



**TOGETHER**  
*for a sustainable future*

## OCCASION

This publication has been made available to the public on the occasion of the 50<sup>th</sup> anniversary of the United Nations Industrial Development Organisation.



**TOGETHER**  
*for a sustainable future*

## DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

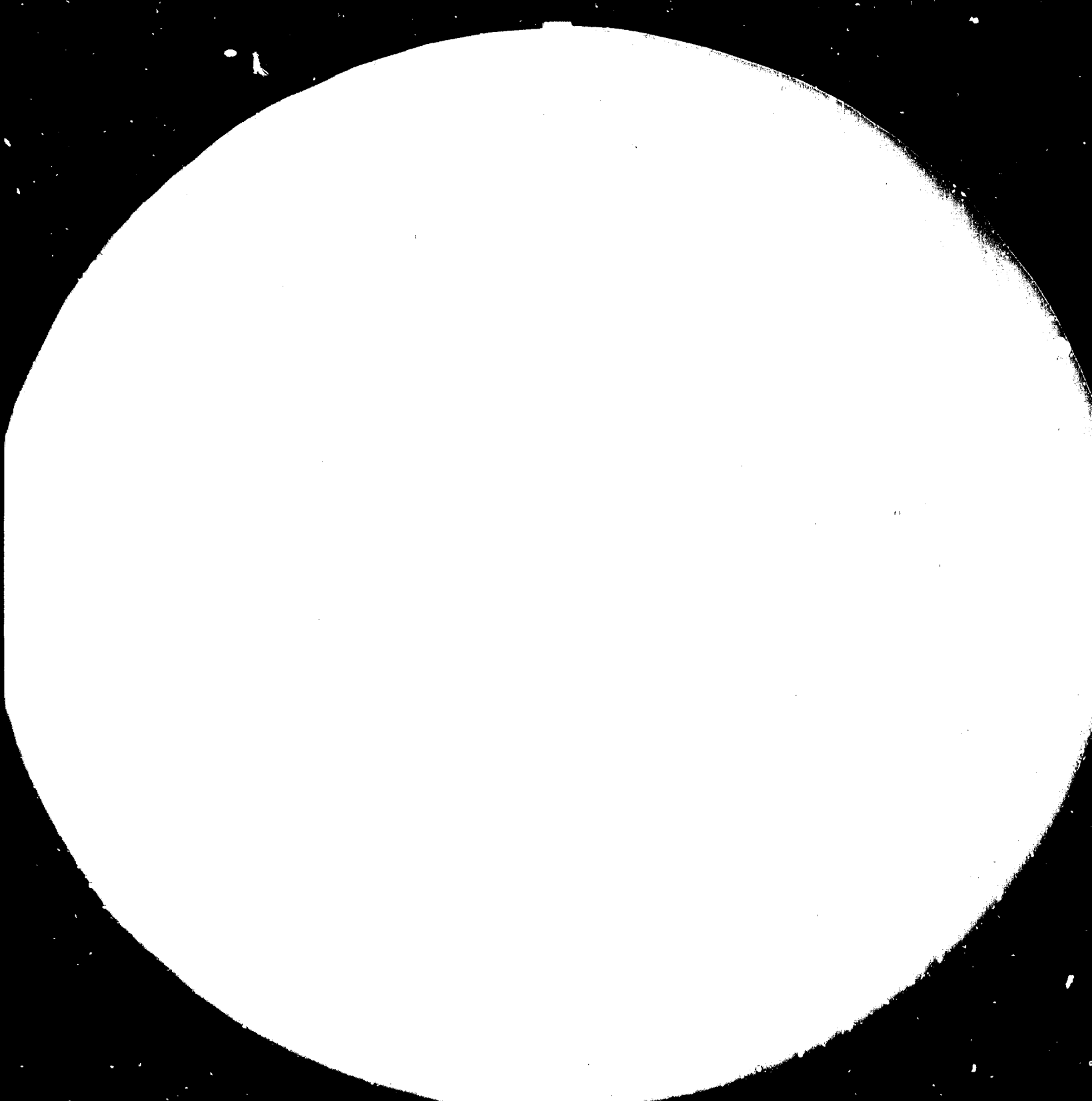
## FAIR USE POLICY

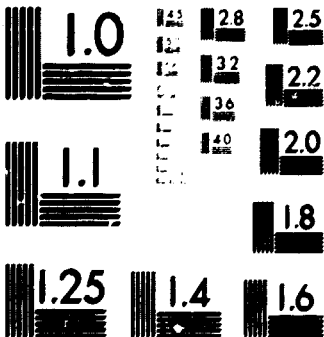
Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

## CONTACT

Please contact [publications@unido.org](mailto:publications@unido.org) for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at [www.unido.org](http://www.unido.org)





MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS-1963-A



UNITED NATIONS INDUSTRIAL DEVELOPMENT  
ORGANIZATION



FOOD AND AGRICULTURE ORGANIZATION  
OF THE UNITED NATIONS

**FIRST CONSULTATION  
ON THE WOOD  
AND WOOD PRODUCTS INDUSTRY**

**Helsinki, Finland  
19 - 23 September 1983**

**Distr.  
LIMITED**

**ID/WG.395/6  
30 June 1983**

**ENGLISH  
Original: FRENCH**

**12671-E**

**BALANCING SUPPLY AND DEMAND WORLDWIDE BY THE YEAR 2000  
THROUGH RESOURCE MANAGEMENT\***

**prepared by  
the FAO Forestry Department  
on the basis of work by**

**M. H. Marchand**

12113

707

\* This translation has been reproduced as received, without formal editing.

## CONTENTS

	<u>Page</u>
PREFACE	3
GLOSSARY	4
SUMMARY	6
INTRODUCTION - Definition of Forest resource management	8
CHAPTER I - OUTLOOK FOR THE EVOLUTION OF THE PRIMARY RESOURCE IN DEVELOPING COUNTRIES BETWEEN 1980 and 2000	9
1.1. Present world situation	9
1.2. The evolution of forests in developing countries	16
1.2.1. Relevant factors	16
1.2.2. Resource depletion in developing countries	16
1.2.2.1. Deforestation	16
1.2.2.2. Degradation	19
1.2.3. Positive influences on resource evolution	20
1.2.3.1. Plantations	20
1.2.3.2. Qualitative and quantitative improvement through intensive management	23
1.2.3.3. Improvement in operating conditions	23
1.2.3.4. Increase in accessible areas	24
1.2.3.5. Reducing the pressures - agroforestry	24
CHAPTER II - BALANCING RESOURCES AND REQUIREMENTS BY THE YEAR 2000	25
2.1. Industrial wood	25
2.1.1. Consumption forecasts	25
2.1.2. State of supply	28
2.2. Fuelwood and charcoal	33
2.2.1. Consumption forecasts	33
2.2.2. Equilibrium between supply and demand impossible	34
CHAPTER III - THE ESSENTIAL PREREQUISITES FOR IMPROVING THE FOREST RESOURCE SITUATION IN DEVELOPING COUNTRIES AND THE NATIONAL ACTIONS REQUIRED	36
3.1. Classification of action areas	36
3.1.1. Land use policy, forest policy and forest legislation	36
3.1.2. Progress of rural communities	37
3.1.3. Institutional development	39
3.1.4. Education, training and extension	40
3.1.4.1. Extension and public education	40
3.1.4.2. Professional training	41

	<u>Page</u>
3.1.5. Raising of awareness	41
3.1.6. Research	42
3.1.7. Inventories and assessments	44
3.1.8. Information collection and dissemination	45
3.2. Classification of actions zones	46
3.2.1. Critical areas	46
3.2.2. Protected areas	47
3.2.3. Natural forests mainly for production	47
3.2.4. Natural forests mainly for protection	48
3.2.5. Areas set aside for the establishment of man-made forests	48
3.2.6. Remote forests	49
3.3. National actions for the management of forest resources in developing countries according to action zone	49
3.3.1. Land use planning	50
3.3.2. Types of management and their means of application	50
3.3.2.1. Harvesting and transport	51
3.3.2.2. Industrial development	52
3.3.2.3. Marketing	53
CHAPTER IV - INTERNATIONAL ACTION	54
4.1. Determination of long-term strategy	55
4.2. Corresponding objectives	55
4.3. Corresponding actions	55
4.3.1. Characteristics	55
4.3.2. Content and structure	56
4.3.3. 30 basic elements	57
CONCLUSION	64
BIBLIOGRAPHY	

PREFACE

This document has been prepared by the FAO following on from the preparatory meeting held in Vienna from the 24th January 1983. It takes into account the observations and conclusions made then.

It sets out the outlook for forest resources around the year 2000, the chances of worldwide demand meeting supply, and the action to take at both national and international level in order to increase the contribution made by developing countries towards the attainment of such an equilibrium, taking into account the main difficulties met within the management of natural and man-made forests in these countries.

In the preparation of this document, three FAO Forestry Papers were particularly valuable: no. 29 'World Forest Products - Demand and Supply 1990 and 2000' (Rome 1982), no. 30 'Tropical Forest Resources' (Rome 1982), and no. 37 'Conservation and Development of Tropical Forest Resources' (Rome 1983) which contains the proceedings of the Second Expert Meeting on Tropical Forest Resources held in Rome in January 1982. Reference has also been made to a number of other publications which can be found listed in Appendix 1 (Bibliography), and especially to a FAO document entitled 'Management of Forest Resources in Developing Countries' (ID/WG 387/5) which was prepared by the FAO for the preliminary meeting in Vienna.

## GLOSSARY

The glossary below relates only to this document. Special reference was made to the following:

- Tropical Forest Resources (FAO Forestry Paper no. 30) (1)
- Classification and Definition of Forest Products (FAO Forestry Paper no. 32) (2)
- Conservation and Development of Tropical Forest Resources (FAO Forestry Paper no. 37)

Annual Increment: Volume increase in growing stock (trunks).

Shifting Agriculture: Agricultural systems where crops are grown for a few years on cleared areas of forest land which are later abandoned for an indefinite period during which they are covered by new woody growth, before being cultivated again.

Agroforestry: Mixed farming and forestry systems which unite in a same area, simultaneously or successively, on the one hand crops and/or natural or artificial pasture land, and on the other, the cultivation of trees.

Fuelwood: All wood in the rough used as a source of energy.

Roundwood: All wood in the rough as felled.

Industrial wood: Wood which undergoes some industrial process (sawing, squaring or peeling) before being utilised. Railway sleepers are an example.

Small Wood: Wood in the rough utilised directly (without any industrial processing), such as beams, poles, pilings, pit props etc.

Pulpwood: Wood used in the manufacture of pulp, panels or wood fibre.

Conservation: The management of human use of the biosphere such that the present generation derives the maximum benefit from living resources while maintaining their potential to meet the needs and aspirations of the generations to come. (World Conservation Strategy - IUCN 1980).

Forests: Areas covered by vegetation and largely composed of trees.

Managed Forests: Forests with a conventional management plan or the subject of institutional regulations concerning the felling of wood.

Closed Forest: Forest with continuous cover, as opposed to forests with discontinuous cover as referred to in the following expressions: 'woodland', 'open forest', or 'other wooded areas'.

Undisturbed or Primary Forest: Forest which has not recently undergone any changes.

Natural Forest: Used only in contrast to 'plantations' which are entirely man-made.



Productive Forest: Forest which is deemed suitable for production irrespective of the distance from processing or export centres. Contrast unproductive forest, which may be so for either 'physical' or 'legal' reasons.

Annual Allowable Cut: The volume which can be removed each year without affecting the capital stock (for managed forests, this is given in the Plan).

Standing Volume (VOB): Total gross volume of trees with a diameter greater than 10cm at head height.

SUMMARY

At the present time it may be thought that global forest resources are sufficient to meet world demand for wood and wood-based products, given certain intra- or inter-regional transfers. However, when the situation is looked at more closely, significant imbalances appear. In some areas, a critical stage has already been reached, particularly as regards fuelwood.

