



**Forestry Department**

**Food and Agriculture Organization of the United Nations**

**FRA 2000**

**ANNOTATED BIBLIOGRAPHY  
FOREST COVER CHANGE**

**NEPAL**

Rome, October 1999



## The Forest Resources Assessment Programme

Forests are crucial for the well-being of humanity. They provide foundations for life on earth through ecological functions, by regulating the climate and water resources, and by serving as habitats for plants and animals. Forests also furnish a wide range of essential goods such as wood, food, fodder and medicines, in addition to opportunities for recreation, spiritual renewal and other services.

Today, forests are under pressure from expanding human populations, which frequently leads to the conversion or degradation of forests into unsustainable forms of land use. When forests are lost or severely degraded, their capacity to function as regulators of the environment is also lost, increasing flood and erosion hazards, reducing soil fertility, and contributing to the loss of plant and animal life. As a result, the sustainable provision of goods and services from forests is jeopardized.

FAO, at the request of the member nations and the world community, regularly monitors the world's forests through the Forest Resources Assessment Programme. The next report, the Global Forest Resources Assessment 2000 (FRA 2000), will review the forest situation by the end of the millennium. FRA 2000 will include country-level information based on existing forest inventory data, regional investigations of land-cover change processes, and a number of global studies focusing on the interaction between people and forests. The FRA 2000 report will be made public and distributed on the World Wide Web in the year 2000.

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The FRA Working Paper Series provides an important forum for the rapid release of preliminary FRA 2000 findings needed for validation and to facilitate the final development of an official quality-controlled FRA 2000 information set. Should users find any errors in the documents or have comments for improving their quality they should contact either Robert Davis or Peter Holmgren at [fra@fao.org](mailto:fra@fao.org).

## Abbreviations

CF	Community Forestry
CFU	Community Forestry Users Groups
DOF	Direction of Forestry
FAO	Food and Agriculture Organisation of United Nations
FORIS	Forest Resources Information System
FRA	Forest Resources Assessment
GDP	Gross Domestic Product
GNP	Gross National Product
FY	Fiscal Year
HKH	Hindu Kush-Himalayas
HMGN	His Majesty's Government of Nepal
ICIMOD	International Centre for Integrated Mountain Development
IFRI	International Forestry Resource and Institutions
LRMP	Land Resource Mapping Project
NFI	National Forest Inventories
NWFP	Non Wood Forest Products
RRA	Rapid Rural Appraisal
HLFFDP	Hill Leasehold Forestry Forage Development Project

# 1 Introduction

The world's forests are changing, in quantity and quality, and in both positive and negative ways. This process is associated with social, economic and environmental factors. These factors are not always presented in a comprehensive way, based on all available information and free of preconceived ideas or biases. What are the factors that motivate people to plant or cut trees and forests (human driving forces)? What are the natural phenomena that affect forest cover (natural driving forces)?

Forest Resource Assessment 2000 (FRA 2000), a priority program within the FAO Forestry Department, is executed at the request of all FAO member countries. FRA 2000 is based on country-level information from national inventories, research projects, national consultations and various studies that provide information on forest cover, volume and change over time.

FRA 2000 conducted two pilot studies on forest cover change (positive and negative) in Nepal and Guatemala. Country selection was based on the importance of the forestry sector in the development process of each country. The Nepal case study was developed in co-operation with national and international institutions that provided the best available information regarding the major factors, situations and processes that have an impact on forest and land cover change (deforestation, reforestation, afforestation, degradation).

This document is divided into the following main sections:

General information on Nepal;

Summary of the principal causes of forest cover change based on interviews and documents reviewed;

Documents organised in an annotated bibliography;

Results of interviews conducted in Nepal;

Bibliography and secondary sources;

List of contacts and people interviewed during the development of the study;

Recommended reading by topic.

## 2 General Information about Nepal

Location: Southern Asia, between China and India.

Geographic co-ordinates: 28° 00' N, 84° 00' E.

Map reference: Asia

Area: <i>Total:</i>	140	800	km <sup>2</sup>
<i>Land:</i>	136	800	km <sup>2</sup>
<i>Water:</i>	4 000 km <sup>2</sup>		

Land boundaries:

<i>Total:</i>	2	926	km
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*Border countries:* China 1 236 km, India 1 690 km.

Coastline: 0 km (landlocked).

Maritime claims: None (landlocked).

Geography – notes: Strategic location between China and India; contains eight of world's 10 highest peaks

Climate: Varies from cool summers and severe winters in north to subtropical summers and mild winters in south.

Terrain: Terai or flat river plain of the Ganges in the south, central Hill region, rugged Himalayas in the north.

Elevation extremes:

<i>Lowest point:</i>	Kanchan	Kalan,	70	m
<i>Highest point:</i>	Mount Everest, 8 848 m			

Natural resources: Quartz, water, timber, hydropower potential, scenic beauty, small deposits of lignite, copper, cobalt and iron ore.

Land use:

<i>Arable land:</i>	17%
<i>Permanent crops:</i>	0%
<i>Permanent pastures:</i>	15%
<i>Forests and woodland:</i>	42%
<i>Other:</i>	26% (1993 estimate).

Irrigated land: 8 500 km<sup>2</sup> (1993 estimate).

Natural hazards: Severe thunderstorms with flooding and landslides or drought and famine depending on the timing, intensity, and duration of the summer monsoons.

Environment – current issues: Almost total dependence on wood for fuel and cutting down trees to expand agricultural land has resulted in widespread deforestation with associated soil erosion and water pollution (use of contaminated water presents human health risks).

Environment – international agreements:

*Party to:* Biodiversity, Climate Change, Desertification, Endangered Species, Hazardous Wastes, Law of the Sea, Nuclear Test Ban, Ozone Layer Protection, Tropical Timber 1983, Tropical Timber 1994, Wetlands.

*Signed, but not yet ratified:* Marine Dumping, Marine Life Conservation.

Population: 24 302 653 (July 1999 estimate).

Age structure:

<i>0-14 years:</i>	41%	(male	5	182	829;	female	4	869	895)
<i>15-64 years:</i>	55%	(male	6,	856	905;	female	6	571	916)
<i>65 years and over:</i>	4%	(male 407 797; female 413 311) (1999 estimate)							

Annual population growth rate: 2.51% (1999 estimate).

Birth rate: 35.32 births/1 000 population (1999 estimate).

Death rate: 10.18 deaths/1 000 population (1999 estimate).

Net migration rate: 0 migrant(s)/1 000 population (1999 estimate).

Sex ratio:

<i>At birth:</i>	1.05	male(s)/female
<i>Under 15 years:</i>	1.06	male(s)/female
<i>15-64 years:</i>	1.04	male(s)/female
<i>65 years and over:</i>	0.99	male(s)/female
<i>Total population:</i>	1.05	male(s)/female (1999 estimate).

Infant mortality rate: 73.58 deaths/1 000 live births (1999 estimate).

Life expectancy at birth:

<i>Total population:</i>	58.42	years.
<i>Male:</i>	58.47	years.
<i>Female:</i>	58.36	years (1999 estimate).

Total fertility rate: 4.78 children born/woman (1999 estimate).

Nationality:

*noun:* Nepalese (singular and plural).  
*adjective:* Nepalese.

Ethnic groups: Newars, Indians, Tibetans, Gurungs, Magars, Tamangs, Bhotias, Rais, Limbus, and Sherpas.

Religions: Hindu 90%, Buddhist 5%, Muslim 3%, other 2% (1981)

*Note:* Only official Hindu state in the world.

People: Various ethnic groups, including the Bhotiya (which include the Sherpas), Khas, Kirati, Magar, Newari, Tharu, Tamong and Tibetans.

Languages: Nepale (official), 20 other languages divided into numerous dialects.

Literacy: *Definition:* Age 15 and over can read and write  
*Total population:* 27.5%  
*Male:* 40.9%  
*Female:* 14% (1995 estimate)

People – note: There is a refugee issue over the presence in Nepal of approximately 91 000 Bhutanese refugees, 90% of whom are in seven United Nations Office of the High Commissioner for Refugees (UNHCR) camps.

Country name:

*Conventional long form:* Kingdom of Nepal.

*Conventional short form:* Nepal.

Data code: NP

Government type: Parliamentary democracy as of 12 May 1991.

Capital: Kathmandu.

Administrative divisions: 14 zones (anchal, singular and plural); Bagmati, Bheri, Dhawalagiri, Gandaki, Janakpur, Karnali, Kosi, Lumbini, Mahakali, Mechi, Narayani, Rapti, Sagarmatha and Seti .

Independence: 1768 (unified by Prithvi Narayan Shah).

National holiday: Birthday of His Majesty the King, 28 December (1945).

Constitution: 9 November 1990.

Legal system: Based on Hindu legal concepts and English common law; has not accepted compulsory ICJ jurisdiction.

Suffrage: 18 years of age; universal.

Government: Democracy.

Prime Minister: Krishna Prasad Bhattari.

### **3 The principal causes of forest cover change, based on interviews and documents reviewed**

Nepal is divided into three main regions: the Middle Hill (MH), including the Mahabharat and southern Himalayan foot hills; the Upper Hill (UH), including the Himalayas and inner Himalayas; and the Terai (T), comprising the southern plains and Siwaliks. The reasons for forest cover change in Nepal can best be analysed by region because of differing cultures, needs, and environments. The climate and ecology of Nepal is highly influenced by the topography of the country. People in the Middle Hills and Upper Hills have traditionally lived in these areas, while in the Terai there is mixture of people due to migration. In the mountain areas, access to infrastructure, markets and communications is more difficult compared to the Terai.

In Nepal, forestry activities are closely related to the needs and survival of rural people. Dependency on fuelwood for cooking and house heating represents 83% of the energy consumption in the Country. Fodder collection and grazing are traditionally practised for livestock production, a major food resource for the people of the Hills, Upper Hills, and Terai.

This section presents a summary of the main causes of deforestation organised according to geographical area.

#### Land clearing for migration and settlement, development and infrastructure building

In the Middle Hills, land clearing for agriculture purposes was exacerbated by the nationalisation of forests in 1957. People conducted illegal felling because legal authorisation to manage a forest area was difficult to obtain and there was no incentive to protect, plant or manage forest resources. Clearing was especially prevalent on private lands. The Forestry Department could not control or monitor this illegal activity due to the lack of budget and personnel. Thus, the forests in Nepal face the problem presented by the theory of the “tragedy of the commons” – everyone has an incentive to utilise resources but little incentive to protect them or manage them on a sustainable basis.

In the Terai, after the successful implementation of malaria control, people of the Middle Hills saw the opportunity to migrate to this area. The Terai is recognised as an area of fertile soils with easy communication and transport. Land clearing took place for the establishment of new settlements and agriculture. The migration process was not organised or controlled. Large numbers of people moved to the Terai, with a high impact on forest cover. The migration process was so fast that the forest did not have the time to regenerate and re-establish on a natural cycle. A total of 182 770 ha were cleared from 1956 to 1985, primarily for food production.

A large amount of exploitation also took place when the India railroad was built and the Terai forest provided all the sleepers.

Infrastructure development, road construction, irrigation projects and the production of electricity are also reasons for land clearing.

References: 6) (7) (8) (21), UH (3) (8) (21), T (3) (4) (8) (21) (22) (23).



## Dependency

People in Nepal depend on forest products, especially for fodder and grazing, fuelwood for cooking, medicinal plants and construction material. Unfortunately, the unregulated collection of these materials has contributed markedly to the deterioration of the forests.

In the Middle Hill and Upper Hill, people traditionally depended on these resources and had mechanisms to manage them and distribute the benefits. In the Terai there is a mixture of people, both traditional from the area and in new settlements, which complicates the use of forest resources.

Dependency is different according to area. People of the Middle Hills have traditionally depended on the forests, especially for fodder and fuelwood. The environmental conditions in this area facilitate the natural regeneration process. In the Upper Hill, the National Forests are widely used for fodder and grazing. However, the regeneration process in the Upper Hill is difficult due to climatic conditions, especially low temperatures.

Various documents report that in the Middle Hill, community forestry programmes have been successfully implemented. Traditional dependency on forest resources has provided the incentive for users to get organised and to develop and implement forest management plans. These plans are approved and monitored by the Department of Forestry and updated every five years.

People in the Terai also depend on forest products for fuelwood and timber. Dependency and ownership in the Terai area also provides an incentive for forest protection and planting of private land. The Terai has rich forests that have been used in the political and economic interests of the country.

References: MH (2) (3) (8) (10) (21) (22), opposite opinion (13); UH (9) (12) (21); T (2) (3) (8) (11) (23).

## Management

Forest cover change, both positive and negative, is a management issue. Authors of the papers reviewed argue that when social, economic, political and technical dimensions are considered in a forest management plan the quality and quantity of forest should improve.

In the Middle Hill, the community forestry programmes that involve user groups in the management of forest areas have had a positive effect on forest cover. Management plans are developed by the users and approved by the Department of Forestry. User groups assume the responsibility to manage and monitor the forest area on a daily basis and to distribute the benefits appropriately among the users. Management plans also include grazing and fodder extraction. Middle Hill environmental conditions allow easy natural regeneration, which is monitored by the user groups.

The management and organisation of user groups is a factor to take into consideration. Big groups can be difficult to organise but provide the necessary labour to monitor the forest area. Small groups are easy to organise but the cost of monitoring the forest area increases. User groups must establish the appropriate size of forest area, together with the appropriate number of households that can manage and monitor the area and can benefit from this approach.

The Upper Hill presents management difficulties due to the harsh climate. Forest recuperation is difficult in this area and a number of areas have been set aside for protection. Professionals interviewed mentioned that people from the Middle Hills use Upper Hill forest resources because of

limited access to forest areas established as community forestry areas in the Middle Hills. The problem is that regeneration in the Upper Hill is more difficult so inappropriate use of forest resources has greater impact. The government has not monitored or controlled grazing, which is the main activity related to forestry in these areas, and the impact has not been assessed or a management strategy implemented.

The problems of management in the Terai area are related to the number of people that have migrated to the area, clearing forests for settlement and agriculture production. Inappropriate mechanisms of timber extraction by commercial firms also have had negative consequences in the Terai Forest.

Tourist industries have been identified as an incentive for appropriate management of forest areas, but can also be a threat if not appropriately managed.

References: MH (3) (17) (18) (19) (24), UH (3) (9) (18) (24), T (3).

### Trade

Authors report that changes in trade, markets, communications and infrastructure have impacted communities and changed them from a subsistence to a market system, which has given the incentive to communities to convert land from forest into cash crop production.

