

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

FOREST RESOURCES IN THE EUROPEAN REGION

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

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	ABBREVIATIONS AND SYMBOLS	
ha	= hectare	
_m 3	= cubic metre	
m ³ ob	= cubic metre overbark	
m ³ ub	= cubic metre underbark	
m	= metre	
om	= centimetre	
m ³ /ha	= cubic metre per hectare	
$m^3/ha/s$	= cubic metre per bectare per annum	
,	nil or less than half of the appropriate unit	
& 0	= not available	
长	= unofficial figure	

INTRODUCTION

The Forestry Department of FAO has over the years published the results of its enquiries into the forest resources of the world in a series of World Forest Inventories, the last of which was published in 1963. An imperfection of the earlier inventories stemmed from the fact that knowledge of the total forest resource was incomplete and these inventories were not designed to make use of the fuller information available about economically important parts of that total. The work carried out since 1963 has been directed towards gathering information in greater depth on the state of knowledge of resources of the individual countries.

This document is one of the new series resulting from this revised approach and presents information on the area of the forests and the volume of their timber growing stock in the countries of the European region. The function of such a regional survey of the data of forest resources is to provide a basis for estimating their ability to meet the requirements of the community of the region for wood products and to indicate their potential to contribute to national economies and to keep in balance with the increasing demand over the next decades up to the end of the century. Work on this survey has been carried out in collaboration with the Joint FAO/ECE Timber Division in Geneva which is preparing a study on European Timber Trends and Prospects, 1950-2000, at the request of the FAO European Forestry Commission and the ECE Timber Committee. In the latter study, the wood-producing potential of the European forest is viewed as one of the components within the total of supply possibilities of wood raw material from all sources, with which to compare projected requirements. A preliminary version of this study was presented and discussed at a joint session of the sponsoring bodies, held in Geneva in October 1975. Revisions and corrections received from countries up to 31 March 1976 have been incorporated in the final preparation of this appraisal.

The Quality of the Information

The information was assembled during the period 1974-1975. Questionnaires were circulated to all countries of the region; in addition, experts on forest inventory nominated by them assisted in the task of analysing and interpreting information as up to date as possible on the national forest resource situation. When detailed information from countries was missing, all other available sources were used as background in formulating estimates to ensure a comprehensive coverage.

As compared to other regions of the world, the available statistical information on the forest resources in the European region is rather complete. However, before entering the survey itself, some limitations on the quality of the information should be identified which affect the reliability of the conclusions to be drawn: they are mainly related to the differences in basic definitions and classifications and to the comparability of the statistical data over time and from country to country.

National statistical tools and forest inventories have often been designed on a subjective interpretation of definitions and classifications in an effort to adapt them to the specific national requirements. Problems arise for example in relation to land use assessments and to the precise definition of such basic concepts as growing stock or increment. For example, is the growing stock of a stand to be considered as the volume of stem wood above a given minimum diameter or as the total biomass? Most countries use the first definition which brings the problem of young stands with trees under the minimum diameter and of their increment before they form part of the measured growing stock.

Because of the wide range of forestry situations of the countries within the European region, the grouping of countries is not entirely satisfactory from every point of view; furthermore the comparison of situations between countries or groups of countries gives rise to difficulties, as the attempt to apply the same basic concepts to different existing situations inevitably results in the loss of information on specific features.

It is difficult even in one single country to compare the forestry situation which arises in two different periods. Over the last decades the quality and coverage of information about the forest resources in the countries of the region has improved substantially. Since the last World Forest Inventory was published in 1963, several countries have carried out national forest inventories; methodologies and equipment have made substantial progress. Thus when analysing the change of the forestry situation in a country over even recent periods of time, it is particularly difficult to assess what part may be related to actual structural changes of the resource and what part to improved knowledge. Information about the actual change is essential to any attempt to forecast future development.

Finally it appears that knowledge about forest resource in the European region is still incomplete and should be further improved in order to constitute a completely sound basis for assessing the future supply potential; in its present state of availability and comparability the information provides good indication of the situation of forestry in the region but there is a need of considerable caution in order to avoid too definitive conclusions.

Grouping of Countries within the Region

In this study the countries are grouped in geographical sub-regions made up as follows:

Nordic countries: Finland, Iceland, Norway, Sweden

European Economic Community: Belgium, Denmark, France, Germany (Federal Republic of),

Ireland, Italy, Luxembourg, Netherlands, United Kingdom

Central Europe: Austria, Switzerland

Eastern Europe: Bulgaria, Czechoslovakia, German Democratic Republic, Hungary,

Poland, Romania

Southern Europe: Greece, Portugal, Spain, Turkey, Yugoslavia

Other Mediterranean countries: Cyprus, Israel, Malta

The following regional totals are shown:

European region: Total of the above sub-regions which include all countries

which are members of the FAO European Forestry Commission

Near East countries: Cyprus, Israel, Malta, Turkey

Europe: Including all countries of the European region other than the

above Near East countries

THE FORESTS OF EUROPE

The overall land use in the European region is shown in table 1, together with the extent of forests in relation to the 1970 population and total land area in addition to the total area of forests and other wooded lands, by sub-regions.