There are a number of outside factors which effect the situation with respect to accessible forest resources. These resources may be depleted due to clearances (especially in tropical countries with a tradition of shifting agriculture) or to other negative influences of varying importance. On the other hand, the situation may be improved both in quantitative and in qualitative terms, by afforestation and by re-forestation. It is sad to have to state though that forest resources are shrinking faster than they are increasing. Deforestation and degradation continue, with effects which are often irreversible in the short and medium term since the forest areas remaining are subject to yet more pressure from the population.

By the year 2000 it will be even harder for supply to satisfy demand since requirements for all categories of wood will be all the greater. As regards industrial wood however, equilibrium may yet be achieved, thanks to the opening up of new tropical forests which will help compensate for the final depletion of other forests already doomed to disappear.

As regards fuelwood, the shortage will continue to grow more acute in developing countries situated in arid or semi-arid regions, seriously affecting to different degrees 2,000 million people or more. This figure represents a threefold increase on 1980. The wood capital is now so depleted in these countries that the situation can no longer be reversed, transfers from wood-rich countries being impossible for a variety of reasons. And in those areas where both industry and the local population burn wood for fuel, the two groups compete with one another for the resources available, though the local population will always have priority. Nor can fast-growing plantations possibly meet the level of forecast demand in many regions.

Developing country authorities are paying increasingly greater heed to the state of their forest resources as well as to organizing their exploitation in space and in time as a prelude to more intensive management schemes. Making greater use of these resources can be achieved by a better knowledge of the volumes and species that can be used, by a rational exploitation plan, and by making better use of the available material. Where physical and

economic constraints permit, resources can be augmented by opening up forests which were hitherto classified as unexploitable, or, over a longer time-span, by laying out high productivity industrial plantations.

However, in inhabited regions particularly, the mobilisation and the management of forest resources can only succeed if there is close collaboration with the local population, with priority being given to their own vital agricultural and grazing requirements. It is unreasonable to insist on the maintenance of the forest in its original state. Existing forests should not be exploited for one specific purpose only, but should provide as many different goods and services as possible. On the other hand, concern for the protection and conservation of the environment may restrict the removals of wood products. Finally, in their concern to obtain the maximum benefit from forest resources and thus to enhance their role in economic development, Third World countries increasingly tend to process as many forest products as possible themselves, and consequently reducing the volume available to the processing industries of the developed countries.

It is the responsibility of the governments of the countries concerned to define their forestry policy objectives and to decide on the means by which they are to be achieved. But it may well be that the means at their disposal, whether in manpower or in monetary resources, are inadequate. Furthermore, short-term political considerations and reluctance on the part of local populations to change their ways may prompt the decision-makers to partially abandon their objectives and put off the implementation of their plans and longer-term programmes.

Some form of international action is therefore required, in everybody's interests. Much has already been done here to back-up and encourage the efforts made at national level to hasten the achievement of solid and meaningful results. But more is needed and all these efforts must be harmonised. In 1982, several international organizations attempted to lay the foundations for such harmonisation, and this work will continue over the next few years.

INTRODUCTION

The forestry resource (usually used in the plural, 'forestry resources') is a term which is widely employed, though often loosely and imprecisely. Depending on the context, it can have many different meanings. For example, it may refer to the biomass of a forest area, which is concrete and measurable, or it may refer instead to the range of goods and services which forests in general provide and from which Man directly or indirectly benefits. In this latter case, the term then becomes more abstract and less easily quantifiable.

In a concrete sense, the term 'forest resource' is often read either as being the sum total of all those products which can be extracted directly from the forest without adversely affecting its survival or its renewal capacity, or as the capital which it constitutes and the revenue, in monetary terms or in kind, which can be periodically (generally annually) derived from it.

In this document, taking into account the framework in which it is situated, the term 'forest resource', unless otherwise indicated, refers only to the existing volume of growing stock, and excludes non-wood products whatever their importance.

As for the concept of forest resources management, it is to be understood in a general and multi-disciplinary sense, and embraces the planning, execution and monitoring, in space and in time, of all those actions which are necessary to ensure that the forest resources under management provide the desired level of goods and services, and taking into account the extent to which the resources are renewable, the fact that their potential should be maintained, and that they form part of a system comprising:

- a) the forest, its resources and its functions;
- b) the population, its needs and its contributions to the system;
- c) the enterprise as the dynamic element in the system.

In this sense then, organized forest management involves political, social, economic, and technical factors, and, as far as woody forest resources are concerned, therefore contrasts sharply with 'mining' type operations which are uncontrolled and haphazard.

CHAPTER I

OUTLOOK FOR THE EVOLUTION OF THE PRIMARY RESOURCE  
IN DEVELOPING COUNTRIES BETWEEN 1980 and 2000

1.1. Present World Situation

If just the overall statistics for worldwide forest resources are looked at (Tables 1-4) one might be led to think that the present situation is not too serious. In 1980, the population of the world was estimated at 4.400 million. The area covered by forest was about 4,100 million hectares, around 2,000 million of which are deemed to be productive. In theory, this represents a volume of around 255,000 million m<sup>3</sup>. About 3,000 million m<sup>3</sup> are harvested annually. Rather more than half of this is fuelwood for domestic consumption, the remainder going to industry, to satisfy its needs and those of the population at large. An annual removal rate of 1.2% of the available volume in only those forests which are currently productive does not in fact sound unreasonable and might be thought compatible with the protection and continued existence of forest ecosystems.

Looked at more closely, however, the reality is very different. In many parts of the world, and particularly in tropical zones, the area covered by forest has shrunk over the last few decades. In some cases, the forest has totally disappeared under the pressure of agriculture, and in others, where ecological conditions are difficult, there has been steady degradation. This depletion of the resource is already having serious consequences for the production of those goods and services which a healthy forest might be expected to provide, and in particular of domestic fuelwood.

It is wise to have as accurate estimates as possible of the present state and evolution of these resources, at all levels. Nationally and locally, it is the individual countries themselves who have monitoring responsibility and several of them have already set up the appropriate machinery. On a regional and global level, estimates and appraisals of the situation have been carried out by the FAO at regular intervals over a period of more than thirty years. In 1978, an important report on the likely trends in forest resources in developing countries was carried out (7) and used subsequently by the working party responsible for estimating world consumption and production of industrial wood in 1990 and 2000 (1). At the same time, a major survey of tropical forest resources

was undertaken by the FAO, with grants from the United Nations Environment Programme (UNEP). Although on the basis of the data collected by the two surveys it is not possible to arrive at identical conclusions or forecasts, there is enough that is common to both to enable a clearer idea of the state of forest resources at a regional and sub-regional level to be had.

The present state of affairs varies considerably from one country to another. Even within one country there may be major differences, if that country is large enough or where there are variations in relief or climate. Plainly a line must be drawn somewhere, and countries have therefore been grouped together according to the average conditions prevailing in their area. These conditions are determined principally by two factors, the one climatic, the other demographic.

- a) In countries with a cold climate and low population density, the forest resource is generally plentiful, and sometimes virgin. Where there are managed forests, the volume of growing stock is known and a limit put to the number of trees felled. The unmanaged forests are usually inaccessible and are under no threat. The forests of the USSR and of the Canadian North are examples.
- b) In temperate countries (usually developed or rapidly-developing countries) there is high population density and the forest resource is under considerable pressure there being intense demand both for land and for forest products. But for the most part, forests are managed, their principal purpose laid down (protection or production), and their logging capacity known. These countries are normally net importers of wood since they have insufficient resources of their own to meet their industrial needs. On the other hand, wood for heating is in much lower demand. Fast-growth reforestation programmes, in areas unsuitable for farming, compensate for any depletion in the resource. The countries of Eastern and Western Europe fall into this group.
- c) China's situation is unique and requires separate treatment. One quarter of the world's population lives there, in an area covering nearly 1,000 million hectares. In other words, the population density is around 100 people per km<sup>2</sup>. The demand for both arable land and for forest products has been and continues to be very great, resulting in a decline of accessible forest areas, particularly in the first half of the century. But strong political determination and strict management principles are rapidly improving the situation. A major reforestation programme is underway, extending over an area of several tens of millions of hectares using fast-growing productive species with a short rotation period. In the countryside, agro-forestry is highly

developed, with non-forest areas too, providing a number of complementary woody products. The situation remains difficult but there is reason to hope for a rapid improvement in the near future.

- d) A number of sub-temperate countries can be grouped separately due to their exposure to severe climatic conditions resulting from prolonged dry seasons. They usually have large, rapidly growing populations and limited or very limited forest resources. Apart from in the oil-producing countries, wood is the most commonly used source of fuel in rural areas. Forests and woody vegetation generally are overexploited. Their gradual degradation produces a corresponding decline in their productive and protective capacity and these countries are now importers of industrial wood.

Plantation areas are limited due to the shortage of available land and to the lack of investment credits. Except where irrigated, their productivity is never high. These countries, which are unlikely to achieve self-sufficiency in the foreseeable future, include those located in North Africa and the Middle East.

- e) Not much need be said about the forest resource in desert countries with sparse populations. The inhabitants' way of life is frugal and well-suited to the environment. There is a wood shortage (particularly of fuelwood) but their industrial wood requirements are very small.
- f) Humid tropical countries with small populations still contain large areas of closed forest which are untouched. The volume of growing stock is high: 200-300 m<sup>3</sup> per hectare VOB. Although the present level of increase of these stocks is very low, or nil, just sufficient to replace the trees that die, there is plenty of potential for a volume increase (in high grade heavy timber too). These forests are located in the Amazon Basin, Central Africa, and in some islands in South-East Asia. Exploitation of these tropical wood resources will increase over the next few years.
- g) In humid tropical countries with rapidly growing populations, the accessible forests have all been logged over at least once or several times, usually by selective logging. With respect to the commercial species, the tendency is for volume to decrease or even to be reduced to nothing. The demand for land results in massive clearances and the whole environment suffers as a consequence. Indeed, the forests in some parts of West Africa and Central America are even now doomed to extinction. While these forests were being worked there was no concern for their regeneration and to reforest a sufficient area is now a practical impossibility. These forests will soon no longer be able to contribute towards the meeting of world demand and that of the industrialised countries in particular.

Plainly, the above gives only the most cursory outline of the situation. The FAO/UNEP (2) project survey, which was carried out for each tropical country, gives a far clearer idea of the real state of affairs, and especially if it is wished to make forecasts for the next few decades from them.



