ecosystems that constitute the resource base, management plans for rotational or otherwise regulated extraction, and improvements in trading and processing, all need to be considered as parts of the whole system.

Lokta is the only exception, where an effort has been made to provide a better price to the primary producers, to regulate harvesting for sustained yield, to introduce better technology for procurement as well as for paper making, and to add further to downstream values by secondary industries. Most of this is due to the sustained effort of UNICEF.

Policies and government intervention

No comprehensive policies have been evolved in this subsector in the last thirty years. Regulations governing a few minor products had been introduced in the late 1930s, and licences were being issued to collect royalty. Their extraction has traditionally been a private affair, apart from any customary laws which might be enforced by the village headmen. However, it often followed a system, for instance in the case of "allo" (nettle fibre), the headmen determined its extraction period, quantity to be extracted, and persons entitled to collect it.

The government did make rules, on an ad hoc basis, for the extraction of minor forest products, when they were being traded in large quantities, other-wise the collectors were taxed only at the customs points.

Legal provisions

There is no comprehensive legal provision for punitive action or to prepare and enforce the implementation of management plans with prescriptions for rotational harvesting, etc. On the other hand, there are some forward looking industries that wanted to go in for large-scale plantations. Adequate areas of forest land cannot be given on a long-term basis to these industries, even if they are public sector enterprises. Leases are restricted to thirty hectares for institutions and ten hectares for individuals. This applies even if it is for plantations of khair which is a native tree, or sabai grass which is known for being a soil binder and protector of the ecosystem.

Royalty system

The current royalty system is neither linked to the price received by the primary producers nor to the price a commodity fetches in the final market. If compared to the payments to collectors in the case of sabai it is about 25%, 35% in the case of sal seed, and 60% in the case of pine resin. There are, of course, a number of other taxes and customs duties which are paid by the industries based on processing of these raw materials.

There is an automatic increase of 10% in the royalty every year, irrespective of whether there has been a price increase. In

most cases it is deducted by the final users or intermediate operators from the payments made to the collectors.

Resource base assessment

With the exception of medicinal and aromatic plants and lokta, there has been no comprehensive assessment of the resource base, even for important minor forest products.

Economics and the trading system

In general, minor forest products are an unorganized part of the economy, in which the primary producers are at the mercy of the traders. The price paid to the primary producers has no relation to the wholesale price at the terminal market. The share of the primary producer may be as little as 25% of the terminal wholesale price, although in most cases only transport costs are involved, and there is no processing. There is no monitoring system nor government intervention agency which could ensure an economic price to the primary producer.

Private trade controls the price and market network for minor forest products. The system followed is a traditional one based on financing the collectors during the lean period. The traders buy everything the collectors bring, as they know the terminal markets and the current prices. The collectors usually want both to earn some cash and to purchase essential commodities. The traders commonly supply these goods in advance, on credit, and thereby gain a hold over the collectors.

The Herbs Production and Processing Co. Ltd. buys selected minor forest products only. The primary producers usually bring a mixed package, so they then have to sell their other commodities to the private traders. They may, however, have to sell all their items, including those wanted by the public sector agencies, to a trader, either to pay off their debts or to secure better prices for the other products. This explains why the company cannot get adequate quantities of the herbs it requires. The resource base is generally declining, but supplies currently in demand can be ensured by a more efficient collection and trading system. As it is now, the public sector is unable to provide the package of services provided by the private trade. The public agencies are unable to break or circumvent the linkage of private trade with the primary producers, who remain helpless and unable to obtain economic prices.

For most minor forest products, transport costs are considerable, varying from 40 paisa to Rs 4 per kg. It is unfortunate that no attempt has been made to cut down this cost. If there were a formal linkage to the organizations that carry essential commodities such as salt, sugar, tea, etc. to the interior of the country, they could carry back the minor forest products, and the cost could be reduced.

Primary processing

Elementary processing should be introduced at the primary level where feasible, so that the bulk to be carried is reduced and economic prices may more readily be paid to the producers. Some minor forest products have value addition potential at the primary level, as in the case of lokta, sabai grass, cane and bamboos, honey, etc.

Institutional support

The Department of Forests has no officer to look after minor forest products exclusively. The District Forest Officers and their subordinates are involved only in the collection of royalty. A functional network is needed to plan, promote and supervise the entire subsector at all organizational levels in the department.

An intervention agency is needed which can purchase and process those minor forest products that are not dealt with by other organized sectors. There is no public sector organization specifically to look after minor forest products other than medicinal and aromatic plants; the Herbs Production and Processing Co. Ltd. is involved in pine resin and has a limited interest in extracting tannin from "harro" (Terminalia chebula).

The research and development work undertaken by the Department of Forestry and Plant Research has been on medicinal and aromatic plants, sal seed, pine resin, and "sugandha kokila" (Cinnamomum glaucescens). The research on sal oil and sal meal as well as that on resin is at a preliminary stage. In these cases technology which is readily available could have been imported from abroad, followed by research on how to adapt it, if necessary. In the case of sugandha kokila, some tangible progress has been made, which should be consolidated and followed up with a plantation and extraction plan, processing industry and market research and promotion. The government should provide more funds to work on those commodities with particular potential, where Nepal has a monopoly of production.

The Agricultural Bank of Nepal has not taken up projects on minor forest products except lokta, where it draws advances from Bhaktapur Paper Crafts, an industry set up by UNICEF. These advances flow down to the paper makers and are recovered as paper supplied to Bhaktapur Paper Crafts. The bank should be prepared to take some risks and expand its service network.

The Small Farmers Development Project does not have sufficient capability for economic programme planning and implementation, and needs strengthening. Unfortunately its financial resources and technical expertise are limited. It should be given more resources and staff support, so that it can build up area-specific economic programmes. The strategy of development in areas where transport is difficult will primarily depend on identifying those instruments of growth that employ better technology, and larger investments, so that people with little land can benefit. Once this is done the project could train one of its employees in each of the

commodities or industries identified and place him in charge of extension work for that particular field.

There is no substitute for building institutions that can promote people's own initiatives. Once forest-based industries expand they will provide employment to the hill people, increase their income, improve their life-style, and reduce migration. Help in selecting the most promising commodities, and the provision of supporting services, will be valuable, but finally it is only the people themselves who can fully use the opportunities. As each individual or family operation is small, larger numbers of producers need to cooperate.

Main programme components

The programme calls for the establishment of regional herbal centres, which will be linked to a network of low and high altitude herbal farms. These farms will serve both as demonstrations of herbal farming and as suppliers of commercial quantities of herbs. Farmers will be trained in herb cultivation. The centres will also conduct studies on the sustained-yield collection of medicinal and aromatic plants and its promotion through extension and public information.

The programme also calls for systematizing the collection of such minor forest products as lokta, pine resin, and sal seed to increase production without jeopardizing the resource base. Increasing the collection will enable the expansion of local industries based on these materials.

Plantations based on minor forest products, such as sabai grass and khair trees, will be established after their viability has been confirmed, to provide secure raw materials to the industries dependent on them. Other minor forest products that can be raised in plantations include plants which are as hosts for the production of tasar silk and excellent quality lac. While the production and marketing of each commodity has specific requirements, their common aspects have been categorized into the following primary programme components to facilitate their implementation.

- Immediate follow-up measures to solve problems pertaining to collection, marketing, and related concerns.

- Cultivation of medicinal and aromatic plants and selected minor forest products.

- Development of industries based on medicinal and aromatic plants and other minor forest products.

Supportive programmes

Botanical surveys, genetic conservation, and research and development are essential to backstop the development of the

subsector. Studies will be needed to plan in detail the development of each commodity. A comprehensive review is needed to analyse the role of the subsector and to maximize the development of its socio-economic potentials. Continuous support from the Department of Forests is needed in resource management and in organizing the supply of raw materials. The charter of the Herbs Production and Processing Company Limited will have to be expanded to cover all minor forest products which have promising socio-economic potentials. For this purpose it should be renamed as the Minor Forest Products Company Limited. Training and extension support by the proposed regional training and extension centres of MFSC is also necessary.

Physical targets and phasing

The principal physical targets of the programme are as follows.

Targets	Unit	7FYP 1988-90	8FYP 1990-95	9FYP 1995-0	10FYP 2000-05	11FYP 2005-10
New herbal centres	No.	2	4	6	-	-
New processing centres	No.	-	-	1	1	2
New cooperatives	No.	-	17	6	11	12
Farmers trained	No.*	-	500	1000	1500	2000
Herbal farms:						
-Private farms	ha*	-	100	500	1500	2500
-Community forests	ha*	-	500	1000	2000	3000
-Other plantations	ha*	-	50	150	300	500
Herb collection:						
-from the wild	t/	723	3430	3600	3850	4080
-from farms	period	-	5550	23000	51300	96800
Lokta, increased capacity	t	-	1000	-	-	-
Pine resin processed	t/yr	8000	12000	16000	19000	22000
Sal seed collection	t/yr	10000	25000	40000	60000	80000
New production areas:						
-khair trees	ha*	-	3000	6000	6000	6000
-sabai grass	ha*	-	3000	6000	6000	6000

*Cumulative.

Programme cost and financing

Components

The cost estimates presented in this report are indicative, and reflect the budgetary requirements of the Herbs Production and Processing Co. Ltd., the main agency to be responsible for supporting the development of industries based on medicinal and aromatic plants and other minor forest products, and the investment required to expand or establish these industries. The operating costs of these industries are not included in the costing, except the processing of herbs and other products done by the company itself.

The cost of developing and managing forest resources have been included in the "Community and Private Forestry" and "National and

Leasehold Forestry" programmes. Medicinal and aromatic plants or trees that produce minor forest products may be planted together with fuelwood or timber species. In addition, however, provisions are made in this programme for the establishment of 7000 ha of herbal farms and 8500 ha of plantations of khair, sabai grass, and other minor forest products, after their viability has been confirmed from the follow-up studies.

The budgetary requirements of research studies are built into the Department of Forestry and Plant Research's budget, but some provisions have been made in the development cost estimates for development work, e.g. for commodity studies involving expatriate and local consultants.

Industry development costs

Over the 21-year period from 1989-90 to 2010-11, about Rs 1660 million will be needed for the programme, of which Rs 718 million will be for medicinal and aromatic plants and Rs 942 million for the other minor forest products. Early investments are needed to shift the sourcing of raw materials from the wild to farms and plantations, and arrange low-cost financing for renovation or expansion of the existing industries.

Total cost and financing

The 21-year programme is projected to require about Rs 2071 million, including Rs 411 million for the operations of the herbal farms/pilot plant units, and Rs 1660 million for industry development. For the operations of the herbal farms/pilot plant units, investment items including capital outlay, technical assistance, and fellowships and training accounts for about 88% of its total cost, with salaries, allowances, and maintenance and operating expenses accounting for the remaining 12%. The cost of foreign-sourced goods and services is projected to be 44% of the total cost.

It is envisaged that the government will shoulder 12% of the total cost of the programme, consisting mainly of the recurrent expenses like salaries and operating expenses of the herbal farms/pilot plant units. The company will have to finance its operations through income that it will generate, such as from the sale of processed herbs and other products. About 15% of the cost should be shouldered by the private sector. This represents a 20% share of the industry development capitalization. External assistance will be sought to cover the rest of the financial requirement of 73%, mainly to capitalize industry development.

Benefits and impacts

Socio-economic impacts

Improved availability of medicinal plants in the rural areas will contribute positively to the general policy of controlling population growth through improved health care. The need to have

more children "for safety's sake" is reduced when the existing ones are healthy. Moreover, the increased availability of jobs in the rural areas in resource management, collection, plantation development, and processing will reduce the need for people to move to urban areas; thus unwanted migration is mitigated.

About 463 full-time jobs will be generated through the expansion of the company's operations. Another 119,000 man-years will be required in natural resource management, development and management of herbal farms, and collection and processing of herbs. The minor forest product-based industries will contribute another 70,000 man-years of employment.

Through extension work, the establishment of cooperatives, and private sector participation, it is estimated that by the year 2010 about 7000 ha will be brought under herb cultivation, and another 8500 ha under other minor forest products. Intercropping and multiple use of marginal land is the aim, but if the financial yield is good enough, farmers may even allocate some agricultural land for the purpose. The policy to lease forest land especially to poor and landless people will encourage planting of minor forest products, as well as help to bring about their regulated collection and protection.

Additional income from minor forest products, together with the other positive impacts of the master plan programmes, will be reflected positively in the rural household economy. More parents can afford to send their children to school. The additional income can be used to improve nutrition and housing standards. Increased and steady demand of herbs will motivate people to produce and provide indigenous raw material to the domestic medicinal industry, which in turn can produce and distribute the products at affordable prices.

The estimated annual collection of 4080 t of wild herbs and 96,800 t of cultivated herbs by year 2010 will be worth Rs one billion assuming an average value of 10 Rs/kg. The 8500 ha of plantations of minor forest products can contribute Rs 170 million assuming an annual production of 20,000 Rs/ha. Further added value will be result from processing. The intervention activities of the company is designed to provide a fair share of the income from these economic activities to the primary producers who belong to the poorest segment of the population. The additional income that will accrue to them will help to improve the skewed income distribution.

The development programme contributes directly and in a positive way to three core policies of the country: basic needs and its health component, decentralization, and nature conservation.

Environmental impacts

Soil conservation projects have already tried some medicinal and aromatic plants to motivate farmers to improve land use practices. The establishment of 7000 ha of herbal farms and 8500

ha of plantations of minor forest products will contribute positively to the soil conservation effort.

The establishment of herbal farms and plantations of other minor forest products will contribute to the conservation of germplasm and the preservation of natural habitat. Endangered species can be systematically conserved ex-situ in herbal farms and other plantations. The herbal centres and other field units can monitor and control the nationwide exploitation of plant resources.

The research and development programme will provide the basic expertise for the company, which in turn will promote industrialization and employment. Processing of plants involves chemicals which may be harmful if not handled properly. Solvents can be circulated in the process and reused. The adverse effect of the unwanted chemicals can be minimized, but careful waste management is needed to avoid unnecessary pollution. Because of their relatively small size, the distilleries and laboratories are not expected to cause significant environmental problems.

It is unlikely that the development of medicinal and aromatic plants and other minor forest products will have any noticeable impacts on atmospheric or water conditions.

CONSERVATION OF ECOSYSTEMS AND GENETIC RESOURCES [1]

Introduction

The conservation of ecosystems and genetic resources is an important component of the forestry sector and is interdependent with other subsectors. The national parks and other protected areas play a very significant role by serving as reservoir of genetic resources of flora and fauna, by protecting watersheds, and by providing a baseline for scientific studies. The protected areas also play a vital role in promoting the country as an attractive destination for the tourist industry, a fast growing sector of the economy. Thus, the conservation subsector substantially contributes to meeting the goals of a number of other subsectors. On the other hand, achieving the successful conservation of ecosystems and genetic resources requires healthy production forestry elsewhere, so that resource pressures on the protected areas will be reduced.

The national parks and other protected areas, therefore, do not exist in isolation, but are an integral and important part of the forestry sector locally, regionally, and internationally, in conserving the Kingdom's heritage in nature and culture, and in their contribution to the economy through outdoor recreation and tourism.

Plan objectives and scope

The objectives of this subplan are to identify the constraints and issues hampering the development of the conservation subsector and to outline a systematic scheme for the rational development of all the conservation areas, in particular the national parks, wildlife and hunting reserves, and botanical garden in Nepal. Special attention has been paid to the need to strengthen socio-economic relations with the local people.

The plan addresses the need for a long-term, holistic approach to the management of representative ecosystems and the conservation of genetic resources, both the flora and fauna of Nepal. It reviews the policy and legal basis, and a wide range of other aspects of effective management of protected areas and conservation of genetic resources. In order to provide realistic development prospects, it considers organizational and manpower development aspects, including relationships with other agencies of HMG and with society in general, with particular emphasis on the need to sustain harmonious relationships with local communities near national parks and protected areas.

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[1] Paper presented by B. N. Upreti, Director General of the Department of National Parks and Wildlife Conservation, on 31 August 1989 during the Donors Meeting on the Master Plan for the Forestry Sector at Kathmandu, Nepal.

Past efforts and present status of protected areas

Nepal was famous before the 1960s for its largely untouched forests and diversity in wildlife. It was particularly known for big-game hunting areas in the Terai, and "sport" hunting was fashionable for the aristocracy and their guests. However, after the eradication of malaria in the Terai, the forests of the region and the wildlife they supported suffered great pressure from the huge migration of hill people seeking land for settlement. As a result of this, most of the forested land was cleared for agriculture and grazing, ultimately causing a reduction in both diversity and numbers of flora and fauna.

Although wildlife protection has been practised since the early sixties, national parks management and wildlife conservation have had barely two decades of existence in Nepal. In 1969 seven royal hunting reserves were gazetted under the Wildlife Protection Act but effective management could not be achieved because of the absence of adequate regulations, organization, and staff.

A milestone was passed in 1970 when His Late Majesty King Mahendra graciously approved a conservation programme initiating the establishment of the Royal Chitwan NP in the Terai and the Langtang NP in the Himalayas. This provided impetus to the development and implementation of nature conservation programmes in Nepal.

In 1973, a committee was established, chaired by HRH Prince Gyanendra, to coordinate government policy for national parks and reserves and other conservation activities. Based on the policy guidelines and by the command of **His Majesty the King** and on the recommendation of the National Panchayat, the National Parks and Wildlife Conservation Act, 2029 was promulgated in 1973, giving legal status to conservation. This act defined national parks and different types of reserves, as well as listed protected species of wild animals and birds. Currently, 26 species of mammals, 9 species of birds, and 3 species of reptiles are fully protected by law. Provision is made in the act to regulate hunting and designate hunting reserves.