In the interviews an emerging issue related to timber extraction in community forestry areas was discussed. The main issue is that when community forestry policy was established, it largely considered subsistence products (fuelwood, fodder, medical plants, etc) for use by the community. After fifteen years of appropriate management of community forestry areas, many user groups now possess merchantable timber products. For many areas, there is no consensus as to how to commercialise these products, what prices should be charged, how extraction should be conducted, the distribution of benefits and the role of the Department of Forestry. Those interviewed said that this is not a problem where the management plans established the mechanisms for extraction and commercialisation of timber products, but several plans did not consider this issue. Marketing of timber products, if it is well managed, could provide significant additional income for the communities and an additional incentive to appropriately manage forest resources. Dependency on other forest resources and pressure on National Forests and protected areas could be reduced.

In the Upper Hill, trade in timber products is not possible because the area is largely inaccessible. Alternative income generation activities could be provided through eco-tourism. The Upper Hill has significant attraction for trekking and mountaineering, representing 35.9% of Nepal's economy.

The Terai area, on the other hand, has been negatively impacted by illegal trade in timber, both to India and inside the country. Some of the interviewees mentioned that the trees in Terai are of high quality and value. The area is of political interest because of the income it can generate.

References: MH (2) (3) (5) (21), UH (21), T (2) (3) (5).

### Positive changes

Community forestry practices in the Middle Hill have been identified as an appropriate mechanism of forest management. Dependency and clear ownership has been identified as the prerequisite to hand over forest management to user groups.

Community forestry practices have increased the income for local communities, which is a powerful incentive for appropriate management of forest resources. It is also important to mention that the legal recognition of the forest users groups as formal authorities has had a positive impact on the management of the resources.

International and local non-governmental organisations and projects have made a positive contribution to the process of information dissemination and user group organisation.

The leasehold project has been identified as a positive contribution on the social dimension because it targets the poorest of the poor. In the environmental dimension it has improved forest cover, even in several cases where native species were not included.

Up to now there is no quantitative data that shows that forest condition in the Middle Hill has been improved. The last assessment, conducted by FINNIDA, established that forest cover in the Middle Hill is decreasing. Professionals express their disagreement with this statement, saying that just by travelling around these areas it is obvious that forest cover has increased. The reason could be that the total Hill area is 11.1 million hectares and community forestry land has just reached 112 189 hectares, which is a relatively small amount.

References: MH (13) (14) (15) (16) (17) (19), opposite opinion (6).

### Ownership

Several authors mentioned that clear ownership is a direct factor contributing to the protection and good management of forest land and resources.

National or government-managed forests do not necessarily imply appropriate management of forest resources and the appropriate distribution of benefits to all sectors of society. This type of forest management requires a forest monitoring system, which is very expensive, and forestry officers in Nepal cannot afford this cost. This system of forest management tends to lead to behaviour as described in the theory of the “tragedy of the commons”.

Community forestry policy places forest management in the hands of user groups. The users assume responsibility for managing and monitoring the area so as to control the use and distribution of goods and services provided by the forest. User groups are those that have traditionally have used the forest area that they are to manage and will have the right to include or exclude “new people” in the use of the resource. In some cases, this mechanism has been misused and has excluded minorities and weaker groups. As an alternative, a leasehold forest policy has been proposed that targets the poorest of the poor in the community.

Both community forestry and leasehold forestry are intended to be used on degraded land, rather than natural forest areas. This is why these policies focus on the Middle Hill and not the Terai, which has natural forest cover.

When decisions are made collectively, community forestry revenues are commonly invested in community development. When management is the responsibility of one person, revenues are often reinvested in the management of the forest. The problem of definition of boundaries has been identified as a cause of conflict in community forestry practice. Planting trees along fences is not widely practised because they shade adjacent crops. Private plantations usually take place on the larger areas of private land.

References: MH (2) (13) (16) (20) (23) (24) (25).

## Policies

In 1980, forestry policy classified Nepal's forests into National Forests and private forests. National forests have been divided into five groups:

Government Terai area;

Community forests managed by forest user groups;

Leasehold forests that are subdivided into deteriorated lands given to groups of at least three households above the poverty line under 40 year leases; leaseholds for forest industry; and leaseholds for tourism;

Religious forests;

Protection forests (protected areas).

With the support of local and international non-governmental organisations and projects, rules, regulations and management mechanisms are more or less understood by the users, especially in the Middle Hill areas and where forest areas have been depleted. Uncertainty exists in the Terai and Upper Hills areas as to how the community forestry areas that, after fifteen years of appropriate management, now have merchantable timber products will be managed in the future.

References: MH (3) (8), UH (3) (8), T (3) (8).

## Assessment

The Ministry of Forestry and Soil Conservation established the Department of Forest Research and Survey. The main objective of the Department is to monitor the forest cover of the Country. A survey was conducted (1990-1993) in the Middle Hills, Upper Hills and Terai with the financial assistance of FINNIDA.

References: MH (4) (7) (8), UH (8) (9), T (8) (6).

## Lack of information

Authors report that there is little systematic information that can identify the causes of deforestation and/or forest recovery. The existing information is simplistic and did not take into consideration local processes associated with deforestation, afforestation and forest recovery. There is a need to document change in a systematic way to avoid generalisations and to target specific problems that can be solved with short-term actions.

Reference: T (2).

## Natural forces

Natural forces mainly affect the Upper Hill. Climate conditions, landslides, riverbank cutting, floods, heavy rains, droughts, hailstorms, glacial lake outbursts, and snow avalanches affect Upper Hills ecosystems.

Reference: UH (21).

## 4 Annotated Bibliography

1. Bajracharya, MK. 1986. *Forestry in Nepal (An introduction)*. Kathmandu.

There are three main forests zones: the Terai zone, comprising the southern plains and Siwaliks; the mid-land zone, including Mahabharat and the southern Himalayan foothills; and the high mountain zone, including the Himalayas and inner Himalayas. Local categories for each zone and particular characteristics are included in the document.

The process of gradual extension of agriculture land by clearing the forests was too rapid and did not allow forest adjustment to population growth and the subsistence farming communities in the middle Hills. In the Terai, the migration from the Hills to this area after the malaria eradication programme was the main cause of forest deterioration.

Forest change in the Terai		
Period	Forest cleared, ha	Number of families
1956	16 187	5 000
First plan period (1957-62)	26 564	5 213
Second plan period (1962-65)	20 234	6 000 target
Third plan period (1965-70)	13 900	6 000 target
Fourth plan period (1970-75)	25 000	8 000 target
Fifth plan period (1975-80)	62 900	35 400 target
Sixth plan period (1980-85)	17 985	16 350 target

Thus, 182 770 hectares of Terai forests have been officially cleared for 409 800 emigrants. There are an additional several thousand hectares of forest illegally encroached upon and cultivated by migrants. The author refers to a map prepared by Forest Service Regional Office in 1974 for the eastern Terai. It shows that 258 316 ha of forest present in 1928 was reduced to 187 171 ha by 1953, to 130 352 ha by 1964 and 82 962 ha by 1972, which represents 28%, 30% and 36% as the rate of deforestation for the corresponding periods.

Other causes of deforestation are land use change from forest to pasture, agriculture or settlement; grazing, including fodder collection; and fuelwood collection for cooking and heating. Fire is another primary factor that has a considerable influence, especially during the dry season. Logging for industrial wood and house construction is another form of exploitation but in general is not a major cause of forest deforestation.

2. Barraclough, S. Ghimire, K. 1990. *The Social Dynamics of Deforestation in Developing Countries: Principal issues, and research priorities*. United Nations Research Institute for Social Development. Discussion Paper 16. ISSN 1012-6511. Switzerland.

In a preliminary review of literature there was considerable controversy about the rates, causes and social consequences of deforestation. There has been little systematic and comparative analysis of the interaction of deforestation processes at local levels with associated changes in livelihood of different social groups and individuals. In the developing world, expansion of commercial agriculture and cattle ranching, migration to agricultural frontiers and rapid urbanisation are the main processes that stimulate deforestation.

The author expresses the belief that the easy explanations that poverty, population growth or wasteful consumption are the primary causes of the deforestation process are tautological. To confuse these symptoms or styles of development with the causes of deforestation tends to be unhelpful for practical solutions and policy elaboration. The generalisation of deforestation as a consequence of poverty distracts attention from other issues that may lend themselves to solutions in a relatively short period of time.

The document reports the total and agricultural population changes 1975-1988, per capita GNP as of 1987 and annual rates of deforestation 1981-1985:

Total Population, 1988 (1 000)	Percent Change, 1975-1988	Agricultural Population, 1988 (1 000)	Percent Change, 1975-1988	Per Capita Gross National Product, 1987 (US\$)	Deforestation, Annual Rate, 1981-1985
18 237	40%	16 772	38%	160	4%

Sources: FAO, 1987, 1988; World Bank, 1989.

The land tenure system, the broader agrarian system and socio-economic structures are the institutions that have a direct influence on the deforestation process. State and community ownership cannot guarantee that resources will be used for the public interest and made available to the poorer strata of the population. Property relationships have to be understood in specific socio-economic, political, cultural and historical contexts. State programmes to promote export crops, commercial livestock production and national forest industries have frequently led to accelerated rates of deforestation.

Particularly for the mountain areas of Nepal, fuelwood gathering, grazing and fodder-lopping, combined with shifting cultivation in some locations, are considered to be the main factors responsible for deforestation. In recent years this process has been further exacerbated by activities related to road construction, dam building and the proliferation of administrative centres. The open border between Nepal and India and the higher prices of wood in India have also stimulated exports.

3. Bhavan, R. 1990. *The effects of Nepal-India Trade and Transit crisis on Fuelwood and Forest in Nepal*. New Era. Kathmandu.

The chapter related to forest destruction and degradation in Nepal points out that forest resources are important to meet the energy requirements of domestic and rural industries and also for the production of many kinds of material goods such as timber, poles and posts, bamboo, fibre, fodder and medical herbs. The rapid destruction and degradation of forest resources in the country is based on short-sighted policies and actions of the government on forestland conversion as well as exploitation and the non-professional administration and management of forest resources.

Forest resource destruction in Nepal is classified by the author into two categories; loss of forest land due to clearing for cultivation, settlement, etc. and, secondly, loss of growing stock as indicated by a decrease in measurable tree crown density or percent cover.

The author reports that, before 1957, clearance of forestland for expansion of cultivation was modest and occurred mostly in the Hills where population density was high. Since then, most of the Terai and the Siwaliks zone became habitable due to control of malaria under a joint programme of HMGN/US-AID/WHO. After a few years, uncontrolled encroachment into forests for settlement and cultivation spread all over the Terai and Siwalik region.

Man-caused damage is slower but, over time, greater in extent and more long-lasting than natural disasters. Such damage may include regular collection of fuelwood, hacking or poaching of various forest products, continual grazing and lopping and the collection of poles and timber by people to fulfil their basic needs.

Forest destruction, degradation, and damage can be measured by (1) loss of forest land; (2) degradation in quantity and /or quality of forest products; and (3) a gradual decrease in the productivity of material, products and services.

Between 1956-76 the main causes of destruction and deterioration of forest in the Terai were:

agricultural development;  
the malaria eradication programme; leading to  
mass migration of the Hill people to the Siwaliks and Terai;  
infrastructure development activities and expansion of cultivable lands;  
large-scale exploitation of the Terai for railway sleepers and distribution of trees to local people for house construction and agricultural purposes;  
undue advantage taken by influential individuals, industries, commercial firms and businessmen in acquiring high value trees and logs at nominal royalty rates;  
lack of co-ordination between forestry and other land use allocations for optimal benefit to the people and the economy.

During the period 1976 to 1990, large-scale destruction of the Terai and Siwalik forests have ceased. Minor clearing of forest under planned land use changes (cultivation for cotton, herbs, etc) continues. There are also allocations of forest land for various infrastructure and other development schemes (transmission lines, irrigation canals, etc) and clear felling of natural forests for conversion to plantations (e.g. the Sagarnath forest plantations). The most devastating loss of forestland is the damage due to continued illegal extraction of timber and fuelwood.

The primary development programmes for forest protection are:

Community and private forestry programme;  
Leasehold forestry programme;  
Wood-based industries programme;  
Medicinal/aromatic plants;  
Soil conservation and watershed management;  
Conservation of the ecosystems and genetic resources *in-situ* and *ex-situ*.

The author concludes:

Fuelwood plays an important role in the energy economy of Nepal and will continue to do so for a long time into future.

Production of fuelwood is not conducted on a planned basis in the country.

Marketing of fuelwood is not geared to economic efficiency rather than administrative and managerial effectiveness.

Many avenues are still available to reduce fuelwood consumption and forest destruction.

Forestry problems are complex and they differ significantly from one agro-ecological zone to another.

Forest destruction, degradation and damage in Nepal needs better understanding and recognition.

Macro-planning of the forestry sector alone is not enough for the overall use and management of the forest resource in Nepal; micro or operational planning as well as effective implementation are also required.

Organisational reforms within the government and promotion of freely competitive market mechanisms in the private sector for the efficient use and management of forest resource are needed.

4. Gurung, H. 1989. *Regional Patterns of Migration in Nepal*. Papers of the East-West Population Institute. Number 113. Kathmandu.

The author references a report prepared by Zelinsky in 1970 that refers to the factors influencing out-migration from rural areas due to the growth of the local population beyond the carrying capacity of the land. Kosinski and Prothero (1975) also mention that excessive pressure on land resources and increasing poverty generate a large amount of migration.

In Nepal, where migration is rural-rural, several surveys indicated that there is higher mobility among the most deprived groups. This pattern may be related to the low cost of moving. Migrants in Nepal are mainly in the "subsistence" category rather than people who are more well off. The forces that influence migration in Nepal may be categorised as economic dislocation, population pressure, effective malaria control, land settlement and regional income disparity.

The international boundary between Nepal and India is not regulated. International migration across the boundary is primarily an outward expansion of population into similar ecological niches: Nepalese eastward to the subtropical Hills in India and Indians northward into the tropical Terai.

The author prepared a multiple regression analysis using land at origin and destination as variables. This showed that the effect of land available at the destination was always positive and highly significant. The more people in an area the more the movement; the more the land available the more in-migration.