Closed forest area refers to the total area of land with a "forest cover", i.e. with trees whose crowns cover more than 20% of the area, and which are not used primarily for purposes other than forestry. This area includes all plantations, all forests whether reserved or not, forest roads and streams and other small open areas, as well as forest nurseries, which cannot be readily excluded, and areas of windbreak and shelter trees managed as forests; it also includes young plantations which have not yet reached a crown density of more than 20% and temporarily unstocked areas in which trees have been temporarily removed by cutting or burning; isolated groups of trees which cover an area smaller than 0.5 ha are excluded.

TABLE 1

LAND USE IN 1970

	Clos	ed forest		Other	Forests ar	nd other d land	Agricul-		Laı	nd area
,	Total	Per caput	of total land area	wooded land	Total	% of total land area	tural	Other	Total	Per caput
	million ha	ha	- %	milli	on ha	%	m	illion ha		ha
Nordic countries	51.3	3.0	46	6.7	58.0	52	9.8	44,8	112.5	6.7
European Economic Community	30.5	0.1	20	2.1	32.6	22	98.7	19.2	150.5	0.6
Central Europe	4.7	0.3	38	0.1	4.8	39	5.8	1.7	12.2	0.9
Eastern Europe	26.8	0.3	28	0,9	27.7	29	60.6	8.7	97.0	1.1
Southern Europe	30.5	0.3	16	21.1	51.7	30	72.0	50.0	173.6	1.6
Other Mediterranean countries	0.3	0.1	8	-	0.3	9	1.0	. 1.7	3.0	0.8
REGION	144.1	0.3	26	31.0	175.0	32	247.8	126.0	548.9	1.1
of which: Near East countries	8.4	0.2	10	12.0	20.4	25	28.4	31.7	80.5	2.1
Europe	135.7	0.3	29	19.0	154.7	33	219.4	94.3	468.4	1.0
	!					<u> </u>				

TABLE 2

OWNERSHIP STRUCTURE AND MANAGEMENT STATUS

in million ha

	Total area	Public	cly owned	Privat	ely owned	Total	area
	covered <u>a</u> /	Total	with management plan	Total	with management plan	with management plan	under other regulations
Nordic countries	51.3	12.6	` 11.0	38.7	20.4	31.3	20.0
European Economic Community	30, 6	11.9	10.6	18.7	2.0	12.6	18.0
Central Europe	4.8	1.5	1.4	3.2	0.8	2.15	2.6
Eastern Europe	27.2	25.2	25.1	2.0	1.2	26.3	0.7
Southern Europe	45.1	33.3		11.8		••	••
Other Mediterranean countries	0.2	0.2	0.2	-	-	0.2	0.1
REGION	159.3	84.7	.,	74.6		••	6 0
(% of total)	(100)	(53)		(47)	,		
of which: Near East countries	20.4	20.3	19.90	-	-	19.9	0.5
Europe	138.9	64.3		74.5	• •	• •	4 0
(% of total)	(100)	(46)		(54)			

a/ Available information does not allow complete coverage of the forest and other wooded land area.

NOTE: Detail may not add to totals due to rounding.

Other wooded land is defined as a land with trees whose crowns cover from 5% to 20% of the area or with shrubs or stunted trees covering more than 20% of the area; such land has some forestry characteristics and should not be primarily used for non-forestry purposes such as grazing.

Forests and other wooded land combines the two previous categories and indicates the total area of land under forestry conditions and not used primarily for any other purpose.

Total area of forest and other wooded land is 175 million ha or nearly one—third of the total land area. Closed forest covers 144 million ha which represents approximately a quarter of the total land area and amounts on average to 0.3 ha per head of population in the region. In the Nordic countries closed forests constitute 46% of the total land area, the highest proportion in any sub-region, and the average of 3 ha per caput is ten times the regional average. All other sub-regions have a varying proportion of closed forest area but it is noteworthy that without exception they have a similarly low level of area of forest per caput between 0.1 ha in the relatively densely populated European Economic Community and 0.3 ha elsewhere. The countries of Southern Europe have the smallest proportion of closed forest area, 16%, as compared to their total land area. However this is compensated for by the large area of other wooded land, two-thirds of the region's area of this type, which is an indication of the particular situation of forest and other wooded land in the Mediterranean area.