The National Parks and Wildlife Conservation Act provides four basic categories of protected areas, these are national park, strict nature reserve, wildlife reserve, and hunting reserve. In the short history of nature conservation in Nepal, diverse natural areas have been selected to protect notable communities representing the flora, fauna, and culture of the kingdom. There are now 7 national parks covering 864,400 hectares, 3 wildlife reserves covering 82,900 hectares, and one hunting reserve of 132,500 hectares. No strict nature reserves have been established so far. In addition, hunting is prohibited or strictly restricted in twenty five districts. The need for further protected areas to achieve better representation is recognized in national policies. By-laws and other regulations were formulated and amended as per requirement to provide sound legal base for the management of national parks and reserves.

Also, the Annapurna Conservation Area Project of 266,000 hectares in the Western High Himal is being implemented by the King Mahendra Trust for Nature Conservation in an attempt to balance the needs of local people, tourism, and nature conservation. Similarly, the conservation of the Barun-Makalu Area, an extension of Sagarmatha National Park, is under way with the help of the Woodland Mountain Institute for boundary investigations and preparation of a preliminary management plan.

Nepal became one of the active members of the major international organization dedicated to nature conservation, IUCN, in 1974. A year later, the country joined the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and became a state party to the World Heritage Convention, UNESCO, concerning the protection of the world cultural and Natural Heritage. Nepal now has two of its National Parks, Sagarmatha and Royal Chitwan, as World Heritage Sites in the natural area category. Nepal is also a member of Ramsar Convention devoted for the protection of waterfowls and their wetland habitat. The country has already endorsed the principles of the National Conservation Strategy (NCS) and is closely working with the World Conservation Strategy, IUCN, CITES, FAO/UNDP, WWF, KMTNC, and other international agencies concerned with nature conservation.

Field research on several rare and endangered species has been conducted, for example on rhinoceros, tiger, swamp deer, red panda, musk deer, gharial, and few prey species of tiger. A general survey of rare and endangered species was conducted in all parks and reserves in the Terai.

So far, a batch of 13 rhinoceros had been translocated to a second secure site as a safeguard against any unforeseen natural calamity or epidemic outbreak.

A gharial crocodile breeding centre was established in Royal Chitwan National Park in 1977 to restock the wild population in different river systems. On different occasions, 307 gharials have been reintroduced in two major rivers of Nepal, Koshi in the east and Narayani in the centre. Similarly, in 1984, an elephant breeding station was established in Royal Chitwan National Park to propagate the population of domestic elephants.

In accordance with the significant territorial expansion, the National Parks and Wildlife Conservation Office, under the Department of Forests, was upgraded to the status of Department within Ministry of Forests and Soil Conservation in 1980. The Department of National Parks and Wildlife Conservation (DNPWC) is the primary agency for in-situ conservation of ecosystems and genetic resources. The department is responsible for the execution of the National Parks and Wildlife Conservation Act, 2029 and its regulations. In most of the parks and reserves the department shares the responsibility for protection with the Royal Nepalese Army.

The King Mahendra Trust for Nature Conservation was established in 1982 as an autonomous, non-governmental, and non-profit

organization. It is basically a fund raising organization for various conservation programmes, but its flexible mandate allows it to take up projects also. A notable example is the management of the Annapurna Conservation Area, which involves people's participation in its conservation programme.

Role and impacts of national parks and wildlife reserves

National park management and wildlife conservation and the other forestry subsectors are fundamentally interdependent. The national parks and protected areas play a very important function in conserving the country's natural and cultural heritage of national and international importance, as well as in the development of the tourist industry.

Most of the protected areas are sources of natural resources for the local people. The ultimate goal is to safeguard human and cultural values along with flora, fauna and landscape. Great emphasis has been put on maintaining and recognizing the importance of cultural heritage.

Arrangements are made in terms of the NPWC Act and Regulations to meet the legitimate needs of local communities, without compromising protected area values. Protected areas include important sites of both Hindu and Buddhist culture.

The establishment of some parks and reserves has had dramatic social and cultural impact on local people. It is possible to argue, however, that in the Himalayas these impacts have generally been more positive than negative. Recognition of social and cultural concerns also appears in the Himalayan Park Regulation, which exempts from payment of entry fees any person entering a park for worship in a religious place, or in accordance with family tradition.

However, national parks and wildlife reserves have their negative impacts also. The establishment of parks and reserves has caused resource use conflicts in that the local people are deprived of the frequent use of forest resources especially in the Terai. Parks and reserves at present cover almost 14% of Nepal's total forest, shrubland, and grassland areas. The impact of parks or reserves has been particularly adverse in those cases where local communities had to be resettled elsewhere. Finally, while tourism contributes substantially to foreign exchange, it puts a heavy burden on some of the popular areas by increasing fuelwood demand, causing local price inflation, spreading litter, and undermining traditional lifestyles.

Some issues and constraints related to the subsector's development

Representativeness and growing pressure on resources

Nepal has established a commendable national parks and wildlife reserves network which covers the country's range of

principal ecosystems and habitats fairly well. There are proposals to extend the network to make it as representative as possible of all the biogeographic zones and habitats in the country. However, Nepal has already contributed a full share to the preservation of representative Himalayan ecosystems. Moreover, where natural resources outside the park or reserve are depleted, and where resources of the protected area are seen as prime targets for human survival, the needs of the community become a big problem. No amount of conservation education, consultation, nor communication effort within the subsector can alone overcome this problem. The entire forestry and other related sectors will have to organize in such a way that the basic need for forest products is satisfied without disregarding the need for having protected areas.

People's involvement in conservation

Community attitudes and community needs are perhaps the greatest constraints on nature conservation, particularly, where population pressures are greatest. Human pressure on the natural resources of protected areas for fuelwood, timber, and livestock grazing is going to increase. In order to maintain the existing network of protected areas for conservation purposes, there is a need to foster good relations, and to encourage harmonious socio-economic development among communities in or near protected areas, to meet their basic needs and reduce the pressure they put upon protected areas.

Where continued resource use is permitted, the local communities themselves must be given an opportunity to participate in utilization control, on the clear understanding that use must not compromise protected area values. The underlying aim should be to bring local communities to the point where they see protected areas as an advantage to them rather than a liability.

The involvement of the people in conservation has to start in the development and wise use of forest resources outside the protected areas. Surpluses in fuelwood and fodder in populated areas adjacent to the protected areas will mean less attraction for people to cross the boundaries of the protected areas for their needs. Forestry production areas should be planned and developed outside the boundaries. Once pressure on the protected areas is relieved, the other issues concerning the relationship between people and conservation can be tackled through conservation education and extension.

Protection

In policing parks and reserves, the deployment of Royal Nepal Army in the protection of national parks and protected areas has been both positive and negative. On the one hand, the improved wildlife population in some parks and reserves, particularly in the Terai, can be attributed to the military deterrent on poaching. On the other hand, the large size of the protection unit also puts pressure on the local fuelwood supply, particularly from the protected area. Protection by this method has taken about seventy percent of the annual financial allocation for parks and reserves.

Inadequate policy guidelines

A major constraint on achieving effective and consistent management of protected areas is the inadequate working policy for the operational guidance of the DNPWC staff and all other interested parties.

Shared responsibilities

Another major constraint on more effective management is that responsibility for the subsector is shared among several organizations. While DNPWC is responsible for the management and administration of protected areas, the sharing of protection responsibilities with the Royal Nepal Army inevitably creates problems of divided control. Outside protected areas, wildlife conservation is the responsibility of the Department of Forest's field offices. The Department of National Parks and Wildlife Conservation is not in a position, nor does it plan to expand its organization to include district level offices to look after wildlife conservation.

Management capability

The severe limitation on management capability imposed by lack of staff is a common problem among government agencies. In the case of DNPWC, this problem is aggravated by secondment of staff to other organizations, research assignments, and overseas fellowships. The effectiveness of the department's field staff is also hampered by temporary appointments, and lack of logistical support and incentives.

Coordination

From the country's view-point it is important to facilitate and manage appropriate visitor use and tourism, as well as to bring economic benefits to Nepal without prejudicing natural or cultural values of the protected areas. Therefore it is necessary to improve coordination with HMGN agencies responsible for tourism and issue of permits for trekking and mountaineering, to ensure more effective control and avoid overuse and adverse impacts.

Strengthening the management capability of the department

The department has successfully established an excellent network of protected areas. However, the issues outlined above, relating to resource conflicts, divided responsibilities, and limited management capability, need to be resolved. To strengthen its management capability, the department must train its staff, particularly in handling problems arising from human behaviour, both organizational and in relations with communities. It must also cooperate with other agencies, such as those responsible for tourism and immigration, in issuing permits for trekking and mountaineering expeditions, and with research institutions in the

conduct of research within protected areas. It should lay down policy guidelines for its officers as bases for management planning, community liaison, and general conduct of operations.

DNPWC desperately needs a continuing programme of in-service training for a greater management capacity to ensure that benefits are gained from tourism and that adverse effects are minimized. This includes a greater capacity for planning tourism and resource management.

Education is needed not only in the technical aspects of forestry, but also in effective management, in resolving resource conflicts, and in community relationships. Matters of practical value include:

- Natural resource allocation and management.
- Natural resource interrelationships.
- Organization and management of staff.
- Community development and relations.
- Natural resource and conservation education.

Trainees should be exposed to these kind of issues, along with technical subjects, as a group, before specialization.

Some long-term research is under way, and there is a need to develop programmes and means for maintaining and expanding it. The monitoring mechanisms and a database being developed must be built into the DNPWC management structure at headquarters as well as in the field.

Alternative sources of energy have to be developed for tourism related activities in the protected areas, in order to ease pressure on the forest.

Objectives for the conservation of ecosystems and genetic resources

The primary mission of DNPWC is to ensure that representative examples of Nepal's natural ecosystems; areas of special scientific, scenic, and recreational values; and culturally significant sites are protected within HMG's system of national parks and reserves. All the areas in this system must be managed to ensure the continued survival of those qualities and values for which they are protected, while at the same time allowing for an appropriate and sustainable level of traditional uses and the enjoyment of these areas by the people of Nepal and by visitors to the kingdom.

Main objectives

The following are the main objectives for the conservation of ecosystems and genetic resources:

- To manage diverse ecosystems represented in protected areas for their scientific, educational, scenic and recreational, economic, and cultural values.

- To conserve flora and fauna diversity and enhance rare and endangered species of plants and animals.

- To manage visitor use and tourism in protected areas without prejudicing natural or cultural values.

- To help preserve the cultural heritage and religious values of communities living inside protected areas.

Operational objectives

To meet the main objectives for the conservation of ecosystems and genetic resources, the following operational objectives will be carried out:

- To improve the legal basis for the conservation of ecosystems and genetic resources, and to formulate working policies for the consistent and effective management of protected areas.

- To strengthen the organization and management of and coordination among the Department of National Parks and Wildlife Conservation, the Department of Forest, the Department of Forestry and Plant Research, and other relevant institutions.

- To develop human resources needed to properly manage protected areas and protect genetic resources outside protected areas.

- To encourage research into areas of priority for ecosystems and genetic resources conservation.

- To enhance education in natural resource and protected area management and in people park relations.

- To establish databases for resource management, and to develop effective management plans.

Programme components

To meet the main objectives for the conservation of ecosystems and genetic resources, a development programme has been formulated with the following components:

- Protected area management.
- Genetic resources conservation.
- Visitor use and tourism in protected areas.
- Preservation of natural and cultural values.
- Institutional strengthening for effective programme implementation.

Management of protected areas and conservation of genetic resources will be intensified by:

- Developing infrastructure that blends with the nature and character of the protected area.

- Building good relationships with people living adjacent to protected areas through:

  - Conservation education.
  - Developing alternative sources of energy and forest products.

- Better habitat management.

- Paying greater attention to population dynamics.

- Better management of visitor use and tourism.

- Ensuring the protection of natural and cultural values.

To support these thrusts, policy and legislation concerning protected areas and genetic resources will be improved; the department's management capacity will be strengthened; training and logistical support to field staff will be increased; resource surveys and studies will be conducted; and in formulating the management plans for each protected area, the needs of people in adjacent areas, the proper handling of visitor use, and the preservation of natural and cultural values will be accounted for.

Programme cost, financing, and impacts

Total cost and financing

The programme is projected to require about Rs 1078 million for the department's operations, Rs 96 million for the Royal Botanical Garden's operations, and Rs 1846 million for the protection unit's operations, over the 21-year period, or a total of Rs 3020 million. The respective budget shares of the department, the botanical garden, and the protection units are 36%, 3%, and 61%. The projected cost of the programme in million rupees by five-year plan period is as follows:

Last year of	the 7th Five-Year Plan:	138.9
	the 8th Five-Year Plan:	740.2
	the 9th Five-Year Plan:	727.9
	the 10th Five-Year Plan:	714.5
	the 11th Five-Year Plan:	699.0

It is envisaged that the government will shoulder 69% of the total cost of the programme, consisting mainly of the recurrent costs like salaries and operating expenses. External assistance will be sought to cover the rest of the financial requirement.

Programme impacts

Given the limited information, it is not possible to quantify the benefits resulting from the conservation of ecosystems and genetic resources. These benefits may be listed in terms of major categories as follows:

- Economic returns from tourism.
- Economic returns from the conservation of flora and fauna of commercial value.
- Potential economic returns from the conservation of genetic resources whose value has not yet been assessed or discovered.
- Better amenities from national parks and reserves for enriching the quality of life of the people through outdoor recreation, enjoyment of scenic beauty, and preservation of the cultural heritage.

The programme is environment oriented, and consequently has primarily positive environmental impacts. However, preventing the local people from utilizing forest products from the protected areas is a major adverse impact of the programme, which can be mitigated by increasing the involvement of the local people in economic ventures related to outdoor recreation and tourism in the protected areas, and by improving the productivity of forests and farm lands outside the protected areas through the various master plan programmes.

SOIL CONSERVATION AND WATERSHED MANAGEMENT [1]

Introduction

Soil and water are the principal natural resources of Nepal. Production on these resources is the primary source of livelihood for her people. Population pressure is now overloading this production system. While the country managed to maintain a balance between human activities and the natural support system until the 1960s, within the past two and a half decades, the increase in both human and livestock population has drastically changed the land-use picture. More and more fragile land has been farmed, further increasing the soil erosion rate, which is already very high because the mountains are geologically young. With the conversion of large areas of forests to farms, the forest production has been outstripped by consumption of forest products, and this has resulted in overcutting and further deforestation.

The increasing rate of loss of top soil is a key indicator of the ecological imbalance that has crept in. The general condition of the watersheds has been rapidly deteriorating. Improper land-use practices such as deforestation of land which is not capable of supporting other uses, uncontrolled and excessive grazing, use of unsuitable land for agriculture, and construction of roads and irrigation channels in fragile landscape, have fuelled the continuing deterioration.

The establishment of a department specifically for soil conservation and watershed management is a recognition of His Majesty's Government's concern for this problem. The formative years of the Department of Soil Conservation and Watershed Management, following its establishment in 1974, saw the development of a capability for soil conservation and watershed management and the promotion of better land management.

After its formative years, the department is now being developed to accelerate its operations in accordance with its mandate; it will need more manpower, financial, and other resources than it has been allocated so far. The Master Plan has drawn attention to the need for investment in this subsector. When resources are assured, the department can more confidently plan and implement an effective response to mitigate the effects of the country's soil and water conservation problems and the degradation of the environment.

Plan objectives and scope

The objectives of this subplan are to present the status and problems of, and efforts currently exerted in the soil conservation

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[1] Paper presented by S. Bhattarai, Acting Director General of the Department of Soil Conservation and Watershed Management, on 31 August 1989 during the Donors Meeting on the Master Plan for the Forestry Sector at Kathmandu, Nepal.

and watershed management subsector; to present the subsectoral strategies, policies, and programmes; to estimate the magnitude of the intervention measures that are needed, and the resources required; and to set out future directions for the department so it can effectively fulfil its mandate.

The soil conservation and watershed management plan is a macro-level plan intended to identify the direction of development, the nature of the proposed programmes, and the required investment of financial, manpower, and other resources in the subsector. It is not a "feasibility" level plan for field-level implementation. Rather, it is meant to complement field-level plans and to assist the subsector in identifying and obtaining the resources needed for field-level operations.

Watershed condition in Nepal

The watersheds of Nepal are broadly divided into four major river basins, namely: Mahakali, Narayani, Koshi, and Karnali. Each river basin covers areas within different physiographic zones. For example, the Mahakali watershed extends from the Terai to the High Himal. The watershed condition of the ecological units in these major river basins was the subject of an FAO reconnaissance inventory which was completed in 1980. Watershed condition was defined in the study as the state of soil erosion in an area in comparison to the soil erosion estimated for that area under natural or well-managed conditions. Five classes of watershed condition were identified, namely: excellent, good, fair, poor, and very poor.

Among the ecological zones, the Siwaliks has the worst watershed condition. About a third of the zone has diminished productivity and disturbance in the soil mantle and channels, and about 2% has accelerated erosion in advanced stages. The condition of watersheds in the Terai is considered to be excellent in the FAO study. Soil erosion occurring in this zone is mainly natural. However, it should be noted that the poor condition upstream has contributed heavily to the sedimentation and shifting of Terai rivers.

A further study done in the department classified the districts of the country according to watershed condition. The study showed that a third of the country's districts can be considered to have marginal to very poor average watershed condition. Moreover, the districts with good or fairly good average watershed condition have land units which are poor or very poor.