The lowlands of Nepal formerly constituted a malarial zone. The Hill people traversed the lowlands during the winter. The fear of malaria imposed a work schedule whereby the people retreated to upland settlements at dusk after working in the valley fields. During 1955 a program for malaria control was introduced in Nepal and successfully implemented. As a result, large number of Hill settlers began to move to the Terai. The initial target was to resettle a population of 30 000 by reclaiming 20 240 hectares of grassland and forestland. During the period between 1970 and 1983 the number of households resettled was 50 859 on 33 733 ha of land that were mostly reclaimed from the forest. The results of the settlement program were (1) a decline in the area of land for settlement from 4 322 ha in 1974-1975 to 1 011 ha in 1982-1983; (2) increasing demand for land led to a decrease in plot size allotted to each settled household from 1 ha in 1974-75 to 0.34 ha in 1982-1983 and (3) the depletion of forestland for resettlement in the densely populated Eastern Terai meant a shift in program emphasis to the Western Terai.

Forest resource surveys estimate a total loss of approximately 120 000 ha of forestland during 1964-1972; of this 56 000 ha was due to spontaneous migration and illegal settlement. Other significant reasons given for migrating to the Terai were land distribution by government (10.9%), more productive land (7.8%), cheaper land (7.1%) and availability of timber for construction and other purposes (3.7%).



One of the most visible consequences of migration to the lowlands has been the change in land use. Since most of the movement has been rural-rural, it has involved large-scale forest encroachment for agricultural settlement. For the period 1962-1974 the official figures reported by the Nepal Forestry Ministry for deforestation range from 120 000 to 340 000 ha. The first inventory of forest resources (1963-1964) for the Terai and adjacent regions, covering 3 million ha, indicated that 51.1% of the area was under forest. The 11 Terai forest divisions, excluding the Inner Terai, had 1.5 million ha of forest of which 23 278 ha were encroached upon.

Change in land use in the Terai: 1963-1964 and 1978-1979				
Area and Land Use	1963-1964		1978-1979	
	Hectares	Percent	Hectares	Percent
Forest land	631 800	72.0	626 037	67.5
Cropland/agriculture	112 845	12.8	249 062	26.8
Other	133 371	15.2	52 905	5.7
Subtotal, West	878 016	100.0	928 004	100.0
Forest land	240 293	48.8	232 070	44.7
Cropland/agriculture	211 323	43.0	261 903	50.4
Subtotal, Central	492 006	100.0	518 631	100.0
Forest land	654 298	40.5	404 883	28.1
Cropland/agriculture	826 028	51.1	927 392	64.3
Other	137 126	8.5	111 074	7.7
Subtotal, East	1 617 452	100.0	1 443 349	100.0
Forest land	1 526 391	51.1	1 262 990	43.7
Cropland/agriculture	1 150 196	38.5	1 438 357	49.8
Other	310 887	10.4	188 637	6.5
TOTAL	2 987 474	100.0	2 889 984	100.0

5. His Majesty's Government of Nepal. 1999. *Economic Survey, Fiscal Year 1998-1999*. Unofficial Translation. Kathmandu.

A preliminary estimate is that gross domestic product grew 3.4% in the current fiscal year and reached Rs 84 315 million, with a agricultural growth of 2.4%. The problem of poverty alleviation has been acute in the country due to the lack of expected improvement in production, income, skills, employment generation and development of socio-economic infrastructure. The lack of satisfactory reduction in the population growth rate and the failure to sustain a high rate of economic growth have been the main reasons for the persistence of poverty. Out of the 42% of the population below the poverty line, 41% and 42% were found living below the poverty line in the mountains and Terai, respectively, whereas 56% were below the poverty line in the Himalayan region.

The majority of the country's population is dependent on agriculture, and this remains the backbone of economic development. In the context of Nepal, agriculture has been the main basis of income and employment generation and the major source of production. The difficult geographical setting, dependence on the monsoon due to the lack of irrigation facilities and the traditional subsistence-oriented agriculture system have been the main problems of development in this sector.

The tourism industry plays a large and significant role in Nepal's economy. Tourists visiting Nepal increased by 7.2% compared to last year. The majority of tourists are interested in trekking and mountaineering. A total of Rs 8 581.5 million was earned from the tourist sector, representing 35.9% of the foreign exchange earnings of the country.

Energy consumption is increasing with the corresponding increase in population. The majority of the population is dependent on traditional sources of energy such as fuelwood and animal residues. Despite implementation of a number of projects in the government and private sectors to decrease the dependence on traditional sources of energy, progress on this front could not be made to the desired degree. Deforestation has increased substantially. Co-ordination to conserve forest resources is lacking, especially in the context of unsystematic urbanisation and settlement as well as the development of infrastructure and industrialisation.

During the review period exports (excluding those to India) of two items – ready-made garments and carpets – comprised 83.1%. The share of these two items was Rs 7 069.8 million and Rs 7 027.1 million, showing an increase of 38% and 18% respectively.

In FY 1997-1998, bilateral assistance increased by 4.7% in comparison to the previous fiscal year and reached Rs 6 297.7 million, comprising 38.3% of the total aid disbursement. Multilateral assistance increased by 12.6% in comparison to the previous financial year and stood at Rs 10 159.4 million, or 61.7% of the total disbursement.

6. His Majesty's Government of Nepal. 1999. *Forest and Shrub Cover of Nepal 1994*. Forest Survey Division. Department of Forest Research and Survey. Ministry of Forest and Soil Conservation. Forest Resource Information System Project/Government of Finland. Publication 72. Kathmandu.

This study combines the results of three different types of inventory. Fourteen Terai districts were assessed with Landsat TM satellite imagery. The remaining 51 districts in the Hilly area were assessed by aerial photo interpretation.

Forest and shrub covers 39.6% of the total area (including protected areas) of Nepal. Forest (crown coverage more than 10%) covers 29% of the total area and shrubs occupy 10.6% of the area. According to photo point sampling the lowest percentage of forest and shrub in the Hilly area was found at altitudes of 1 000 to 2 000 meters.

In 1978-1979 the Land Resource Mapping Project (LRMP) estimated that forest and shrub cover was 42.7% of the total area (forest 38% and shrub 4.7%). LRMP also suggested that deforestation would not be common in the Hills. Nevertheless, loss of density of forest crown cover has taken place according to the LRMP report. The analysis in this study indicates that forest and shrub cover (together) in Nepal has decreased at an annual rate of 0.5% from 1978-1979 and that the decrease of forest cover has been 1.7% annually. The main trend in the Terai lowlands is that forest and shrublands have been turned into other uses, mainly agriculture (at an annual rate of 1.3%), while in the Hills the trend has been toward forest recovery. In the 51 Hilly districts that were analysed by photo-point sampling, forest cover has declined from 34.2% in 1978-1979 to 23.7% in 1992-1996 (a 2.3% annual rate). This does not support the conclusions of the LRMP.

7. His Majesty's Government of Nepal. 1999. *Forest Resources of the Hilly Area in Nepal*. Forest Survey Division. Department of Forest Research and Survey. Ministry of Forest and Soil

Conservation. Forest Resource Information System Project/Government of Finland. Publication 73. Kathmandu.

This report includes 51 Districts and the Hilly part of the Terai District that were not inventoried previously. The work is part of the ongoing National Forest Inventory (NFI) in Nepal. The fieldwork was carried out during 1994-1998.

The volume and biomass estimates presented in the study were compiled for reachable forest. Forest is not reachable when it is located on a slope of more than 100% (45 degrees) or if it is surrounded by steep slopes, landslides or other physical obstacles. Forest inside protected areas is considered as non-reachable. The definition of reachable forest in this inventory differs from the definition of accessible forest as used in the Master Plan for the Forestry Sector of 1988 based on distance from the nearest village to the forest. In that case, all forest close to a village was accessible (i.e. within 3 km).

The total land in the Hilly area is 11.1 million ha. The total forest area is 2.9 million ha and the total shrub area is 1.57 million ha. They cover 26.1% and 14.2% of the total land area of the Hilly area, respectively. The reachable forest of the Hilly area totals 1.38 million ha. The total biomass including stems, branches and leaves is about 305 million tonnes (air-dry). The most frequent non-timber forest product collected is *Phoenix humilis*. The most frequent human impact in the Hilly Area is cattle grazing, which was recorded on 32% of the plots, and fuelwood collection and lopping on 28%. Human impact is frequent at all altitudes.

8. His Majesty's Government of Nepal. 1988. Ministry of Forests and Soil Conservation. *Master Plan for Forestry Sector Nepal*. FINNIDA. Kathmandu.

The Master Plan for the Forestry Sector in Nepal is the basic document for forestry issues in the Country. Officially, Nepal has around 35 percent forest cover, although at least a quarter of the forest area is heavily degraded. Although most of Nepal lies within the sub-tropical monsoon climatic region, the wide range of topographic conditions allows for a wide variety of forest types. The distribution of natural forests generally follows altitudinal zones. The most common, below 1 000 metres, are tropical sal forests, predominantly of *Shorea robusta*. Sub-tropical forests occur between 1 000 and 2 000 metres and may be coniferous or broad-leaved. The principal coniferous species is chir pine (*Pinus roxburghii*). The broadleaved forest is mainly a mix of chestnuts, alders and chilaune (*Schima wallichii*). Temperate forests, between 2 000 and 3 000 metres, include a mix of oak, pine and rhododendron. Sub-alpine forests are found from around 3 000 metres up to 4 200 metres with a mix of firs, beech, rhododendron and juniper. Nepal has a modest area of plantation forest. Almost 15 percent of the country's land area is in national parks, wildlife reserves or conservation areas.

Forest Cover as of 1995-1999	
	1 000 hectares
Nepal	482 235
South Asia	7 713 718
World	345 438 226

Fuelwood is a major source of domestic energy consumption. The sawn wood and wood-based panel mills are small, labour-intensive and face material shortages. The paper industry uses non-wood fibres, mainly grass and straw.

Nepal's important non-wood forest products include medicinal and aromatic plants; paper; pine resin; fodder; grasses for thatching, matting and rope making; lemongrass and essential oils.

As part of the Nepal Master Plan for the Forestry Sector, an institutional development plan was written in 1989. The documents established that “increasing numbers of people, their dependence on fuelwood for energy and timber for construction and other economic uses, their reliance on forests for fodder to maintain a large number of livestock and the scarcity of agricultural land have together put heavy pressure on Nepal's forest resources and brought about their decline. In turn, it has become increasingly difficult for the population to meet their basic need for forest products. Pressure on the remaining forests has intensified further, creating a vicious cycle and aggravating the already serious problem of environmental deterioration and declining farm yields.”

Forests Acts and Rules: In 1957 forests in Nepal were nationalised as a move to reduce the power of large landowners wanting more land to be converted to agriculture. Pasturelands were similarly nationalised in 1967. The government, however, did not have the means to protect and manage the forests and an administrative vacuum was created. Simultaneously, population growth put more pressure on the forests. The adverse effects were accelerated by misunderstood cadastral survey rules that gave the impression that only treeless areas could be privately owned.

The Forest Act of 1961: In the Terai there were increasing demands on the easily accessible forests because of railway construction and other development in India. The favourable climate, good soils and eradication of malaria attracted migration from the Hills as well as from outside the country, creating additional demands to convert forested land to cultivation. HMGN promulgated the Forest Act of 1961 to regulate and systematise forest utilisation. Today, it is still the basis of most forest-related subsidiary legislation.

Forest Protection Special Act, 1968: It was an official practice to resettle people from the Hills in the Terai while unofficial encroachment of the forests was also tolerated, and this led to increasing wanton destruction of the forest. In response the Forest Protection Act was passed in 1968 giving police and judicial powers to forest officials. By the late 1970's, however, with the development of the decentralisation policy and its application in community forestry it was officially recognised that in many areas the adverse consequences of this Act were greater than its occasional successes. This act was made stricter through the Forests Products Sales and Distribution Rules passed in 1971.

The National Forestry plan of 1976 Panchayat Forestry Decentralisation recognised that there was a critical situation in the forestry sector. In accordance with this plan, the Panchayat Forest and Panchayat Protected Forest rules were promulgated in 1978. Their intention was to hand over parts of the government forests for management by local communities. The rules specify which forests can be handed over to Panchayats, criteria to prohibit certain activities and the way in which revenue can be utilised. Since then a more general policy of decentralisation of development activities has been announced and the Decentralisation Act of 1982 has been put into effect through the Decentralisation Rules of 1984.

The Leased Forest Rules of 1978 that allow barren or highly degraded areas to be leased have not been applied on a significant scale. If not removed, the restriction that only barren lands can be leased may encourage the cutting of the trees so that areas can be claimed.

The Private Forest Rules of 1984 entitle owners of private forests to free supplies and planting materials as well as technical assistance from forest officials. However, the bureaucratic procedure is difficult to utilise.

The National Parks and Wildlife Conservation Act of 1973 makes provision for the protection and conservation of flora and fauna, together with their habitats, for control of hunting and proper management of protected areas.

The Soil and Watershed Conservation Act 1982 empowers HMGN to declare any area to be a protected Watershed Area. In such areas measures for afforestation and forest protection may be taken and official permission is required for cutting or planting trees. Land use, including cultivation and planting of trees, may also be subject to official controls.

The Land Act of 1963 has an indirect negative impact on forestry development because government land includes forests. Its provisions have encouraged people to cut trees so that the treeless land can be unambiguously claimed as private land.

The Pastureland Nationalisation Act of 1974 is applied all owners of pasturelands. The local village Panchayat is responsible for protection and improvements and must not use the land for any other purpose.

9. His Majesty's Government of Nepal. Not dated. *Biodiversity Profile of the High Himal High Mountains Physiographic Zones*. Biodiversity Profile Projects. Kathmandu.

The Highlands of Nepal cover 43% of the territory with just 6% of the population. The people of the Highlands are more dependent on natural resources than those living in the Middle Hills because there are few employment and income-earning opportunities. Although the population is sparse, the per capita demands on the natural resources are great.

Thirty-eight ecosystems are found above 3 000 meters in the Highlands. The altitude distribution is split into three zones. The Sub alpine zone, (3 000 to 4 200m) is heavily forested due to the sparse population and its forests are still largely in good condition. The Alpine level is the area between the tree line and the region of the perpetual snow. The conditions here are too harsh for trees and other vegetation. The Nival level (above 4 500 m) has permanent snow cover. Large areas of the highlands in western Nepal lie to the north of the Himalayas. The main influence on the vegetation of these areas are the strong winds and low levels of rainfall caused by the rain shadow effect of the Himalayas.

The document reports that there are three main areas of concern with high altitude forests:

Settlements are widely distributed and it is difficult to accurately identify users.

Forests are often in good condition and a valuable resource. There is therefore the danger that the local elite will appropriate commercially valuable forest products for themselves.

Appropriate silvicultural applications may well be different for the high altitude forests where some forest types regenerate less easily than lower altitude forests.