TABLE I

WORLD FOREST RESOURCES (1980)

Regions	Area (millions of ha.)		Total standing volume (millions of ha.) exploitable forests
	all forests	exploitable forests	
<u>Developed regions</u>			
North America		366	36400
Europe		131	14100
USSR		389	40000
Others		54 <sup>a/</sup>	5500
Sub-total	1910	940	96000
<u>Developing regions</u>			
1) <u>Temperate</u>			
South America		9	1200
North Africa		1	100 <sup>b/</sup>
Middle East		15 <sup>a/</sup>	1800 <sup>b/</sup>
Temperate Eastern Asia		125	9700
Sub-total	280	150	12800
2) <u>Tropical</u>			
Tropical America		522	78500
Tropical Africa		162	38500
Tropical Asia and Oceania		201	31500
Sub-total	1935	885	148528
Total Developing Regions	2215	1035	161000
WORLD TOTAL	4125	1975	257000

a/ estimated

b/ incomplete  
data

TABLE II

COMPARATIVE REGIONAL PERCENTAGES OF WORLD POPULATION,  
FOREST RESOURCES AND ANNUAL ROUNDWOOD PRODUCTION  
(1980 estimate)

Regions	Population	Standing volume	Annual Production			
	%	%	roundwood %	industrial roundwood %	saw- & peeler- logs %	pulp- wood %
Developed	26	37	41	79	77	92
Temperate Developing	32	5	12	7	6	3
Tropical Developing	42	58	47	14	17	5
Total Developing Regions	74	63	59	21	23	8
Whole World	100	100	100	100	100	100

TABLE III

Regions	Total Production ( 1 )	of which: heating wood ( 2 )	Total ind. roundwood ( 3 )
<u>Developed regions</u>			
Temperate N. America	483631	19674	463957
Europe	334346	43025	291321
USSR	356000	77800	278200
Japan	34034	1889	32145
Others (incl. S. Africa)	<u>42274</u>	<u>8412</u>	<u>33862</u>
<u>Sub-total</u>	1,250,285	150,800	1,099,485
<u>Developing regions</u>			
Latin America & Caribbean	362410	285530	76880
North Africa	8501	7604	897
Middle East	30844	18885	11959
Africa (South of Sahara)	408592	368818	39774
SE Asia	645954	556590	89364
Centrally planned Asia	306268	233033	73229
Developing Oceania	<u>7452</u>	<u>5569</u>	<u>1883</u>
<u>Sub-total</u>	1,770,021	1,476,035	293,986
World total	3,020,306	1,626,835	1,393,471

Source: FAO Yearbook of forest products 1980

a/ Includes all removals of wood in the rough, for whatever purpose (including heating wood)

N.B. Column (1) = col. (2) + col. (3)

Column (4) = col. (5) + col. (6) + (7)

WORLD ROUNDWOOD PRODUCTION (1980)<sup>a/</sup> ( 000m m3)

of which: softwood (4)	sawlogs & peeler logs (5)	fibrelogs (6)	others incl. unawn pitprops (7)
376001	300904	148343	14710
212744	161706	103807	25808
246900	151000	37600	89600
20228	21079	9631	1435
<u>16110</u>	<u>16639</u>	<u>13045</u>	<u>4178</u>
871,983	651,327	312,426	135,731
35512	51438	17179	8263
247	137	235	525
6760	5625	1100	5234
3014	20524	1981	17269
5112	71540	2957	14867
44500	39182	5313	28734
<u>124</u>	<u>1707</u>	<u>170</u>	<u>6</u>
95,269	190,153	28,935	74,898
967,252	841,481	341,361	210,629

## 1.2. The evolution of forests in developing countries

### 1.2.1. Relevant factors

The evolution of the forest resource depends on a number of different factors which are listed below.

- a) The local population and even the responsible authorities may threaten the existence of the natural forest through their preference for other kinds of land-use.
- b) Damage, sometimes irreversible, may be caused to the forest by Man or other, environmental, factors.
- c) On the other hand, the actions taken by Man, or indeed the influence of other environmental factors, can prove beneficial, improving the forest's condition and increasing its value in both quantitative and qualitative terms.
- d) Man can increase the forest resource through judicious plantation of high-yield, high-quality species. Occasionally, forest areas may grow in extent without Man's intervention but when this does occur it is usually slowly and the value of these natural forests is generally much lower.
- e) Prudent exploitation is more than simply a means of mobilising the forest resource. It is the most efficient method of developing the forest. It is an integral part of forest management and on it depends the future regeneration and renewal of the forest. Furthermore, it is itself conditioned by the processing and marketing of the raw forest products.

### 1.2.2. Resource depletion in developing countries

The international community has been rightly concerned about this problem for some years. In almost all the developing countries, both open and closed forest areas have been shrinking. There are two different aspects to this. The first one is the most striking and its consequences are often final, at least in tropical countries. The second is insidious but, in its early stages at least, theoretically reversible. The first one is deforestation, or clearance, of wooded areas; the second is the degradation of the forest environment, for whatever reason.

1.2.2.1. Deforestation A major reason for the disappearance of forest areas, it poses a very serious threat for the future. It covers a number of different situations, not only as between the regions and sub-regions of the developing world but also as between individual countries and even within these countries themselves. Deforestation for agricultural reasons, shifting cultivation in particular, occurs to varying degrees in different places, since the

pressure exerted by farmers on forest areas, which is the most widespread reason for clearance, depends on how badly the local population requires arable land. These people do not clear land because they like doing it, nor because of any inherent character defect. Factors which are important, however, are rural population increase, the extent of the land area under shifting cultivation and how long it is farmed for, the forest land's topography, and local traditions as well. Pressures like these are not spread from one country to another, nor even from one area to another, since these migrant farmers do not move far and never in large numbers.

TABLE IV  
ANNUAL DEFORESTATION IN TROPICAL FORESTS - 1981-85  
(000s of ha.)

Regions	productive closed forests	all closed forests	all tree formations
Tropical America	3150	4350	5600
Tropical Africa	1250	1350	3700
Tropical Asia	1700	1800	2000
TOTAL	6100	7500	11300

Source: FAO/UNEP Survey of forest resources (1981)

One of the most important objectives must be to determine the rate of deforestation and the extent to which it has occurred in the critical sectors. It may then be possible to stop the situation getting out of hand, and to minimise the risk of irreversible damage or damage of an indirect nature. Government Development Officers in the countries concerned can then intervene before it is too late. As for the forest authorities, it is their role to assess the extent of depletion in forest cover over a given period and examine ways of compensating for any loss in the resource.

The FAO/UNEP project (2) deals with the subject of tropical forest deforestation in depth. The results are briefly summarised above (see Table IV).

Closed broadleaved forests are being cleared and put to other uses at an estimated average rate of 7.1 million hectares per annum (for the period 1981-85). This represents an annual rate of 0.6% and is much the same for all three regions.

The depletion rate is higher for productive forests (0.67%), but much lower for unproductive forests (0.41%), due mainly to the fact that large areas of the latter are either unsuitable for cultivation or their settlement and use has been forbidden by the authorities. It does however appear that the clearance rate for unproductive forests is rising faster than that for productive forests. Clearances have been proportionately less in undisturbed closed broadleaved forests than in closed forests which have already been logged over. This is particularly true for Latin America and Africa (where the ratio is 1:12 or 13). The former are less accessible than the latter and the usual tendency is for clearance to follow closely upon exploitation.

The annual clearance rate for coniferous forests is significantly higher than for broadleaved forests. Here the rate is 1.2% for productive forests, and 0.72% for unproductive ones.

In any event what does emerge as well is that managed closed forests, whether broadleaved or coniferous, for protection or for production, are less endangered by such clearance. The average rates are given above but

there are major disparities as between sub-regions, and even more so as between individual countries. Both top and bottom extremes are encountered in Africa: 0.2% for the closed broadleaved forests of the Congo-Cameroon block, and 6% for the productive closed broadleaved forests of West Africa, which are likely in the end to disappear completely. The primary cause of deforestation everywhere, whether the area has been previously logged over or not, is spontaneous shifting agriculture. Since the rural population has continued to expand, despite considerable migration towards the towns, the forests are no longer able to withstand the effects of this traditional method of present farming. Compared to shifting cultivation, other factors such as extensive grazing, permanent cultivation, dams, infrastructure, and urbanisation, are of secondary importance.

The same can be said for planned settlement programmes involving deforestation which should not, as a general rule, be harmful for the environment. Finally, the establishment of new forest plantations subsequent to the elimination of the original closed forest should not be considered in a negative light since if such projects have been well thought out they can increase and improve the resource.

Clearing also has damaging effects on open forest formations. The average depletion rate is 0.59% per annum, slightly higher in America and in Asia than in Africa. Shifting agriculture is once again the primary cause of deforestation.

In addition, it should be noted that clearance, in destroying the forest cover, does not just destroy the trees but the entire forest resource as well, and all the indirect advantages it can provide. Consequently, if forest clearance is envisaged, the cost-benefit analysis should take this into account.

1.2.2.2. Degradation. Compared to deforestation, which has serious, rapid, and usually quantifiable effects upon forest areas, most forms of degradation bring about progressive changes which are often less easy to discern or measure, although their consequences are ultimately just as harmful. This is particularly true as concerns overgrazing, overexploitation of fuelwood, or burning. As a result, statistical data relating to the loss woody resources in large geographical areas or population centres is lacking.



Degradation has many causes and in combination its effects are often multiplied. This is the case in the African Savannas where there has been repeated burning and overgrazing Overexploitation of fuelwood over and above the productive capacity of forest areas, and overgrazing, are even more prevalent in the vicinity of large centres of population, near towns, and along the main arteries of communication. But degradation occurs even in remote forests where wood is converted into charcoal to facilitate its transportation. Degradation arising from over-exploitation is one of the reasons for the fuelwood shortage, a shortage which is already chronic in some countries and which can only deteriorate still further in the next decades.

But if the immediate effects of overexploitation, overgrazing, and forest fires are damaging, their indirect ones may be even more so: the denudation of poor soil, especially of tropical soils, encourages wind or rain erosion which may have irreversible consequences resulting in total deforestation and desertification.

There are other causes of degradation, apart from exploitation, which will receive separate treatment.

### 1.2.3. Positive influences on resource evolution

There are a certain number of factors which, if they do not exactly make up for the negative effects of depletion, do go some way towards mitigating them.

1.2.3.1. Plantations. Plantations are certainly the most obvious way of taking direct action to develop the resource. They may be established where no forest existed before or where none has existed for half a century or more, or they might be the result of a decision to reforest existing or recently-existing forest areas. The most common situation is reforestation after clear-cutting. As for afforestation, the difficulty lies in finding suitable land which is not at the same time wanted for cultivation. Unfortunately, this is precisely the case in developing countries with a high population density. In those countries with a large land area though, afforestation can provide many benefits, since it enables future wood stocks to be placed nearer where they are needed, within reach of the factories. In so far as ecological conditions allow, it is also possible to replace natural mixed stands (where the

proportion of utilisable species is low) by stands which, if they are not entirely homogenous, contain only a few species. This enables maximum utilisation of the production.

One regrettable fact restricts the establishment of new plantations - their cost. According to an UNCTAD/FAO study published recently (8), this may range from US\$780 to \$1700 per hectare. Now if these costs can be quickly recovered by speedy returns (through high-productivity plantations with a short rotation period) then finding the initial finance is not too great a problem. However, if the rotation period is long and productivity only average, then it is a different story. This is the case for plantations of the so-called 'noble woods'.

When the worldwide plantation rate for the last few years is compared to the rate at which natural forests are being cleared (for whatever reason), then it becomes apparent that the 'replacement rate' is very low, and particularly so in tropical regions. The worldwide average is 1:10.5, but the spread goes from 1:4.5 in tropical Asia to 1:29 in tropical Africa. If individual countries are examined, the divergences can be even wider.

At the moment, the plantation rate seems to be increasing, but there are too many factors operating for a reasonably specific forecast to be made about the situation in the year 2000. A number of countries have however drawn up major programmes which are at present at different stages of fulfilment.

TABLE V

ESTIMATED AREA COVERED BY PLANTATIONS AT THE END OF 1980  
IN DEVELOPING COUNTRIES a/

Regions	Industrial plantations			Total	All plantations (1000 ha) industrial and non-industrial
	fast-growing	broadleaved others	coniferous		
Tropical America	868	129	1571	2568	4620
Temperate S. America <sup>b/</sup>	261	88	909	1258	1508
Tropical Africa	162	294	541	997	1780
Tropical Asia	1083	1813	606	3502	5111
TOTAL	2374	2324	3627	8325	13019

Source: FAO

a/ excludes temperate developing countries in Africa and Asia

b/ approximate figures

TABLE VI

ANNUAL PLANTATION RATE IN TROPICAL DEVELOPING COUNTRIES a/  
(1981 - 1985)

Regions	Industrial plantations			All plantations (1000 ha) industrial and non-industrial
	hardwood	softwood	total	
Tropical America	116	167	283	535
Tropical Africa	38	26	64	126
Tropical Asia	160	73	233	438
TOTAL	314	266	580	1099

Source: FAO

a/ Accurate figures for temperate developing countries not available.

1.2.3.2. Qualitative and quantitative improvement through intensive management.

In non-managed forests, an approximate idea can be obtained of the existing capital stock, and by extrapolating past tendencies it may even be possible to try to predict its future evolution. But as soon as an exact evaluation of the availability and utilisability of the resource is required, together with an estimate of the effect which exploitation will have on its future existence and renewal capacity, then a management plan becomes indispensable. This involves a preliminary inventory and allows an estimation of the annual allowable cut to be made, and maximum and minimum quotas to be fixed. Furthermore, since a management plan takes into account user demand (which determines how the resource is to be exploited and what its value is to the users), its preparation ultimately favours both a quantitative and a qualitative improvement in the utilisable resource in natural wood-rich forests. However, in the majority of developing countries, the application of intensive management faces many severe constraints with regard to means and to personnel.