This information on watershed condition is useful for the assessment of soil conservation problems and the allocation of resources in macro-planning. However, it is based on 1980 data, and the condition of the watersheds may have worsen since then. The department is in the process of updating this information.

Soil conservation and watershed management administration

The government's concern for soil conservation and watershed management is expressed both directly and indirectly in a number of policies. The Soil and Watershed Conservation Act promulgated in 1982 gives authority to the government to declare any watershed a Protected Watershed, and then to implement various conservation measures in these areas. In 1985, the government formulated the Soil and Watershed Conservation Regulations to support the enforcement of the Act.

Responsibilities for watershed management, soil erosion, and flood control used to be distributed among several agencies. In 1974 the government established the Department of Soil and Water Conservation and equipped it with multidisciplinary expertise to address these issues. In 1980 the department became the Department of Soil Conservation and Watershed Management. The department has no regional offices, but it is providing its services to twenty-five districts through a number of district- and central-level projects. The recent reorganization of the department with its two major divisions, the Environment Division and the Technology and Management Division, and three sections, Administration, Planning, and Monitoring and Evaluation has provided impetus for effective management. There is however, a tremendous need to strengthen this new organization so it can function smoothly.

Various inter-departmental coordination mechanisms have been adopted at different levels to promote the implementation of soil conservation and watershed management programmes. Coordination at the centre was to be done through the National Commission for Conservation of Natural Resources. Recently, **His Majesty the King** issued a directive for the revamp of this commission so that it will function effectively. District- and panchayat-level catchment conservation committees perform coordinative functions at the local level. These committees have been formed in some areas where the department operates.

Some soil conservation and watershed management issues

Resource allocation

A mechanism is needed to allocate scarce resources rationally among areas requiring soil conservation and watershed management services. Logically, this mechanism should take account of such criteria as watershed condition, cost against benefit, and political priority. Presently, district-specific interests of donors weigh heavily in deciding which districts are to obtain the department's services. Through the programme approach adopted in the ministry with the support of donors, it is expected that the department will be able to rationally allocate scarce resources to meet the soil conservation needs of the different districts.

Institutional development

The institutional framework of the department still has to mature. While the government recognizes the need for soil conservation and watershed management all over the country, staff and financial constraints inhibit the department's expansion to cover all seventy-five districts. Its future institutional framework will have be formulated carefully, taking into account national and local conservation needs and the resources with which to address them.

Soil conservation coordination

Land management responsibility is divided among different agencies. The management and protection of upstream watersheds and grazing land is the ministry's responsibility; the extension of management expertise in agricultural lands and livestock management is under the Ministry of Agriculture; the construction and protection of water supply systems, under the Ministry of Housing and Physical Planning; and the control of waterflow and its uses in downstream valleys, under the Ministry of Water Resources. No agency has sole responsibility over these conservation concerns, although the department has a distinct role and should be entrusted with greater authority and responsibility over them. Better coordination can be provided by a more active National Commission for Conservation of Natural Resources at the central level and conservation committees at the field level.

Impact monitoring and evaluation

Very limited data exist from which the impact of past project activities can be evaluated. Physical accomplishments have been measured in relation to expenditures against work plan budgets and targets. The department has initiated efforts to develop a system of checking the work accomplished in the field to assess their impacts on people and the environment. A Monitoring and Evaluation Section was established recently in the department. As with other subsectors, monitoring and evaluation will have to be integrated in programmes, projects, and activities as a regular function.

Need to expand services

The activities undertaken so far are nominal compared to the magnitude and extent of the conservation problems. More resources are needed to expand the coverage of soil conservation services. In the meantime, the limited resources have to be concentrated on priority catchments so as to create an impact, rather than spread thinly over many catchments. However, general services can be strengthened in terms of creating awareness of people to conservation problems and their mitigation, through various media.

Staff training

The department has not been able to provide adequate professional training to the professional level staff and has been conducting only limited training of mid-level technicians. Training

is needed at all levels to develop staff capability for planning and conduct of field operations, environmental impact assessment, and monitoring and evaluation.

On-going projects and activities

There are several projects under implementation. They may be classified as watershed management projects, integrated rural development projects with soil conservation component, and "other" projects. Various activities consisting of preventive and curative measures were implemented through different IRD and watershed projects. These activities have resulted mainly from reaction to requests for services. There is a need to move to a programmed approach that includes the establishment of priorities based on a number of factors, including of course the people's needs.

Impacts of on-going activities

Field experience shows that among the various soil conservation and watershed management activities, community water-source protection, conservation plantation, and terrace improvement have been well received by the rural people, compared to engineering structures. Through conservation education efforts, there is a growing awareness among the rural people of the negative effects of soil erosion and the need for conservation measures.

Soil conservation and watershed management activities, if implemented in scattered areas by time-limited projects, have very little impact on the general environment. A long-term commitment is needed to combat watershed degradation effectively. The activities undertaken so far have been nominal compared to the magnitude and extent of the problems. To have greater impact, various activities should be concentrated on priority micro-catchment areas and supported by innovative and motivative extension activities.

Plan objectives

The overall objectives for the long-term development of the soil conservation and watershed management subsector are to contribute to meeting the people's basic needs for forest products and food products through the conservation and management of watershed resources; and to protect the land against degradation by soil erosion, floods, landslides, desertification, and other effects of ecological imbalance.

The specific objectives are (1) to establish a permanent organizational network with maximum scope and flexibility for implementing programmes related to soil conservation, watershed management, and environmental protection on a countrywide scale, with appropriate inter-sectoral and intra-sectoral coordination and collaboration; (2) to institute a system for recruiting and developing the technical manpower in the subsector on a continuing basis; (3) to prepare and implement plans for the conservation and management of the priority watersheds and the overall protection

of the environment; (4) to build up a strong and adequate database and applied research and monitoring and evaluation support for improved field operations; and (5) to institute a system of extension and education that will ensure the continued participation of the people in soil conservation, watershed management, and environmental protection.

Strategies

To meet the above objectives, the main strategies of the plan will be partly institutional and partly operational. Institutional strategies include the phased restructuring and strengthening of the existing organization to make it responsive to the problems at local and national levels; development of technical capability through appropriate staff training and programmed generation of additional manpower; and introduction of policies to effect coordinated and collaborative action in the use of natural resources by all the related sectors, and to persuade the different development sectors to adhere to environmental protection requirements in the conception, formulation, and implementation of development programmes.

Operational strategies include the up-to-date appraisal of the soil erosion and land degradation situation in the various watersheds, and prioritization of the watersheds' management and development on the bases of the severity of their situations and socio-economic conditions; involvement of the people and non-governmental organizations; build-up of technological development capability within the department based on research done in collaboration with DFPR; setting up a system for regular monitoring and evaluation of developmental activities, and for the timely correction of operational weaknesses; and assessment of the impact of the physical development programmes of other sectors on the environment in the local and national contexts.

Programme components

Primary programme components

The soil conservation and watershed management operations in the field will be aimed at maintaining the productivity of the land and mitigating the effects of soil erosion, landslides, and other phenomena that reflect a deteriorating environment. Whether implemented through district or national-priority watershed offices, the field operations will be integrated with other development operations, by effective inter-agency coordination. In this respect, the department will take on a leadership role. It will complement the Department of Forests's forest development operations by attending to land treatments, particularly in areas of critical importance for the protection of farms, settlements, and other structures of economic, social, or cultural importance.

Three classes of measures will be the focus of field operations, namely: preventive measures, rehabilitative measures, and

conservation education. The adage in medicine that an ounce of prevention is better than a pound of cure is also true in soil conservation. Preventive measures will therefore be accorded high priority. Whether it is intended to be preventive or curative, before a proposed measure is implemented, it will have to be justified in terms of its benefits over its costs, taking due consideration of its environmental impacts.

Preventive measures

Preventive measures bring about a long-term solution to watershed degradation. They are relatively inexpensive as they are generally applied in areas where there are comparatively minimal problems. Their widespread application in an area is an indication of good land use and management practice; the land and the soil are stabilized and the causes of soil and water conservation problems are greatly reduced. In view of the increasing human and animal population pressure, the Nepalese hills deserve immediate preventive measures.

Rehabilitative measures

Soil conservation activities reduce the danger to human lives and the damage to valuable properties, infrastructures, natural resources, and productive land. Because some damage will have already occurred, rehabilitative measures are expensive and their marginal benefit over their cost is low. Moreover, their benefit will last only if they are protected and properly maintained. A high level of technology is needed to design and maintain them. These measures will have to be implemented by using long-lasting, low-cost engineering methods and locally available resources.

Conservation education and extension

The successful implementation of the various measures depend on the people's awareness of the dangers of misusing the land, and conversely of the benefits of soil conservation, so that they will be motivated to engage in proper land use and management practices and to participate in applying conservation measures.

Supportive programme components

To be successful, the implementation of SCWM primary programme components needs the backstopping of supportive programme components, such as policy and legislation development; organizational development; training; research and development; watershed resources survey and management planning; and monitoring and evaluation.

Program cost and financing

The programme will cost about four billion Rupees over the 21-year period from the last year of the current plan to the end of the 11th plan. About 69% of the cost will be for the application of the various conservation measures. It is envisaged that HMGN

will support 13% of the cost of the programme over the 21-year period from 1989-90 to 2009-10. People's participation will be sought in implementing the various measures. It is envisaged that the worth of their participation will be about 16% of the total cost. The rest of the financial requirement, or 71%, is envisaged to be meet through foreign assistance.

Benefits from the programme

Benefits from soil conservation and proper management of watershed resources are well-known, but are quite difficult to assess quantitatively in many cases, particularly in a country like Nepal where data are scarce. The benefits expected from the programme include: (1) saving and protection of lives and valuable infrastructure and other properties by the reduction in the incidence of man-induced landslides by various preventive measures; reduction in the incidence of streambank cutting and flooding in areas where torrent control and streambank treatment have been applied; and reduction in sediment delivery; (2) maintenance and improvement of the productivity of the land by the reduction of soil erosion, and conservation of moisture; protection of riverside farms from bank undercutting; and protection of hillside farms from terrace failure and gully enlargement; (3) rehabilitation of degraded land to a productive condition by plantation development, range management, silvo-pastoral management, agroforestry, and fire protection; (4) increase in water yield and improvement in water quality by the protection of water sources and the maintenance of canals and other water production and delivery systems; (5) amelioration of the environment and enhancement of its aesthetic value, and (6) generation of employment.

Economic viability of programme components

Local case studies which have looked into the economic aspects of soil conservation measures provide some insights and lessons that will be valuable in setting priorities, and deciding where and under what conditions specific measures should be applied. The studies have found that generally, bio-engineering methods of rehabilitation have proved to be more useful and cost effective than merely structural methods. The latter have required large investments to set up and will require more to maintain. Improperly maintained structures may cause more damage than if they had not been introduced in the first place. Terrace improvement requires smaller investment and its benefit is clear and sustainable. Streambank treatment benefits can cover the cost of construction only if the structures withstand the river force for a long time. Landslide and gully treatments are very expensive activities and can only be economically justified if they are applied to protect land occupied by large and important infrastructures.

The willingness of the farmer to participate in the implementation of a particular measure is an excellent indication of the high payoff from such activity. Farmers are generally risk-averse and will not want to forego the present benefits from their labour,

or incur costs, even if substantial returns are forthcoming. The introduction of small, income-generating components help to make soil conservation and watershed management activities to be attractive.

Environmental impacts

The SCWM programme is generally directed towards improving the environment. Therefore its implementation will have substantial positive impact on the environment of the country. Negative impacts, if any, are negligible and could occur only in the event that improper measures or failure of some engineering structures create environmental degradation. In any case, bio-engineering methods are preferable to pure engineering structures with few exceptions.

RESEARCH AND EXTENSION [1]

Introduction

There are unique features of Nepal and Nepalese forestry that have a particular bearing on research. Within about 150 km there is a range from the subtropics of the Terai to the upper tree limit and perennial snow. There is a summer rainfall regime, with precipitation generally increasing from the west to the east. Rainfall aberrations exist resulting in heavy annual rain and semi-arid conditions existing within a region, a short distance of each other. The number of different sites and ecosystems per unit area is probably greater than in any other country, and many of these ecosystems cover small areas.

About ninety-five percent of the population depend on agriculture and forestry; sixty-six percent live in the mountains, where land capable of supporting sustained arable agriculture is exceedingly limited and is virtually fully developed already. The population is still rising at an alarming rate (2.7% annually). Migration to the Terai, already heavily populated, is taking place. There is a comparable high animal population.

There are high demands, in relation to area, which cannot be met sustainably under the present system of forest management, for fuelwood, timber, poles, fodder and litter (both vital to the agricultural system in the mountains), and also for cottage industries such as paper making, and for plant-derived drugs and chemicals.

Research developed in different departments of the Ministry of Forests and Soil Conservation, and some projects in forestry or with forestry component found it necessary to carry out research work needed to support their own immediate needs, although the former Department of Medicinal Plants and the Forest Survey and Research Office were involved in research as their major activity. These two organizations has been integrated recently as a new Department of Forestry and Plant Research (DFPR).

Research work has suffered from a general lack of funding, and from staffing difficulties - it has not been seen as providing good career prospects. There has been much criticism of the paucity of results in relation to expenditure, but in fact a great deal has been achieved in a relatively short space of time. It is necessary to appreciate that forestry research is always difficult, time consuming, and relatively expensive.

Objective and scope

The Master Plan for forestry research aims to formulate a 25-year research development plan to support the overall forestry

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[1] Paper presented by Dr. S. B. Malla, Director General of the Department of Forestry and Plant Research, on 31 August 1989 during the Donors Meeting on the Master Plan for the Forestry Sector at Kathmandu, Nepal.

sector of Nepal. It includes all the departments, agencies, and units of MFSC. It also considers the Institute of Forestry at Pokhara and Hetauda, and other agencies and units in both the public and private sectors, and anticipates that they will take part in many of the research programmes. The needs of the departments and parastatals of the ministry are given special attention.

Essentially, forestry research is aimed at improving the sustained productivity of forest land and vegetation, in particular so that arable agriculture can be sustained at its present area in the mountains; environmental degradation is halted and reversed; and the country's increasing demand for forest produce can be met, even on a possibly reduced forest area.

The plan tries to rationalize and give priorities to all research and development (or R & D) activities required to serve the forestry sector, taking account of the need to maximize the benefits to be derived from the limited resources available. Research in a third world country with very limited natural, human and financial resources should be strictly of an applied nature, to meet actual and anticipated needs of management.

"Research" is taken to cover not only research in the traditional sense, but also technical and policy information and their dissemination to the government's forest development workers and eventually to the large masses of rural people, who will be managing the country's community and private forests. Forestry extension is therefore included in this paper. Research also covers related management services, such as directories, statistical analysis, resource surveys, planning, etc., although these are covered in other aspects of the Master Plan.

Assessment of past and current activities of R & D related organizations

Until the recent organization of the Department of Forestry and Plant Research, forestry R & D has been scattered among several departments and projects in a rather unsystematic and uncoordinated way. The following gives an assessment of R & D related organizations and their programmes and activities.

In support to forest management

Research should be in response to forest management needs. Forest management is so new, however, especially in the mountains, that in general the forest managers have little idea of what they need. Moreover, their needs relate to how and where to start, rather than to actual practices.

Ever since it was first started as the Forest Survey and Research Office, the Forestry Research Division has been carrying out surveys of forests, soils, and land use as bases for developing management plans for national forests, although these activities have been inadequate in relation to the need. The Forest Research and Information Centre was established within this office. Work

has been going on in many fields, including information, forest management, soil survey, soil and plant analysis, nurseries, silvicultural field trials, fodder trees, and bamboos.

The Department of Forestry and Plant Research has been engaged in R & D work that supports forest management in several fields, namely: botanical survey, plant identification, clonal propagation, production of cuttings, biomass studies, economic mapping, and cultivation of medicinal and aromatic plants.

Various forestry projects have also been involved in R & D to backstop their development activities. Primary attention has been paid to biomass studies and silvicultural trials.

Outside the ministry, limited research involving species trials and growth studies of fuelwood, fodder, and pine species has been conducted in the Lumle and Pakhribas Agricultural Research Centres. The Royal Nepal Academy of Science and Technology has also been doing forestry-related work such as on nitrogen-fixation in leguminous crops. The Institute of Forestry has also been conducting research as part of its academic function.

In support to utilization

A particular problem is the shortage of fuelwood. Efforts have been made not only to increase forest productivity, but also to reduce demand through the use of more efficient stoves and alternate energy sources. In the Terai and the lower mountains there has been a limited programme of converting manure to biogas and slurry, which would provide both energy and plant nutrients. In the mountains, especially in the urban areas, there has been a programme to develop improved domestic cooking stoves. It has had limited success, apparently because of faulty manufacture and limited socio-cultural acceptance. There have also been limited programmes on mini-hydels and solar heaters, but more are needed. There is clearly scope for more research in the general field of energy saving and substitution, a mandate which has been given recently to the ministry.

For fodder from shrubs and herbaceous plants as well as trees, some R & D has been done. In general this work is at the stage of surveys to find out which naturally occurring species are used, how and by whom, and what their nutritional characteristics are, and only limited work has been done on propagation, management, and harvesting. This is a subject of the greatest importance in view of the prevailing agricultural-pastoral system, and deserves much more attention than it has had in the past.

R & D on minor forest products, especially drugs, aromatics, gums, tannins, perfumery, and resins by the former Department of Medicinal Plants, now DFPR, has been relatively more substantial.