Eco-tourism, especially in the Annapurna National Park, needs to be effectively managed to reduce the negative impact of this activity.

10. His Majesty's Government of Nepal. Not dated. *Biodiversity Profile of the Middle Hills. Physiographic Zones*. Biodiversity Profile Projects. Kathmandu.

The Middle Hills in Nepal have the greatest number of ecosystems within five physiographic zones. With the high and increasing population density and utilisation of every accessible niche for subsistence farming the natural ecosystems of the Middle Hill are depleted or under serious threat. The population is projected to increase by 50% in the years between 1995 and 2005.

Much of the degradation in the Middle Hills is due to overexploitation for grazing, fodder, firewood collection and timber harvesting. With sound management these areas can recover some of their biodiversity value but as long as they are managed for subsistence needs of the local people their biodiversity cannot approach that of undisturbed forest. These areas are poorly represented (at an elevation of between 1 000 and 2 000 meters) in the protected areas system because this is the area of the country longest settled, with the highest population density and the least remaining forest cover.

11. His Majesty's Government of Nepal. Not dated. *Biodiversity Profile of the Terai and Siwalik Physiographic Zones*. Biodiversity Profile Projects. Kathmandu.

The Terai/Siwaliks biodiversity is entering a stage of crisis, especially in the Terai. The human population density is high and increasing annually by about 3%. Most of the people have subsistence demands.

Development across the Terai, including road improvement programmes, irrigation and hydropower projects, and the decentralisation of industry and government from Kathmandu to the Terai has major environmental implications for the protected areas in this region. The Siwaliks are threatened mainly due to the increasing population in the Terai and Middle Hills. The frontier for pioneer settlement of Nepal's poor landless people is shifting to the fragile ecosystem of the Siwaliks. These areas are rapidly degraded due to over-exploitation and conversion of forest into farmlands.

12. ICIMOD. 1998. *Mountains 2000 and Beyond*. Second Regional Collaborative Programme for Sustainable Development of the Hindu Kush-Himalayan Region (HKH) 1999-2002. Kathmandu.

The International Centre for Integrated Mountain Development (ICIMOD) was established due to increased concern about environmental degradation and poverty in the Hindu Kush-Himalayan (HKH) region. This document builds upon the successful experiences of the First Regional Collaborative Programme and the needs expressed by 200 institutions in the HKH area. The document presents the way in which ICIMOD intends to implement its programme in the coming four years.

The document emphasises that mountain ecosystems are fragile and susceptible to soil erosion, landslides and loss of genetic diversity. Physical isolation has excluded the mountains and their population from development, resulting in political and economical marginality. Mountain people suffer from unemployment, poverty, poor health, and inadequate sanitation. Among the world's mountainous areas, Asia contains the largest, highest and most populated systems. More than 200 million people live in mountain and upland areas of Asia. Another one billion people downstream are affected by mountain conditions.

The document reports that 37% of the country's area is under forest cover, while that under agriculture is about 20%. Around 75% of the country's energy requirements are met by fuelwood.

Rising population pressure on the land and deterioration of the environment have been recognised as the main challenges to sustainable development in Nepal. Land degradation, deforestation and pollution cause the major environmental problems. Land and forest resources are overexploited because of heavy dependence on the natural resource base, while water and mineral resources are under-utilised owing to lack of financial resources and infrastructure. Soil erosion, fertility decline, sedimentation and floods continue to degrade the scarce land resource.

13. ICIMOD. 1995. *Community Forestry the Language of Life*. Report of the First Regional Community Forestry Users' Group Workshop. Kathmandu.

This report summarises how community forestry has gained importance in planning for sustainable mountain development. Life and livelihood are intricately linked and the forest areas in the HKH remain a critical source of diverse products that make an invaluable contribution to household survival in mountain areas.

Participatory forest management has emerged as the key to sustainable management of forest resources in the Himalayas. The process of democratisation, decentralisation and the emergence of people-oriented approaches provided the opportunity to reflect on strategies needed to unleash the latent potential of community forestry so that it can be an effective vehicle for sustainable mountain development.

Participants in the workshop identified key issues that would be necessary to make community forestry an effective mechanism. These included developing strategies to strengthen local institutions, establishing conceptual understanding of advocacy, enhancing the role of community institutions in influencing policy and strategies to give women and the poor more control over natural resource management.

The document reports that over 3 300 community user groups were legally registered and were managing about 135 151 ha of forestland. More than 4 000 community forestry user groups were in the process of being formed.

Region	Number of User Groups	Area (ha)
Hill	2 987	112 189
Terai	320	22 962
Total	3 307	135 151

The process of handing over management to user groups includes:

- Identification of the users;
- Preparation of the group's constitution and the forest operation plan with the participation of the users;
- Certification and handing over of the forest

Steps for handing over include:

- Dissemination of the rules, regulations and information about community forestry to the household level;

Organising small group discussions leading to preparation of the group's constitution and forest operation plan;  
Calling a mass meeting for final approval of the constitution, operation plan and users committees;  
Holding a community meeting every month;  
Holding a general assembly meeting once every two years.

14. Jackson, W. Tamrakar, R. Hunt, S. Shepherd, K .1998. *Land-use changes in Two Middle Hills Districts of Nepal*. Mountain Research and Development. 3 (18). pp 193-212.

This document presents four comparative land use studies in the Sindhu Palchok and Kabhre Palanchol districts of Nepal that evaluate the impact of Australian development assistance in community forestry over a continuous 19-year period. The studies made use of sets of aerial photographs taken in 1978 and 1992 to assess land use change. The samples covered almost 15 percent of the 400 000-ha land area of the two districts; ranging between 600 and 4 000 m in altitude. Land use change based on photo interpretation and groundwork was implemented by rapid rural appraisal (RRA) and by information obtained from local villagers.

The study found that community forestry activity within certain areas at lower altitudes is having a beneficial effect on the balance of land use as part of a broader process of agrarian change. Shrublands and grasslands are being converted to more productive categories of forestland, reflecting the care of communities in managing and conserving their forest resources. On upper slopes, however, there is evidence that forest cover is being rapidly denuded and that the shrubland and grassland areas are expanding at the expenses of forest cover. Many current land use practices need to be changed or modified.

Land use for agricultural purposes appears to be stable. Reliance on subsistence farming is declining as opportunities increase for off-farm income. It appears that community forestry has reduced the pressure on the land at the lower altitudes of Sindhu, Palchok, and Kabhre Palanchok.

Sustained population pressures combined with the lack of coherent and co-ordinated land management policies and practices have resulted in a rapid decline in forest resources on the upper slopes together with loss of catchment stability.

15. Gilmour D. 1992. *Not Seeing the Trees for the Forest: a re-appraisal of the deforestation crisis in Hill Districts in Nepal*. Readings in Social Forestry and Natural Resource Management for Nepal edited by Messerschmidt, D. Rai, and N. HMGN Ministry of Agriculture-Winrock International. Research Support Series. Number 10. Kathmandu.

The author challenges the commonly accepted premise of disastrous deforestation in the Hills of Nepal. These arguments are commonly used to create alarm and to provide convincing arguments why projects should receive government or aid agency support. Most investigators have concentrated their efforts on documenting the decline of Hill forests and have overlooked the fluid nature of tree cover on private farmland. This study is based on oral history of two districts in Central Nepal and illustrates how the Hill peasant farmers have increased the tree cover on their farmland during the last 20 years.

Several studies indicate that forest boundaries have shown very little change in the last century. The most recent and probably most accurate assessment of the condition of Nepal's forests was made by



the Land Resource Mapping Project, which pointed out that during the years of 1964 to 1978 there was no detectable loss of forest area. There has been a decline in density of around 2.1% of tree crown cover. This period coincides with the period of maximum conversion of forestland to agriculture land in the Terai, which means that the figure for the Hills could be lower.

In the context of the village setting the author suggests that there is a broader dimension to the whole question of deforestation and that this dimension takes in the whole landscape (not just the forest) and specifically includes the villagers. In this context, he found that in many areas substantial changes are taking place in the number of trees on private land. The author used the available quantitative data together with oral history for the study. He found that Hill peasants responded to a changing situation resulting from the decrease in availability of forest products from nearby forests. In villages still close to areas of accessible forest there has been little incentive for farmers to encourage trees to grow on their private land. On the negative side the author reports that during the past 20 years the two research districts lost about 29 000 ha of forest. On the positive side, about 6 700 ha of new forests have been established during the past 10 years, and these areas are expanding at the rate of 2 000 ha per year (1 500 ha of effective forest).

The author does mention that there are still problems in managing the natural forest in the Hills that have been ignored by the government and the aid agencies.

16. Kanel, K. K. 1998. *Leasing Public Land to Poor and marginal Families: an initial assessment of Baramchi site*. Hills Leasehold Forestry and Forage Development Project IFRI case study. FAO-IFAD. Nepal.

This document relates to the Hill Leasehold Forestry and Forage Development Project (HLFFDP) that aims to alleviate the poverty of poor rural households and restore the ecological balance of the degraded Hills. The objective of the study is a long-term study that:

assesses the impact of the HLFFDP in terms of changes in vegetation cover;  
assesses the impact on household income and production systems as influenced by changes in biological systems; and  
assesses institutional arrangements and their impact on biological systems and their use and management.

The study is based on eight groups and their leasehold forests and one national forest used by a household area (46.2 ha).

The authors state that the composition of the forest indicates that the users attempted to plant multipurpose trees on the leasehold forest. Many trees, shrubs and seedlings have regenerated naturally. The only planted species that appear to survive successfully are *Pinus roxburghii* and *Choerospondias axillaris*.

The document summarises the different species, together with the size of trees, shrubs and saplings in the study areas and compares this data with the 1974 study. The condition of the Karangkurung Pakah National Forest appears to have improved in terms of stems per unit area and the average DBH. The condition of the forest is also improving in the case of the Salmarang forest. The study mentions that people's awareness of the importance of conserving and utilising forests for local need have decreased timber extraction from the national forests as well as promoted the establishment of plantations and the protection of natural regeneration.

Method and model: International Forestry Resource and Institutions (IFRI) research method. There are 12 case studies developed in the HLFFP area. Ten research protocols have been developed to assess the impact of institutional arrangements and socio-economic conditions on vegetation in the area. The method can be used to monitor and examine long-term impacts of projects and other interventions on the condition of the vegetation. The research program is conducted in multiple countries over time and examines relationships among the physical, biological and cultural worlds. The research protocols include: site overview, forest form, forest plot, settlement form, user group form, forest association form, forest user group relationship, forest products, non-harvesting organisations, organisational inventory and inter-organisational arrangements form.

17. Ohler, F. 1999. *Discussion Paper on the Future of the Hills Leasehold Forestry and Forage Development Project*. Electronic Conference on Mountain Trees and People: Strategies Balancing Local Management Land. Kathmandu.

The author reports that the leasehold forestry project has had a positive environmental impact through:

greatly increased natural regeneration of forest species (trees, shrubs, herbs, and grasses) in most leasehold sites as a result of protection from grazing (improved management);  
 greatly increased production of high quality fodder species on barren and degraded forest land;  
 improved regeneration of forests adjacent to and protected by a corridor of leasehold forest;  
 halting gradual encroachment onto forest areas adjacent to and protected by a corridor of leasehold forest;  
 halting and bringing under control of shifting cultivation practices.

18. Partap, T. 1998. *Managing Agro-biodiversity in the Hindu Kush Himalayas (HKH) Region*. ICIMOD. Newsletter. (31) 1998. Kathmandu.

The author's initial conclusion is that the boundaries between biodiversity and agro-biodiversity are not clearly demarcated. ICIMOD conducted several studies related to agro-biodiversity agriculture transformation, including farmers' seeds supplies. These studies revealed that in the HKH region, agro-biodiversity and its management is under pressure. Transformation of agriculture systems resulting in land use changes is having an adverse impact on native agro-biodiversity. Farmers are transforming their lands and farming methods to achieve better production and increased benefits. Traditional agro-biodiversity is the loser in this process. There is little knowledge about the biodiversity of unique ethnic mountain cultures and their small-scale agro-ecosystems or the changes affecting them. In the absence of knowledge it is difficult to assess the appropriate institutional responses needed to contain the loss of agro-biodiversity in the HKM Region. There is regional interest in encouraging co-operation in the conservation and protection of agro-biodiversity.

Diverse horticultural resources and their use in the HKH Region			
Crop type	Number of species in cultivation		Approximate number of species used locally
	Major	Minor	
Fruit trees	5	18	150-200
Fruit shrubs	2	5	80-120
Vegetables	8	20	230
Tuber vegetables	1	6	15
Spices	3	8	40
Mushrooms	1	6	280
Medicinal and aromatic plants	10	50	500
Other plant resources		7	50

19. Pelenick, E. 1998. *Community-focussed Approaches to Biodiversity Conservation*. ICIMOD. Newsletter. (31) 1998. Kathmandu.

The author refers to the different indicators that government and communities use to monitor forests. National institution use biodiversity rankings and communities use their daily needs; for example, dense forest with grasses or quality of broad-leave forests compared with availability of leaf, litter, mushrooms, and medicinal plants.

He points out that biodiversity conservation should focus on effective integration of natural and social capital. Considering both natural and human-influenced ecosystems, four broad categories of landscape were identified in the Hindu Kush Himalayan Region:

Grasslands, range lands and barren lands	50%
Forest and shrublands	32%
Crop land	11%
Shifting agriculture	3%

The author mentions that in these ecosystems it is mainly people who have influenced the conservation of plants and animals.

The lessons learned from community based approaches were presented as:

ensuring people's participation at all stages of the forest management process;  
 establishing linkages between the macro and the micro economy;  
 increased income for local communities through the management of biodiversity as a powerful motivation for collaborative management;  
 facilitating the integration of all stakeholders to achieve real participation;  
 presenting an enabling policy and institutional framework that allows people's participation and sharing of benefits and responsibilities in the management of the resources.

20. Sakurai, T. Raymahi S. Pokaherl R. Otsuka K. 1999. *Communal Vs Private management of Timber Forest: a case study from inner Terai of Nepal*. Forest Management and Agriculture in the Hills of Nepal. Kathmandu.

The study identifies the extraction of forest resources by local people as the cause of deforestation. The nationalisation of the forests of Nepal made the government responsible for the costs of monitoring and controlling the forest area, which the DoF could not afford.

This study compares management efficiency of timber plantations under collective community management and private management systems and natural forests under collective and centralised community management systems.

The document argues that collective management is more efficient for protection of planted trees. Cost for protection of seedlings and control of the area is shared by the members of the community. Silvicultural practices are more efficient under centralised management because decisions are made by one person and do not need the approval of all members of the community.