1.2.3.3. Improvement in operating conditions - Cost reduction - Regeneration after harvesting. Although not an intrinsic part of the management plan, these aspects can be considered a natural extension to it. Once again, it is a question of a quantitative and qualitative improvement in the utilisable resource, and not in the total resource. However, an improvement in operating conditions, especially as regards the minimising of harvesting losses, together with a more effective utilisation of trees felled and the extraction of a greater variety of species, allows productivity to be markedly increased and large reductions to be made in operating costs.

Moreover, if at first it seems expensive to make provision out of the receipts for the regeneration of the forest after harvesting, this does serve to increase the value of a future crop and consequently of the potential resource too.

At the present moment, progress is slow in this area, since the people responsible for harvesting and those who benefit from it are usually not themselves the owners of the forest. As a result, they pay too little attention to the forest's future.

1.2.3.4. Increase in accessible areas. Increase in the utilisable (not the total) resource is also slow because road construction is expensive. Furthermore, without a proper land-use plan it may even be dangerous in the medium term to open up the forest since it encourages uncontrolled settlement and clearing of the forest by shifting cultivators.

A special case where access to the forest has been provided is that of controlled settlement areas. An area within the forest is set aside where salvage logging is organized before clearing takes place. This temporarily increases the yield from the resource, which however is no longer renewable. But apart from in a few countries such as Costa Rica and Peninsular Malaysia, the volume harvested is not significant.

1.2.3.5. Reducing the pressures - Agroforestry. One way of reducing the tremendous pressure put on forest resources by farmers and shepherds in most developing countries, and thus a way of limiting the decline in forest resources, is to provide land-hungry populations with the means of existence appropriate to their way of life and traditions. An example is the provision of pasture land in arid or semi-arid zones which helps the foresters to prevent the local flocks from gaining unrestricted access to the forest areas, which can then be managed according to whether they are required for wood production or as a protection for the environment. The expense which is incurred in developing the grazing land in turn benefits the forest.

Another example of more relevance to tropical forests is that of agroforestry. Since land managed under this system is taken from the forest, strictly speaking it constitutes deforestation and reduces the forest resource. In actual fact, however, it is an example of multiple forest land-use which gives the maximum of direct and indirect benefits whilst at the same time preserving the potential for wood-production, within a framework differing from traditional forest management. The direct economic advantages can be calculated and the cost-effectiveness weighed. These advantages vary a great deal depending on the prevailing physical and ecological conditions, and what particular method was chosen from the range

of alternatives available. But there are immense social advantages as well, since this is a system which primarily benefits the local people, providing them with work, food and income. It is an effective way of making forestry activities intelligible to them and of eliciting their co-operation. With the size and needs of the rural populations increasing all the time, this method will certainly become more widespread in the next few decades, despite its relatively high cost.

## CHAPTER II

### BALANCING RESOURCES AND REQUIREMENTS

#### BY THE YEAR 2000

#### 2.1. Industrial wood

##### 2.1.1. Consumption forecasts

It would be outside the scope of this document to go into detail concerning the assumptions made by the extended working party in their forecasts for the year 2000. These can be found in no. 29 in the FAO Forestry Paper series (1). Mention will only be made here of the main results as set out in Table VII (see following page).

The overall figures for the increase in world consumption for the different categories are as follows:

<u>Product Group</u>	<u>Growth Percent Per Annum in Consumption</u>	
	<u>1963-1975</u>	<u>1975-2000</u>
Sawnwood	1.3%	1.2%
Wood-based panels	6.9%	2.7%
Paper and paperboard	4.4%	3.7%

It will be seen from Table VII that the figures for paper are in metric tonnes, the usual unit of measurement, whilst those for the first two groups are in cubic metres.

On the basis of these statistics it is not easy to put a figure on roundwood volume, particularly since paper and paperboard use the residues from sawmills and fibreboard plants. However, a reasonable estimate would be from 1.6 to 2.2 m<sup>3</sup> of roundwood for 1m<sup>3</sup> of sawnwood, 1.6 m<sup>3</sup> for 1m<sup>3</sup> of panels, and 1.8 m<sup>3</sup> for 1 ton of wood pulp.

Whatever the type of product under consideration, the expected rate of increase is always greater for developing countries than for developed countries. Moreover, at world level sawnwood will continue, as it has done in the past, to form the bulk of forestry consumption until the end of the century. However, in developing countries consumption of paper and wood-based panels will increase at a faster rate, paper being expected to catch up with, and even overtake, sawnwood.

TABLE VII  
RECENT AND PROJECTED FUTURE CONSUMPTION -  
Industrial Wood Products. a/

	Sawnwood			Wood-based panels			Paper		
	1980	1990	2000 (millions m <sup>3</sup> )	1980	1990	2000	1980	1990	2000 (millions of t)
<b>WORLD</b>	455	520	570	109	141	169	180	256	357
<b><u>Developed market economies</u></b>	246	271	284	84	106	122	139	189	253
N. America	118	129	133	41	50	55	70	92	120
W. Europe	74	81	86	30	40	49	46	61	79
Oceania	7	7	8	1	2	2	3	4	6
Others	47	54	57	11	14	16	20	32	48
<b><u>Developing market economies</u></b>	46	69	90	6	11	18	17	29	53
Latin America and Caribbean	17	22	27	3	5	8	9	15	26
Africa	5	6	10	1	2	3	2	3	4
Middle East	6	8	9	1	2	3	2	5	11
Far East	18	33	45	1	2	4	5	8	13
<b><u>Centrally planned economies</u></b>	163	181	199	19	24	30	24	37	56
USSR and E. Europe	141	154	167	17	21	26	17	25	39
Asia	22	28	32	2	3	4	7	12	17

Source: FAO Forestry Paper no. 29

a/ extended working party estimates



2.1.2. State of supply

In most developed countries, forests are managed in order to ensure a steady supply of wood. Forest areas remain fairly stable whilst clearing (for construction zones, road surfaces etc.) is compensated for by the return of spontaneous forest vegetation on abandoned farming land. In the least accessible parts of Northern Canada and the USSR large forest areas are still available, but production in the rest of the developed world is approaching the maximum potential of the natural forests. But industrial plantations in many areas of the world such as Japan, Oceania, and some parts of Europe are increasing theoretical production capacity.

Taking the annual clearance rate for 1981-85 (see Table I), closed tropical forests will be reduced by about 12 percent by the year 2000, the principal cause being clearing for cultivation. However, production of industrial wood could rise in some of the wood-rich countries of Latin America and Africa if forests inaccessible at present are opened up.

As regards the wood crop for industrial input, this only affects, and has only ever affected, a few selected species and a small volume/hectare (from 5 to 30 m<sup>3</sup> in Africa for 250-400 m<sup>3</sup> VOB for example). Eventually, these will disappear entirely and the forests from which they are taken will cease supplying wood, unless the market accepts alternatives. Technological progress will make possible the utilisation of a wider range of species which will improve these countries' prospects in the matter of wood-pulp production especially.

As for the areas covered by industrial plantations in tropical countries, an increase from 7 million hectares in 1980 (Table V) to 20 million hectares or more by the year 2000 is forecast. It is estimated that between 1975 and 2000 production will rise tenfold. The yield from these plantations will amount to more than 100 million m<sup>3</sup>/annum, Latin America being responsible for two thirds of the total. Softwood will account for 60 percent of the production.

Industrial plantations in the temperate regions of the developing world will also achieve significant production levels. Although exact figures are unavailable, mention may be made here of the southern cone of

of Latin America (Argentina, Chile and Uruguay) and especially of China, which has a major plantation programme, extending over tens of millions of hectares (30 million between 1949 and 1980).

Since there is no reliable inventory for most of the world's forests, and few have any clearly defined management objective, to quote any figures as to future production has value only as a working hypothesis. Estimates of industrial wood production are based firstly on detailed information which relates only to production in managed and inventoried forests, and secondly on an evaluation of likely future production using as criteria either the means available, or economic accessibility.

World production is thought to be capable of meeting a level of demand over 2000 million cubic metres by the end of the century. In fact, if one goes by the working party's estimates, it is likely that demand will be markedly less than supply. But in Western Europe and in Japan demand will far outstrip regional capacity and both will be obliged to rely increasingly upon imports. Table VIII shows how world market equilibrium is likely to be achieved.

In tropical regions, increased industrial wood production will come from the less accessible areas, and will be composed largely of types, dimensions and qualities not much used today, as well as from plantations. Currently, 33 million m<sup>3</sup> of industrial wood are extracted in Africa, and 86 million m<sup>3</sup> in Asia. They are capable of respectively tripling or doubling the volume of removals destined for domestic processing or for export. It follows that neither region will have any difficulty in satisfying internal demand. But if demand from the developed countries were to be stronger than forecast, then their exports of peeler-wood, plywood and perhaps of sawnwood and undressed timber too may not be sufficient. On the other hand, Latin America will be able both to satisfy internal demand and in all probability increase its potential export capacity beyond the level indicated in Table VIII.

Industrial wood production in North America is likely to increase by 50 percent during the period but net export levels will not be significantly affected. In the USSR, much of the available resources are in remote areas; internal demand will however be met easily, leaving a large exportable surplus.

Forecasts indicate that the developing countries will consume greater amounts of wood-based panels and paper than at present. Since it is only plywood that needs large sized trees and high-quality material, any extra production requirements will probably be met from within the regions. The developed countries will however be forced to import considerable volumes of raw or processed material, with the exception of the USSR and Oceania.

The forecasts appearing in document no. 29 (1) make a distinction between hardwood and softwood which highlights the need to make greater use of the former in those areas where traditionally softwood has been employed, if demand is to be met. For example, whilst in 1975 only 34 percent of wood-pulp was produced from hardwood, it is estimated that 45 percent of the increase between then and the year 2000 will come from this category.

PROJECTED SITUATION AND ESTIMATE OF WOOD REMOVALS  
**TABLE VIII : AND UTILISATION IN THE YEAR 2000**

Regions	REMOVALS Annual average		APPARENT CONSUMPTION		Industrial roundwood	NET TRADE		Total
	Fuelwood	Industrial wood	Industrial Roundwood For Processing	Forest Products In Roundwood Equivalent millions m <sup>3</sup>		Processed wood	( in roundwood equivalent imports: - ; exports : + )	
WORLD	1820	2085	1930	1930	-	-	-	
<u>Developed market economies</u>	70	1093	1138	1190	- 78	- 52	- 130	
N. America	28	642	617	581	+ 10	+ 36	+ 48	
W. Europe	30	320	325	384	- 16	- 59	- 75	
Oceania	2	58	41	30	+ 16	+ 11	+ 27	
Japan	-	58	143	175	- 86	- 32	-118	
Others	10	15	12	20	- 2	- 8	- 10	
<u>Developing market economies</u>	1350	365	274	238	+ 44	+ 36	+ 80	
Africa	300	60	28	21	+ 10	+ 7	+ 17	
Latin America & Caribbean	400	124	108	98	+ 5	+ 10	+ 15	
Far East	600	161	128	96	+ 29	+ 32	+ 61	
Middle East	50	20	10	23	-	- 13	- 13	
<u>Centrally planned economies</u>	400	627	518	502	+ 34	+ 16	+ 50	
USSR & E. Europe	100	531	444	428	+ 34	+ 16	+ 50	
Asia	300	96	74	74	-	-	-	

Source: FAO Forestry Paper no. 29

TABLE VIII a  
1975 WORLD PRODUCTION (ROUNDWOOD)  
AND PROJECTIONS FOR 2000

Regions	millions of m <sup>3</sup>					
	1975			2000		
	Total Roundwood	Fuelwood	Industrial Roundwood	Total Roundwood	Fuelwood	Industrial Roundwood
Developed Market Economies	761	57	704	1165	70	1093
Developing Market Economies	1305	1112	193	1715	1350	365
Centrally Planned Economies	733	304	429	1030	400	627
Total	2799	1473	1326	3910	1820	2085

Source: FAO

Another point is that the estimate for 1975-2000 forecasts an 80 percent increase in wood-pulp products, and only 44 percent increase in sawnwood. This will affect harvesting costs. In addition, the use of residues is expected to double during the period while the use of non-wood materials such as bagasse and bamboo will also rise sharply.