Agricultural land comprises arable lands, orchards, vineyards, meadows, pasture, other grassland, agricultural land producing concurrent tree crops and land under fallow rotation. Total agricultural land area in the European region amounts to nearly 250 million ha, some 45% of the total land area. The lowest relative area of agricultural land is found in the Nordic countries, while the highest is in the European Economic Community where it represents two-thirds of the total land area, and in Eastern Europe with a slightly lower proportion.

Other lands include all lands which are not classified under either agricultural or forestry uses. They include unused areas, sand dunes, rock surfaces, high mountain bare lands, swamps and bogs too wet to be included in other classes, built-on areas, town roads, etc. The area of other lands not classified elsewhere amounts in the region to 126 million ha, some 23% of the total land area. Three-quarters of these other lands are found in the Nordic countries and in southern Europe.

When considering geographical Europe, land use percentages appear somewhat different with closed forests accounting for 29% of the total land area and poorly stocked other wooded land for a smaller proportion, 4%, as compared to respectively 10% and 15% in the Near East countries of the region. Agricultural land in Europe represents 47% of the total land area.

Description of Main Forest Types

The development of a variety of vegetation types in the European region is to be related not only to such evident factors as the diversity of climate and soil conditions but also to the prolonged influence of man due to the action of high density of population over several centuries. For these main reasons, the forests of the region are particularly varied and the present nature of most of them is the result of more or less heavy interventions by man. Only in the most remote locations some natural types of forest may still be found which perhaps recall the virgin forests which formerly covered the region. Because of their diversity it is difficult to estimate the area of forest falling into each of the main types: for this reason the following description of the main forest types only deals with the geographical distribution without attempting to estimate their extent. 1/

^{1/} Most of the description of forest types in the European region presented here rely on Eyre, S.R. (1968) Vegetation and Soils, Edward Arnold Ltd.

On the other hand, within the different forest types of the region, the ecosystems are generally of a certain simplicity with regard to the number of important tree species and often in a given limited area only very few species are dominant. Centuries of human influence and management have tended to accentuate the feature while orientating many forests towards pure and even aged stands easier to operate economically.

The boreal forests cover large areas in the Nordic countries as evergreen coniferous are particularly adapted to very cold winters and short growing seasons which prevail in most of Finland, Sweden and Norway. The species composition of the boreal forests of Europe is simple with pine, Pinus sylvestris, and spruce, Picea excelsa, absolutely predominant. Pine dominates in almost pure stands on sandy soils and spruce on loams and clays. However birch, Betula spp., and aspen, Populus spp., may be found on relatively large areas where they could spread over after clearings have occured due to human or accidental causes such as burning.

The sub-alpine forests dominated by evergreen coniferous extend far south even into the Mediterranean peninsulars as air temperature decreases with increasing altitudes, thus forming climatic conditions somewhat similar to those of the boreal area; the altitude of sub-alpine forests increases with decrease in latitude. Some species are the same as those in the boreal forest but most species are quite distinct. Pine, Pinus sylvestris, spruce, Picea excelsa, larch, Larix decidua, and fir, Abies excelsa, constitute most of the sub-alpine forests of western and central Europe; they cover large areas of the Black Forest and Bohemian Forest, of the Pyrenees and throughout the Alps. The sub-alpine forests extend southwards in southern Europe where they have to resist summer drought in addition to the reduced temperature in mountain areas. In addition to Pinus sylvestris and Abies excelsa, Abies pinsapo, A. cephalonics, A. cilicica are found respectively in Spain, Greece and Turkey with Pinus nigra being more important further south. Pinus brutia constitutes large areas of forest in Turkey.

The ecotone mixed forests constitute a transition between the previous types of coniferous forests and the non-coniferous deciduous communities of the humid regions. Changes in species composition are often hardly perceivable and furthermore centuries of human influence make it difficult to determine the former nature and extent of its component associations. Main species are pine, Pinus sylvestris, spruce, Picea excelsa, silver fir, Abies excelsa, oak, Quercus robur, birch, Betula spp., and beech, Fagus silvatica. Larger and continuous extensions of these forests are found eastwards from the slopes of the northern Alps, eastern France, central and north east Germany and south Sweden, with some others in Scotland and northern Spain.

The evergreen mixed forests were widely spread over the Mediterranean area where they constitute a true formation and not a transition as the previous mixed type. Intense human activities have gradually modified the nature of this formation as most of these forests were swept away and confined to relics or to degraded forms of which "maquis" is the more common. The original woodland vegetation now appears mainly as scattered clumps of helm oak, Quercus ilex, and cork oak, Quercus suber, particularly common in Portugal and Spain, of Pinus pinea, often as isolated trees, as well as in continuous stretches. P. pinaster is similarly distributed in the western part and P. halepensis in the eastern area of southern Europe.