In communally managed forests, the benefits of the plantation are invested in community development actions. Under centralised management, more funds are allocated to the management of the area, especially for hiring personnel.

Shengi-ji , P. Sadeque S. Myint A. Richard C. Not dated. Training Manual on Application of GIS and RS to Assessment, Monitoring and Management of Mountain Natural Resource. ICIMOD. Vol. (1). Kathmandu.

This project took place in the Hindu Kush-Himalayan (HKH) Region, which is the largest mountain system in the world and has a unique function and role in the context of the natural environment. The region covers approximate 3.5 million square kilometres. Geophysical features include elevations that vary from a few meters above the sea level to the highest point on the earth at 8,848 meters, with more that 50 peaks. The area includes the following topographical subdivisions: Baluchistan, Assam Himalayas, Hengduan, Arakom Yoma, Shan Plateau, Gongga Shan and Yulongxue Shan. The HKH Region is spread over eight Asian countries: Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan, and has a population of about 120 million people.

Large-scale human activity in the region over the past few decades has resulted in overall environmental degradation and/or depletion of forests, soil erosion, decline in soil fertility, a growing scarcity of water resources and loss of biological diversity. These activities include extensive deforestation and intensive farming activities on steep slopes, heavy population pressure on soil, land, water and biological resources, and the adverse impacts of large development projects in mountain environments.

Also mentioned were changes in value systems due to recent socio-economic developments, improvements in transportation and communication and the influence of modern culture. The subsistence economy is changing to a market economy and more natural forests are now being utilised for cash-crop cultivation and plantations.

The authors mention the need for complementary actions between the mountain and plain economies, which through appropriate management could guarantee sustainable use of the natural resources in the mountains. Such complementary development actions that guarantee a flow of benefits to both upland and lowland populations are the best hope and probably the only alternative to halt the destruction of the environment and to conserve natural resources in the mountains.

The document refers to the theory of Himalayan degradation (Ives and Messerli, 1989). It concludes that the general degradation of the Himalayan environment is a result of increasing population pressure on its natural resource base. The degree and extent of such degradation as well as its impact on the upland environments are largely unknown, mostly exaggerated and based on myths rather than on reliable and pertinent facts and figures. Data is needed in order to do away with prevalent myths and confront the problems of the Himalayan environment.

Data on the geography of the HKH region shows the area of forest, pasture, national parks and protected areas, agriculture, population, and livestock (areas in 1 000 ha, population and livestock in thousands).

## Master Plan for Forestry Sector, Nepal (1988):

Nepal (entire country is included in the HKH)

Geographical area	14 718
Agriculture area	2 653, equivalent to 18% of the country.
Forest area	5 424, equivalent to 36.4 % of the country.
Pasture land	1 745, equivalent to 11.9% of the country.
National park and protected areas	1 315, equivalent to 0.9% of the country.
Approx. population	18 500
Forest area per capita	0.34
Approx. livestock numbers	15 232

In relation to ownership there are three categories reported: State or Government Forest, Community or village forest and private forest. In relation to function there are protected forest, production forest, multiple use forest and national parks.

Natural forces, especially those affecting highly fragile ecosystems, include: mass wasting, landslides, riverbank cutting, heavy rains, floods, droughts, hailstorm, avalanches and glacial lake outburst.

The impacts of human pressure relate to livestock grazing; the conversion of forest land to farm lands and pasture; settlements and infrastructure uses such as roads, irrigation canals, channel dams, power lines, industrial sites, mining and other development projects. Furthermore, there is continual removal of biomass to meet the growing day-to-day need for fuelwood, fodder, timber, minor forest products and industrial raw material for the increasing human and livestock population.

Estimated average annual rates of deforestation and reforestation in the HKH region of Nepal, 1970's and 1980's:

Nepal total forest area	5 424 000 ha
Annual deforestation	44, 000 ha (equivalent to 0.8% per annum)
Annual reforestation:	
Gross area planted	8 000 ha (equal to 18% of annual deforestation)
Net area reforested	4 000 ha (50% survival rate, resulting in reforestation equal to 9 % of the annual deforestation).

The authors present information on forest cover and deforestation rates. Martens (1983) estimated that the forest was being eliminated at the rate of 2% annually. Joshi (1984) estimated that the rate was 3%. The LRMP (1986) and WECS (1986) indicated that between 1964 and 1979, 3.3% of the forests and shrublands (382 000 ha) were converted to other land uses, tree cover decreased by 1.8% and shrubland increased by 4% per year. Tiwari (1991) observed an annual rate of deforestation of 0.3% and an increase in cultivated land of 1.7%. Rautianinen (1991), based on aerial photographs taken in 1972-1986, calculated the average annual loss of forest area at 0.9% and the decrease in crown cover as 1.2%. Dense forest declined by 2.4%, medium density forest by 12.7% and scattered forests by 5.5%. Grassland has increased by 18.7% and shrubland by 12.7%. The area of natural forest decreased by 570 000 ha between 1964-1985 (or 0.4% per year) (MPFS, 1988). The Forestry Master Plan (1988) estimates that, based on present trends, 0.6 million ha of forest will be lost during the next 25 years. Banskota et al (1990) estimates the average annual deforestation rate at 44 000 ha (or 0.8% annually) and the average annual reforestation accomplished in all categories of plantations

(government, community, private) at 7 900 ha which, at a 60% survival rate, amounts to a meagre 5% of the area deforested.

The document mentions that infrastructure development in Nepal creates conditions 200 times more likely to cause land movement compared to other human activities. The socio-economic factors in rural areas and the dependency of local people on the forests is a cause of forest depletion. There is a great need for investment in these areas that will provide alternative sources of income. Only in this way will it be possible to break the cycle of poverty and forest depletion.

The role of foresters and the Forestry Department is still not clear, which creates confusion among the personnel.

There are also problems related to the lost of biodiversity. Deforestation usually takes place in fragile mountain ecosystems, while reforestation programmes take place in the plains. Afforestation programmes are oriented to economic benefits and that means that species are usually selected with this perspective in mind and indigenous flora are not considered. Product extraction is a selective process tied to economic benefits. Protected areas are vulnerable to poaching and encroachment. Local communities have used traditional shifting systems of agriculture.

Cost-benefit analysis overestimates the benefits of exploitation and underestimates the value of conservation. When land, species or ecosystems do not have clear ownership and value, they are overexploited.

OVERVIEW OF MOUNTAIN NATURAL RESOURCES AND STATUS OF NATIONAL PARKS/PROTECTED AREAS AND FLORA AND FAUNA IN HKH AS OF 1991*	
Total area	14 080 000 ha
National Parks/protected areas	11 000 ha
Number of protected areas	965
Protected areas with wildlife habitat	1 094 (958**)
Original tropical wildlife habitat	11 707 ha
Remaining tropical wildlife habitat	5 285 ha
Tropical wildlife habitat lost	54%
Number of mammal species threatened	17
Number of bird species threatened	2
Number of reptile species. threatened	4
Number of plant species occurring	6 500
Endemic flora	5
Rare and threatened plant species	15

\* Master Plan Forestry Sector Project, 1988.

\*\*Estimate by the author, 1991.

The authors suggest some appropriate mechanisms for forest management and biodiversity conservation using a sustainable approach:

- natural resource conservation and economic development in the mountains to reduce dependency and pressure on the natural resources;
- rehabilitation and regeneration of those areas with damaged or destroyed vegetation;

increase production and productivity of forests, farmlands, and rangelands so farming systems meet the needs of local people at the grassroots level;  
implement policies and institutions moving toward a common objective of managing resources for the benefit of all;  
full use of indigenous knowledge of the county's rich biodiversity, with a proper blend and application of modern science and technology and appropriate transfer of suitable successful experience as the fundamental basis for sustainable use of natural resources and biodiversity.

The document refers to the forest types analysed using 1994 NOAA satellite data and reports mixed and coniferous forest covers 41.6% of the country, excluding 14.5% of degraded forest.

The document describes the problems in rangeland areas. The main issues relate to:

inadequate understanding of rangelands and their ecosystem dynamics;  
lack of knowledge and appreciation for traditional pastoral production systems;  
rangeland degradation and loss of biodiversity due to socio-economic and climatic factors that decrease productivity;  
shortage of forage supplies, most pronounced in the winter months, which constrains improvement in livestock productivity. The regulation of winter resource access, rather than the management of the total rangeland resource, is key to the successful management of rangelands;  
weak institutional capacity and insufficiently trained personnel to adequately address rangeland development issues;  
inappropriate policies and development approaches.

**22. Shrestha, R. 1986. *Socio-economic Factors Leading Deforestation in Nepal*. HMG/USAID-GTZ-IDRC-WINROCK Project. Research and Planning Paper Series. Number 2. Kathmandu.**

This document presents the results of research conducted in the Terai and Hill areas of Nepal. The study explores forest dependency, evidence of deforestation and attitudes of farmers, local leaders and foresters. The results show a correlation between ownership of forest land and family size.

The main factor leading to deforestation is fodder collection. Dependence on forests for fodder is inversely related to farm size. Small farmers are less willing to plant fodder trees. In some National Forest areas the damage is so great that regeneration is impossible.

About 87% of the country's total energy is derived from wood. The average per-capita consumption is one cubic meter per year. In addition to home heating and cooking, large quantities of wood are consumed in the Kathmandu Valley to heat brick kilns.

Timber requirements for each household depend on altitude and ethnic group but no additional details are given in the document.

Land clearing in the Terai is increasing because it has fertile land, easy communication and transport, and an effective malaria eradication programme. Migration into this area is estimated to be 0.7 percent annually.

There is a lack of co-ordination between forestry development programmes and the resettlement programme.



**23. Subedi, B. Das, CH. Messersmidt, D. 1993. *Tree and land Tenure in the Eastern Terai, Nepal: A case study from Sirha and Saptari District, Nepal.* FAO-CFU Community Forestry Case Study 9. Edited by Daniel Shallon. Rome.**

Subedi et al conducted a case study of tree and land tenure the Eastern Terai area. Several causes of deforestation in the Terai are mentioned. The Terai was once a dense forest belt. After the anti-malaria programme in the 1950's it was opened to clearing and farming and now very little natural forest remains. In the early 1980's, with the support of the Sagarmatha Integrated Rural Development Project, some forest plantations were established on 1 338 ha of land, including the natural forest. The intent was to upgrade the existing forest, provide more timber and fuelwood resources and stabilise streams and riverbanks.

The author develops an interesting analysis on how tenure issues and dependency might motivate a group to plant or cut trees. Patch planting is done on private farmlands larger than 2 to 3 ha and on common properties. Line planting usually is done on boundaries, especially with *Moringa oleifera* and *Delonix regia*, to avoid shade that can affect the adjacent cultivated fields. Scattered planting is done in home compounds and by small farmers and the near-landless (nut trees, fuelwood and timber trees). Hedges are planted as protection against livestock.

The authors classify land tenure as private, common or government reserves. The way that people relate to these areas are different depending upon their social status, economic condition, gender or caste.

The common land is divided into village forests (used by a community with an authorised management plan) and wasteland. The wasteland concept is applied to those areas in which agriculture crops, trees or other profitable products (bamboos and grasses) are not viable and not grown. In the subsistence economy of Nepal, common land can be used as a source of fodder, fuel wood collection, medicine plants, roots, tubers, etc.

Government areas are established to exclude the community from the forest area.

Religious and cultural factors also contribute to the management of forests. Funerals in Nepal need specific trees for the ceremony and these are protected and well managed by communities.

**24. Tachibana, T. Pokharel R. Raymajhi S. Otsuka, K.1999. *Dynamics of Common-Property Forest Management in the Hill Region of Nepal.* Seminar on Forest and Agriculture in the Hills of Nepal. NAES, CEAPRED. Kathmandu.**

This study analyses the causes and consequences of forest user group management in the Nepal Hills. The study used aerial photos to determine forest condition. However, the authors found that in the Nepal Hills this technology is inappropriate. The reason is that user groups collect minor products such as fodder and branches but not timber, and these products cannot be evaluated with this technology.

The authors postulated that the lower crown cover they observed as of 1978, the greater the probability of forming a user group. Similarly, the smaller the size of the community the more likely it is to form a user group. They also found that formal user group management leads to improved

forest condition. Complete prohibition of tree cutting and grazing by formal user groups are the major factors affecting forest resource condition.

The authors proposed to conduct more research on the impact that the caste system has on forest management and enforcement of rules and regulations inside user groups.

**25. Upadhyaya H. Otsuka, K. 1999. *Community Forest Management in the Hill Region of Nepal: Rules and Practice in Firewood Collection*. Seminar on Forest and Agriculture in the Hills of Nepal. NAES, CEAPRED. Kathmandu.**

The authors state that one of the critical factors leading to deforestation is the absence of clear ownership rights to forestland and resources. They argue that, without ownership rights, incentives to protect or regenerate natural resources do not exist. They mention that traditional economists have proposed private ownership as an alternative but the cost of management is high. Other authors cited believe that local communities have the potential to perform effective management of natural resources, particularly if they are granted formal and assured land rights.

The study attempts to explore statistically how effectively the management rules for common property forests are enforced in practice by estimating labour allocation, firewood extraction and labour-sharing functions. The study was conducted in 99 forests in the Hills of Nepal. Special emphasis was given to the analysis of scarcity of resources, forest area, household organisation and numbers, fuelwood as the main forestry resource extracted from the forest area and rules and regulations.

The main conclusions of the study are:

if there are no rules and regulation the "tragedy of the commons" will occur in forest areas;  
users groups tend to be formed after the forest has become degraded and forest products scarce;  
the "open day" rule for collecting fuelwood is an appropriate management and monitoring strategy when user groups act as mutual supervisors and forest watchers. It produces the best results in small forest areas;  
major restrictions are more effective when there are formal organisations compare to informal organisations;  
tree planting usually takes place on private land.

## 5 Results of interviews conducted in Nepal

A wide range of information was collected on forest change at the country level, including published and unpublished information, interviews, comments and discussions with professionals of the Nepal forestry sector.

Forest change perceptions are different from country to country, time to time, and people to people. (Personal comment , Professor Chen Wang Wei).

During the interviews, professionals commented on changes that resulted from the Nepal Forestry Policy since 1960. In 1960, Nepal's forests were nationalised. All trees, including those on private land, were considered national property. As a consequence, there was no incentive for people to manage, plant, or conserve the forests and trees. The impact of this policy was not formally evaluated, but they estimated that a great deal of illegal cutting took place.