In the event of forecast demand being exceeded (and reaching the higher of the two consumption estimates fixed by the FAO in the document 'Agriculture: towards the year 2000' (9)) then the considerable extra

volume required (500 million m<sup>3</sup>) could be supplied, though at a much higher cost, by the tropical forests of the Amazon Basin, by the Siberian coniferous forests (not easily accessible), and by the North American broadleaved forests (though of indifferent quality). But the plantation of fast-growing tropical species would also be necessary.

To conclude this brief overview, two points should be noted:

- Towards the end of the century, there will be very heavy demand for industrial wood and in particular for tropical hardwood logs, softwood logs and wood-pulp. In Japan and Western Europe, demand for all product groups will be especially heavy.
- In developing regions, in Asia and in Africa, which have hitherto been major suppliers of wood to the international market, a higher proportion than before of their industrial wood production will go towards meeting their domestic requirements.

## 2.2. Fuelwood and Charcoal

### 2.2.1. Consumption Forecasts

Although this document is concerned primarily with forest resources for wood industries, a quick review of the outlook for fuelwood and charcoal would not be out of place. For this reason: in a large number of developing nations situated in arid or semi-arid zones (excluding the oil-producing countries), the overriding need to satisfy the inhabitants' requirements in fuelwood can hinder, if not prevent, the normal development of wood industries.

This is an area where it is difficult to obtain a clear idea of the actual situation on account of variations in the harvest from country to country, not to mention that subsistence farming is the norm in rural areas. Even in developed countries, putting a figure on fuelwood consumption is not easy. A rough idea can however be obtained from statistics based upon likely average consumption per household.

What can be said is that in developed countries since the oil crisis, there has been a tendency for fuelwood consumption to increase, on which the rise in wood prices has acted as a brake. If wood is frequently too expensive to be used in the home, then this is at least as true for

industry. As a result it is unlikely that between now and the year 2000 there will be a significant rise in the use of wood as an energy source in developed countries, with the exception perhaps of those zones in the developed world which have a large supply of low-grade wood in close proximity to the main centres of consumption (i.e. North America, the USSR, and possibly Oceania). The reason for this being that fuelwood, even if converted to charcoal, cannot be transported for long distances (unless of a particular quality or for a special purpose).

Overall, in developing countries the oil crisis has had a detrimental effect on the use of fossil fuels. It is probable that local industry in these regions will increasingly rely on fuelwood. Per capita domestic consumption is likely to stabilise, the growth in population accounting for any increase.

However, the main constraint upon consumption in many developing countries will be the shortage of the resource itself. Indeed, taking all the developing countries together, it is estimated that total consumption in the year 2000 will not be more than 1,700 million m<sup>3</sup>. Yet, if present trends in consumption and population growth are confirmed, a figure of between 2,400 and 3,000 million m<sup>3</sup> will be necessary to meet even the minimum requirements estimated.

#### 2.2.2. Equilibrium between supply and demand impossible

A map showing the fuelwood situation in developing countries (6) was drawn up in 1981, and a report on the same subject is shortly to be published.

The survey upon which the map is based shows that in 1980 about 2,000 million people depended on fuelwood and other fuels of similar type for their daily energy requirements. Fuelwood shortage affected 1,150 million people, which corresponds to a volume of around 400 million m<sup>3</sup>. 100 million people were unable to satisfy even their basic energy needs. 1,050 million people are faced with an ever-growing shortage and are obliged to overexploit the existing resources.

If current trends continue, by the year 2000 a total of about 3,000 million people will find themselves in deficit areas, unable to satisfy their fuelwood requirements. The shortfall (between requirements and available volume) will be of the order of 1,000 million m<sup>3</sup> for rural areas alone.

Yet the very prevalence of the problem, the fact that it is a daily fact of life, may actually obscure the real gravity of this deficit:

- the energy derived from wood is vital and virtually irreplaceable as a means of preparing food and rendering it fit to eat and digestible;
- damage, often irreversible, is caused to the vegetation environment whilst the effects on soil protection and the regulation of water flow are both harmful and lasting. In some areas the situation is already so serious that immediate emergency measures need to be taken: for instance, supplying the victims of fuelwood shortage with alternative fuels which would in the normal run of events be beyond their means.

There are other ways of mitigating the effects of the shortage: the use of more efficient wood-burning stoves is one. But often the simplest, the quickest, and the least expensive method of expanding wood production remains the intensive management of existing resources. It does not however eliminate the long-term need to create, in conjunction with the local population, new sources of fuelwood by means of village plantations, or by planting along the edge of fields or river banks. In fact, this has been the solution adopted by China where the problems of fuelwood supply will soon be resolved if the present efforts are maintained. But considerable financial and manpower resources need to be committed to such programmes for the establishment and maintenance of nurseries and plantations before significant results can be achieved.

The UN Conference on New and Renewable Sources of Energy which was held in Nairobi (Kenya) in August 1981 included, besides nine others, fuelwood and charcoal in its list of energy sources; it fixed priority action zones, and recognised the urgency for developing countries in particular to meet the demand for energy in rural areas through integrated management programmes.



CHAPTER III

THE ESSENTIAL PREREQUISITES FOR IMPROVING THE  
FOREST RESOURCE SITUATION IN DEVELOPING COUNTRIES AND THE  
NATIONAL ACTIONS REQUIRED

3.1. Classification of action areas

In recent decades there have been significant advances in the management of tropical resources in developing countries, although many regional and national variations can be noted. Considerable progress has been achieved in the institutional field (particularly with respect to forest policy and legislation), in education and training at all levels, in resource inventories and in research. But however encouraging these results may be, they are only a start, and much more needs to be done.

3.1.1. Land use policy, forest policy and forest legislation. Recognition of conservation problems

Any government which recognises the short and long term importance of forests for the socio-economic development of a country must be able to display and to sustain sufficient political determination to ensure the conservation and renewal of its forest resources in the context of a national land use policy. Agriculture and forestry are not two conflicting forms of land use. They need to be considered as interdependent and complementary. Major issues affecting tropical countries such as the reduction of pressure on forest lands by more efficient use of existing agricultural land, or the transferring of forest lands to agricultural or other uses can only be tackled satisfactorily within the framework of a national land management policy.

Tropical resources management cannot be considered apart from the subject of rural development and must therefore be in harmony with national socio-economic development policy. Within such a policy, due weight should be given to the protective, social and productive functions of forests according to the broad development options which each country has fixed for itself.

In establishing basic objectives for land use and forest policies, special attention needs to be paid to the following:

- a) urgently improving the standard of living of poor communities living in or near the forests and associating them, materially and financially, in all productive (including industrial) activities based on the exploitation of local forest resources. This is particularly crucial in areas of high population density;
- b) extending the socio-economic benefits derived from the forest to the national community as a whole, through integrated resource management;
- c) maintaining intact the forest environment and preserving its benefits, particularly in mountain watersheds;
- d) curtailing as quickly as possible those activities which cause deforestation or degradation.

If policies designed to meet these objectives are to be defined and adopted, then this presupposes that the appropriate legislative machinery either already exists or will shortly be put in place. Legislation's special importance lies in that it gives rise to and encourages social attitudes and behaviour which themselves mirror the values and objectives of the original policy. Forest laws need not be restrictive and coercive (as was unfortunately too often the case under colonial administrations). Rather, they should act as a constructive force, and as an inciter to action, being judged according to the degree to which they encourage attitudes and behaviour conducive to the implementation of the policies adopted.

### 3.1.2. Progress of rural communities

In developing countries, the inhabitants of the forests and the immediate surrounding populations are generally the poorest members of the community. One of the aims of forest management should therefore be to help raise and then protect these people's standard of living. Indeed, the future of forests depends on it. This underlines the crucial importance of the social aspects of forest management. Planning and management should take account of the experience and the culture of the local populations, their habits and customs, and their family and social structures. It is only through respect for their traditional values that government action can adapt to local conditions.

Forest management has always to be considered within a context where the balance between agriculture, forestry and grazing is always changing, and where the development of one wooded area may entail the parallel development of a neighbouring, unwooded one. For example, in arid or semi-arid countries, where the forests are unable to support intensive multiple exploitation, it is often necessary to complement management of the productive forest by providing land for grazing and cultivation nearby. In the more humid regions, on the other hand, a balance may be reached through multiple exploitation of the same plots of land. Indeed, it is likely that agroforestry will be of growing importance in the future.

Following on from this, it has even been proposed, where governments deem it appropriate, that small forest communities be established with the name of 'forest prosperity centres'. These would consist of a natural or artificial forest area where a variety of integrated forest activities could be pursued, ranging from production (silvicultural treatments, plantations, reforestation, agroforestry, cultivation of food and medicinal plants, management of wildlife and fishery resources, agriculture etc.), to exploitation (logging, agricultural crops, hunting, fishing, fruit-picking, harvesting of seeds, bark, latex, fuelwood etc.), to transport and industry (sawmills, board and cellulose plants, cottage industries, installations for energy production and distillation industries), and finally to trade (local, national or foreign). These would all be components of a multiple system of forest management, and would contribute to the stability of the whole ecosystem (and of course to that of the local population). It does seem desirable, particularly where new forests are established, that the local inhabitants should feel themselves to be a part of the forest, tied to it by ownership or interest, whether individual or collective, and their participation should be sought in all the areas which concern them, at the planning stage of a project, during its execution, and when the profits are distributed.

Undoubtedly however, the setting up of these technically innovative prosperity centres would initially require a considerable level of expertise and resources for the model to succeed and for it to be applicable to other areas.

### 3.1.3. Institutional development - creation of a permanent forest area

The extent of the forests' contribution to the welfare of the immediate populations, to rural development and to national socio-economic development, and their role in environment protection, depends on the existence of an appropriate institutional framework which includes both the public and the private sectors. As regards the public sector, the main priority is an appropriate national institution (public forest administration) which has responsibility for the management of forest resources and works closely with other institutions in related fields. Land use planning, the establishing and strengthening of infrastructure and services, the management, development and use of natural resources - these all require a multi-sectoral approach and the participation of multi-disciplinary teams.

Although the pattern of forest ownership is very different from one country to another, it is rare for there to be no State involvement at all. Indeed, a state-owned sector is highly desirable since so many constraints, physical or otherwise, prevent maximum benefit being derived from the forest resources. For example, only the State can guarantee the continuity of policy that may be necessary to safeguard the forests' productive or protective functions or impose the restrictions on exploitation, or other coercive measures, that may be required. Indeed, national planning is impossible without an effective public sector. The management of publicly-owned forests, whether belonging to the State or to local authorities or both, necessitates the intervention of an appropriate national body along the lines of the public forest administration mentioned above.

There are a number of organizations having an important role in the promotion of forestry development:

- firstly, the public forest administrations. It is their technical capacity, links with other organizations, public image and reputation (often excellent), which are the decisive factors in their success as the principal executors of forest policy and legislation;
- rural organizations;
- public and private enterprises.

Yet, although progress has been achieved, many developing countries still lack forestry institutions with sufficient influence or experience. Therefore, every country should take a close look at the situation regarding its own forestry institutions and take the appropriate steps to:

- a) ensure the efficient functioning of an institutional framework which includes both public and private sectors;
- b) ensure that the public forestry administrations occupy an appropriate position within the country's institutions;
- c) provide the public forestry administrations with the necessary powers to develop and execute policy rapidly and forcefully;
- d) guarantee co-ordination and harmony between all institutions with responsibilities for forest resources or their immediate populations, and encourage the active participation of the rural communities concerned;
- e) expand and reinforce local offices of the public forest administrations.