In support to protection and conservation

The field activities of the Department of Soil Conservation and Watershed Management include pilot work on protective and

remedial soil conservation measures, employing both biological and engineering techniques. In relation to R & D, what is lacking is the development of mechanisms for sustained monitoring and evaluation of past programmes.

The Department of National Parks and Wildlife Conservation conducts research on flora and fauna, as well as surveys of endangered species. It has not done much R & D using its own resources, but fortunately considerable foreign aid has been available. The King Mahendra Trust for Nature Conservation has also been supporting a number of studies.

The former Department of Medicinal and Aromatic Plants has been engaged in a botanical survey of the country, undertaking ecological studies, cultivating a number of species in the botanical garden and herbal farms, maintaining a herbarium, improving tissue-culture methods, conducting an ethnobotanical survey, and developing a germplasm bank.

In support to policy research

The forest policy regarding forestry related research has been essentially adequate up to now. The actions recommended to implement policy have also been formulated, e.g. the National Forestry Plan of 1976. However, there is a wide gap between policy and reality. In the future when the new forestry sector policy is in effect and its impacts can be monitored, policy research should be given appropriate attention.

Research priorities

As has been earlier emphasized, research should be in response to the needs of management. When management is in its infancy or virtually non-existent, or when its activities are not those most appropriate to fulfilling the policy, it has been difficult to draw up a meaningful research programme.

It is now generally considered that management of the degraded seral stages of natural forest in the Middle Mountains is even more important than reforestation, certainly less costly, and almost certainly more rewarding. After its first beginnings, the next phase of community forestry should give emphasis to management. Research priorities must therefore shift to support these changes.

It is also recognized that planning is not merely a question of forestry technology, but even more of the social sciences. These also demand appropriate research in a forestry context. Other priority areas include agro-silvo-pastoral studies; collection, processing, and utilization of medicinal and aromatic plants and other minor forest products; plantation development in the Bhabar and other degraded areas; and conservation of Siwalik and High Mountain forest ecosystems.

Research manpower and management

In general, human resources for R & D are exceedingly poor in the ministry. The only area with a very strong R & D base is in medicinal and aromatic plants. Forestry research staff has been reduced through deputation to administrative posts.

Over-all management of forestry research is deficient. In 1986 there were 68 organizations and projects concerned in some degree with forestry and many of these carry out some form of research in support of their operations. Too often, the work is not sustained after the project ends and foreign funding ceases. The National Forest Research Committee was established in 1985, but it has yet to become active in research management.

The recent organization of the Department of Forestry and Plant Research, which combined the Department of Medicinal Plants and the research arm of the Forestry Survey and Research Office, was done to integrate the scattered research efforts and focus R & D to the priority needs in the field.

Constraints

A number of constraints affect R & D in the ministry. Since the integrated organization is not yet fully operational, these constraints are still worth consideration here.

Human resources

Human resources charged with R & D in the ministry are scarce. Dedicated, research-minded, well trained personnel in Nepal are generally not attracted to research. An incentive system has to be developed to generate interest in a research career and to encourage greater research productivity.

Despite the current regulations, a degree in forestry is not really essential for some aspects of forestry research, such as those that are based on the biological and the social sciences. Recruitment of staff with non-forestry qualifications, particularly women graduates, should be favoured in such areas of research.

Institutional development

Forestry R & D activities is not confined to the ministry. While the recent organization of the Department of Forestry and Plant Research should ease the problem of fragmentation of research within the ministry, there remains a need to coordinate all forestry R & D. The National Forestry Research Committee should not only be activated, it should grow into an effective body for coordinating and managing the forestry R & D network covering the various organizations and projects. Linkages and cooperation with other disciplines should be established, notably with agriculture in fodder research, soils, entomology, and pathology, and with the health and industry sectors in forest products utilization. Inter-

national cooperation should be increased through links with foreign research institutes, participation in international meetings, and encouragement of research by foreign universities in fields that have national priorities.

Developing facilities and improving research technology

Equipment is not adequate in some instances and where available, it has often been poorly maintained, especially after it has ceased to be under the control of a project. Funds for spare parts have been inadequate.

Technological constraints have not been as limiting to the development of forestry R & D as human and financial ones. New technology has been available more or less as soon as there have been funds to pay for it or staff to make use of it. Information and computational services have been introduced; while the small number of computers and ancillary equipment can be seen as a constraint, the introduction of new machinery has not lagged far behind local capacity to operate, maintain, and make good use of it.

Financial allocation for R & D

Funds have not been adequate for the conduct of priority research. The low per diem rate and budget for travel discourages the conduct of research away from Kathmandu. Money for paying labour has often been released late. As the peak season for forestry is the same as for farm work, labourers naturally prefer to work on the farm if payment for their services is delayed. Funding for R & D should be raised to an appropriate level, and handled more efficiently.

Assessment of research trends

Trends in research must respond to trends in practice, which in turn should be responding to national trends that affect the forests. The wider issues are discussed in the other Master Plan reports under the headings of human and livestock population; forest products demands, needs, and markets; and resource base and supplies.

The broad picture is that the human and animal population is rising rapidly, that there are only few possibilities for increasing the area of arable land, and that the forests, already much reduced, are still declining in area and productivity.

In the Middle Mountains, it has come to be realized that afforestation is not an adequate, or even always an appropriate response to the problem. A particular point to be made is that in many places the site has been degraded to the point that only pines will succeed as plantation species, but that pines do not meet the people's requirements for animal fodder, nor are they good fuelwood species. On the other hand, it has been widely observed that

protection of such sites often leads to the recovery of the natural vegetation.

There is therefore a trend towards more research for the management of the natural forest. High priority must be given to studies on "biomass", rates of growth, and composition of the early seral stages of the predominant natural broadleaved vegetation types, and the extent to which intermediate cropping can be carried out without setting back plant succession.

It has come to be widely accepted that the Department of Forests' capability of securing the necessary protection by direct action is inadequate, and that it would be more effective to transfer control of degraded scrub lands to the panchayats. There is then a huge administrative task of trying to devise suitable simple management prescriptions, and of having these adopted and put into effect by the rural communities. The corresponding tasks for forestry research lie partly in the fields of applied plant ecology, as suggested above, and in socio-economic studies to find out, for example, how animal husbandry works and how modifications can be introduced.

At the same time, the country needs forest produce such as timber and fuelwood for the urban as well as the rural areas, and the predictions are that the natural forests will not produce enough, even if there are radical improvements in their management. Industrial-scale plantations will be needed, especially in the Terai. There is a continuing interest, therefore, in nursery and afforestation research, and to an increasing extent in the tending and management of the plantations as they grow up. As the size of the country's forestry problem becomes clearer, it can be seen that this field of research must expand to help ensure that available resources for planting are put to the best possible use.

There is also an increase in demand for minor forest products such as Daphne fibre, sabai grass for paper, and medicinal and aromatic plants for plant derived drugs and other economic products, in response to both local and foreign markets. Research should therefore continue, both on the products and on how to bring selected plants under cultivation.

Tourism is a major foreign exchange earner and tourists are increasingly becoming interested in the country's wildlife. Related research (including sociological studies) requires to be intensified on the conservation of ecosystems and their individual components; on the impact of tourism, industry, and other factors on watersheds, national parks and other important areas; and on the impact of conservation areas on surrounding communities, and how conflicting interests can be reconciled. There is also an increased need for research on methods of mass communication and extension work in the local context.

R & D objectives and strategies

Objectives

There should be systematic applied research and development, especially such as will produce quick worthwhile results that can be disseminated to various development agents, in order to conserve the country's environment, conserve the unique flora, fauna, and ecosystems, especially those that are endangered, to preserve genetic diversity; ensure that renewable natural resources are only exploited on a sustained-yield basis and not "mined" for short-term gain; upgrade the management and protection of all natural ecosystems, including their seral stages, and of afforested areas; improve the management of the national parks and wildlife reserves to enhance both their ecological value and their interest for visitors and tourism; utilize the country's medicinal and aromatic plants and other minor forest products, in particular to provide work for the rural population, both in collecting natural forest products and when possible in cultivating the plants, and in the production of industrially important products based on forest resources; involve the private sector in the promotion and application of science and technology in the forestry sector; and maximize the production of forest products on a sustained yield basis in order to satisfy the basic needs.

Strategies

Organizational consolidation

The fragmentation of R & D efforts has been wasteful in material, financial, and human resources. The organizational reform already begun in the ministry should be continued to establish a strong, functionally integrated but physically decentralized organizational structure which can support development.

It will take a number of years to attain a strong R & D organization. Ultimately, the ministry offices that support development efforts in the field will be linked by an integrated information system, that will take advantage of major world technological developments, such as the use of computers in managing information. It will coordinate, monitor, and evaluate the relevant accumulating data from all sources, to support the planning decisions and the activities of the operational implementation departments and other interested agencies, as well as the private sector.

Development of research capacity and human resources

Some essential improvements are needed. The following are some of the steps that can be taken. Degrees in relevant fields other than forestry should be accepted in recruiting staff. Women should be brought into forestry research, especially in the biological and socio-economic fields, where suitably qualified candidates already exist. Research staff should be suitably rewarded financially. Greater emphasis should be placed on promotion for merit

and achievements rather than seniority, qualifications and points. There should be clear and detailed job descriptions, and decentralization and delegation of responsibility. Managerial staff must actively guide and direct those for whom they have responsibility. Stricter discipline should be enforced and motivation instilled. There should be increased opportunities for early specialized training, usually up to M.Sc. level and in meritorious cases up to Ph.D. Such training and post-graduate facilities should be developed locally as far as possible. Staff should be encouraged to write papers and attend national and international conferences, workshops, study groups and short-term courses. Staff should be required, where appropriate, to assist in the work of the Training Division. The number of staff should be increased in all important fields to take account of losses through deputation, post-graduate training, promotion outside the research field, and resignations, so that breaks in continuity can be avoided. Professional staff must have intermediate-level technical support, as a general rule in the ratio of one to three.

Research for community forestry

It is assumed that a major feature of Nepal's forestry will be the transfer of responsibility for the protection and management of much, if not all, of the accessible forest particularly in the Middle Mountains to local communities. Any substantial move of this kind will call for a considerable change in R & D strategy. In particular, it will no longer be sufficient merely to investigate what is technically possible. All research relating to community forestry must be set in its socio-economic and administrative context.

There is, at the same time, a great need for more biological research on the natural forests and their seral stages, to provide a sound scientific basis for silvicultural management.

The executive foresters will be looking for ways to introduce very simple forms of management to these forests. The support they need from the research arm is information about the human societies and the ecosystems involved, and about experience and ideas relating to this kind of management. A major source of information will be systematic monitoring of activity as it develops.

Research and development direction

Research is necessary to support all five categories of forest by ownership - National Forest, Community Forest, Private Forest, Leasehold Forest, and Religious Forests, and to support the private sector generally. The object should be to obtain the optimum cost effective produce per unit area to meet the owners' needs in accordance with their policies.

R & D must be extended to cover all five Development Regions. Local headquarters should be at Regional Centres, and activities strongly linked with Regional and District Forestry work, especially in community forestry. Where possible, research for internationally aided projects must be centrally or regionally based within

the ministry, in order to strengthen its long-term capability. Full use should be made of research carried out in other countries.

The ministry should be especially strengthened in its capacity to plan, manage, coordinate, monitor, evaluate, and carry out or commission economic and social studies.

Especially in relation to "industrial" forestry in the Terai, more attention should be given to R & D in agroforestry. Among other things, there are possibilities for more effective utilization of minor forest products and for the cultivation and processing of medicinal and aromatic plants.

R & D on timber harvesting, conversion, and utilization should be conducted. Research on medicinal and other valuable plants and phytochemicals, essential oils, rosin and turpentine based products, and other industrially important minor forest products should be actively pursued or initiated when it is considered economic in the Nepali context.

R & D is needed on the conservation of ecosystems and their individual components, on the impact of tourism, industry and other factors on watersheds, national parks and other important areas, and in methods of mass communication and extension work.

Inter- and intra-ministry and private sector liaison

There must be close cooperation with related disciplines. A classic example is the question of fodder research. In the middle mountains of Nepal the supply of fodder concerns agriculture and forestry as well as animal husbandry. Related research will be done at different institutions, but it should be coordinated by discussion and perhaps by the formation of an inter-ministry body. There must also be the closest cooperation among all organizations within the forestry sector.

Action for coordination outside MFSC

The ministry must encourage other bodies to undertake forestry-related R & D, and to provide supporting services. In particular, it should ensure that the Tribhuvan University produces sufficient well trained graduates and encourage its various units, and those of other agencies, to take up aspects of research that are within the National Forestry Research Plan and Programmes.

International cooperation and liaison

The development of international contacts will help to improve the quality of research. In particular, the ministry should maintain its membership of the International Union of Forestry Research Organizations. Twinning arrangements should be encouraged between the Institute of Forestry and foreign universities, as well as contacts between the Department of Forestry and Plant Research and foreign forestry research institutes. Researchers should be enabled to attend international conferences, seminars and workshops. Participation should be encouraged especially in regional

projects and initiatives. Foreign scientists and post-graduate students should be encouraged to undertake research in Nepal within the framework of the National Forestry Research Plan.

Research programme

Species/provenance trials

This programme was formerly given very high priority because of the emphasis on afforestation, especially in the community forestry programme. The programme has a rather lower priority today. This is partly as a result of work carried out during the past seven years, and partly because it is increasingly being realized that a faster increase in biomass production would probably be achieved through the management of existing scrub and poor forest than by planting.

In the short term, trials should be carried out with a view to the introduction of commercially important minor forest products and medicinal and aromatic plants, which could be introduced in agroforestry; and the introduction of new species and provenances should continue, but there is an increasing need for experiments in silvicultural treatment, and in growth studies, of successful species.

Seed collection, seed storage, selection and preservation of plus trees and stands, and creation of seed orchards

The present programme of selection and conservation of existing natural plus-stands of proven species and provenances, and their management to upgrade genetic quality and increase seed production, should be intensified in the short-term by concurrently short-listing and phasing the species under study, selecting and preserving plus trees generally and then moving on to the formation of seed stands and to the testing of plus trees and the formation of seed orchards and production of improved clonal material. The germplasm centre under DFPR should be further strengthened.

Stand improvement

With the increased attention being paid to the management of natural forests, this programme must be given high priority. The particular need now is for studies in all the major broadleaved vegetation types and their zonal stages in the Middle Mountains, of biomass production, and of the best methods of upgrading these vegetation types in the shortest possible time. Priority must also be given to research on genetic improvement.

There is also an urgent demand for socio-economic studies on the user groups of the forests in the Middle Mountains, in view of the need to produce and implement simple, practicable management plans in community forests, and to guide the choice of species for afforestation and enrichment planting.

Agro-silvo-pastoral studies

Along with the programme of stand improvement, this programme should have increased priority, especially in the Middle Mountains for community forestry. For work in the Terai, advantage should be taken of the techniques developed at Sagarnath.

Plantation establishment

This programme is still very important, but should now have less priority than stand improvement. It is particularly important, however, in reclamation work where pioneer species are appropriate. More research should be undertaken with large cuttings of suitable species rather than seedlings, since cuttings are cheaper to produce and less liable to damage by browsing.

Improved management of fodder trees, shrubs, and herbs

This is still a most important programme. Research should concentrate more on the probable better species of the future, and for broad site types, leaving field projects, as far as possible, to undertake research on a wide range of favoured local species. More work is needed on the vegetative propagation of these species, especially the use of long cuttings to minimize the problem of protection from livestock. Cuttings are simpler to transport than tubed seedlings.

Introduction and propagation of bamboo species

Bamboos are especially important in the Middle Mountains and Terai. Seeding is infrequent but vegetative propagation is often possible; research on it should be intensified for all preferred or potentially valuable species, both those with thin or with thick culm walls, and with long or with relatively short culms.

Improved nursery management and planting stock

This programme has been given very high priority during the past decade, great progress has been made and the results are well documented. It should continue.

Protection and management of the coniferous forests of the High Mountains and of the broadleaved and coniferous forests of the Siwaliks

Little research has been done since 1981 in the important coniferous forest of the High Mountains. These forests give very valuable protection to the upper water catchment areas. They are also one of the most important areas for the future productive forest estate, especially for construction timber for urban centres and industry. Research on the coniferous high mountain forest and the forests of the Siwaliks should be given high priority in order to develop proper management methods. It should be carried out before exploitation begins, where this is still possible.

Ecological studies of Nepal's vegetation, flora, fauna, and ecosystem security

Past studies have concentrated on surveys of indigenous flora and fauna and of the various ecosystems. Attention should now be directed to ecological, including biomass, studies of vegetation types and succession of seral stages of scrub vegetation, and ecosystem conservation.

Improved utilization of forest products and prevention of unnecessary waste

Increased effort is needed in the development of biogas installations at high elevations and in the production of a cheap mini-hydel for 1-3 dwellings in rural areas, to reduce dependence on wood fuel. An economic survey should be made soon of the waste of timber in Nepal through poor logging, conversion, seasoning, grading, storage, standardization and marketing of sawn timber and roundwood. A small component for timber utilization research and advisory activities should be considered in that context. It should look into the quality and market potential of the future plantation grown timber. Further work should be done on oleoresins and other extractives from the foliage of Eucalyptus camaldulensis grown for fuelwood; and derivatives obtained from the distillation of pine oleo-resin. Increased attention should be given to minor forest products for development of local industries. The programme for an improved design of stove and its manufacture and extension should be intensified.

Insect/pathogen and pests/diseases survey

This is likely to become an important programme as increasing areas of industrial plantations are created. Much information can be obtained from other countries, but a local survey should be started soon.