In 1980 this policy was revised and changed to the existing one that categorises Nepal's forests into two major categories: National forests and private forests.

National forests have been divided into five groups:

Government Terai area;

Community forests managed by forest user groups;

Leasehold forests, further subdivided into: (1) deteriorated lands given to groups of at least three households above the poverty line under 40 year leases, (2) leaseholds for forest industry, and (3) leaseholds for tourism;

Religious forests;

Protection forests and protected areas.

Leasehold forests for poor people are a project funded by International Food for Agricultural Development, the World Bank, and the Asian-Pacific Development Bank. Leasehold users receive a loan for forest plantations or forest regeneration and animal production. Through these activities the families can guarantee their survival and will increase the forest cover of the country.

There are many positive and negative arguments in relation to the leasehold project. The unique aspect is that it is the only forestry project that targets the poorest of the poor and marginal groups. The leases are for 40 years. The people receive their loan from an international institution or bank, which avoids traditional loans made inside local communities that can imply long-term family commitments, debts of gratitude, etc.

One of the difficulties in the implementation of the project is to identify the poorest sector and marginal groups. Because of their traditional practices and distribution of labour, these groups are very busy working the fields, collecting forestry products (especially firewood and forage) and feeding animals, and it is often difficult to locate them.

The initial leasehold project began in 1974. Since that time the value of the Nepal Rupee has decreased. Thus, the people that accepted a loan 1974 are now paying seven times more than the initial loan plus 2% interest. Even though the banks said that these loans are "soft" loans, those same banks required the formal devaluation of the Rupee. The sustainability of the project has been

questioned because it depends on international support. The Government is now looking for local alternatives that will allow the continuation of the project.

Nepal is divided into three main regions: the Terai area, the Middle Hills and the Himalayan or High Mountains.

The Terai is the more controversial forest area because it has the best quality forests and easy access to markets and roads. This area is basically National Forest, with some protected areas and very few community forestry areas. It is argued that these forests should be under government use and management because the revenues from these areas should be invested in national development activities. As an opposing argument, community forestry movements say that they have invested more money in their own development as a result of community forestry activities in ten years than the Government has done during the same period of time.

It is very well documented is that, historically, people from the Middle Hills used to move to the Terai areas on a daily basis to collecting forest products and for crop production. At night they moved back to the Hills where they had their own houses. During the decade of the 1950's a programme of malaria control was implemented in the Terai. The disease was eliminated but the use of DDT had a direct negative impact on the environmental condition of the area and an indirect effect on migration processes. Once malaria was controlled, people from the Middle Hills settled in the Terai on a permanent basis. Roads were built in the Terai and a railroad in India. The communication system was improved between India and Nepal. All these factors affected forest condition, leading to deterioration in both quantity and quality, mostly inside Nepal's borders.

The Middle Hills (600 to 2 000 meters elevation) is where most of the community forestry activities take place. Community forestry regulations assign the right and responsibility for forest management and protection to the traditional forest users. Users must be legally organised and recognised as a Forest User Group (FUG). User groups develop and present their forest management plans to the Department of Forestry (DoF). Once the management plan is approved the DoF will hand over forest management in the area to the FUG. The FUG and the DoF are supposed to revise the plan every five years.

Community forestry was officially recognised and regulated in 1995, but community forestry practices actually began in 1993. Also in 1993 the Wildlife Conservation Act was passed which included the concept buffer zones and people's participation.

Community forestry projects have been easy to implement in the Hills because the inhabitants of these areas are the traditional users of the forests. They are not migrants, some of them own their own land, and others have a traditional system of using the forest as common property. These areas are high populated, with a very high percentage of emigration to the Kathmandu Valley, to the Terai and the Himalayans or High Mountains. Forest regeneration in these areas is relatively easy when soil conditions have not deteriorated.

In areas over 2 000 meters in elevation forest depletion is generally due to grazing activity. In these areas, people basically depend on livestock raising because the land and climate are not appropriate for crop production. Up until now the Government has not controlled grazing. There is also a large demand for fuel wood for cooking and heating. In these areas forest regeneration is very difficult due to the climate, particularly the very low temperatures.

## 5.1 The problems

There are contradictory opinions and lack of consensus as to the impact of forest use, marketing systems, tourists and community forestry practices on forest depletion and recovery. Reliable data are often lacking. The arguments and positions are presented below.

Professionals have two different ways of analysing forest cover change in Nepal. One way is to divide the country into geographic zones: the Terai, Middle Hills and Himalayas or High Mountains. The other way is to analyse the origin of settlements and types of land use (traditional and new) over time, both of which have had an impact on the quality of the forest, the organisational capacity of the forest users and the traditional uses of forest areas.

The arguments in relation to Terai forest deterioration are:

- poverty and forest dependency;
- high quality and quantity of the forest in this area representing wealth to the country and therefore open to negotiation at the international and national levels;
- increased depletion because of better access to external markets, primarily India;
- illegal cutting, felling and logging activities;
- corruption;
- population density increases through migration and natural growth, usually of people that have not been traditional users of forests;
- lack of Government capacity to control these actions and internal corruption.

Professionals interviewed stated that forest cover change is an issue of proper management. A good management plan should result in forest productivity and sustained production of forest products and, at the same time, satisfy human needs and allow forest regeneration.

Communities use forests as a common property resource in Nepal. Use and access rights have been carefully respected as they evolved over the years. Over time mountain economies have changed and state intervention and regulations implemented in 1960 nationalised the forests. With this policy, communities lose their local autonomy.

Others mentioned that forest depletion began when forest practices changed from traditional subsistence use to cash income from forest products. This was made possible by road construction that permitted access to markets.

The loss of or denied access to forest resources hit poorer people harder than others because of their dependence on forest products. As the resources on common properties are now being managed ownership and responsibility are not clear defined. These resources belong to the nation but the national government does not have the capacity to manage them.

The activity of forest-based industries has produced short-term economic benefits but at the cost of deterioration in forest quality. Harvesting has been done without management plans, or with management plans that were not monitored. The revenues from these activities have not been re-invested in forestry programmes such as fire control, pest control, training, or forest conservation.

In the High Mountain areas it is difficult to have full registration, supervision, and monitoring of forestry and land use practices at the local level because of the lack of infrastructure. Roads,

electricity and communications are very expensive and uncertain in these areas because of the steep slopes, the types of soils and the potential for earthquakes. Forest monitoring is very difficult.

Community forestry regulations require that these areas need to be used primary for subsistence purposes by the users and for community development projects, but not (or only very limited use) for commercial purposes. If marketing of forest products takes place, it should first satisfy the demands of all the users involved. Further, it should be confirmed that there are no other user groups that need the forest's products, or they should have priority to buy the forest's products. The last option is to sell the products in markets outside the community.

There are some commercialisation of forest products in Kathmandu, and the Department of Forestry is trying to control the process. The first problem has been timber prices. The Department of Forestry has established government timber prices to avoid intermediaries who were paying lower prices to user groups for their forest's products. The Department of Forestry is trying to ensure that users know the official prices so they will not be exploited. Timber and forest products are quite expensive in the Kathmandu Valley.

Depending upon the area, community forestry could be done either with plantations or natural regeneration. In some places there is adequate natural regeneration, and it even competes with plantations. In such areas, plantations are needed only in areas such as rice terraces, agro-forestry systems, the very high mountains or where the soil quality is poor.

Some professionals stated that the community forestry policy and user groups have made a significant contribution in improving the quality of the forests in the Hills. But it was also mentioned that there is no information or assessment that shows that community forestry has not had a negative impact on the Upper Hill area. Many of the community forestry users may also collect forest products from the Upper Hill (basically the National Forest areas). This means that the National Forests are acting as a subsidy to support the community forestry programme.

In any case, the community forestry policy could be considered successful because the Middle Hills are in better condition. It is expected that within five more years, when the community forestry areas improve further in quality and quantity, the forest user groups will tend to use their own forests more and extract their products from these areas that are closer to their villages. This may alleviate pressure on the fragile Himalayan ecosystems, perhaps permitting them to recover.

Even though community forestry appears to be a successful programme, it covers just 10 to 15% of the total forest cover of Nepal, so the impact is still limited.

Community forestry is difficult to implement in the Terai because the traditional user groups are located far away from the forest. The new immigrants to this area are located closer to the forest, but giving the right to use the forest area to one group will deny the right of the other group, with the potential for conflict.

Another problem with community forestry in the Terai is that users are asking for larger areas, managed by a large number of users, that make the forest user organisation difficult to manage. It is virtually impossible to manage an assembly of 2 000 people. As an alternative, the Forestry Department is proposing a revision of the regulations in order to limit the number of households and the area of forest in each community forest. As a counterproposal, local groups maintain that deforestation is prevalent in the Terai because it is accessible for cutting and marketing forest products, there is high demand and the Government does not have the capacity to manage the

National Forests. Community forestry has been proven to have this capacity. In one pilot area, users have been allowed to establish the way they want to organise themselves and Government officials monitor the area.

Others state that the Government should be responsible for the Terai area because it is a risk for user groups to control areas along the border with India.

In relation to the tourism industry, it was mentioned that eco-tourism has been a good income alternative in the Terai. However, tourism infrastructure in the mountains has been a source of forest depletion. Trekking activities were evaluated as both positive and negative in different interviews.

Other effects of community forestry activities include:

Leopards and other predators have attacked people and livestock.

There have been some problems in relation to the extraction of timber products for commercial purposes. If these activities are not included in the community forestry management plan they are not supposed to be done. If commercialisation takes place, the Department of Forestry is considering taxing these products, but it is not clear how this procedure would be implemented.

Appropriate technology for timber product extraction is lacking and markets are far away from the Middle Hills where most community forestry programmes are implemented.

Community forestry was planned and promoted as a subsistence alternative for the production of fuelwood, fodder, medical plants, etc., and not as a programme for poverty alleviation. Now that community forests are beginning to produce timber and other products at more than the subsistence level it will be more difficult to control the distribution of benefits. Monitoring and distributing the benefits in an equitable way will be a new challenge that community forestry user groups and the Ministry of Forestry and Soil Conservation will need to face in the near future.

The Department of Forestry is a weak governmental institution, with few personnel. Every day there are more Community Forestry Programme applications. In addition, community forestry management plans should be revised every five years and approved by Department of Forestry. With the present number of people it will be impossible for the Department of Forestry to respond to the demands placed upon it.

Equity problems: When the Government was in charge of the forests it was the objective to keep people outside the forest. Now the forests users groups, through the Community Forestry Programme, are in charge of many of the forests. Some forest user groups are headed by elites (land owners and people of higher caste) who may have their own trees and not need the common forest resources. In these cases management plans might be developed basically for preservation purposes, directly affecting minority and marginal groups that are dependent on the forest. They will then have to extract their products from the National Forests to satisfy their needs.

Other professionals mentioned that even though the caste system exists, communities have their own organisation systems and that in many cases higher classes are the ones that take care of satisfying the needs of lower castes as part of the forest management system. So it depends on the area, the group and the people. It is up to the forest ranger to guarantee the inclusion of marginalised groups so that all members receive proper benefits.

## 6 People met

Winston Ruthven Rudder	Nepal FAO Representative
P.M. Shresta	FAO Forestry National Officer
Frist Ohler	CTA Hills Leasehold Forestry and Forage Development Project
Egbert Pelinck	Director General International Centre for Integrated Mountain Development ICIMOD
Moe Myint	GIS Specialist ICIMOD
Chen Guang Wei	Division Head Natural Resources ICIMOD
Ambika Adhikari	Country Representative IUCN
Siwakoti	Botany Specialist IUCN
Kanchan Verma Lama	Gender and Development DoF and Soil Conservation
K.B. Shresta	Community Forestry and Soil Conservation
Steve Hunt	Community Resource Management Project
Laurits A. Hansen	Natural Resource Management Sector Assistance NARMSAM
Amrit Joshi	NARMSAP
George Varughese	UNDP Official
Bal Ghopal	New Era Research Institution



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**Pelenick, E.** 1998. *Community-focussed Approaches to Biodiversity Conservation.* ICIMOD. Newsletter. (31) 1998. Kathmandu.

**Sakurai, T. Raymahi S. Pokaherl R. Otsuka K.** 1999. Communal Vs Private management of Timber Forest: a case study from inner Terai of Nepal. Forest Management and Agriculture in the Hills of Nepal. Kathmandu.

**Shengi-ji, P. Sadeque S. Myint A. Richard C.** Not dated. *Training Manual on Application of GIS an RS to Assessment, Monitoring and Management of Mountain Natural Resource.* ICIMOD. Vol. (1). Kathmandu.

**Shrestha, R.** 1986. *Socio-economic Factors Leading Deforestation in Nepal.* HMGN/USAID-GTZ-IDRC-WINROCK Project. Research and Planning Paper Series. Number 2. Kathmandu.

**Subedi, B. Das, CH. Messershmidt, D.** 1993. Tree and land Tenure in the Eastern Terai, Nepal: A case study from Sirha and Saptari District, Nepal. FAO-CFU Community Forestry Case Study 9. Edited by Daniel Shallon. Rome.

**Tachibana, T., Pokharel R., Raymajhi S., Otsuka, K.** 1999. *Dynamics of Common- Property Forest Management in the Hill Region of Nepal.* Seminar on Forest and Agriculture in the Hills of Nepal. NAES, CEAPRED. Kathmandu.

**Upadhyaya H., Otsuka, K.** 1999. *Community Forest Management in the Hill Region of Nepal: Rules and Practice in Firewood Collection.* Seminar on Forest and Agriculture in the Hills of Nepal. NAES, CEAPRED. Kathmandu.

## Secondary Bibliography

FAO. DTCP. 1988. *Monitoring and Evaluation system for the department of conservation and watershed management.* 1988

His Majesty's Government of Nepal. 1988. Ministry of Forests and Soil Conservation. *Master Plan for Forestry Sector Nepal.* Kathmandu.

Kanel, K. K. 1998. Leasing Public Land to Poor and marginal Families: an initial assessment of Baramchi site. *Hills Leasehold Forestry and Forage Development Project IFRI case study.* FAO-IFAD. Nepal.

Stahapit, K. 1990 *Soil Conservation Status in Nepal.* Minister of Forest and Soil Conservation. Nepal.

## Appendix 1: Disturbed forest

Brown, K. Pearce. 1994. *The causes of Tropical Deforestation*. University of British Columbia. Canada  
Document availability: Photocopies of some articles are available in the FRA Library.

This document presents a compilation of studies with various hypotheses as to the causes of deforestation in tropical forests. It presents mechanisms that could provide incentives for the conservation and sustainable management of tropical forests (Data presented in the document are based on FRA 1990).