Deciduous summer non-coniferous forests in the past almost entirely occupied the lowlands of western and central Europe as far north as the southern coastlands of the Baltic and of Norway, and south as far as Northern Spain and Central Italy. Much of the original forest area has been cleared and that which remains is strongly affected by human activities so that the original species composition and ecological associations can hardly be ascertained. In the western area, in the United Kingdom and northern France, oak, Quercus robur, is still predominant with birch, Betula spp., in more siliceous soils. In southern Europe those species are replaced by other deciduous oaks, Q. lusitanica, Q. pubescens, by the sycamore, Acer platancides, and chestnut, Castanea sativa. Beech, Fagus sylvatica, appears of special importance. It is the dominant tree at the northern edge of the formation; it forms large and almost pure stands in central Germany and in Czechoslovakia

and it dominates the deciduous forests of the lower slopes of the Alps. An important feature of the deciduous summer forest in Europe is the large extension of pure coppice and coppice with standard stands which are still to be found mainly in France and Italy. Throughout these two countries they constitute a substantial though decreasing proportion of the deciduous non-coniferous forests with an estimated area of 5 million ha. There is also a large area of coppice in Turkey, of which however a substantial proportion is of degraded nature.

Ownership Structure and Management Status

Some information is presented below on the ownership structure and management status of the forests in the European region. There are differences in definitions used from country to country and hence a need of caution in comparing national situations. Escause of the differences in managerial performance in the different ownership categories, the picture which emerges at the regional level has an important bearing for the understanding of the present situation of the resource and the wood supply prospects. The information is set out in table 2.

A little more than half of the closed forests of the European region is publicly owned, that is by national, state or central governments, by towns, villages or communes and any other public type of organization. Just under half of the region's forests is owned privately by individuals or families, private companies and corporations, including private forest industries. Privately owned forests are negligible in extent in the Near East countries and more than 90% of the forests in Eastern Europe are publicly owned. Private ownership of forests is largely predominant in the Nordic countries, in the European Economic Community and in Central Europe.

In all sub-regions the most common type of private ownership of forests is by farmers. In the Nordic countries the industry ownership has some importance in Finland but especially in Sweden. In Southern Europe three-quarters of the forest area is in public ownership but the situation varies from country to country: private ownership is predominant in Portugal and in Spain; in Turkey forests are owned almost exclusively by the state, and in Yugoslavia by public enterprises. Among public ownership the state is not the major public owner in all sub-regions: centralised state ownership is largely predominant in the Nordic countries and in Eastern Europe but in the European Economic Community and in Central Europe most publicly owned forests belong to local or regional authorities frequently having a large degree of autonomy with regard to the central forestry administration.

Information on the size of the forest holdings is of particular interest. However there are difficulties related to the definition of a holding. In some countries forests owned by one entity, for example the state, may be considered as one holding. In other countries forests seperated geographically and administratively or forests lying in more than one administrative district such as a commune may be considered as several holdings even though they constitute a single ownership; one owner may thus have several or only one holding according to the definition adopted. Information about the size of forest holdings should thus be treated with caution. However it does provide some interesting indications about the structure of the ownership and its variation between the sub-regions.

In Eastern Europe the central state owns 88% of the forests but private ownership still has some importance in the German Democratic Republic and in Poland where, however, the average size of private holdings, less than 1 ha, clearly indicates that their utilization is for the domestic requirements of their owners. Insufficient information is available on Southern Europe where public ownership of forests is also largely predominant with three-counters of the area covered.

In the Nordic countries the high proportion, 10%, of the total population who are forest owners provides an indication of the importance of forestry to the community in these countries. The average size of farm forests in the Nordic countries is approximately of 40 habut more than half are smaller than 25 ha. In the European Economic Community the average size of public holdings is slightly above 200 ha while that of private holdings is below 5 has Excluding Ireland and Immembourg for which the information is not available, a

quarter of the total forest area and 40% of the privately owned forests area is in private holdings of less than 10 ha. The scattered nature of private forest ownership is also characteristic of a large proportion of the remainder in this sub-region and constitutes a severe constraint on the achievement of proper management and the mobilization of the forest resource in this area.

In the two countries of Central Europe the structure of forest ownership varies widely between Austria where private forests largely predominate and Switzerland where most forests belong to individual public bodies such as cantons and communes: however in both countries only one-third of the total forest area is in holdings smaller than 50 ha and one-third is in holdings larger than 1000 ha.