Phytochemistry

The botanical, chemical and pharmacological study of forest and cultivated plants represents about seventy-five percent of the cost of R & D activities of the former Department of Medicinal Plants. The current programme is to make a botanical survey of Nepal and to screen plants that have been profitably used, or are closely related to those that have been used, as is known from the international literature or local traditional/modern ayurvedic/ medical practices. The plant extracts are then processed on a research basis before handing over to the commercial sector. Formulation, quality control, and standardization of plant derived drugs are currently undertaken. Where the natural plant source is scarce or very dispersed, cultivation trials are carried out.

Minor forests products

The importance of minor forest products, especially to the rural community in the development of local industry and for cash generation, cannot be over-emphasized. They are therefore given

even more emphasis in the present plan. Programmes that contain an element of minor forest product development, and to which reference should be made, are: species/provenance trials, seed collection and storage, agro-silvo-pastoral studies, fodder species, bamboos, nursery management and planting stock, ecological studies, improved utilization of forest products, and phytochemistry.

Watershed management and environmental impact

The hydrological resource of Nepal is very large, and it is one of the main potential foreign exchange earners. The conservation of the country's environment, especially the fragile mountain ecosystem, is an important goal.

There is a need for monitoring and evaluating the medium to long-term effect of the various remedial activities, including the improvement of forest management and agricultural and animal husbandry. There are substantial benefits in concentrating studies in a limited number of areas. It is essential to select a minimum number of representative watersheds for special study and for use as enlarged demonstration areas. It is also necessary for lessons to be learned from future activities in other watersheds.

Extension programme

Extension phases

Research results need to be disseminated through effective forestry extension. Forestry extension should be carried out in three phases:

- Mass communication, to increase awareness of the masses of the efforts of the government to help them meet their needs for forest products, of the policy changes that the government has instituted to transfer control and management of the forest in people's hands, of the incentives and other assistance that the people can have in developing and managing the forest, etc.

- Field extension, to bring the government's extension workers in contact with the rural people to reinforce the mass communication process, assist in the formation of users' groups, and subsequently provide technical assistance in the forest development, management, and utilization activities.

- Transfer of technology and other fruits of research through field demonstration and related research dissemination activities to raise the level of productivity of the forest land and to conserve the ecosystems, in general, and the genetic resources in the forest, in particular.

There are two important preconditions for the success of forestry extension in the country:

- The systematic development of an extension programme and an organizational network for implementation.

- The development of a corps of dedicated and motivated extension workers who are not only well grounded in technical aspects, but are also properly informed about the recent policy shifts and aware of their role as catalysts for forestry development.

Extension work is necessarily a decentralized activity, and extension workers are therefore attached to field offices of the ministry. The ministry will be fielding thousands of extension workers to implement its forest development and management programmes mainly through people's participation. Training of a large number of these staff can be effectively managed if it is decentralized. Regional and District Training Centres will therefore be established. The Training Division will assist in the establishment of Regional and District Training Centres, the training of instructors, and the development of curricula which will in turn be implemented in training courses for the extension workers in say, community forestry. Extension and training functions will be closely interrelated in the field organization. Training of the rural people themselves will eventually be done through the District Training Centres as part of the field extension and technology transfer phases.

Extension coordination

Coordination has to be provided at the centre. In the recently approved ministry organization an Extension and Communication Division has been created to fill the needed role as extension coordination office. This division will work closely with the Training Division and the different departments.

Related development programmes

Information service

The development of an information service was initiated in a small way with the creation of the Forestry Research and Information Centre. It has been generally strengthened by FRP and is probably the most important single step in a strong and realistic R & D plan, and in the dissemination of information. It can now be seen in terms of making use of computers to establish databases and databanks. The information sector should also have the expertise to advise on the development of "management information" in the operational Departments as well as in the computerization of research, analysis, monitoring and evaluation.

Publication

Publication serves the purpose not only of exchanging information within the research sector, but more importantly of bringing the results of research to the hands of the users, which

in Nepal will mainly be the rural people. Important publications should therefore be made available in Nepali.

Programme implementation

The Department of Forestry and Plant Research is the R & D arm of the ministry and its agencies. While its staff and other resources came from the former Department of Medicinal Plants and the Forest Survey and Research Office, it is no longer just concerned with the development of medicinal and aromatic plants, or with silvicultural and related research. It has to serve the multidisciplinary R & D needs of a number of departments and corporate bodies. During its formative years, preparatory work and guidance are needed to help it mould itself into this role. Work is urgently needed on the analysis of R & D areas based on socio-economic studies and the needs of both the public and private sectors, setting up of priorities and targets for the Eighth Five-Year Plan period, and updating of the 1981 National Forestry Research Plan into an operational plan for R & D. The creation of a "Council for Forestry Sector Research and Development" is also needed to replace the already inappropriate NFRC. The organizational development of the new department and the establishment of regional R & D centres have to be studied. Programming of R & D staff and other resources among the R & D areas on the basis of priority have to be undertaken. Analysis of the extension and training programmes to ensure adequate support to field extension operations, and dissemination and proper use of R & D results have to be done.

The Council for Forestry Sector Research and Development should be created as a policy-making body to guide the operations of the new department, as well as to approve on such matters as research subject areas, priorities, and resource allocation.

The preparatory study should analyse the organizational development of the new department. The following Master Plan proposal should serve as a starting point for the analysis:

- The department to have three technical divisions: Forest Research Division (FRD), Conservation Research Division (CRD), and Plant and Plant Product Research Division (PPRD); major sections within each division to evolve later into fully fledged divisions.

- The Forestry Research Division to be concerned with nursery and silviculture; soils; forest management; and socio-economic aspects of community, private, and national forestry; and utilization and marketing of forest products.

- The Conservation Research Division to be concerned with studies on soil conservation and the conservation of ecosystems and genetic resources, conservation of flora and fauna, controlling pests and diseases affecting plants and wildlife, and research on environmental impacts of forestry related activities.

- The Plant and Plant Product Research Division to be concerned with economic botany, genetic engineering, biotechnology, phytochemistry, and plant product development and related studies, including medicinal and aromatic plants and minor forest products development, utilization, marketing, pilot plants, and demonstration.

Attention is also given to the institutional constraints on human resources. Proposals are made in the Master Plan that, if accepted, would remove the present disincentives to good work. Hopefully, they would even attract the right individuals to research, thereby creating a contented and efficient integrated multi-disciplinary team, in which professional merit governed advancement. The proposals should also help to ensure continuity of research by experienced specialists trained in particular fields, instead of allowing their expertise to be dissipated or lost.

It is appreciated that many of the constraints are national and not solely ministry problems, and therefore may take a long time to resolve. However, some kind of reform, preferably early, is absolutely essential. The present system produces a poor output in relation to the number and quality of personnel involved.

Programme cost and financing

Components

The cost estimates presented in this report are indicative and reflect the budgetary requirements of the core of the forestry research and extension programme. Other programmes of the Forestry Sector Master Plan also deal with R & D, and the generation and use of information, e.g. "Resource information and planning assistance", "Medicinal and aromatic plants and minor forest products development", "Wood-based industries development", or of extension at the field level, e.g. "National and private forestry". Costs already provided in these programmes are excluded here to avoid duplication, e.g. computers for the integrated information system, cost of field extension.

Total cost and financing

The forestry research and extension programmes are projected to require about Rs 1008 million over the 21-year period, excluding the cost of field extension activities which have been built into other development programmes of the master plan. Research is projected to require Rs 929 million; extension coordination at the central level, Rs 79 million.

Investment items including capital outlay, technical assistance, and fellowship and training accounts for about 62% of the total cost, with salaries, allowances, and maintenance and operating expenses accounting for the remaining 38%. Foreign cost is projected to be 60% of the total cost.

It is envisaged that HMG will shoulder 38% of the total cost, consisting mainly of the recurrent expenses like salaries and operating expenses. External assistance will be sought to cover the rest of the financial requirement.

RESOURCES INFORMATION AND PLANNING ASSISTANCE [1]

The need for a good forest resource information base for planning

Any country, at whatever stage of development, needs good information to direct its development programmes. Investment on information will ultimately pay off as savings in developmental resources. Case histories tell of millions of dollars wasted on projects that were poorly designed and directed because of the poor quality of information upon which they were founded and managed. Wastage of scarce financial resources is lamentable, but even more lamentable is the waste of time on bad programmes or projects; the problems they were designed to solve will multiply during the time that the projects are floundering.

Forestry planning, whether for long- or medium-term macro-level programming or short-term operations, requires a good information base, which should cover the nature, extent, productivity, and other aspects of the forest resources of the country or a locality. The scenarios for the future and the strategies to attain the desired scenarios, both important elements of the plan, should be based on a reasonably accurate picture of the present. Where the planning exercise is on a country-wide scale, a macro-picture of the forestry situation is sufficient. Detailed information, such as the type and extent of a particular panchayat forest is necessary for local-level planning.

Forest resource inventories

The first attempt at country-wide forest resource inventory was made in the sixties, based on 1963-65 aerial photography covering most of Nepal, but excluding the Himalayas and parts of the High Mountains. This Department of Forests project, supported by the US Agency for International Development, produced four forest resource inventory reports over an eight-year period, namely: Forest statistics of the Timber Corporation of Nepal area, Chitawan (1965); Forest statistics for the Terai and adjoining regions (1967); Timber resources and development opportunities in the Lower Bheri and Karnali watersheds (1969); and Forest statistics for the hill region (1973).

A more complete coverage of the country by aerial photography was made in 1978-79 with Canadian International Development Agency funding. The Land Resources Mapping Project (LRMP) was started in 1980 to prepare maps of land systems, land utilization, land capability, and other topics, and to extract various information from the 1978-79 aerial photography and subsequent extensive surveys. LRMP did not produce forest resource inventory reports, since this work was not part of its objectives. However, it

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[1] Paper presented by P. N. Suwal, MFSC Additional Secretary, on 31 August 1989 during the Donors Meeting on the Master Plan for the Forestry Sector at Kathmandu, Nepal.

published land-use information of sufficient detail for it to form the basis of a forest resource inventory.

Satellite imagery has also been used by the country's Remote Sensing Centre to assess land use and land cover, but it does not provide accurate and detailed information on forest types, because of low resolution and classification difficulties.

The Forest Statistics and Survey Division in its former capacity as the survey wing of the Forest Survey and Research Office has also been engaged in district-level inventories for the purpose of providing resource information for district forest management plans. Forest inventories have also been conducted in connection with the implementation of externally-assisted projects, e.g. Hill FOrestry Development Project.

Forest resources information

Subregional 1985-86 summaries of forest area, standing timber, forest biomass, and yields have been generated by the Master Plan for the Forestry Sector Project for long-term macro-planning purposes. These information were derived from 1985-86 land-use estimates and the 1978-79 estimates of forest area, standing timber, and forest biomass. Updating of disaggregated forest resource inventory data to 1985-86 was not possible due to lack of suitable data.

Forest resource productivity is mainly related to site factors and varies relatively little with time. Some of the forest resource productivity information in the Master Plan study are based on old plots, but the plot data are considered relatively timeless in comparison to land-use changes and are therefore considered valid for the purposes of the master plan.

The Master Plan report "Forest resources information, status and development plan" has presented the country's forest resources data, or the lack of them, and has displayed the ingenuity that is needed to derive information from these meagre sources for planning and management decision-making.

The following statements can be made about the present state of forest resources information and the direction it needs to take. These statements are not intended to ignore the efforts, both past and present, that have been made by various organizations to improve the situation, but rather to indicate that the desired stage of effectiveness is still far from being reached, and much remains to be done.

- Spatial forest resources information is out of date. Although LRMP land-use information was published only a few years back, it is now a decade old. Nepal may not be able to afford a nation-wide inventory every five years, or even every ten years, but spot imagery or strip sampling, based on stratification by degree of land-use pressure, can provide data for updating spatial information at affordable cost.

- More attention needs to be paid to the definition of land-use categories. For example, how different are shrublands from forests with crown cover close to ten percent? To facilitate comparison and evaluation of land-use changes, definitions of land-use categories for future inventories must not deviate too much from those of LRMP, but clarity of information must not be sacrificed.

- Inventory plot information is lacking for some forest types. Past inventory plots were concentrated in the Terai and Middle Mountains. Not enough plots are available for the forest types of the High Mountains.

- Inventory plot information is out of date. Compared with spatial information, inventory plot information is relatively timeless, because its limits and hence applicability are defined, e.g. species, crown cover ranges, tree size ranges. However, the ranges may be too broad, e.g. 40 to 70 percent crown cover. It is not suggested that very narrow ranges should be adopted, as this would entail additional cost in data collection and interpretation. It is to be noted, however, that population pressure on forest resources must have caused forest stands to be distributed more towards the lower limits of crown cover ranges, so that present inventories based on old plot data may tend to overestimate stand densities, and that this problem of uneven representation is aggravated by having such broad ranges.

- Growth plots are lacking. There is a need to find out how forest of various categories (in productive, unproductive, or open areas) develops under various management regimes (including unplanned exploitation, simple protection, or various sets of cultural and regulatory treatments). Growth and yield information is needed for forest plantations, of both single species and mixtures, under various site conditions.

- There is a lack of information about how best to develop a forest on any particular piece of land. Information is needed on species-site compatibility for new planting. Studies need to be made on natural succession and the ecology of grasslands and degraded forests.

- Biomass studies have to be extended from individual species to forest types. Except for some coniferous stands, forests in Nepal are seldom totally pure.

- Minor forest products, especially medicinal plants, have not been given adequate attention in forest inventories. There is no valid way to estimate the quantity of these products from present inventory information.

- Specialized inventories are needed for wildlife resources.

- Surveys of farmers' species preferences appertain to the demand more than the resource supply side, but their findings

have implications for the extension work and development efforts that are aimed at establishing more forests through people's participation. Attention should be given to this type of information.

- There is a need to determine the most appropriate inventory methodology. Intended use and accuracy of inventory must be balanced against cost. For national and regional planning, inventory should be based on low cost remote sensing. Intensive and expensive inventory based on field work can only be justified in operational level planning for the intensive management of specific forest stands.

The need for a forest resources information-decision system

The above list indicates that more organized effort is needed to provide good and up-to-date information, at the time it is needed, and making use of the most appropriate technology, to assist policy-makers, planners, and resource managers. The need can be met by better-staffed, better-organized, better-directed, and better-funded research and development work. Research requires resources that many may think the country can ill afford. On the contrary, the country cannot afford to forego research and base its development efforts on guesswork.

Components of a forest resources information-decision system

A forest resources information-decision system is a set of elements organized to collect, process, store, and retrieve forest resources information and use it in planning and management decision-making processes. The major components of the system include the kinds of information and the methodologies to collect, process, store, and use it; the organization, linkages, roles, and manpower required for efficient generation and use of information; the hardware needed to facilitate processing, storage, retrieval, exchanges, and use of information.

Methodologies

Classes of forest resources information

Forest resources information may be spatial, i.e. tied to coordinates in the two-dimensional or three-dimensional space of the earth's surface, or non-spatial. At the present stage of development of information system technology, spatial information may be assigned a two-dimensional set of coordinates. Altitude is an important dimension in the Nepalese context, but it is handled as a theme or subject, like others such as topography, geology, or land use.

Non-spatial information is generally measured by sampling and is aptly described as statistical information. Taking a plot of forested land as a sampling unit, examples of non-spatial,

statistical information are: species composition, plot volume, volume per ha, plot biomass, biomass per ha, and volume or biomass increments between two points in time.

Geographic information system

Maps are the oldest carriers of spatial information. For a specific area, several types of maps may be made, one for each theme or subject. With the advent of the computer, map plotting programs have been written to enable map information to be stored in computer memory. Such computer mapping techniques are incorporated in a Geographic Information System (GIS).

In GIS format, map information is digitized and assigned coordinates. The power of the computer allows easy handling of multidimensional map information. For each pair of coordinates, many themes of information can be assigned, stored, processed, superimposed, computer-analyzed, and maps made from them for visual analysis.

For the forestry and soil conservation sector, such themes as geology, soils, land systems, topography, rainfall, temperature, land use, water resources, transport, population, parks and reserves, and administrative divisions are all important. Furthermore, such themes as land use will have to be broken down further into subthemes, such as forest type, crown cover, and tree size. With such location-specific information available, planning and management decision-making can be made more effective.

Spatial data collection

To collect macro-scale spatial data, remote sensing through aerial or space photography is indispensable. Nepal's most recent nation-wide aerial photography was made in 1978-79. Some advanced countries have adopted a five-year cycle for nation-wide aerial photography coverage. Developing countries have other priorities and cannot afford such frequent photography, not even one coverage every ten or fifteen years.

With the fast development of low-cost satellite-based remote-sensing technology, nation-wide aerial photography is becoming redundant. Even now, there is a need to ask whether the usefulness of the resulting information warrants the use of expensive aerial photography or only of lower resolution, but cheaper, satellite imagery. LANDSAT thematic mapping and SPOT imagery are capable of producing 1:25,000 maps of adequate resolution for local-level land-use planning at less than five percent of the cost of aerial photographs. Satellite imagery is available on computer compatible tapes, and is amenable to rapid analysis by digital image-data processing.

For Nepal, a nation-wide aerial photography may not be necessary, provided there is updating at intervals of five years or oftener by less expensive methods like satellite imagery or strip sampling. Inaccessible areas of the country do not change as much as the accessible areas. Areas subject to intense population

pressure undergo rapid change. Aerial photography and ground inventory may be conducted in these areas, as well as those where intensive management is to be applied at the time the information is most needed.