CIFOR. 1999. *Proceedings of the Global Workshop. Underlying Causes of Deforestation and Forest Degradation held in Costa Rica*. 1999. Sixty case studies and discussion papers  
Document availability: FRA Library.

Participants adopted a set of recommendations (Annex II of the document). This was the final consultation meeting after several meetings in Asia, Africa and Latin America. There was no standard methodology for the conduct and reporting of case studies, so it is difficult to compare results. Conclusion are very general.

CIFOR. 1996. *Rates and Causes of Deforestation in Indonesia: towards a resolution of the ambiguities*. Sudendelin W. Resosudarmo I. *CIFOR occasional paper 9*. ISSN 0854-9818. Indonesia.  
Document availability: Centre for International Forestry Research CIFOR ([cifor@cgnet.com](mailto:cifor@cgnet.com)).

Indonesia: There have been several research efforts on the rate and causes of Indonesia's deforestation in recent years, but there is still no consensus in the research community on these causes. The paper reviews these areas of uncertainty and confusion, including the problem of imprecise and conflicting definitions; positive and negative effects of shifting cultivation; tree crop production (rubber, for example); migration, both encouraged and spontaneous; and population density. There is a correlation between population density and deforestation, but it is not clear whether it is causal or incidental. There is typical sequence whereby forests are first cleared by loggers and then occupied by agriculture. Logging takes place on from 77 000 to 120 000 ha annually. Little information exists related to management of logging concessions.

There is a need to study the recuperative capacity of forests following clearing, degradation or other poor management practices. Studies are also needed on the costs and returns of plantations, especially in comparison to agriculture.

Drigo R. and Marcoux A. 1997. *Population Dynamics and the Assessment of Land Use Changes and Deforestation*.  
FAO. Rome 1997.

Document availability: Population And Environmental Linkages  
(<http://www.metla.fi/info/vlib/forestgen/breeding.htm>); FAO  
(<http://www.fao.org/sd/Wpdirect/WPam0030>)

Brazilian Amazon: Analyses the linkage between population and deforestation in tropical countries. Looks at population-deforestation linkages using several geographical levels and approaches. Simplistic methods may lead to misconceptions and false conclusions.

Method and model: Model for estimating forest change; regional biomass flux diagrams.

Minde, I. Ngugi, D. Luhanga, J. Kowero, G. 1999. *Agricultural Land Expansion and Deforestation in Malawi* (draft).  
Unpublished material  
Document availability: FRA Library.

Malawi: Literature on deforestation in Malawi points to a number of causes including high population in relation to available land, poverty, markets, policy failures, drought and the severity of structural adjustment policies. The prevalence of small land holdings leads to cultivation of marginal lands and forest encroachment. When macroeconomic structural adjustments tend to increase the prices of agricultural products the pressure on forest areas increases.

Human population impacts forests through demand for fuelwood and agricultural production, but it is important to know the proportion of material that is collected from the living forest as opposed to dead branches. This can help assess if the activity is driving deforestation or forest degradation.

Ostrom E. 1995. *A framework relating human driving forces and their impact on biodiversity*. Workshop in Political Theory and Policy Analysis. Indiana University. USA.  
Document availability: Indiana University ([workshop@indiana.edu](mailto:workshop@indiana.edu)).

The author presents the problem of measuring social, political and economic variables that affect forest condition. It is difficult to determine the right scale for measurement and analysis. As an alternative, Ostrom presents human choices and the variety of adaptations that individuals may make when populations increase and resources become scarce.

Method and model: International Forestry Resources and Institute (IFRI) research methodology: micro-level, multiyear, multi-country study of demographic and institutional variables and these impacts on human incentives, behaviour and forest ecology.

Palloni A. 1992. *The relation between Population and Deforestation: Methods drawing cause inferences from Macro and Micro Studies*. Workshop on Population and the Environment. Mexico.  
Document availability: The Social Science Research Council. Workshop On Population and The Environment. FRA Library.

This document presents population pressure as an important force leading to deforestation, but rarely acting alone to produce the outcome. The qualitative analysis in this study identified important social institutions that can create an environment where population pressure may or may not affect deforestation. Data was provided by the Center for Advanced Studies in the Behaviour Science for Latin America, Africa and Asia.

Method and model: Meta-analysis, a combination of statistical techniques designed to convert disparate statistics to a common system, and development of a coefficient of correlation.

Remarks: Different definitions were used in the countries studied. Each study used a different model or simplification. It was not possible to standardise the estimation procedures used in each study.

Repetto, R. 1999. *The Forest for the Trees*. World Resources Institute. USA.  
Document availability: <http://www.wri.org/wri/critcons>

USA and some developing countries (Indonesia, Malaysia, Philippines, China, Brazil, West Africa): A policy document showing how governments, although committed in principle to conservation and wise resource use, are exacerbating the loss of their forests through misguided policies. Analysis of forest sector policies.

Method and model: Not available

Turner, P. 1995. *Explaining Deforestation a preliminary review of the literature*. Workshop in Political Theory and Policy Analysis. Indiana University. USA.  
Document availability: Indiana University [workshop@indiana.edu](mailto:workshop@indiana.edu) and FRA Library

The author presents a summary and logic of the various explanations of the causes of deforestation. This review essay is an initial step in a project sponsored by the Beijer Institute of the Royal Swedish Academy of Science that will allow researchers to examine deforestation at multiple levels of analysis. The documents organises the causes of deforestation by (1) demographic factors; (2) agricultural factors (3) macroeconomic factors; (4) industrial factors; (5) forest accessibility; (6) political factors; and (7) land use constraints.

Verolme, Hans JH. Moussa, Juliette. April 1999. *Addressing the Underlying Causes of Deforestation and Forest Degradation. Case Studies, Analysis and Policy Recommendation*. Biodiversity Action Network. Washington.  
Document availability: Raincoast Conservation Society (<http://www.raincoast.org>) and Biodiversity Action Network (<http://www.wrm.org.uy>)

World Bank. 1998. Summaries. *Underlying causes of deforestation* Meeting in Accra, Ghana 26-29 October. 1998.

World Bank. 1998. Summaries. *Underlying causes of deforestation and forest degradation* West Java, Indonesia 4-6 December 1998.

Document availability: <http://www.worldbank.org>

Web site articles with summaries provided from Bank staff for different meetings.

Africa, Asia: Underlying causes of deforestation meetings in Ghana and West Java. Participants mentioned that the structural adjustment programmes of the World Bank had affected the process of forest conservation. Adjustment programmes influenced governments to reduce public expenditures, resulting in the reduction of forest department staff. There are also contradictory strategies between agriculture and forestry. Other major causes were issues of governance, corruption, lack of transparency and participation in decision-making and the rise of militarism.

Method and model: No information available

World Bank. 1999. Summaries. *Forests and Sustainable Rural Livelihood Expert Meeting* April 14-16. United Kingdom.

Document availability: <Http://www.worldbank.org>

Web site articles with summaries provided from Bank staff during different meetings.

Asia: The document describes the impact that the poor have on forest degradation and deforestation and the impact that forest degradation/deforestation and various forest policies have on the poor. The draft document will be placed on the web site when it becomes available. The author points out that there is little information about degradation of ecosystems at the local level compared to the information available relating to the global and regional levels.

Method and model: No information available

World Resources Institute. 1999 *Critical Consumption trends and implication degrading earth's ecosystems.*

Washington. USA.

Document availability: <http://www.wri.org/wri/critcons>

For more information: [robinz@wri.org](mailto:robinz@wri.org)

General: Consumption patterns contribute to the degradation of the earth. Wood fibre consumption and logging have increased during the last year. Changes in consumption habits and improvements in technology and efficiency (alternative products, recycling, etc.) are opportunities that could reduce the impact on ecosystems.

Method and model: No information available.

## **Recommended readings**

*Aid that destroys the forest.* International Agriculture Research 16. No 6 (1996):11-12

Document availability: <http://www.cgiar.org/ipgri/> Virtual library.

General: Deforestation.

Bhusal, Thapa. Weber. 1998. *Thailand Disappearing forests- the challenge to tropical forests.* International Journal of Environment and Pollution 9. No 2-3 (1998):198:212

Document availability: CGIAR-IPGRI (<http://www.cgiar.org/ipgri/>) virtual library.

General: Forest ecology and management.

FAO-FO 1989. Catterson, T. M., Gulick, F. and Resh T. *The role of forestry in combating desertification.* Proceedings: FAO conservation guide. Expert consultation. Rome.

Document availability: FAO Forestry Library.

African experience drawn from USAID activities.

Magnusson, W. de Lima. Ries. Niguchi. Ramos. 1999. *Logging activity and tree regeneration in the Amazonia forest*. Forest Ecology and Management. 113, No 1:67-74.  
Document availability: CGIAR-IPGRI (<http://www.cgiar.org/ipgri/>) virtual library.

General: Forest ecology and management.

Matlack. G. 1997. *Four Centuries of Forest Clearance and Regeneration in the Hinterland of a large city*. Journal of Biogeography 24. No 3 (1997):161-65  
Document availability: CGIAR-IPGRI (<http://www.cgiar.org/ipgri/>) virtual library.

General: Regeneration

Rocha J. 1997. *Huge projects threaten to devastate the Amazon*. The Guardian. August 1997 (news article).  
Document availability: The Guardian (<http://www.earthnet.net/~popnet/amazon.html>) virtual library

Amazon: Brazil, Colombia and Venezuela: The article describes development projects proposed for the Amazon region. Around 50 000 inhabitants will be affected.

## Appendix 2: Forest assessment

Topics include: Inventories, early warning systems (especially fires), monitoring systems.

Achard, F. Malingreau, JP. 1999. *TREES*. Monitoring Tropical Vegetation Unit, JRC, TP 440, 21020 Ispra (VA), Italy.  
Document availability: Tropical Ecosystem Environmental Observation by Satellite, TREES home page.

Monitoring change in the forests of the tropical belt by remote sensing. TREES is developing techniques for a global tropical forest inventory using AVHRR and ERS-1 as the main source of data supplemented by high resolution optical data. They are also developing techniques for the detection and monitoring of the active deforestation areas and measurement of deforestation rates in critical areas. A comprehensive Tropical Forest Information System is being developed to support the modelling of tropical deforestation dynamics.

Method and model: Monitoring tropical forests using remote sensing, intensive data collection

CIAT-UNEP. 1999. *Environmental And Sustainability Indicators*. CIAT Homepage.

Document availability: <http://www.ciat.cgiar.org/indicators/unepeciatic/public.htm>

Presents a conceptual framework that facilitates the analysis and monitoring of the environmental impact of development projects and programs. The author's hypothesis is that for any pressure (or use) of the forest resources, the quality and quantity of the resource will change, with consequent impact on society. Society will respond to that impact and will create new technologies as an adaptation, which will cause new pressure on the resource, re-initiating the cycle.

Methods and models: Sustainability models, Land Use Change Analysis (LUCAS), Agriculture and Environmental Geographic Information System (AEGIS), Integrated Model to Assess the Greenhouse effect (IMAGE), Toward a fully integrated model of the global dynamics for the analysis of sustainable development (TARGET), Dynamic GIS Sustainable Development model (GIS-SD), Ecological Change Model Gallopin/Winograd.

Lund, Gyde 1997. IUFRO. *Primer on Designing Arid Land and Gallery Forest Resources*. University of Brasilia. Brazil.

Document availability: IUFRO virtual library: (<http://iufro.fpp.csiro.au/iufro/publications/pub.htm>)

Herbohn J. Harrison S. Emtage E. 1997 *Financial Models for Small Scale Farm Forestry*. Kyoto University. Japan.

Document availability: IUFRO virtual library (<http://iufro.fpp.csiro.au/iufro/publications/pub.htm>)

Case studies on sustainable management of small scale forestry

Models and Methods: Financial models for small scale farm forestry in Japan

Kaimowitz, D. & Angelsen Arild. 1998. *Economic Models of Tropical Deforestation*. Indonesia. Conference on Assessment and monitoring of forests in Tropical Dry Regions with special reference to gallery forest. Indonesia.  
Document availability: IUFRO virtual library (<http://iufro.fpp.csiro.au/iufro/publications/pub.htm>)

The document presents several models and methods to determine the basis for degradation of arid and gallery forests. The author reviewed 150 models that propose to explain the causes of deforestation. The author found that multicountry regression models have limited value in making global recommendations. He recommends a shift of analysis from the global toward household and regional level studies.

Salver, R. Sigh, A. Fosnight E. 1999. *Global Forest FireWatch: Wildfire Potential, Detection, Monitoring and Assessment*. UNEP.



Document availability: Population And Environmental Linkages  
(<http://www.metla.fi/info/vlib/forestgen/breeding.htm>); UNEP  
(<http://grid2.cr.usgs.gov/indofire/firepaper.html>)

Mapping of potential fires, detection of fire starts, monitoring of fire movement and assessment of the impact of wildfire at regional and global scales. Describes the Global Forest Fires Watch System, using earth observation technologies and local expert knowledge. Based on vegetation maps, satellite images and weather information systems.

World Conservation Monitoring Center. 1999. Information web page.  
Document availability: WCMC (<http://www.wcmc.org.uk/forest/indes.html>)

The forest program of WCMC, in collaboration with IUCN and CIFOR, is developing a Biodiversity Map Atlas of Tropical Forests. It includes information on forests, projects and protection status.

WCMC. 1999. *Strategic Planning*. June 1999.  
Document availability: WCMC (<http://www.wcmc.org.uk/forest/indes.html>), e-mail [info@wcmc.org.uk](mailto:info@wcmc.org.uk)

- Provision of forest information as required.
- Working with WWF, IUCN, UNEP, IIED, FAO, IPF, and ITTO to compile data and provide relevant information at international, regional and national levels.
- Working with the Institute of Terrestrial Ecology and FAO on the feasibility of developing a general global nomenclature for land cover and land use.
- Forest Resource Accounting\* (FRA) forest monitoring system at national level.
- Global overview of forest cover through the Biodiversity Map Library.
- Low forest cover: needs a requirement from countries.
- System of analysis of world's forests.\*\*
- Conservation and management of trees.
- Forest indicators.
- Contribution to Global Forest Resources Assessment 2000: Giving advice on parameters to enhance ecological information values and functions of forests.

\*Forest Resource Accounting is a pilot study in Ecuador, Guyana, Indonesia and Pakistan. Forest Resource Accounting keeps down the cost of information usage by focusing on what is essential, i.e. information to set, achieve and review forest policy and management goals. Forest resource accounting focuses on three areas of information: the supply of forest assets, the demand for forest goods and services and the use of forest resources.