#### 3.1.4. Education, training and extension

To a great extent, forest resource management depends on the one hand on public attitudes towards it, and on the other on the availability of skilled specialists, technicians and workers.

3.1.4.1. Extension and public education. People, and in particular those living in the vicinity of forests or those whose livelihood depends upon them, need to be better informed about the value of this major resource and how essential it is to protect it and use it appropriately. They have, after all, an important role to play in forest management. The necessary information may form part of a general programme of environmental education disseminated at community meetings by the mass-media or by the inhabitants themselves, through collective organizations such as co-operatives, youth and religious groups, and community management committees.

As a complement to such a programme, primary and secondary school children should also be taught about the problems and the value of the forest. Teaching staff should previously have been suitably trained, and teaching material be made available. Instruction in the subject should be both continuous and progressive.

3.1.4.2. Professional training. Because of the rapid advances made in forest sciences and technology, and the recent reorientation of the traditional forestry objectives towards meeting the needs and aspirations of the populations concerned, it has become increasingly necessary to revise and update the training programmes for specialists. This could be supplemented by the development of continuing professional education (seminars, intensive courses, on-the-job training, study trips) for practising forestry personnel. Such a training programme should be expanded to take into account the problems inherent in land use planning and integrated rural management. At the same time, specialists from other disciplines, notably agronomy and animal husbandry, should also be taught about the forest environment and resources and the importance of forest management.

More effort needs to be put into the training of technicians too, since they are the people responsible for implementing a whole range of practical activities originating in many different disciplines. Up till now, recruiting enough suitable ones has posed something of a problem, yet they are indispensable to the effective operation of forestry units. More technical schools are therefore required, existing teaching programmes need to be reorientated, and further training given to technicians already in the field.

Whilst specialists and technicians may be trained abroad (although it is preferable if training occurs in their own country), forest workers can only be trained on the spot. Efficiency, productivity and safety are the three elements which make up their training, together with recommendations as to the manner in which their work should be carried out without damaging the environment. This training may be provided in specialist centres, or by private firms, or, where necessary, by the public forest administration itself.

#### 3.1.5. Raising of awareness

As indicated in section 3.1.4., it is essential to ensure that the general public, interest groups, and selected individuals are kept well informed about forests and their use. The gearing of information to raise public awareness is closely related to education and extension but deserves separate treatment.

The general public must be made aware of the benefits that can be derived from careful management of forest resources and of the damage caused by their destruction or degradation.

Lectures, meetings and round-table discussions should be organized for politicians with decision-making powers affecting the forest sector so as to illustrate the relationship between forestry and rural development and to explain the contribution which forests make to the protection of the environment and to socio-economic welfare in general. Organized visits and special publications giving relevant examples of successes and of failures (from which conclusions will be drawn) will be used to supplement the theory.

In order to minimise divergencies of opinion between officials with development responsibilities, it would be useful to encourage dialogue between the members of multi-disciplinary teams with the object of analysing the available alternatives and selecting the best ones, due consideration having been paid to their economic, social and environmental consequences. To this end, courses and meetings should be held at which all the natural, economic and social parameters can be studied, together with the impact of each development alternative. In addition to foresters, these meetings should also be attended by, amongst others, agronomists, agricultural extension officers, sociologists, and rural economists.

The enterprises involved in the harvesting, processing, transportation and marketing of wood would also derive benefit from a greater knowledge of the forest resources in their supply area and of the consequences of inadequate management.

Finally, forest management officials should not underestimate the importance of raising Press awareness of forestry matters. It is journalists and all those who work in the mass-media who will disseminate information on forest problems to all the target categories, and they should be adequately prepared for this task.

#### 3.1.6. Research

If all the interrelationships that make up forest ecosystems and the effects which Man's management of forest resources has on them are to be understood, then the research now being conducted in developed and in developing countries will continue to play an indispensable role for the foreseeable future.

Tropical forest ecosystems are so rich and complex that Science still has a long way to go before a comprehensive knowledge of all the species, their behaviour and the interrelationships within the system can be obtained.

But this is no reason for delay: we already have enough expertise and experience to take useful action to help tropical forests and their dependent populations now. Indeed, the history of forest management in developed countries shows a record of steady progress made on the basis of past results.

More than 40 million hectares of productive tropical forest are already under management plans and constitute an important source of experience. The results obtained by different silvicultural treatments have given rise to a vast store of knowledge upon which new efforts in tropical resources management can be based. This store will result in further advances in applied techniques. Consequently, the original management plans need to be under continuous review and to be kept updated. Using our existing knowledge and practical experience of tropical forest ecosystems as a base, sensible new management methods may be introduced provided that they are backed up at all stages of their development by the appropriate research, and that wherever possible other options are left open.

Thanks to the progress achieved over the last few decades in many fields of science and technology we are now in a better position to appreciate the dynamics of ecosystems and related phenomena, such as soil and water balance evolution, erosion problems and geochemical cycles. There has been marked progress in inventory techniques, in land classification and evaluation methods, in watershed management, in the protection of soil against wind and water erosion, quite apart from the advances made in afforestation and reforestation methods. Neither is agroforestry standing still. Shifting cultivation can now be improved as a method and given the right conditions it may be transformed into a more permanent form of agriculture. Logging techniques have moved on as well, with corresponding improvements in machinery and equipment. Fuller utilisation of forest products is now possible as a result of advances made in industry which affect particularly the board and pulp sectors and the production of energy from wood wastes and residues.

Nonetheless, large gaps in our knowledge still remain and much still needs to be done in the realm of science and technology, particularly with a view to integrating all the ecological, social, cultural, and economic aspects. If this goal is to be achieved, research efforts must be co-ordinated,



expanded and consolidated, especially in those areas where our knowledge is still insufficient, or where urgent action is most necessary. Where the situation is particularly serious, and where little time is left for action, research may have to be 'speeded up' in order to find acceptable short-term answers to the problems without awaiting the discovery of the best possible solution.

Integrated ecological research should serve as the basis for a better understanding of the functioning of forest ecosystems so that the maximum benefits compatible with their conservation may be obtained from management of the resources. The relationship between climate, soil, water, and vegetation, and between ecosystem, niche and species should form the bedrock of ecological studies. Research into different tropical forest types must not be divorced from research into soil and agriculture.

#### 3.1.7. Inventories and assessments

If progress is to be made in forest management in developing countries, then more information concerning the potential, extent, composition and evolution of forests is required, and particularly as regards the rate at which they are converted to other uses. This could best be achieved by means of well-designed and drawn up national inventories and by monitoring systems providing continuous, or at least periodic, updates on tropical forest ecosystems which take into account all the elements in the picture (e.g. soil, flora and fauna) and what trends are indicated.

In designing and drawing up these national inventories, care should be taken to:

- i) base the inventory upon a clear definition of national forestry and land use objectives;
- ii) take into account the many possible uses of forest resources;
- iii) give special attention and priority to those forest zones where the situation is critical;
- iv) take into account relevant socio-economic parameters such as the income, goods and services which the forest provides to the immediate populations;

- v) include parameters for determining the environmental impact of any action ;
- vi) obtain the necessary data for the planning of forest utilisation, for the programming of silvicultural treatments, and for other purposes such as the conservation of genetic resources, of wildlife etc.;
- vii) provide data relating to the forest biomass with a view to cellulose and energy production ;
- viii) provide data to aid in determining the use to which the land should best be put ;
- ix) ensure that the data to be provided accords with established priorities and that the project is carefully carried out by suitably qualified personnel.

Permanent forest inventories and continuous monitoring activities should permit the detection of any changes affecting forest resources and the immediate populations so that their interrelationship and the reasons for the changes can be studied further. The information thus provided should be processed rapidly and then presented in the most appropriate form for its use by planners and managers. The co-operation of forest enterprises should be enlisted in the design and implementation of these studies so that data obtained can be of value to both the users and the owners of the forests.

It will take some time before the results of these national forest inventories and continuous monitoring activities can be easily combined to give a uniform picture of the regional and global evolution of forest resources. In the meantime the FAO/UNEP tropical forest resources assessment programme will be required to continuously expand and update the first data based obtained for 1980.

#### 3.1.8. Information collection and dissemination

In many countries, an enormous quantity of forest data and research has never been published due to lack of means, financial or otherwise. Even when such information is published it is not widely circulated, whether inside or outside the country of origin. Yet, if it is to have any value, then it must reach a certain number of user groups such as research workers, forest managers, politicians, the mass-media, the general public, and the international forestry community. This implies that the same information needs to be presented in different forms. Consequently, its collection, storage, updating, retrieval and dissemination need to be greatly improved. Here it is necessary to make a distinction between information of a permanent nature which, once stored and made readily accessible then forms the basis for

research and development activities, and that of a more temporary nature such as that relating to marketing, which ought to be in a form allowing it to be disseminated rapidly.

In the first case, a network of forest information centres should be set up within the existing AGRIS and CARIS systems. One recommendation would be for the network to collect together all the information currently lying dormant in the files of the international agencies and national institutions and disseminate it in all the main international languages. It would be complemented at a regional level by secondary centres, and at a national level by at least one specially selected and developed centre whose role it would be to disseminate information to all relevant bodies.

### 3.2. Classification of action zones

#### 3.2.1. Critical areas

Critical areas are those types of forest areas which are threatened by deforestation or degradation, or where these processes are already under way, to an extent or in a manner that disastrous environmental and social consequences may be foreseen. Several of the types listed below may be encountered in one zone. For example, a mountain watershed which is eroded and suffering in addition from an acute fuelwood shortage. Such an area would require the combined use of the management techniques appropriate to each type of area. Industrial wood production has only marginal importance in some types of critical area and these are therefore listed below without further comment.

- mountain watersheds;
- forest areas in fuelwood deficit zones;
- forest areas in agricultural land deficit zones;
- eroded forest areas;
- forests overexploited for wood production; these areas result from a lack of control or management. Excessive and repeated harvesting and inappropriate logging methods can severely damage forest stands. The resource, now degraded, is then further depleted through clearing and short-term cultivation by spontaneous settlers in the absence of any control.

- forest areas inhabited by aboriginal populations requiring special government attention: several torpical countries have special policies concerning forest-dwelling aboriginal populations. In some instances, these forests are protected for their benefit but in others the integrity and way of life of the inhabitants are put at risk by conventional development. Accordingly, it is essential to clearly delimit these areas or reserves and to adopt as quickly as possible appropriate measures which conform to national policy in this respect.
- remote forests accessible recently or in the near future: some development projects which are not necessarily forestry-related involve the opening up of remote forests through road or railway construction. Experience shows that the consequence is often the destruction of forests in proximity to the newly accessible areas.
- forest areas in small islands: the problems stemming from the relationship between the forests and their immediate populations may be particularly serious in small islands on account of their enforced isolation and the limited nature of the resources available to a growing population.

Whatever the characteristics of the critical zone however, some form of intervention using simple and well-tried methods is always possible. At the same time, care should be taken to actively involve the immediate population in the work carried out.

### 3.2.2. Protected areas

The particular interest of these areas lies in their great ecological variety, in the wealth of their wildlife, their scientific, recreational and aesthetic value, not to mention that they are also unique and outstandingly representative samples of natural ecosystems, containing as they do important genetic resources that may be in danger of destruction or extinction. In protected areas, the preservation of the resources overrides all other concerns (including production), and so places them outside the scope of this document.

### 3.2.3. Natural forests mainly for production

This group includes forests destined primarily to produce raw materials, usually of wood, and which lie outside the areas in which the satisfaction of the needs of the immediate population must be given reasonably high priority. In most cases, the reason for this is the low population density in these forests and in the neighbouring areas, although it may be that they are State forests where it is possible to restrict and control usage rights.

Since the main object is the production of wood, attempts may be made to convert tropical forests which are heterogenous in the natural state to becoming more homogenous, or even to replace them completely by artificial stands, bearing in mind though all the ecological implications of this. The treatment options available cover the whole range of known mono- or polycyclic harvesting and silvicultural systems, many of which have already been applied to tropical forests, and which may result in even- or uneven-aged stands. Where necessary, these options may also involve the artificial enrichment of poor stands. Consideration has also to be given to the utilisation of spontaneous fast-growing secondary species, and to the establishment of man-made forests composed entirely of fast-growing trees, the unit volume of whose wood may well be lower than that of the natural forest species, but whose volume increments are much higher. In any event, in developing tropical forests for wood production much depends on the marketing of the products themselves.