Focusing on the specific needs of the forestry and soil conservation sector, the interpretation of the imagery should pay close attention as usual to such land-use categories as forested lands, shrublands, grasslands, and uncultivated and marginal lands which may be developed into tree farms, and such forested land subcategories as forest types, crown cover classes, and maturity classes. These visible features need to be combined on maps with policy and administrative data, and with categories such as parks and wildlife reserves and watershed protection reserves, where wood or fodder collection may or may not be permitted. Soil erosion variables, such as frequency and extent of landslides and erodibility class, should also be mapped.

Inventory plots for wood and non-wood resources

Over the years FSRO has been establishing and measuring inventory plots. In the sixties, this was in connection with the nation-wide forest inventory, and later in connection with the preparation of management plans. The recently established Forest Survey and Statistics Division (FSSD) of the Ministry of Forests and Soil Conservation should continue this activity as part of a continuous forest inventory programme. It should tap the technical expertise of the district forestry offices and act as coordinator and controller for this activity in every project.

In the traditional sense, inventory plots are the sampling units to determine such forest stand statistics as species composition, structure, and density by categories consistent with the spatial forest inventory categories (land-use and forest cover classes). The data from these plots allow assessments to be made, for example, of the biomass of the forests by species, etc. However, the use of inventory plots should be expanded to measure stand variables that have not traditionally been measured, such as the type, quality, and quantity of minor products, which may not come as tree or wood extracts, but as herbs, vines, or other forms of vegetation. It may be possible to correlate these variables, which are measurable from ground plots, with variables which are measurable from remotely-sensed media like photographs, thereby allowing them to be estimated over wider tracts of the country.

Growth plots for forests and plantations

Past inventories have included both permanent and temporary plots. In practice there is no distinction, since permanent plots are not protected and have not been remeasured. The maintenance of permanent inventory plots is necessary to get "real time series" information on stand development. Important change variables, from which planning and management inferences can be drawn, are estimated from successive measurements of these plots. The maintenance of permanent inventory plots should be arranged in connection with a continuing forest management research programme,

whose objective is to monitor stand development resulting from varying management regimes. Plots near populated areas will be difficult, if not impossible, to protect, but measuring them at successive times will at least give information on the degradation of forests to scrub, that results from overcutting. Plots which should not be exploited, or in which exploitation is part of a prescribed set of cultural treatments, should be located where they can be effectively protected, for example in national parks.

Although "real time series" data are ideal for growth estimation, permanent plots, which such data are obtained, are difficult and expensive to maintain and measure. In pure, even-aged forest plantations, "abstract time series" data substitute well for real time series data. Collecting abstract time series data entails only the measurement of randomly chosen temporary plots. Plot age, planting density, and other information can be taken from plantation records.

Biomass studies

Several organizations and individuals have made biomass studies in Nepal, because such studies had been called for, explicitly or implicitly, by the terms of reference of the projects or individual consultants, or were the subject of individual graduate research. Biomass studies should continue as part of an overall, coordinated research programme, along with other inventory and forest management studies, to assess the potential of the country's forest resources to meet basic needs.

So far, biomass studies have been concentrated on a limited number of species, each studied separately. More attention should be given to the mix of species in recognized forest types.

More attention to medicinal plants and other forest products

The need to put more effort into the survey of medicinal plants and other minor forest products cannot be overemphasized. Special surveys may be designed to gather baseline information. Subsequently, no special surveys may be needed, provided that inventory of these resources is integrated in the inventory of the main forest products.

Use of Information in Planning

With the development of a resource information system, the capability to access, analyze, further process, and update such information should be developed at both central and field levels in the ministry. Information used in macro-level planning is not readily applicable in operational level planning, since national averages of most statistics are not necessarily correct in specific field situations. On the other hand, to be useful for central decision-making, field data have to be appropriately aggregated.

The planning function and assistance to users

Planning at each level of the organization serves a distinct purpose. Macro-level planning aims to organize the nationwide effort by identifying and formulating development programmes and finding sources of funds and other resources needed to implement the programmes. Planning at field or operational level seeks to solve local-level problems.

The forestry sector master plan has proposed that the main bulk of the country's accessible forests should be managed by the private sector parties, whether they be forest users' groups, individual farmers, or industrial concerns. These parties must themselves make the forest management plans for the areas that they control. Such plans must be made because they are needed for the proper management of the forest, and not because it is a requirement for the government to recognize their management and control over the forest. It is the responsibility of the ministry field staff to assist the private sector in preparing forest management plans, by providing resource information and technical advice.

District-level forest management plans should not be more than the integration of the individual forest users' plans (plans of both public and private sector forest users). It cannot then be said that the plan is not being implemented, since it is a collection of individually implemented plans. Such a plan will be a good source of information on what is going on, and on what resources are needed to meet forest management objectives in the district.

Organization

The organizations which form part of the forest resources information-decision system and their linkages are depicted in Figure 1. The system itself is not a formal organization, but an arrangement or consortium for sharing in the collection, processing, and storage of forest resources information so as to facilitate its use in policy, planning, and management decision-making.

The National Land Resources Centre

The collection, processing, storage, and dissemination of spatial information in GIS format should be the responsibility of a central government organization. Spatial information is used by almost all sectors, but it will be economical if each sector does not aim to develop its own spatial information generating capability; this task should rather be assigned to a central body. The National Land Use Planning Project recommended that this organization be formed by merging the Topographical Survey Branch (the successor of LRMP) and the Remote Sensing Centre of the Department of Soil Conservation and Watershed Management, to be placed under the aegis of the National Planning Commission and named the National Land Resources Centre. A slightly different proposal for the formation of the proposed centre is made below.

The proposed National Land Resources Centre will also have other functions relating to land resource management, but in the area of resource information, it should be responsible for:

- Acquisition of data for remote sensing, from satellites or aerial photography. It is not necessary for the proposed centre to acquire satellite reception capability; it can rely on data purchases from other countries. However, it should encourage the country's private sector to develop the capacity to take aerial photographs. Until now this activity has been contracted out to foreign firms, although limited attempts at aerial photography has been made by government agencies, such as the Remote Sensing Centre.

- Digital image data processing, photo-interpretation and the use of other remote sensing technologies; studies to derive ground-truth information; and mapping.

- Development and maintenance of a GIS network, with branches in forestry and other ministries that use spatial information.

- Acting as central exchange of resource information; disseminating it in computer-readable form to other GIS centres.

Forest Survey and Statistics Division

While the proposed centre handles remote sensing, mapping, and database management of nationwide and multisectoral coverage, sectors that use spatial information should develop GIS centres with the following functions:

- Specialized digital image data processing for the planning and decision-making needs of the sector.

- Specialized remote-sensing and ground-truth studies.

- Production of specialized sectoral maps and other resource information.

- Development and maintenance of the sectoral GIS as part of the GIS network; participation in information exchanges.

In the ministry, the proposed centre's counterpart will be the Forest Survey and Statistics Division which is being formed by merging relevant sections of the Forest Survey and Research Office and the Remote Sensing Centre. In addition to the functions of a sectoral GIS centre, the division will handle all kinds of forest resource statistical surveys, data collection, and analyses, as well as the maintenance of the ministry's central library.

The earlier recommendation was to merge the Remote Sensing Centre with the Topographical Survey Branch to form the proposed National Land Resources Centre, but it would be better for the ministry to retain the Remote Sensing Centre to form the core of its own GIS centre. While the proposed centre is being organized and developing its capability, the Forest Survey and Statistics

Division through its Remote Sensing Section can take care of the country's remote sensing needs, including the training of people to man the proposed centre and other GIS centres.

Forest inventory is a main function of the division. At the present time it is important that there should be a review of the Inventory Section's methodology. Consideration needs to be given to the uses that are envisaged for the information, appropriate accuracy for these uses, and the manpower and financial resources that are required. It should again be stressed that forest inventory that requires time-consuming and expensive field work should be limited to stands that will be subject to intensive management. Such work is best done by field officers of the ministry, who can best decide on the priority and need for the resource information. The division's Inventory Section staff should then devote their time to national and regional inventories based on remote-sensing data, as well as on the conduct of biometric studies involving inventory and growth and yield plots.

Department of Forestry and Plant Research and other research organizations

While the division will collect and analyze forest resource statistics, it cannot be the sole body for this purpose. There are other capable agencies like the Department of Forestry and Plant Research, the Tribhuvan University Institute of Forestry, and other forestry organizations. However, the division should support, monitor, and coordinate all collection and analysis of resource statistics throughout the forestry sector.

Collection of such statistics should be related to specific research programmes. One research programme may concerned with the management of natural forests, another with the management of forest plantations, another with the development of degraded areas, and so on.

Planning Division and other MFSC offices

The users of information are an important component of the forest resource information-decision system. The Planning Division is one of the main information users, in long-term policy and programme development; macro-planning and budgeting; and development programme coordination. In turn, the Planning Division contributes to the system the various information that it has processed during its planning and other analytical exercises.

At the national, regional, and district levels, the various ministry departments and offices will also be both users and generators of forest resource information. Field offices are not expected to develop digital image data processing capabilities, even when they have developed computer capabilities. Such data processing needs can be dealt with by the division. However, as the need arises, hard copies of remote sensing data should be provided to field offices.

Important kinds of information that field offices can provide to the Forest Survey and Statistics Division, and through it to the Monitoring and Evaluation Division and Planning Division, are the maps and statistics on their annual operations, such as plantation development, natural forest management, and handing over of community forests to users. Such maps and statistics can be incorporated in the GIS of the division.

Computerization

The National Land Use Planning Project recommended that the proposed centre acquire a computerized GIS on a turnkey basis, comprising hardware, software, installation, and training, using either a mini-computer or a network of powerful microcomputers.

From the point of view of the ministry, it is important that its divisions, departments, regional offices, and eventually the district offices should develop their database collection and processing capability, and be equipped with computer hardware and software that can take inputs from or provide data to the computer of the National Land Resources Centre. As a GIS centre, the Forest Survey and Statistics Division should maintain a full set of digital image data processing facilities, and computers for data-base management. Eventually, the central ministry offices should be hooked up in a computer network.

Implementation programme

Figure 2 shows the proposed phasing in of the Forest Resources Information-Decision System.

Investment programme

It is estimated that the programmes will require a total of Rs 435 million during the 21-year period from 1989-90 to 2009-10, including Rs 296 million for resources information and Rs 139 million for sectoral planning. The operating budgets for the proposed centre, the Department of Forestry and Plant Research, the Institute of Forestry, other forestry research organizations, and regional and district offices are not included. Their budgets are included in other Master Plan programmes. The operating budget of the Planning Division is included.

About 30% of the cost is local cost, while 70% will require foreign exchange. It is envisaged that HMG will allocate Rs 102 million or 24% for the programme, with external assistance taking up the remaining financial requirement.

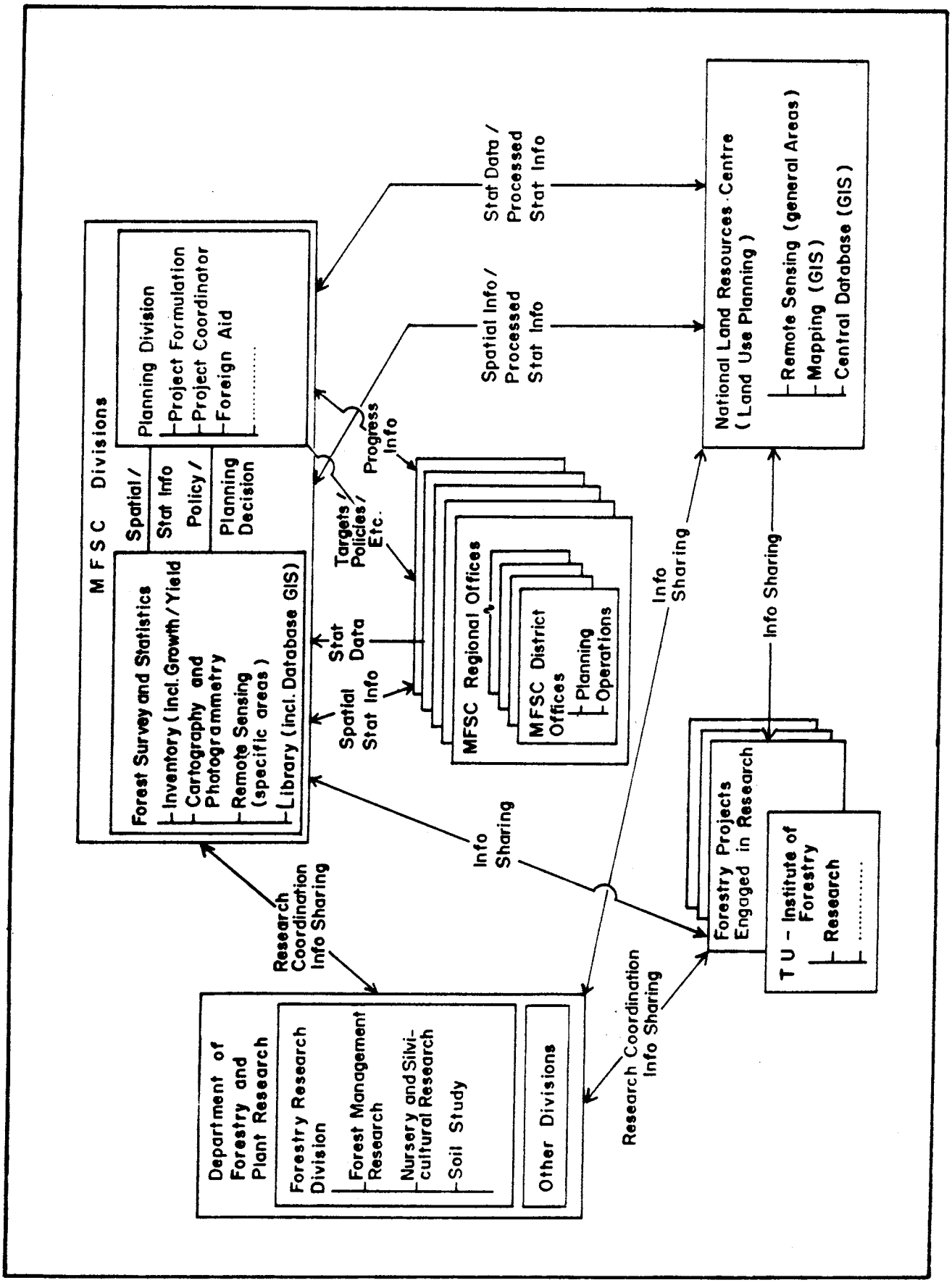

Figure 1 Organizations involved in the forest resources information-decision system

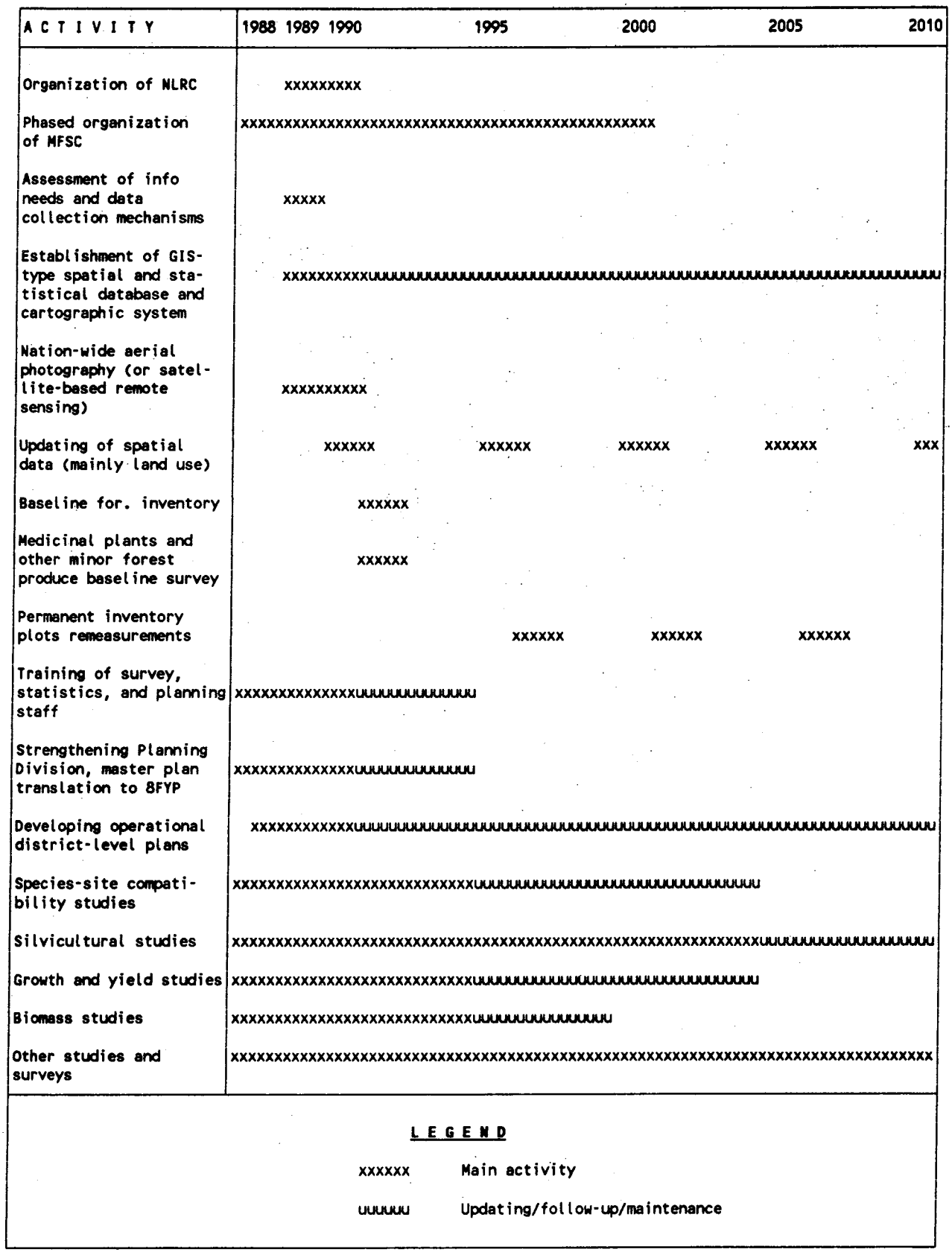

Figure 2 Recommended phasing for the Forest Resources Information-Decision System Programme

MONITORING AND EVALUATION [1]

Introduction

The country has witnessed the distressing decline of the forest resources over the years and the threat that has been posed to the traditional sources of fuelwood and other forest products, and has realized the need to rehabilitate the forest resources for the sustained production of goods, services, and amenities.