The type and structure of ownership has undoubtedly some relation with the management status of the forests. The high share of small to very small private forest holdings where management plans can hardly be applied partly explains the low proportion, only 40% or 24 million ha, of private forest area which is under managment plans in the whole region, that is excluding Southern Europe for which no data is available. Among all sub-regions, the European Economic Community has the smaller proportion of private forests with management plans in relation to the very scattered nature of the private ownership. On the other hand in the Nordic countries more than half of the privately owned forest is under management plans. Excluding Southern Europe, about 48 million ha of the total 51 million ha of publicly owned forest in the region, nearly 94%, are worked under management plans, with a similar high proportion in all sub-regions. Of a total forest area of 114 million ha, some 72 million ha are operated under management plans and 42 million ha are under some other form of regulation which certainly cover a wide range of differences in situations between countries. In most countries it appears that the levels of management and of physical and economic productivity of the public forests and of the medium to large-sized forests are generally sound. Most of them still offer considerable scope for improvement in wood production and utilization of the resource. However the main challenge lies with the millions of small holdings where a substantial amount of the regional forest resource stands and tends not to be managed and cropped regularly. Earnings from these forests are often for their owners a subordinate part of their income and thus their response to incentives provided, or other actions undertaken by the forest authorities, tends to be rather weak. The main uncertainty is whether the participation of the small private forest owners in the wood supply of Europe's forest can be significantly improved, and under what social and economic cost conditions.

GROWING STOCK AND INCREMENT IN OPERABLE FOREST

Operable closed forest is defined as closed forest where the current or potential productivity and accessibility would allow forest operations under actual or foreseeable conditions. It includes forest areas that could be opened up for exploitation by the provision of access roads or in which operations may become feasible under improved economic conditions.

The area classified as inoperable closed forest includes closed forest where operations are considered unfeasible under current conditions of productivity or accessibility, due to adverse site, unfavourable terrain conditions or location which makes the area economically inaccessible. In addition it includes among inoperable forests those areas where cutting is prohibited or seriously restricted by legal regulations, e.g. for protection or recreation purposes. It should be noted that the definition itself allows for some flexibility in the areas under consideration in relation to changes in techniques and in economic conditions of forest operations.

Table 3 shows by sub-region the estimated extent of closed forest classified as operable and inoparable in the early 1970s: this classification may change over time as conditions of forest operations evolve. Approximately 6 million ha, or 4%, of the total area of closed forest is classified as inoparable, which seems a fairly low proportion of the total area. It is however significant to notice that in the Nordic countries the strictly inoperable closed forest area amounts actually to 4.2 million ha, or 45%, of the regional

effectively inoperable forest area; this is clearly related to the hard climatic conditions and consequent low productivity of forest areas above the Polar Circle. On the other hand the areas of inoperable forest reported in the other sub-regions are mainly areas where operations are under severe legal restrictions because of protection or recreation reasons or high alpine forest with low productivity.

The total area of operable closed forest amounts to nearly 138 million ha for the European region as a whole, or 130 million ha in Europe itself. This is the area of operable forest to which the information on growing stock and increment is related in table 4. However it should be noted that the strictly operable area would have to make provision for the inclusion of 3.4 million ha of inoperable area in the Nordic countries.

The quality of the data reported for areas and volumes has improved substantially during the last decade as in many countries of the region countrywide inventories have been carried out on the basis of improved methodologies and with a much higher degree of accuracy in the resulting knowledge of the forest resources. This, added to modification or divergencies in definition and classification in several countries, prevents attempting any precise comparison of areas of operable forests, volumes of growing stock and of increment during the past decades.

Table 4 shows that over the 138 million ha of operable forests in the region there are approximately 15 000 million m³ ob of growing stock of which nearly two-thirds are coniferous. Considering the inclusion of some growing stock outside the forests, the standing volume is slightly over 100 m^{3/ha} with broad variations between Central and Eastern Europe and other sub-regions. Growing stock per hectare in Central Europe is about three times higher than in both the Nordic countries and Southern Europe: this is explained by differences mainly in growing conditions but also in management traditions and practices. There is a relatively high proportion of timber standing outside the forest in Southern European countries; this volume is included in the total growing stock in operable forests but it does not amount to a substantial share of the European total.

The net annual increment of 451 million m³ ob for the region as a whole represents an average of 3.3 m³ ob/ha or 3% of the growing stock. In the sub-regions there are wide variations in the levels of net annual increment whether related to the unit area of operable forest or whether in proportion to the growing stock. In Central Europe while the net annual increment is the higher at 5.9 m³ ob/ha, it represents only 2.4% of the growing stock due to a high proportion of mature stands. Differences at the sub-region level reflect the wide variations at the country level from nearly 6 m³ ob/ha/a in Austria or Denmark to 2 m³ ob/ha/a in Norway or in Bulgaria, from over 6% of the growing stock in Spain to 1.9% in Switzerland. Increment of coniferous forest represents approximately two-thirds of the total net annual increment with almost 300 million m³ ob, of which 110 million m³ ob are located in the Nordic countries alone.