\*\*Forest condition and diversity including plantations and natural forest; incorporation of mapped information on world-wide human population distribution and density to analyse forest distribution, fragmentation, type and condition in relation to population data.

### Secondary sources

FAO-FO. 1997. *SOFO. Situacion de los bosques del mundo*. Departamento de Montes. Rome.  
Document available: FAO Forestry Library

FAO- Global Forest Resource Assessment 1990. 1995. Wilcox B. Duin. *Potential forest cover differences as a global indicator*. Draft report. Institute for sustainable development. Rome.

National Oceanographic & Atmospheric Administration NASA. 1999. *Global Fire Monitoring*. USA.  
Document availability: NASA [http://modarch.gsfc.nasa.gov/fire\\_atlas/fires.html](http://modarch.gsfc.nasa.gov/fire_atlas/fires.html)

USA global change research program focuses on fires that particularly impact forests and grassland. USA, Mexico, Brazil, Africa, Indonesia, Boreal forests. Satellite monitoring through the Earth Observing System

Noss, RF 1999. *Assessing and monitoring forest biodiversity: a suggested framework*. Forest Ecology and Management. 115, no 2-3:135-46.

Document available: CGIAR-IPGRI (<http://www.cgiar.org/ipgri/>)

Forest ecology and management.

Reed N. Cooperrider A. 1994. *Saving Nature's Legacy. Protecting and restoring biodiversity*. Washington USA.

Singh K.D. and A.W. Marzoli. 1995. *Deforestation Trends in the Tropics: a time series analysis*. Document Presented at Conference WWF. Puerto Rico.

UNEP compilation. 1999 *Environmental Disasters*. UNEP-Homepage.

Document availability: Population And Environmental Linkages

(<http://www.metla.fi/info/vlib/forestgen/breeding.htm>), UNEP (<http://grid2.cr.usgs.gov/>)

Compilation of information resources on environmental disasters including global detection of forest fires. Maps data, images, articles and other links.

World Resources Institute. 1999. *The Problems of Forest Loss*. WRI-Homepage.

Document availability: WRI (<http://www.wri.org/biodiv/intl-ii.html>).

Links related to forest data, forest type and forest loss.

World Resources Institute. 1997. *Volume on global environmental and natural resource conditions and trends for the United Nations*. USA.

Document Availability: Population And Environmental Linkages

(<http://www.metla.fi/info/vlib/forestgen/breeding.htm>), WRI: ([http://www.wri.org/wri/wr96-97/lc\\_txt1.html](http://www.wri.org/wri/wr96-97/lc_txt1.html)).

WRI. UNEP, UNDP, WB. Based on FAO- Global Forests Assessment 1990. *Global Synthesis*. FAO Forestry papers 124. Rome 1995.

Presents a summary of the FAO FRA 1990 and a summary of the forest policy instruments (UNCED convention, World Commission on Forest and Sustainable Development, CITES). International document.

WRI. UNEP. UNDP. WB. 1996. *World Resources 1996-1997*. Oxford University Press. USA.

### **Other related documents**

Winograd M. 1996 *Desarrollo y uso de indicadores ambientales para la planificacion y la toma de decisiones en la Coporacion Autonoma Regional de Risaralda Marco Conceptual y Aplicacion*. CIAT. Documento de Trabajo 160. Cali

Winograd M. Eade J. 1996. *Report on Preliminary Inventory on environmental and sustainability data availability, databases and digital maps for Latin America and the Caribbean*. Working Paper. CIAT/UNEP. Colombia. (also in Spanish)

### **Global**

Achard F. and G. D'Souza. 1994. *Collection and Pre-Processing of NOAA AVHRR 1 km resolution Data for Tropical*

D'Souza, G. (in prep). *NOAA-AVHRR 1 km Classification Results for Latin America*, TREES Series B : Research Reports n°3, forthcoming .

Forest Resources Assessment. TREES Series A : Technical Document n° 2, EUR - 16055 EN, European Commission, Luxembourg, 56p.

- JRC. 1991. Strategy Proposal 1991-1993 Part 1 : *AVHRR data collection and analysis*. TREES Series A : Technical Document n° 1, EUR - 14026 EN, European Commission, Luxembourg, 20 p.
- JRC. (in prep). *TREES Conference proceedings held in Belgirate, Italy*, October 1993, TREES Series C : General Reports n°1.
- JRC (in prep). *TREES ERS-1 Study' 94 - Proceedings of the final workshop held at Ispra on 23-24 February 95*, TREES Series C : General Reports n° 2.
- Lambin, E. (1994), *Modelling deforestation Processes - A review*. TREES Series B : Research Reports n°1, EUR - 15744 EN, European Commission, Luxembourg, 113 p
- Mayaux, P. and E. Lambin (in press). *Estimation of tropical forest area from coarse spatial resolution data : a two-step correction function for proportional errors due to spatial aggregation*. Accepted for publication in Remote Sensing of Environment.
- SCOT-Conseil (in prep), *Catalogue of forest/non forest interfaces*, TREES Series B : Research Reports n°2, forthcoming May 1995, 90 p.
- Traub, B., Kleinn C. and D. R. Pelz (in prep). *Statistical aspects of the TREES stratification and calibration methodology*. TREES Series B : Research Reports n°3.
- WCMC-EOS (1995). *TREES-1 products presentation CD-ROM*, JRC June 1995

## Appendix 3: Forest management

Topics: Criteria and indicators of sustainability; conservation and protected areas; closed season; eco-tourism; environmental impact; forest investment; socio-economic and financial; management plans; indicators of change.

FAO-FO. COFO 97. *Progress towards sustainable forest management and follow up to UNCED, including implications of the work of the inter-governmental Panel of Forest (IPF)*. Forestry Department. Italy.  
Document availability: FAO Forestry Library.

Forest management, sustainability and planning.

Method and model: Not applicable.

FAO-FO. 1997. Report. *Expert meeting on criteria and indicators for sustainable forest management for Central America*. CCAD-CCAB-AP. Rome .  
Document availability: FAO Forestry Library

Method and model: Not applicable

FAO Land and Water Development Division. 1997. Benitez. Shaxon, Viera. *Land Condition change indicators for sustainable land resource management*. Rome.  
Document availability: FAO Forestry Library

Indicators and their use in sustainable agriculture and rural development.

Method and model: Not available

Morrissey, A. Zinn, J. Corn, M. 1994. *Ecosystem Management Federal Agency Initiatives*. Congressional Research Service Library of Congress.  
Document Availability: Population And Environmental Linkages  
(<http://www.metla.fi/info/vlib/forestgen/breeding.htm>), Congressional Research Service  
(<http://www.cnie.org/nle/biodv-4.html>).

Ecosystem management; co-operation and co-ordination between agencies; tools and ecosystem management; ecosystem management limits and opportunities.

Method and model: Not available in the description.

Naesset E. *Geographical Information System in long-term forest management and planning with special reference to preservation of biological diversity: A Review*. Forest Ecology and Management 93. No 1-2 (1997): 121-36.  
Document availability: CGIAR-IPGRI (<http://www.cgiar.org/ipgri/>)

Geographic information system for preserving biodiversity. Ecology.

Method and models: GIS

Repetto, R. 1988. *The Forest for the Trees? Government policies and the misuse of the Forest Resources*. 1988. WRI. Washington.  
Document availability: WRI: lauralee@wri.org

USA and Indonesia, Malaysia, Philippines, China, Brazil, West Africa: Governments committed in principle to conservation and wise resource use are aggravating the loss of their forest through misguided policies.

Methods and Models: No information available.

Schmithusen F. Wild-Eck, S. 1998. *The meaning of forests to People in the Cities-Analysis of Selected Studies on Uses and Perceptions of Urban Areas.*

Document availability: IUFRO virtual library

First Forum of Urban Forest Conference. Empirical studies related to the social meaning of forests, and the uses of forests in urban areas. Local level. Is not statistically relevant, but could be used as reference. Empirical study, qualitative data.

Whyte, Graham. 1995. *Modelling Sustained Yields from New Zealand's Plantations Forests.* Hokkaido.

Document availability: IUFRO virtual library

Modelling sustained yields from New Zealand Plantations forests. Statistical analysis about forests resources that can be used by independent and national agencies. National level statistical analysis to evaluate the sustainability of forests plantations.

World Bank. 1995. *Monitoring Environmental Progress: Can we save the forest while using the trees.*

Document availability: World Bank (<http://www~esd.worldbankorg/html/esd/env/publicat/mep/mep05htm>)

Improvements in environmentally sustainable development indicators for policy analysis. Forest Management; policy implications; goals for forest conservation management. Shifting from industrial management toward the involvement of local communities in the management of natural resources.

## Appendix 4: Forest ownership

Topics: private forest; communal forests; state forests; urban forests.

World Bank. 1999. Summaries. *Side meeting on FPIRS at IFF*. Geneva May 10 1999.

Document availability: World Bank (<http://www.worldbank.org>).

General: Web site articles with summaries provided from Bank staff during different meetings. Private ownership and secure property rights were raised as necessary to ensure long-term sustainable forestry, as these have been a main factor in retaining forests in Europe. Indigenous peoples rights was one of the issues discussed because a large number of Bank client countries have to address this issue. Other issues discussed were the potential threat of forest degradation due to the necessary increase in agricultural production in developing countries.

Methods and models: Not available

## Appendix 5: Forest services and functions

Bishop J. 1998 *The economics of non-timber forest benefits: an overview*. IIED.UK.  
Document availability: FAO Forestry Library

Environmental economics program.

Method and model: Not available

FAO-FO. 1997 Plan estrategico forestal de la FAO. *Aumentar el bienestar de los seres humanos mediante la ordenacion sostenible de los recurso arboreos y forestales del mundo*. FAO Roma.  
Document availability: FAO Forestry Library

Plan de trabajo del Departamento de Montes de la FAO.

Method and model: Not available

McGinnis, M. Ostrom E. 1992. *Institutional Analysis and Global Climate Change: Design Principle for Robust International Regimes*. Edited by Rice M. Snow J. Jacobson H. Proceedings of a Conference Global Climate Change: Social and Economic Research Issues. 45-85. USA.  
Document availability: FRA Library

The document presents an analysis of the common pool of resources and problems in implementing international regimes and agreements. The authors point out that "the current emphasis on global solutions based on international conventions meant to establish global institutions to manage environmental change may be fundamentally misguided. The policies of national governments, who are called upon to take the initiative to prevent deforestation and desertification, have in many instances been the major source of problems".

Method and model: The research is based on the Institutional Analysis and Development Framework (used to analyse common pool resources in small scale settings, especially for forestry and irrigation resources). The design principles proposed include: clearly defined boundaries; congruence between appropriate rules and local conditions; collective choice arrangements; monitoring, with graduated sanctions; mechanisms for conflict resolution; minimal recognition of rights; and nested enterprises.

Pereira. A. 1997. *Non market benefits of forest: why assess and value*. FAO/ECE/ILO. Committee on Forest Technology Management and Training. Geneva.  
Document availability: FAO Forestry Library.

Social elements of sustainable forest management in Europe.

Method and model: Not available.

## Appendix 6: Institutions

Topics included: Inventories, early warning systems (especially fires), monitoring systems.

INSTITUTION	WORKING ISSUE	GEOGRAPHIC AREA	MODELS / METHODS	REFERENCES / OTHER REMARKS
<b>TREES</b>	Monitoring forests using remote sensing	Tropical forests	Intensive data collection	In the future they want to develop an operational deforestation monitoring system
<b>IUFRO</b> <a href="http://iufro.fpp.csiro.au/iufro/publications/pub.htm">http://iufro.fpp.csiro.au/iufro/publications/pub.htm</a> Conference on Assessment and monitoring of forests in Tropical Dry Regions with special reference to gallery forests	Arid land and gallery forest	Arid land and gallery forests	Combination and selection of models	Reference: Lund, Gyde 1997. Primer on Designing Arid Land and Gallery Forest Resources. University of Brasilia. Brazil. Collected from IUFRO virtual library
<b>CIFOR</b> Economic model of tropical deforestation	Review of 150 models to understand the causes of deforestation.	Global proposal	After reviewing 150 models the author found that multicountry regression models have limited value. He recommended a shift toward household and regional level studies.	Reference: Kaimowitz, D. Author Angelsen Arild. 1998. Economic Models of Tropical Deforestation. Indonesia. Collected from IUFRO virtual library
<b>UNIVERSITY OF KYOTO</b> Case studies	Sustainable management of small-scale forestry. Financial models for small scale farm forestry.	Japan	No summary.	Reference: Herbohn J. Harrison S. Emtage E. 1997 Financial Models for Small Scale Farm Forestry. Kyoto University. Japan. Collected from IUFRO virtual library
<b>WRI</b> Joint publication WRI, UNEP, UNDP and WB. Based on FAO Global Forests Assessment 1990. Global Synthesis. FAO Forest Paper 124. Rome 1995.	Presents a summary of the FAO FRA 1990 and a summary of the forest policy instruments UNCED convention, World Commission on Forest and Sustainable Development and CITES.	International document		Reference: WRI. UNEP. UNDP. WB. 1996. World Resources 1996-1997. Oxford University Press. USA. Secondary reference: Wilcox B. Duin. 1995. Global Forest Assessment (1990) Potential forest cover differences as a global indicator. Draft report. Institute for sustainable development. USA. Singh K.D. Marzoli W.A. Deforestation Trends in the Tropics: a time series analysis. Conference WWF, Puerto Rico. 1995 Reed N. Cooperrider A. 1994. Saving Nature's Legacy. Protecting and restoring biodiversity. Washington,



## FRA Working Papers

1998

1. *FRA 2000 Terms and Definitions* (18 pp. - E/F/S/P)
2. FRA 2000 Guidelines for assessments in tropical and sub-tropical countries (43 pp. - E/F/S/P)  
1999
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6. *Country Maps for the Forestry Department web site* (21 pp. - E)
7. *Forest Resources Information System (FORIS) – Concepts and Status Report* (20 pp. E)
8. *Remote Sensing and Forest Monitoring in FRA 2000 and beyond*. (22 pp. - E)
9. *Volume/Biomass special Study: Georeferenced Forest Volume Data for Tropical Africa* (97 pp. – E)
10. *Memorias del Taller sobre el Programa de Evaluación de los Recursos Forestales en once Países Latinoamericanos* (S)
11. *Non-wood forest Products study for Mexico, Cuba and South America* (draft for comments)(82 pp. – E)

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