From around the mid-1970s, His Majesty's Government (HMG) accelerated forest development and management, soil conservation, nature conservation, research and development, and other activities in the forestry sector. However, the focus was on solving the perceived problems, primarily by acting on the symptoms of the problem, rather than on the causes. Moreover, in assessing performance weight was placed on physical achievement of outputs, or on the spending of the budget, along the idea that if the money has been spent, the work has been effectively done.

Monitoring of accomplishments at the national level has been confined to a system of reporting physical progress and expenditures on a trimestral and annual basis, which is considered not sufficient to measure effects and impacts of development programmes. Progress has been measured in terms of the percentage of allocated budget spent. To augment the national system, some projects have initiated efforts to establish their own appropriate systems of monitoring and evaluation.

The World Bank-assisted Community Forestry Development Project (CFDP) is a good example of the endeavour to institutionalize project monitoring and evaluation. The manuals and guidelines produced by CFDP's Monitoring and Evaluation Unit provide models for other projects to follow. Notwithstanding the lack of trained staff familiar with monitoring and evaluation, CFDP made a good start.

The effectiveness of CFDP's monitoring and evaluation effort was limited, however, by the environment under which it was applied. Since community forestry was a new and not fully developed concept, very little experience was available to guide system development. CFDP itself became preoccupied with quantitative targets, to get more nurseries constructed, more hectares planted, or more seedlings and stoves distributed. More than six years of experience of community forestry under CFDP has taught valuable lessons. Plantation establishment based mainly on government inputs cannot be sustained in the long run. More efforts should be exerted to develop rural institutions and to get the communities to invest their labour and other resources in developing forests for their own benefit. Monitoring and evaluation then has to evolve to reflect these new thrusts.

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[1] Paper presented by T. N. Bhattarai, Chief of the MFSC Monitoring and Evaluation Division, on 31 August 1989 during the Donors Meeting for the Master Plan for the Forestry Sector at Kathmandu, Nepal.

As one of CFDP's monitoring and evaluation publications itself pointed out: "monitoring and evaluation sows the seeds for their own continued development. Rural development projects are designed to induce change. Monitoring and evaluation systems are designed not only to measure and evaluate that change, but to modify the way projects effect change. Since change in project implementation necessitates change in the methods for its monitoring and evaluation, the need for flexibility and change extends to the system of monitoring and evaluation itself".

Monitoring and evaluation objectives in the context of the Master Plan

A hierarchy of objectives has been identified for the master plan and its programmes. The objectives and functions of monitoring and evaluation should therefore be also hierarchical. It should monitor how the various programmes contribute towards the objectives of the forestry sector, how the implementing projects contribute towards the objectives of the programme, and how the project activities or operations contribute towards attaining the objectives of the projects. Then evaluation and control systems should carry on the task of improving the planning and execution processes to correct deficiencies, or to ensure an even more successful attainment of the objectives.

The CFDP monitoring and evaluation manual states that monitoring and evaluation systems should be designed and operated to:

- Improve performance of programmes, projects, or activities by:
    - Providing timely information to management and implementing units on operation and performance, primarily in terms of inputs and outputs.
    - Generating socio-economic information required for effective implementation.
    - Identifying and analysing problems arising during implementation and suggesting possible solutions.
    - Increasing people's communication with HMG staff and participation in activities.
- Evaluate results and improve future planning processes by:
    - Measuring effects and impacts.
    - Identifying and analysing factors affecting performance.
    - Evaluating concepts, assumptions, and models in the light of actual performance and prevailing conditions.

System outputs, effects, and impacts

Every system yields outputs, that produce effects and impacts. Outputs can be measured frequently but the effects and impacts may be discernible only after a longer time.

The design of a monitoring and evaluation system should start with an analysis of the target, be it a programme, a project, or an operation; the clear definition of the indicators of its outputs, effects, and impacts; and with a decision on how frequently outputs should be measured, and their effects and impacts evaluated, with minimum of costs and administrative burden.

The importance of choosing the proper indicators cannot be overemphasized. There may be a number of indicators to choose from, and focusing on a few improper ones can sidetrack a programme or project or activity from its objectives. For example, experience in community forestry has taught that a preoccupation with hectares planted or seedlings distributed masked the need for community based institution-building, which in the long run can mobilize vast local resources and produce as many hectares of plantations as are needed for consumption on a sustainable basis.

Measuring the indicators

Once the proper set of indicators of system outputs and impacts has been determined, and how frequently they should be observed, attention should be focused on obtaining timely and reliable measurements of them. A comprehensive baseline survey is necessary to provide benchmark information upon which the results of subsequent surveys may be compared to determine changes in the values of the indicators over time. Where objectively verifiable indicators cannot be predetermined, proxy indicators can be used to provide the basis for future evaluation.

Through a determined institution of the monitoring and reporting system, and the training of staff to operate it, the generation of the required information can become a routine matter. However, the issue of reliability is a more complex one. The reporting of poor results can be seen as a reflection of poor performance, and the matter of getting reliable information on which to base future action to improve performance can be set aside or conveniently forgotten by the executives in charge.

It is therefore not enough to base evaluation and planning on internally generated information. Some means of cross-checking it must be instituted. This will mean not only that it is possible to assess the quality of the internal information, but also it will ultimately discourage misinformation.

Ex-post evaluation by independent, unbiased outside evaluators, such as local institutions and non-governmental organizations, is one way of cross-checking internally generated information. Also, the importance of participatory evaluation cannot be overemphasized in the design of a monitoring and

evaluation system. For such measures as hectares of plantations established, or even erosion control structures built, remote sensing conducted at regular intervals will also be used for cross-checking. Cross-checking should also be applied to financial information, which should be regularly monitored.

Data processing and analysis and reporting of information

With computers becoming more and more popular, the processing of data and their conversion into meaningful information can be done with minimal time and effort.

The reporting or presentation of information to those who require it for planning and decision-making can be done in a variety of ways, both formal and informal, oral or written. Written reports are important; the use of graphics may enhance understanding. Equally important is the direct channelling of information to decision-makers or implementors during regular or special meetings, where corrective actions or improvements in the system can be instantly discussed and instituted.

Organization and management

To institutionalize a monitoring and evaluation system in MFSC and its departments and field operations, a number of actions are needed:

- Under the leadership of the ministry's Monitoring and Evaluation Division, a monitoring and evaluation system will be designed for each programme. The agencies or offices responsible for the programme will take an active part in this exercise, e.g. Department of Forests for community, private, national, and leasehold forestry; Department of Soil Conservation and Watershed Management for soil conservation and watershed management; Department of National Parks and Wildlife Conservation for nature conservation.

- The design of the monitoring and evaluation system will start from an analysis of the programme, its objectives and role vis-a-vis the objectives of the forestry sector; an analysis of the components of the programme, their lower-level objectives and role vis-a-vis the objectives and role of the programme; down to an analysis of the implementing projects and activities. From such analyses appropriate sets of indicators of programme output and impacts will be identified, and the means for measuring them can be determined, as well as the frequency of such measurements.

- The Monitoring and Evaluation Division of the ministry will develop its capability so as to be able to offer assistance and advice to the different departments and offices regarding their monitoring and evaluation activities. Such assistance as the design of forms, choice of survey instruments and methodologies; data analysis, storage and transmittal; and

effective use of information in planning and decision-making will be given.

- The Monitoring and Evaluation Division will collaborate with the Training Division and later with the proposed training units of the ministry in the conduct of training, or staff indoctrination on the importance of monitoring and evaluation.

- While developing the internal systems for monitoring and evaluation, the Monitoring and Evaluation Division will explore ways to utilize external means of monitoring and of getting feedback on the performance of the forestry sector. The use of remote sensing techniques will be intensified.

Cost and financing

The cost of monitoring and evaluating field activities and implementing projects of the different programmes is assumed to be included in the cost of the programmes. Hence, only the cost of coordinating, monitoring and evaluation at the ministry level is included here. Remote sensing and other techniques for verifying accomplishment of such field activities as plantation establishment are also not included in the monitoring and evaluation programme cost estimate, since they are considered to be part of the resource information programme. On these bases, the financial requirement of the programme is estimated to be Rs 158 million for the 21-year planning period. More than three-quarters of the cost is for investment items. About 70% is foreign cost. It is envisaged that external financing will cover 84% of the total cost.

HUMAN RESOURCES [1]

Introduction

The Master Plan has been prepared to facilitate the systematic development of the forestry sector. It is as much a process as it is a product. To become useful it must be implemented, and it can be implemented only if it is understood and widely supported by the people who have to use it, at all levels. No matter how powerful a combination of money, machines, materials, and organization there may be, these resources are ineffective without competent and motivated people to translate them into action.

The human resources development plan aims to:

- contribute to an understanding of the current status of human resources in the forestry sector;
- provide quantitative and qualitative guidance for operational planning and plan implementation in human resources development, in the areas of basic, in-service and field-level training, which must be made effective in order to open the most crucial bottleneck in implementing the entire master plan;
- emphasize the importance of improving the motivation and performance of the staff of the Nepal civil service. A description is given of the general framework of the development administration, to show how human resources development in the forestry sector is part of the overall national structure. An understanding of this structure is needed for two reasons. First, developments in the forestry sector cannot totally deviate from the nationally acceptable solutions; and second, successful implementation of the master plan programmes may be possible, on the other hand, only if certain privileges are granted to the forestry sector personnel compared with those of some other sectors.

Human resources in the forestry sector

At present there are 10,200 technical and non-technical posts in the Ministry of Forests and Soil Conservation (Table 1), excluding those of the Nepal Rosin and Turpentine Industries Limited, which is an industrial concern. In addition, there are Royal Nepalese Army personnel stationed in some of the protected areas. Master Plan estimates indicate that the full-time equivalent of about 1.35 million workers are engaged in forestry related operations, and that by 2010-11, the forestry sector will engage the equivalent of another million if the master plan programmes are

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[1] Paper presented by M. Haque, MFSC Forestry Adviser and In-charge of the Training Division and Extension and Communication Division, on 31 August 1989 during the Donors Meeting on the Master Plan for the Forestry Sector at Kathmandu, Nepal.

fully implemented (Table 2), or another 350,000 on current trends (Table 3).

Table 1 Technical and non-technical posts in MFSC, 1988

Gazetted posts		Non-gazetted posts		Armed guards	Total
Technical	Non-tech.	Technical	Non-tech.		
200	18	4250	1674	816	6958
86	4	241	243		574
43	3	537	210		793
131	5	200	266		602
75	45	136	1017		1273
535	75	5364	3410	816	10200

Table 2 Projected employment in the forestry sector under the master plan ('000)

Year	1985-86	1990-91	1995-96	2000-01	2005-06	2010-11
MFSC staff	10.2	11.8	15.1	18.6	20.6	22.2
IOF staff	0.3	0.3	0.4	0.4	0.4	0.4
Forest estab./tending	10.3	30.4	43.9	50.5	48.0	50.4
SCWM operations	6.0	12.3	13.6	14.2	15.5	16.1
Herbal operations	28.0	31.0	44.2	64.3	89.4	118.6
Fuelwood collection	66.9	471.6	507.2	573.5	661.7	768.0
Timber harvesting	69.4	76.7	87.1	105.4	137.4	205.0
Fodder collection	89.2	723.8	779.5	859.9	970.0	1,145.7
Misc. industries	82.9	101.9	112.0	120.7	123.5	126.5
Total	1,363.1	1,459.8	1,603.0	1,807.5	2,066.5	2,452.9

Table 3 Projected employment in the forestry sector on current trends ('000)

Year	1985-86	1990-91	1995-96	2000-01	2005-06	2010-11
MFSC staff	10.2	11.2	12.3	13.6	14.9	16.4
IOF staff	0.3	0.3	0.4	0.4	0.4	0.4
Forest estab./tending	7.5	20.4	26.8	32.1	36.3	39.5
SCWM operations	6.0	6.1	6.8	7.1	7.7	8.1
Herbal operations	28.0	25.2	22.7	20.4	18.4	16.5
Fuelwood collection	466.9	476.6	491.3	535.1	594.3	606.3
Timber harvesting	69.4	77.0	82.6	93.8	109.4	134.6
Fodder collection	689.2	705.9	728.8	754.6	786.6	825.5
Misc. industries	82.9	78.8	74.8	71.1	67.5	64.1
Total	1,360.3	1,401.5	1,446.5	1,528.2	1,635.6	1,711.6

Training resources

Tribhuvan University, Institute of Forestry

Forestry training started in Nepal 1947, when the Nepal Forestry Institute was established to train forest rangers and foresters. In 1972, the institute became the Institute of Forestry under Tribhuvan University and took over the training of Junior

Certificate and Senior Certificate staff. The present Proficiency Certificate in Forestry is designed to train candidates for the Non-gazetted Technical I Class service, in the posts of Rangers, Assistant Rangers, and Community Forestry Assistants, and for the fifth level posts in parastatals. Every year 110 trainees are admitted at each of the two campuses, after they have passed the School Leaving Certificate examinations and have been cleared through entrance exams. Ten percent of places are reserved for women and five percent for students coming from remote areas. The two-year training is passed by about sixty percent of the students. The institute has proposed a new curriculum based on its experience and foreseeable future requirements.

Until 1981, when B.Sc. courses were started in Pokhara, all forestry professionals (i.e. graduates and post graduates) received their training in foreign countries, mostly in India. At present, forty students are admitted to the Pokhara campus each year. The graduates are posted to Gazetted Technical Class III in HMGN service and to the sixth and seventh levels in the parastatals. Eventually, they have opportunities for rising higher in their cadres than non-graduates.

Ten of the forty are science graduates. The students taking the B.Sc. course can specialize in forest management, wildlife management, or soil and watershed conservation, in a course lasting two and a quarter years. The pass rate is about eighty percent among science graduates. Thirty students are selected from holders of the proficiency certificate or senior certificate in forestry, who have at least one year of work experience in the forestry sector. Their study time is three years. The pass rate among proficiency certificate holders is 25-35% and among senior certificate holders 50%. The overall pass rate in B.Sc. studies is 60-70%. Ten percent of seats are reserved for women and five percent for students from remote areas.

The institute is administered by the Dean, assisted by two Assistant Deans and Campus Chiefs. The Dean chairs the Faculty Board and the Institute Committees of research, publication and selection of students. Hetauda Campus and Pokhara Campus are headed by Campus Chiefs. The total authorized manpower is 261; the occupancy of technical personnel is 73% and that of non-technical personnel is 81%.

Following directives issued by **His Majesty the King**, IOF has prepared a 15-year development plan. The net annual production of certificate holders is expected to increase, from the present seventy, to 180 by AD 2000, and the annual production of graduates (B.Sc.) is expected to grow from the present twenty-five, to thirty. Master's degree courses are planned to start in 1993, with an annual intake of ten students.

The number of forestry students has increased from 200 to 550 in the last ten years, and now represents 0.8% of the total number of higher level students in the country. Physical facilities in both campuses are new and ample, providing a good environment for the motivation of both students and teachers. The student-teacher

ratio (8:1) is also good, facilitating close relations and individual guidance.

In-service training in MFSC

There was no systematic in-service training in the forestry sector before the establishment of the Training Wing in 1980. In the recently approved reorganization, the Training Wing has been upgraded to the Training Division of the ministry. The main objectives of the Training Division are to conduct job-related courses for ministry staff, to prepare guidelines and training material and to maintain the standard of the courses, to organize seminars, workshops and conferences for all the above purposes, and also to provide library services. The Training Division had already prepared a draft training policy for the forestry sector. Emphasis has been given to orientation training for those who have recently entered the ministry and to re-orientation training for those who have already served the ministry for some time, and whose tasks have been or are going to be changed. In the eight years of operation almost 1500 participants received training in three professional courses, five sub-professional courses and three types of training support programmes.

Various forestry development projects conduct local training courses from time to time, to meet their particular requirements with their own resources.

Graduate and post-graduate forestry training abroad

Before the B.Sc. programme was started at IOF in 1981, all forestry professionals were trained abroad. Most of the professional level training of those now employed was under the Colombo Plan for Technical Cooperation, at the Indian Forest College, Dehra Dun. Other education and training were also received either under bilateral or multilateral grants or through foreign aid projects. Almost three hundred persons have received technical education in foreign countries.

Short-term miscellaneous training

Short term training courses, seminars, workshops, conferences, meetings, etc. are frequently held on different aspects of various matters concerning the forestry sector. These range from one day to a few weeks. Systematic records of this type of training are not available. Almost all the active agencies organize them from time to time.