Having made allowances for the difficulties in comparing the forestry situation over different periods on the basis of the available information, a striking feature of the evolution in the region during the past two decades appears to be the appreciable expansion in growing stock and increment. Between 1950 and 1970 the apparent increase of the growing stock in the region was 1700 million m³ ob, or 13%, and of the net annual increment 77 million m³ ob, or 20%, while the share of coniferous rose over the period. Substantial increases of the proportion of coniferous took place in all sub-regions, especially in the European Economic Community. Not much information nation wide is available within the countries of the region especially as far as the mixed forest types are concerned. As a direct consequence not only this presentation does not include any estimate of related areas but furthermore in this survey no reference to a breakdown by coniferous and non-coniferous volume per unit area shall be made in order to prevent possible confusions about these mixed stands.

TABLE 3

OPERABLE CLOSED FOREST AREAS IN 1970

		Closed	Forest	-
	Operable	% of total area	Inoperable	Total area
	million ha	%	millio	n ha
Nordic countries $\frac{1}{2}$ /	50, 5	98	0.8	51.3
European Economic Community	28.9	95	1.6	30.5
Central Europe	3.8	82	0.9	4.7
Eastern Europe	25.1	94	1.7	26.8
Southern Europe	29.6	97	0.9	30.5
Other Mediterranean countries	0.2	77	0.1	0.3
REGION	138.1	96	6.0	144.1
of which: Near East Countries	8.3	99	0.1	8.4
Europe	129.8	97	5.9	135.7

^{1/} Operable forest area in the Nordic countries includes a total area of 3.4 million ha which are strictly inoperable but whose growing stock and increment volumes are inseparable from those of operable forest.

TABLE 4. GROWING STOCK AND ANNUAL INCREMENT IN OPERABLE CLOSED FORESTS IN 1970

•	Area		GROWING	STOCK	_	1	NÉT ANNU	AL INCRE	MENT	
		Total	Per unit area	Coniferous	Non- coniferous	Total	Per unit area	% of growing stock	Coniferous	Non- coniferous
	million ha	million m ³ ob	m ³ /ha	mi	llion m3 o	b	m ³ /ha	%	million	m ³ ob
Nordic countries	50.5 ¹ /	4 245	84	3 5 7 8	667	135	2.7	3.2	111	24
European Economic Community.	28.9	2 900	100	1 478	1 422	1042/	3.6	3,5	57	47
Central Europe	3.8	951	249	766	185	22	5,9	2.4	18	4
Eastern Europe	25.1	3 906	156	2 303	1 603	104	4.1	2,7	64	40
Southern Europe	29.6	2 501	84	1 218	1 283	87 <u>2</u> /	2.6*	3.2	47	39
Other Mediterranean countries	0,2	5	25	4	1	0.2	0.8	3.1	0, 1	-
REGION	138.1	14 509	108	9 348	5 161	4512/	3.3	3.0	298	154
of which: Near East countries	8.3	931	111	597	334	222/	2.6	2.4	13	9
Europe	129.7	13 972	105	8 870	5 102	429 <u>2</u> /	3.3	3.1	285	145

^{1/} This includes 3.4 million ha of inoperable forest inseparable in the area for which the information was provided.

NOTE: Detail may not add to totals due to rounding.

^{2/} For some countries net annual increment is related to the total growing stock including trees outside the forest. Net annual increment per hectare is therefore only approximate.

A brief description of the situation of operable forests in each sub-region is presented

Nordic Countries

The Nordic countries have more than one-third of the total area of operable forest in the region. However the information provided by the countries on their growing stock and increment relates to a larger area than the strictly operable forests and includes most of the forests considered as inoperable because of their low productivity. The volumes of growing stock and increment given in table 4 for the Nordic countries relates to a total area of forest of 50.5 million ha, of which an area of 3.4 million ha is not strictly operable.

Growing stock in the Nordic countries amounts to 4 250 million m³ ob with a net annual increment of 135 million m³ ob. This corresponds to an average standing volume of 84 m³ ob/ha with net annual increment of 2.7 m³ ob/ha. Despite a relatively low level of annual increment per hectare as compared with other sub-regions, the Nordic countries have a high rate of increment in relation to growing stock of 3.2%.

Coniferous species represent approximately the same share of closed forest area and growing stock, 84%, but slightly less of the net annual increment, 82%.

Differences are marked between the Nordic countries. Sweden has the largest share of forest resources with approximately half of the closed forest area and growing stock of the sub-region: it has the higher average volume per hectare of growing stock and increment. Finland's forest resources are mostly coniferous but non-coniferous are also of notable interest; growth rate is high especially if related to the growing stock. In Norway there exists a large area of poor scrubland, at least part of which is under conversion into coniferous forest. Differences in coniferous growing stock for unit area are less marked even if Norway has an appreciably lower average standing volume and increment, especially if compared with its neighbour Sweden.