But whatever development methods are used, they should be simple and flexible, so that the treatment is suited to the requirements of the forest. This type of tropical resource management will improve as experience is gained and will rapidly provide countries with forest resources with a steady supply of wood equivalent in volume to that currently harvested in the absence of any management or control.

3.2.4. Natural forests mainly for protection (reminder)

3.2.5. Areas set aside for the establishment of man-made forests

The increasing world demand for wood as a raw material for industry, the ever-growing need for wood in developing countries themselves, and the future outlook for wood as a source of energy, all enhance the economic importance of those areas set aside for the establishment of man-made forests of fast-growing species. Because of their high productivity, such forests can help lessen the pressures on natural forests and better provide for population needs.

The planning and management of man-made forests should take account of both the foreseeable national and world demand for wood products and the social demand of the immediate populations. The conditions mentioned above concerning eroded forest areas should also be considered in setting up of afforestation programmes. Furthermore, it is advisable that the immediate

population have their part to play in the ownership of man-made forests and share in the rights and responsibilities arising from such a role. They should also participate in any industrial development based upon these afforestation schemes. In addition, contracts should be studied that would make it possible for afforestation programmes to be set up with capital from countries importing forest products. Joint participation in these contracts by both the national and foreign enterprises concerned should also be encouraged.

Site evaluation, species selection, the production of selected genetic material, soil preparation methods, and the establishment, maintenance, and subsequent protection of the plantation are the main technical elements to be considered and related to past experience and relevant research. Nor should the social component be neglected. It is important to understand the needs and attitudes of the population, and to obtain their agreement to, and participation in, the programmes. On reaching the second stage, further technical decisions have to be made, concerning for example, harvesting and transport, industrial development and product marketing.

#### 3.2.6. Remote forests

In some tropical countries, vast untapped forest resources still remain which are unlikely to become accessible in the near future. These forests have an important protective and environmental function and will eventually have a significant contribution to make to production.

In the first instance, what these forests require is continuous control and monitoring of their present state and evolution so as to avoid their disturbance, and also a study of their resources to facilitate the taking of management decisions in the event of their future development. These decisions might regard the construction of communication links, the building of reservoirs, or the setting up of transmigration schemes.

#### 3.3. National actions for the management of forest resources in developing countries according to action zone

The management of forest resources in developing countries must take account of many very different factors, both natural and socio-economic, and consequently no attempt will be made here to propose a single methodology valid for all situations. To take just one example, in tropical countries management involves combining forestry and agriculture to a far greater extent than it would in temperate countries, and agroforestry plays a

proportionately larger role. Notwithstanding this, the basic principles of management remain the same and the actions that need to be taken fall into the same categories, whatever their relative importance.

### 3.3.1. Land use planning

Decisions regarding land use are based upon a number of political, social, economic or physical criteria. They should also be based upon a systematic land classification established according to actual physical characteristics, interpreted in a multi-disciplinary context according to management objectives. Such a classification should help to prevent land being put to inappropriate uses.

Up until now, most land classification methods have been too slow and detailed, being based upon studies that were too complex. Bearing in mind that the most important aspect of land classification is its practical application, the present situation in forests calls for speedy methods and simple, economic techniques which permit rapid classification at both local and national levels.

For this purpose, the land use classification in section 3.2. might be suitable, once land which is to be devoted permanently to agriculture is set aside (after first conducting salvage logging at the time of clearing). Critical areas will need to be determined first since it is in these that resources are most under threat, and the population most needy.

### 3.3.2. Types of management and their means of application

The main emphasis in forest resource management will vary according to ecological and socio-economic conditions and may be adjusted at each management plan update if those conditions have changed. In some cases, the primary concern will be the protection of the resources themselves, including genetic resources (parks and reserves); in others, it will be protection of the environment (watersheds and eroded areas); in others still, it will be the forest's productive or social functions (as a source of fuelwood, industrial wood, or food).

But there are likely to be other concerns besides the primary one, and therefore the most efficient combination of functions must be identified and defined in the national interest, though at the same time paying due heed to the needs of the local population.

The rules and techniques of forest management which have long been in use in developed countries can also be adapted to developing countries in temperate and sub-tropical zones. In moist tropical forests, where the task is rather more complex, the experience acquired in the different forms of treatment, technical and traditional, can still be of great help. Given caution and good sense, much can be achieved today, although continued systematic research into the best methods and treatments remains indispensable.

The management plan turns next to the actual means of application, which may of course comprise conventional techniques (mainly felling), but will also embrace new ones such as agroforestry. The problems of wildlife management will have to be tackled, since the fauna are important not only for the maintenance of the equilibrium of the ecosystem, but also as a source of direct benefit to the local population. In tropical countries, alternatives to the system of shifting cultivation and the right of common (where it is protected) need to be evolved. But above all, the problems of harvesting and transport, of industrial processing and marketing must be considered, both on account of their importance in management and the extent of their influence on the evolution of the forest. Since these four factors are particularly relevant to industrial development they will be dealt with briefly below.

#### 3.3.2.1. Harvesting and transport of products

Together, harvesting and transport are one of the tools of forest resource management for the development, utilisation and treatment of forest products. However, if these activities are conducted without taking into account forest management criteria, they may become serious obstacles to the natural regeneration and protection of the forest. For example, the intensive exploitation of some tropical forest (e.g. Dipterocarp forests) using heavy machinery, compacts the soil and causes severe disruption of the ecosystem. Some forest roads, planned and constructed with the sole aim of maximizing harvesting profits, may contribute to soil erosion, whilst the large volume of harvesting residues in some tropical forests results in unnecessary waste.



All of which serves to underline the importance of the four points below:

- i) the design and use of machinery which does not cause excessive damage to forest ecosystems (and particularly to the soil);
- ii) the planning and construction of forest roads in accordance with conservation criteria,
- iii) the adoption of measures to restrict any increase in uncontrolled, spontaneous agriculture as a result of the opening up of forest roads;
- iv) reduction in harvesting waste.

3.3.2.2. Industrial development. In many developing countries, forest resources can be a significant influence on socio-economic development through forest industries which add to the value of the raw material and create a bond between forest and population.

Industrialization using appropriate technology and backed up by institutional measures aimed at meeting domestic and export needs enables maximum advantage to be derived from the forest's productive potential. There are however a number of obstacles to industrialization for which remedies need to be found:

- a) insufficient knowledge of the potential that forest industries offer for rural and national development;
- b) shortage of qualified personnel at all levels, of managerial skills and of appropriate business attitudes;
- c) insufficient utilisation of wood from lesser-known species;
- d) lack of technology suited to local conditions;
- e) domestic market too small for the scale of operation to be economic;
- f) inadequate infrastructure and services;
- g) lack of outlets for residues thus preventing an integrated use of the resource with consequent higher costs.

In most countries with large forest potential, governments should encourage the creation of local enterprises as a means of facilitating the practical application of forest management techniques. This may be achieved by whole-hearted co-operation between exporting and importing countries and taking the form of joint ventures where both the risks and the benefits are shared. In the difficult, early stages when technical and commercial

problems may be encountered, it may prove worthwhile to give a minimum profit guarantee to those foreign enterprises which have the necessary technical know-how and the commercial channels to enable projects in the national interest to be carried out.

3.3.2.3. Marketing. The market directly influences all activities along the chain which links producers and consumers of forest products in developing countries. This influence may vary considerably depending upon the type of forest, management methods, the state of processing facilities, the role which the production and utilisation of tropical forest resources has in rural and national development and on the outlets obtainable in importing countries.

The basic objectives of marketing in relation to forest resources management are well-known and can be summarized as follows:

- a) to promote the wider utilisation of forest products (this has a direct effect on the successful application of forest management methods);
- b) to expand and optimise the use of wood and other forest products in accordance with their respective properties.

These two objectives aim at improving the economic return from the resource and at enlarging the ever more important role which forest products will play in the socio-economic development of developing countries.

International activities in the field of tropical wood marketing have hitherto tended to concentrate on improving market information and market research and development, as well as on the technical promotion of less used species so as to reduce the harm done by overselective felling.

Further study of forest ecosystems is required. The utility and individual potential of their components need to be evaluated and they have to be promoted on national and international markets. For there to be a proper forest chain, then the last link, the commercial one, must be able to pull the other ones behind it. And the management of forest resources would be made much easier if silvicultural treatments and methods could be shown to be an economic proposition. To achieve such a result, the establishment and development of large forest units (100,000 hectares

or more) should be promoted, comprising integrated industrial complexes capable not only of processing the maximum quantity of raw materials, but also of ensuring there were sufficient commercial outlets.

Developing countries must continue to promote their forest products firstly, by encouraging multiple use of the forest by the neighbouring communities; secondly, by stimulating domestic consumption of forest products, and, thirdly, by encouraging the export of finished forest products, whilst at the same time seeking to harmonise their interests with those of importer countries. These three points for action complement one another and may go some way towards resolving current marketing difficulties.

#### CHAPTER IV

#### INTERNATIONAL ACTION

The serious situation of the forests in the developing world, a situation which has already reached a critical stage in some tropical areas, calls for urgent action by the governments of the countries concerned. The main cause of this situation is the poverty of the immediate populations. One of the main objects of forest resource management should therefore be the alleviation of rural poverty.

Large-scale forest resources management requires a major effort on the part of national governments, and this should encourage increased international co-operation given that the results obtained will benefit not just individual countries but the community of nations as a whole. Such co-operation can be made much more efficient by harmonising, co-ordinating, and increasing multilateral and bilateral efforts in accordance with established priorities and the degree of urgency, and taking care to avoid gaps, overlapping and duplication.

The purpose of the outline drawn up at the Second Expert Meeting on Tropical Forests held in Rome in January 1982, is to provide a firm basis for the taking of concerted action in this area. (The details may be found in FAO Forestry Paper No. 37: 'Conservation and Development of Tropical Forest Resources' - Rome 1983 (3) ). Although aimed specifically at developing countries with tropical forest resources, with a few alterations the outline could just as well apply to countries with temperate forests.

4.1. Determination of long-term strategy

Recognising the inalienable sovereignty of countries over all their natural resources, the long-term aim is to contribute towards socio-economic development and the protection of the environment in these countries by assisting governments upon their request, to:

- conserve their forests and resources ;
- realise their socio-economic development potential through multiple use management ;
- promote the welfare of the immediate populations.

4.2. Corresponding objectives

- i) to promote co-ordinated, worldwide co-operation in forest resources management in developing countries ;
- ii) to improve worldwide knowledge of forest (especially tropical forest) ecosystems, and their interrelationship with human communities ;
- iii) to improve on the techniques, the technology and all the other methods of tropical forest resources management ;
- iv) to assist the countries in achieving the necessary conditions for the management of their forest resources ;
- v) to assist countries through national and multinational projects in the planning and putting into practice of forest resources management ;
- vi) to encourage investment in forest (especially tropical forest) resources management.

4.3. Corresponding actions

4.3.1. Characteristics

- i) to harmonise, co-ordinate, and organize international co-operation activities ;
- ii) to identify and give priority to critical areas, since the most urgent problems are there, at the same time as pursuing other medium- and long-term activities ;
- iii) to promote regional actions and projects which can be adapted to different countries or similar areas ;
- iv) to strengthen existing forest programmes and projects in developing countries ;

- v) to ensure that these activities are directed and guided by the governments of countries possessing forest resources, and by co-operating governments. This could be done through an inter-governmental body operating at a high level and with overall responsibilities including planning, monitoring and evaluation ;
- vi) to provide assistance and advise on request.