Different government ministries, departments and parastatals have their own training units to take care of their specific needs, and to provide any special skills that may be required.

One much used training centre is the Nepal Administrative Staff College, where the Ministry of General Administration offers in-service courses for all section officers and non-gazetted personnel. It is mainly concerned with improving efficiency in the civil service and state enterprises by providing training,

research, consultancy, information services and policy suggestions. Its basic policy is to make the training programme an integral part of the personnel administration and development programme of the government and the public enterprises, and to integrate training with career development.

Other institutes providing manpower needed in the forestry sector

In 1959 the Department of Agriculture established the School of Agriculture for training junior technicians in agriculture science. In 1969 this school was upgraded to college status, offering the Intermediate Science Programme in Agriculture. Under the National Educational System Plan the College of Agriculture was transferred to the Tribhuvan University in 1972. It provided a base for the present Institute of Agriculture and Animal Sciences, whose main objectives are to provide for both the immediate and long-term manpower needs of agricultural development, to provide teachers for the vocational schools, and to conduct research on farmer-oriented agricultural problems. It offers certificate courses in plant and animal sciences and baccalaureate courses in agriculture and animal science. In the forestry sector graduates from the institute are employed mainly in soil conservation and research.

The Institute of Engineering is the only institution in Nepal responsible for higher education in engineering. It has full responsibility for both technician and degree levels. Some vocational courses related to engineering are also offered. More than four thousand technicians of various engineering disciplines were produced by 1987; the first batch of civil engineers was produced in 1983. There are now four campuses. The institute produces three levels of manpower: graduates (B.Sc.) in civil engineering, technicians, and tradesmen.

Assessment of human resources development in the forestry sector

The Ministry of Forests and Soil Conservation

The ministry is the principal implementing agency in the forestry sector, so a thorough assessment of its manpower status is important. The quantitative assessment has been based on the percentages of authorized posts that are currently vacant. It should be understood that the vacancy rate for the time being is higher than normal, because the posts established in the recently approved organizational reform cannot have been filled in this short time. Even with this qualification, however, high vacancy percentages indicate the present priorities in manpower demand.

The ministry headquarters is clearly handicapped; only three quarters of the posts are filled. Almost half of the gazetted technical staff, who are crucial for leadership, are missing. On the other hand, the Department of Forests headquarters has 28% more staff than the approved posts. Obviously the excess could be utilized in the ministry headquarters, but there is also still a need for more technical officers in the Forest Management and

Utilization Divisions of the department. Its field units also suffer from lack of manpower; 30% of the posts are vacant, although there is an excess of administrative officers. The department headquarters and the Department of Forestry and Plant Research must reduce their gazetted non-technical staff. Overall, the Department of Forestry and Plant Research and the Department of Soil Conservation and Watershed Management are relatively well staffed; vacancies are generally less than ten percent. The later has an excess of non-gazetted technical staff in its headquarters, who can be better employed in the field. The Department of National Parks and Wildlife Conservation suffers seriously from the lack of gazetted technical staff, both in headquarters and in the field; about half of the posts are vacant. More than one third of the technical staff also still have to be recruited.

Parastatals

The Forest Products Development Board has a severe shortage of technical and gazetted staff. Almost half of the non-gazetted technical posts are not filled. The Herbs Production and Processing Co. Ltd. is the only organization that is fully staffed. The Nepal Rosin and Turpentine Industry Ltd. has problems in filling gazetted posts, due to its remote location. The Timber Corporation of Nepal is 41% short of gazetted staff, and one in every four technical posts is vacant. The Fuelwood Corporation has no technical posts at all, which puts the professional competence of the organization into question. The Royal Drugs Ltd. is also clearly understaffed; 28% of the gazetted technical and 34% of the non-gazetted non-technical posts are vacant.

Private sector

The seventh five-year plan puts great emphasis on encouraging private entrepreneurship, but in the forestry sector this has been limited to getting contractors to assist the parastatals in logging and fuelwood harvesting, and in the transport and sale of forest products. Exact data are not available on the number of people permanently employed in private sawmills and other forest-based industries. The master plan estimate is 2500. Seasonal manpower engaged in collecting raw-materials is estimated as equivalent to 45,000 full-time jobs. If non-monetary occupations are counted, such as the collection of fuelwood and fodder, the employment is equivalent to 1.3 million full-time jobs, or 18% of the national labour force.

Almost all forestry professionals are employed by government. There are only some thirty graduate foresters and forty ranger-level technicians outside the civil service; most of them are not engaged in forestry activities. Some fifty mechanical, electrical and chemical engineers or senior technicians are employed by private forest-based industries, along with some 250 machine operators and 400 trained mechanics. Shortage of raw materials has seriously hampered development of forest-based industries, and if the Master Plan were not to be implemented, the employment capacity of the forestry sector would decline in monetary terms. On the other hand there would be an increased demand for (unpaid) manpower

to collect fuel and fodder. Most of the industries are located in the Terai, and traditionally employ trained technical manpower from India, although government policy unambiguously favours Nepalese nationals. One reason is the relatively weak vocational training in Nepal; another is that Indian technicians are readily available at reasonable cost.

Qualitative assessment

Nepalese forestry can be characterized by a few statements:

- Forestry activities **in the Terai** have been exploitation oriented. Sustained-production forestry on a significant scale needs new thinking. Forest management has still to be learned. The District Forest Offices have been occupied primarily in protection and administrative formalities. Continuous pressure on forest land has forced foresters to stay on the defensive. The low pay scale, political pressures, and being put in charge of one of the most valuable national assets, have combined to tempt foresters to misuse their power.

- **In the hills** the difficult terrain and scarcity of staff have made it impossible to manage forests effectively, in the face of heavy demand from the local population. Foresters, recognizing their incapacity to stop the over-exploitation of the forests, have escaped to pass their time in "administration". Too many of them are foreigners in their own country, coming from the Terai or the towns, and being unfamiliar with the hill cultures, values and even languages, when posted to remote and isolated mountain villages.

There are constraints on human resources development that relate to the entire civil service, of which the state forestry sector is a small part. The case of the government owned corporations, companies and boards in the forestry sector is similar; they also form only a small part of the government owned enterprises.

Training

Most of the foresters have been trained in India under a traditional curriculum which treats forestry as a techno-biological discipline, giving only marginal attention to its social aspects. Training in Nepal has recently been reassessed in this respect, but the share of "community forestry" and "extension" together is still less than 11% of the curriculum of the proficiency certificate course. In the present diploma course (B.Sc.), community forestry and extension take up only 7% of the curriculum; and in the proposed new curriculum only 5%! Obviously there are some components under other subjects that also contribute to community forestry management, such as agro-forestry, forest management, nursery methods, etc.; but if community forestry is recognized to be the principal task of field foresters, it has not received sufficient attention. In the absence of clear organizational structures and job descriptions it has been difficult to design curricula satisfactorily in the institute, but the situation is now changing. The ministry has prepared the first set of job descrip-

tions as part of the recently approved organizational reform. At present they are mostly formal and still administration oriented but they provide a good starting point for systematic human resources development; when they are improved they can effectively guide curriculum development in the institute, as well as in-service training in the ministry.

The selection criteria both for basic training in the institute and in-service training in the ministry need to be improved. More students are needed from hilly areas who are used to living there, and who are more likely to stay there than those coming from Kathmandu and the Terai towns. As long as community forestry remains the principal forest management strategy, educated women have a central role to play as natural communicators to other women who are the end-users of the main forest products - fuelwood and fodder. In principle this has been noted already, but in practice more effective measures are needed to encourage talented country girls to select forestry studies, and for employers to recruit women foresters to leading posts. At present only four women forestry professionals are working in the forestry sector.

Management of personnel

Systematic assessment of work performance is one of the key functions in the management of personnel. It provides leaders with the information needed to answer fundamental questions, such as how effectively employees are carrying out their tasks, and whether objectives are being achieved. This information is then used as the basis for any decisions that need to be taken in order to use human resources as effectively as possible; to determine the suitability and potential of people for particular types of employment, to determine the needs of individuals in terms of job experience, training and education, to identify people suitable for promotion to jobs of greater responsibility, to develop motivation and commitment, and to provide a basis for deciding and allocating rewards. An assessment system does exist in the ministry, as it does in the whole civil service, but in reality it is not used. The task poses all the difficulties associated with human subjectivity, human relationships reliability, criteria, measurement of performance, and personal factors which are so prominent in Nepalese society that objective assessment has become rather problematic.

Personnel records and statistics provide a store of information on which important decisions about the use and development of human resources are based. A comprehensive system for all employees including their curricula vitae, work history, performance appraisal, potential for further work, promotion, training, and education is essential. A record system does exist, but the required information is not readily available, and the records are not adequately maintained. Very little attention is being paid to this activity. Record keeping and filing facilities are not adequate and they are handled by untrained staff. A computerized management information system needs to be developed for all forestry sector organizations, and the managers need to be trained in management skills and working ethics.

Systematic evaluation of performance, a just reward system, and an income which can support a reasonable standard of living are needed to motivate the staff, and to raise their morale in a productive working environment. Implementation of the human resources development programme is an urgent task. For it to be successful, it needs policy guidance, appropriate legislation, and a renovation of the internal rules of the ministry.

The organizational reform now started in the ministry can be considered as a first step in the right direction, but it must be conducted under firm leadership and with determination.

In Nepal, effective utilization of staff is hampered by divided responsibilities. In all ministries the administrative staff are appointed by the Ministry of General Administration, and the accountants by the Accountant General's Office. Thus the officer in the direct line of command is not fully recognized as superior by all his subordinates. In turn he often receives orders from influential persons to whom he is not officially answerable, but he knows that to disregard these orders will lead him into difficulty. The absence of clearcut definitions of publicly known rights and responsibilities makes his position even weaker. A logical consequence is that the person in charge tends to minimize risks, which can be done by paying respect to all directives without exercising his own will, and forgetting his own working targets. The result is an overall ineffectiveness of the entire organization. A study made at the request of the National Planning Commission concluded that, as a result of all the negative factors that influence the performance of government staff, only 15% of them work in a dedicated way for the targets of the organization. Interpreted in a positive way, this information shows that there is room to improve the performance of the existing manpower many times over, by a systematic development of human resources and professional management of personnel. However, the forestry sector cannot do it alone. Coordinated action must be taken on the highest political and administrative levels, to provide fundamental decisions with regard to the principal motivating factors, such as a pay scale designed to provide a reasonable standard of living, more generous travel rules and allowances, appropriate working facilities, equipments and tools, and reliable security against misuse of power by superior officials.

Public relations and communication

Government, by definition, implies orders, requests and restrictions imposed upon the people being governed. Nepal was traditionally governed with an iron discipline which has only recently been relaxed with the introduction of the panchayat system. In former ages, the people developed what has become a traditional mistrust of government officials. Forestry officialdom has hardly contributed in a positive way to ease the conflict. The Forest Act of 1961 and the Forest Protection Act of 1967, which are fully in force even today, provide the officials with both police and judicial powers. Sometimes excessive enforcement of legislation, utilizing armed guards, has led to clashes between foresters and local people striving for a livelihood based on

forest products. Although in legal terms the protection of forests may have been justified, the way in which it has been enforced has strengthened the people's negative attitudes towards forest officials. Some cases of the direct misuse of power for personal benefit have further sullied the foresters' image. At the same time, insufficient capacity to enforce forest protection by compulsive methods has further reduced people's respect for the forestry laws and organizations. The people have never fully recognized the legitimacy of the government's claim to have control of forest resources; in practice they still consider the forests to be common property which belong to them as much as to the government. These crucial facts must be understood and accepted before a serious attempt can be made to improve the situation. The community forestry development programme is the first major effort to get the accessible forest lands back into full production and under management. However, in the circumstances described above, the task of re-establishing confidence between people and foresters is not an easy one. Without confidence, however, there will be no cooperation. In addition to the new forestry sector policy, new legislation, the reorganization of the ministry, and the retraining of the staff, the development of effective publicity and communication is a precondition of success. Continuous information, which is repeated in the same terms through the mass media and by extensionists in the field, together with convincing practical demonstrations, can gradually reduce suspicion and mistrust, but only slow progress can be expected.

The ministry has recognized these problems and has already decided to establish a Communication and Extension Division at ministry headquarters to coordinate those activities. However, communication as a management tool inside the ministry is still to be improved and routines have still to be developed. These are essential parts of the organizational reform.

Communication between government agencies is also not sufficiently organized. An example is the case of the Natural Resources Conservation Committee. **His Majesty the King** has recently instructed that this committee be restructured, because it has not been effective. Also in the area of environmental protection, the institutional framework is still to be decided. Conservation of nature and of the environment are functions that require extensive coordination and organized communication between various governmental and non-governmental agencies.

The tasks ahead

Self-criticism starts from the overall finding that the performance of the forestry sector has been unsatisfactory. The ministry has already taken the first step to alleviate this situation, in its administrative reorganization, but this is only the first step. A systematic human resources development programme needs to be implemented as the basis for all the other development programmes formulated in the Master Plan. The very survival of the nation depends on putting a stop to deforestation. Heedless humanity has created the problem, but educated and decisive people can eliminate it. The vast human resources of the rural population,

once informed, motivated and convinced, can turn wanton exploitation to conservation and production. People can be educated by well organized, motivated and properly trained professionals and technicians. In Nepal forestry development is more a question of will and determination than funds. To put it in another way, no amount of money can halt forest destruction without the participation of an enlightened people.

The principal phases of human resources development in the ministry must be:

- Identification of the targets to be achieved.
- Assessment of both the quantity and quality of the available human resources, and the way they are organized and utilized, focusing on the full utilization of the existing staff.
- Re-posting of the available staff according to their capabilities and the operational priorities.
- Retraining of the existing staff in the skills they lack, and updating the curricula of basic training, focusing on community forestry development.
- Improved performance of the entire forestry sector and attaining the set targets.

Human resources development programme

Objectives of the programme

Meeting the objectives of the forestry sector require additional or better trained manpower. The ultimate objective of the human resources development programme is to provide the necessary manpower for implementing the other master plan programmes. It is a vast task, which calls for a systematic and phased approach. The short term objective is to give effective support to the early reforms and efforts that have recently been directed towards policy implementation. The initial focus will therefore be on staff development in ministry and in those parastatals that are vital for implementing the master plan programmes. A trained and reorganized staff will facilitate the rapid implementation of the primary development programmes, acting as motivators and advisors to the people in their forest management efforts, and as professional managers of the national forest resources, with the aim of producing enough forest products to satisfy the basic needs of the people. Once started the process will be directed more directly to the people, by those who are already trained in the first phase of the human resources development programme. In the first phase the main targets will therefore be the paid manpower of the ministry and of relevant parastatals. In the second phase, the focus will be on the masses.

Strategies for implementing the programme

Selected strategy guidelines, which will facilitate systematic implementation of the human resources development programme, are:

- To direct the human resources of MFSC to priority areas, and allocate the existing manpower to productive technical work, paying less attention to non-productive tasks. This is a precondition of rational progress.

- To use the results of target-oriented R & D for continuous improvement of working techniques.

- To train sufficient, motivated and competent manpower for the prioritized posts and tasks, by target-oriented planning to develop manpower that can carry the responsibilities of the forestry sector; prioritizing manpower and training needs before launching development programmes; organizing systematic orientation training; optimizing the use of the national campuses and the institutions of friendly countries; radical improvement of the training capabilities of MFSC and Tribhuvan University; and vocational training in forest management and harvesting.

- To gradually increase the income of the staff of MFSC, to the extent that a reasonable standard of living can be attained, based on salary, substantive allowances, and other post-related benefits.

- To develop a strong work ethic throughout the sector.

Programme components

The simultaneous development of policies, legislation, institutions, organizations and human resources will provide the machinery that is needed for executing the development programmes. The components of the human resources development programme are as follows:

- Assessment of manpower and training needs.

- Improvement of forestry and forestry-related education and training, emphasizing in the curricula the various roles of forestry staff in development.

- Development of vocational forestry education.

- Establishment of a network of national and regional training centres.

- Training programme for extension workers and community leaders.

- Provision of career opportunities for staff.

Costs and financing

Components

The following programme components have been costed:

- Improvement of forestry and forestry-related education and training.
- Developing vocational forestry education.
- Establishment of a national and regional network of training centres, assessing manpower and training needs, and managing training programmes for extension workers and community leaders.
- Provision of fellowships and other career opportunities for staff.

Emphasis has been given to the needs of the manpower employed in the ministry and some related organizations. It should be noted that cost of field extension activities and training of the masses is considered to be part of the cost of the community and private forestry development programme, and is not duplicated here.

Cost of forestry training

About Rs 957 million will be required in the 21-year period from 1989-90 to 2009-10 to establish and operate the network of national, regional, and district training centres under MFSC. Over the same period, about Rs 489 will be required to operate the Institute of Forestry and about Rs 134 million to operate the proposed forestry vocational schools.

Fellowships

Foreign fellowships costed under the different Master Plan programmes were combined and included as one item of the human resources development programme costs. Local fellowships and training costs were subsumed under the costs of IOF; the proposed network of national, regional, and district training centres; and the proposed forestry vocational school. About Rs 599 million will be required for foreign fellowships in the next 21 years.

Total cost of the programme

About Rs 2101 million will be required for human resources development during the 21-year period from 1989-90 to 2009-10. About 42% will be needed to run MFSC training centres, 31% for foreign fellowships, and 27% for the other training institutions. Investment items amount to more than 52% of the total cost. About 70% is local cost. It is envisaged that the government will take up 62% of the total cost.