European Economic Community

The operable forests of the nine countries of the European Economic Community cover nearly 29 million ha, while 1.6 million are considered as inoperable mainly because of the legal restrictions which affect their exploitation. The larger area of inoperable forest, nearly 1 million ha, is located in Italy. Growing stock in operable forests amounts to 2 900 million m³ ob, while there is an additional volume of 100 million m³ ob standing outside the forests, mainly in Italy. The net annual increment is of 104 million m³ ob for the total 3 000 million m³ ob of growing stock. The average volumes per hectare of growing stock of 100 m³ ob and of annual increment of 3.6 m³ ob are relatively close to the regional averages of 105 m³ ob/ha and 3.3 m³ ob/ha/a.

In the early 1970s the European Economic Community's standing volume of timber was almost equally distributed between coniferous and non-coniferous species, but coniferous represent 55% of the net annual increment. Coniferous prevail among the growing stock of operable forests in Belgium, Germany (Federal Republic of), Ireland and the Netherlands, that is to say mainly in the northern part of the sub-region. Non-coniferous are clearly predominant further south, chiefly in France and Italy, but also in the United Kingdom.

Two features are worth noting as far as the situation country by country in the sub-region is concerned: the wide range of situations which is not really surprising when its geographical extension is considered, and the predominance of the forest resources of France and Germany (Federal Republic of) in the total. These two countries own three-quarters of the sub-region's growing stock and increment: there is a high proportion of coniferous in Germany (Federal Republic of) where the growing stock per hectare, 145 m³ ob and the increment 5.1 m³/ha/a, are well above the average. On the other hand non-coniferous account for nearly two-thirds of the growing stock in France where the standing volume and increment per unit area are much closer to the average. The situation of some countries

such as Ireland is affected by a high proportion of young plantations of quick growing species in the growing stock, resulting in the case of that country in an annual increment almost double the average and corresponding to a much higher proportion of the growing stock. Because of the relative importance of the Mediterranean component, Italy finds itself in a singular situation with a fairly extended area of operable forests but a low standing volume of 54 m³/ha and an annual increment of 2.6 m³/ha which are by far the lowest in the sub-region. Finally the importance of coppice in the operable closed forest in France and Italy should be recalled as it covers an estimated area of 5 million ha, or 27%, throughout these two countries.

Central Europe

In Austria and Switzerland operable forests cover 3.8 million hectares, some 82% of the total area of closed forest. Inoperable forests are mostly in Austria where they are made up of almost an equal share of wholy unproductive forests and of protection forests where harvesting is very limited. Reported areas of inoperable forest in Switzerland are not large. Three-quarters of the sub-region's operable forests are in Austria.

The volume of standing timber in operable forests amounts to 951 million m³ ob, 80% of which consists of coniferous species. The average volume per hectare in the sub-region is of 249 m³, or 2.5 times the regional average. Switzerland ha by far the highest volume per unit area anywhere in Europe, at 278 m³/ha; it reflects at least partly the Swiss forests structure of a dense high forest of fairly large diameter trees with a high volume per hectare and insufficient renewal. The same feature is shown by the net annual increment which appears relatively high as per hectare, a volume of 5.4 m³/a, but notably low if related to growing stock: with less than 2% it is in fact the lowest ratio in Europe. The situation of Austrian operable forests appears more balanced.

Net annual increment in operable forests of Central Europe amounts to 22.5 million m³ ob, an average of 5.9 m³/ha/a again much higher than the regional 3.3 m³/ha/a average. Annual increment for coniferous and non-coniferous are at a similar level as compared to growing stock and coniferous represent 18.2 million m³, the same 80% proportion as of the growing stock.

Because of the limited area of this sub-region, Central Europe appears, as to the forest resource situation, as the more homogeneous group of countries in the region.

Eastern Europe

Operable forests cover 25 million hectares or approximately 84% of the total area of closed forests in Eastern Europe. The area of inoperable closed forest amounts to 1.7 million hectares of which a substantial part is located in Czechoslovakia. A total volume of 3 900 million m³ ob is reported as growing stock in operable forests which corresponds to 156 m³/ha, a volume per unit area appreciably higher than the regional average. Net annual increment is at 103.5 million m³ ob which is equivalent to 4.1 m³/ha, or 2.7% of the growing stock volume.

Coniferous species account for approximately 60% of the growing stock and annual increment in the sub-region, the annual increment per hectare being somewhat higher than for non-coniferous. However the composition of the standing volume and the share of coniferous and non-coniferous vary substantially among the countries of the sub-region: there is a clear contrast between the more southerly Romania, Bulgaria and Hungary, where non-coniferous amount to more than 60% of the growing stock and the northern German Democratic Republic, Foland and Grechoslovakia where coniferous make up three-quarters or more of the standing volume. The larger part of forest resources of the sub-region is in the latter group of countries. Czechoslovakia and Romania have among the highest volumes of growing stock per unit area with over 200 m3/ha with consequently a low annual increment as related to growing stock. The other countries have volumes of growing stock per hectare slightly higher than the regional average.