#### 4.3.2. Content and structure

The primary structure of the proposal for concerted international action consists of thirty elements which follow the sequence given in Chapter III. Such a structure offers a variety of possible combinations suited to dealing with the whole range of problems relating to forest (and especially tropical forest) formations. Elements 1-8 help to fulfil the requisites for forest resources management. Elements 9 and 10 are concerned with the improvement and application of existing knowledge relating to land use planning (9) and the various methods and techniques of forest resources management (10). Elements 11-17 address themselves to the development and improvement of forest resources management methods. Elements 18-25 deal with the eight types of critical area already identified and aim both at checking the destruction and degradation of forests, and at combating poverty. Finally, elements 26-30 concern protected areas, and productive, protected, man-made and remote forests.

The means and capabilities set out in the first seventeen elements apply also to the remaining elements which refer to forest resources management in specific situations. The accumulated experience gained from the application and testing of these means and capabilities will result in their continual improvement.

The programme needs to enlist the co-operation of groups of national institutions in countries with forest resources (for example, public forestry administrations, universities, research institutes, extension services), international agencies and organizations (FAO, UNEP, UNESCO, IUCN, IUFRO etc.), as well as that of national institutions and organizations in countries where international co-operation programmes are being carried out.

Most activities would be developed within a series of projects (related either to individual countries or to groups of countries) covering a network of forest zones. Within this network, both the theory and the practice of forest resources management could be applied, knowledge and techniques could be improved (basic and applied research and practical training), and the requisites would be better fulfilled. But one should not lose sight of the main objective

of projects carried out in critical areas: namely, the rapid solution of existing problems.

4.3.3. The 30 basic elements

1. Land use policy, forest policy and legislation

Purpose: To assist countries in defining or redefining national forest policies, and in drafting the necessary land use legislation.

Implementation: Advice to responsible institutions, comparative studies, and publications.

2. Progress of rural communities

Purpose: To assist countries in designing or implementing rural development projects or project components based on forest resources (or potential) with special priority given to critical areas.

Implementation: Advice to responsible institutions and support to pilot and demonstration projects.

3. Institutional development

Purpose: To assist countries by strengthening national forest institutions for forest resources management, and institutions responsible for rural development, with special attention given to critical areas.

Implementation: Advice to responsible institutions and support to pilot and demonstration projects.

4. Education, training and extension

Purpose: To assist countries in developing environmental education programmes for the public; in training the specialists and technicians responsible for forest resources management; in project planning and implementation; and in managing forestry extension services in forest areas using the appropriate advanced communication techniques.

Implementation: Advice and assistance to responsible national institutions and to regional and international centres.

5. Research

Purpose: To assist countries in developing national research projects on natural and man-made tropical forests, on the relationships between forestry, agriculture, energy and conservation, and the socio-economic aspects arising

from involvement of rural populations in forest activities; to assist these countries in strengthening their research institutes; in training research workers; in planning and implementing basic and applied research projects; and in disseminating the results of such research.

Implementation: Advice and financial assistance to public forestry administrations and to national, regional and international research centres, with particular reference to areas where tropical resources management and its methods are applied, including MAB reserves (UNESCO programme on Man and the Biosphere).

6. Raising of awareness

Purpose: To give backing to national efforts aimed at informing and educating the general public and selected sections of it; at promoting a better knowledge base for development policy-makers; at encouraging dialogue between governmental and non-governmental bodies responsible for the development of tropical areas, and at ensuring active participation of private companies in all matters concerning the conservation and management of tropical forest resources.

Implementation: Assistance to responsible institutions, special facilities for congresses and exhibitions, assistance to communities in towns and villages.

7. Inventories and assessments

Purpose: To assist countries in improving the quality, scale, methods, and relevance of inventories and of the monitoring of forest resources, in conducting relevant socio-economic surveys on the immediate populations in particular and in carrying out the inventory, monitoring and socio-economic surveying of critical areas.

Implementation: Assistance to responsible institutions and support to projects in critical areas.

8. Information collection and dissemination

Purpose: To gather, bring together, and disseminate information available worldwide on forest resources and their management, and to assist countries to develop their capabilities in this field.

Implementation: Co-ordination of, and assistance to, specially selected national, regional and international centres.

9. Land use planning

Purpose: To develop speedy methods for the classification of forest lands, in accordance with their capabilities, and to assist countries in applying appropriate methods and criteria for the urgent determination of critical areas, including those with important genetic resources in danger of extinction.

Implementation: Assistance aimed at giving special priority to critical areas.

10. Forest resources management

Purpose: To assist countries in improving forest management methods and silvicultural techniques, considering the forest and its interactions with the neighbouring populations and enterprises as a whole; to assist countries to apply these methods and techniques to different forest and social situations.

Implementation: Advice and assistance through a network of national and regional model projects.

11. Agroforestry

Purpose: To identify, select and develop the different crops, techniques and practices used in agroforestry, and to assist countries in their application or use, priority being given to critical areas.

Implementation: Assistance to a network of national and regional projects and activities consisting of research into agroforestry and its application.

12. Wood-based energy production

Purpose: To improve energy production from the forest biomass, including harvesting, transport, distribution and conversion systems, for both domestic and industrial use, but especially for forest industries, and to assist these countries in determining and implementing those aspects of their national energy policies which relate to forestry.

Implementation: Expert assistance to responsible institutions and to a network of national and regional model projects.

13. Alternatives to shifting cultivation

Purpose: To conduct research on and find solutions for shifting cultivation, either through improving existing systems or through conversion to permanent or semi-permanent agriculture, or through agroforestry, and to assist countries in the practical application of such solutions.



Implementation: Assistance to responsible institutions, particularly through a network of national and regional projects and through research and demonstration activities.

14. Wildlife management

(reminder)

15. Harvesting and transport of products

Purpose: To conduct studies and assist countries in designing and adapting logging machinery and systems, including the lay-out of forest roads, in accordance with conservation criteria, and in reducing waste and residues from harvesting.

Implementation: Assistance to responsible institutions and to a network of national and regional projects and demonstration activities.

16. Industrial development

Purpose: To assist developing countries in organizing industrial development based on forest resources, in improving their business skills and attitudes, in applying appropriate technologies, in promoting the use of a maximum number of species, in minimising wastes and residues, in stimulating the production and consumption of wood-based energy, and in encouraging the co-operation of public institutions, rural institutions and enterprises to further these ends.

Implementation: Support for surveys and research projects, and advice and financial assistance to responsible institutions for the carrying out of feasibility studies, and the creation of model industrial projects; support for study tours and for training centres, at national and regional levels.

17. Marketing

Purpose: To assist countries in furthering the multiple use of forests, in identifying the immense range of forest products and in encouraging their consumption by local communities; in stimulating national consumption of wood-based and other forest products, and promoting the export of manufactured and processed forest products.

Implementation: Assistance to national institutions involved in the timber trade, and to the public enterprises responsible for processing, local distribution and export, and the carrying out of relevant international studies.

18. Mountain watersheds  
(reminder)
19. Forest areas in fuelwood deficit zones  
(reminder)
20. Forest areas in agricultural land deficit zones  
(reminder)
21. Eroded forest areas  
(reminder)
22. Forests over-exploited for wood production

Purpose: To assist developing countries in the management of over-exploited forests so as to restore their productive and protective capacity and their contribution to social progress, and including the formulation and execution of management plans involving appropriate forestry treatments and agroforestry; to assist these countries in carrying out studies and research with an emphasis on the culture of productive tropical tree species, on silvicultural systems and integrated land use options consistent with the restoration of productive forest cover.

Implementation: Advice and assistance to regions with over-exploited forest areas, through national and regional projects.

23. Forest areas inhabited by aboriginal populations requiring special government attention.

Purpose: To assist developing countries in their efforts to preserve threatened forest areas where the welfare of the human population is endangered; to assist these countries in identifying these areas, in formulating and implementing management plans which are appropriate and consistent with national policies towards these populations and areas, and in conducting relevant studies and research.

Implementation: Advice and assistance to responsible national institutions.

24. Remote forests accessible recently or in the near future.

Purpose: To assist developing countries in the management and restoration of forests located in proximity to roads recently constructed, or soon to be constructed, including the preliminary classification of the capability of the land, and the formulation and implementation of management plans (involving cultural treatments, agroforestry, alternatives to shifting cultivation, and balanced policies regarding human settlement.)

Implementation: Advice and assistance with respect to forest areas under the influence of new communication systems through national projects.

25. Forest areas in small islands

Purpose: To assist developing countries in formulating and implementing forest management plans in small islands taking into account the critical situation arising from increasing population pressure, and to assist them in conducting studies and research into the specific problems of these areas.

Implementation: Advice and assistance to deal with critical areas and with tropical forest management in small islands, through regional and national projects.

26. Protected areas

(reminder)

27. Natural forests mainly for production

Purpose: To assist developing countries in formulating and implementing management plans for forests intended mainly for wood production (with special emphasis being given to the regulation of felling and to silvicultural treatments, to harvesting and transport systems, to industrial development and to marketing), and in assisting them in conducting studies and research (particularly into botany, the silvics of natural species, their characteristics and their conversion into useful products).

Implementation: Advice and practical assistance with respect to these productive forests through regional and national projects.

28. Natural forests mainly for protection

(reminder)

29. Areas set aside for the establishment of man-made forests

Purpose: To assist developing countries in identifying the most suitable areas for the establishment of man-made forests, in planning and implementing afforestation programmes and projects for productive and social purposes, and subsequent industrial projects; in assisting them in conducting studies and research with the emphasis upon increased productivity through improved propagation, establishment, management and processing techniques.

Implementation: Advice and assistance in afforestation, management and industrialization programmes through national projects.

30. Remote forests

Purpose: To assist countries in controlling and monitoring the situation in remote forests and in studying their resources with a view to their future management.

Implementation: Advice and assistance through international projects such as the Global Environment Monitoring System (GEMS).

### CONCLUSION

A look at the situation regarding world demand for wood in the year 2000 and at the forest resources available to meet it may give rise to a number of differing conclusions.

If one's chief concern is for there to be a global equilibrium between the supply and demand for industrial wood, and one looks at the situation at just one particular point in time without considering its evolution and ignoring any apparent trends, then there might well seem ground for moderate optimism. Given the quantity of growing stock available for exploitation, particularly in the moist closed forests of tropical regions, the volume of wood needing to be taken from the developing world's forests to cover the shortfall in industrialized countries does not seem at all excessive. All that need concern importers and consumers in the developed countries is that they will have to change their sources of supply (some being already very low) and look for their wood further afield, with a resultant increase in extraction costs. They will also have to make do with wood from hitherto lesser-used species that has already undergone some processing, instead of the logs which have suited them so well up till now. They will have to realise too that these 'deposits' are not inexhaustible and that their renewal should be of concern to them. There will also be a certain number of man-made forests which will have reached productive age, and these will prove a valuable supplementary resource, although not on the same scale as the production from natural forests.

However, the outlook is not nearly so healthy if one considers the way the situation is developing in certain regions of the world, and becomes even less so if individual countries are examined. By the year 2000 the present surplus will have turned into a growing deficit as a consequence of the over-exploitation of valuable species or because of the excessive pressure exerted on forests by other land use systems, and notably by shifting agriculture.

And the outlook becomes even more gloomy, justifying considerable pessimism, once one considers the situation of the thousands of millions of human beings engaged in the fruitless search for the fuelwood indispensable for their basic subsistence. Nor is the situation any better for those others who wear themselves out farming land which they will soon exhaust and be obliged to abandon. In countries where competition is likely between the need for fuelwood and the need for industrial wood, there can be little doubt that human survival will have priority and that wood industries will suffer as a consequence. Another cause for pessimism is the slowness of the natural forest

cycle, and even that of commercial plantations. Furthermore, there is little comfort to be had if those tendencies observable today are confirmed by the beginning of the next century.

But pessimism need not mean resignation. Enormous efforts, particularly in the financial and political spheres, will be necessary. However, there is already enough organized goodwill for an attempt to be made now to check current trends and to reverse them. What is needed is for these efforts to be harmonised - only thus can their effectiveness be maximised. No offer of help should be turned down since, above and beyond the profitability of forest projects themselves, the situation concerns everyone, be they from the North or from the South.