Southern Europe

Of a total area of closed forest of 30.5 million ha, 29.6 million ha are classified as operable forests leaving only an area of less than 1 million ha as inoperable forest, scarcely 3% of the total. In view of the growing conditions in the Mediterranean area and of the role of the forest in the protection of soils and nature and its contribution to landscape and tourism, the proportion of inoperable closed forest in the sub-region seems rather low and likely to rise in the near future, especially in those countries which at present report no inoperable forest area at all.

Growing stock in operable closed forests amounts to 2 500 million m³ ob, to which can be added a further substantial volume of 290 million m³ ob of wood standing cutside the forest. The average volume of timber per hectare is at 84 m³, lower than the regional average but at the same level as the Nordic countries. Net annual increment is estimated at approximately 87 million m³ ob for the total growing stock inside and outside the forests, some 3.2% of the standing volume and slightly above the regional average. As information on the increment of growing stock in operable forests is not available, only a tentative figure can be shown as regards the increment per hectare which in any case is substantially lower than the 3.3 m³/ha/a of the region.

Coniferous represent half of the growing stock in operable forest and some 55% of the annual increment. Non-coniferous are reported to occupy a considerably larger area in a wide range of growing conditions which result in a lower average standing volume and annual increment. Furthermore non-coniferous account for approximately two-thirds of the growing stock outside the forest in the sub-region, mostly in Yugoslavia.

The wide distribution of Southern European countries over the Mediterranean area covers a variety of situations. Turkey and Yugoslavia account for half of the operable forest area but for 70% of the volume of growing stock with a clear predominance of coniferous in the former and of non-coniferous in the latter. Partly because of the importance of plantations but also in relation to the climatic conditions, Portugal and Spain have the higher rate of annual increment, especially for coniferous.

The other Mediterranean countries have a limited extent of operable forest, approximately 220 000 ha, mostly in Cyprus with a large predominance of coniferous; non-coniferous are mainly in plantations in Israel where the rate of annual increment is among the highest in the Mediterranean area of the region.

TRENDS IN REMOVALS

The difficulty of comparing international removals statistics is well known, resulting as it does from differences in definitions, coverage and measurement methods from country to country. It makes it necessary to be cautious in any attempt to compare levels of removals between countries but also within a country with other dimensions of the forestry situation and especially with the annual increment. However the relative stability over time in the way removals data are collected and their availability make them of particular interest as indicators of trends in forest production.

The more significant elements of the removals situation in the region in 1970 are shown in table 5, where in addition, and as an indication, the net annual increment has been reported in the same underbark measure. Ratios which relate removals to net annual increment and to growing stock were also calculated in order to provide a broader basis for comparison between sub-regions, although they are not directly comparable; for example a ratio of over 90% of removals related to net annual increment would indicate overcutting in a "normal" forest.

Total roundwood production in 1970 in the European region reached a recorded annual level of 336 million m³ ub, of which four-fifths were made up of industrial roundwood. This volume represents approximately 85% of the indicated annual increment, a difference which even when large allowance is made for logging and transport losses indicates removals to be appreciably less than current increment. In 1970 removals represented 2.3% of the growing

TABLE 5

REMOVALS IN RELATION TO NET ANNUAL INCREMENT UNDERBARK

	Net annual	Estimated fellings			REMOVA	LS 1970	<u>b</u> /		
	increment underbark	- 1	Total	Industrial roundwood	Fuelwood	Conif- erous	non-conif erous	ing stock,	% of net annual in- crement ub
			mil	lion m ³ ub				%	%
Nordic countries	115.3	121.0	111.8	100.0	11.8	91.6	20.2	2.6	97
European Economic Community	92.9	87.0	78.3	67.6	10.7	39.8	38.4	2.6	84
Central Europe	20.2	17.9	16.1	14.0	2,1	13.0	3.0	1.7	. 80
Eastern Europe	90.7	78.5	72.8	58, 8	14.0	40.5	32.3	1.9	80
Southern Europe	73.5	64,0	57.6	27.8	29,8	26.1	31.5	2,1	78
Other Mediterranean countries	0.1	0.2	0.1	-	0.1	0.1	~	2,2	85
REGION :	392.7	368,6	336.7 (100)	26 & 3 (80)	68.4 (20)	211.2 (63)	125.5 (37)	2.3	86
of which: Near East countries %	18.0	20.0	17.9 (100)	5.0 (28)	12.9 (72)	10.7 (60)	7.2 (40)	1.9	99
Europe %	374.7	348.6	318.8 (100)	263, 3 (83)	55.5 (17)	200; 5 (63)	118.3 (37)	2.3	85

^{3/} Fellings equal removals plus harvesting losses. Estimates of harvesting losses are available for the Nordic countries and for Eastern Europe. Elsewhere it was estimated that harvesting losses were 10% of the felled volumes.

NOTE: Detail may not add to totals due to rounding.

<u>b</u>/ 3 year average, 1969-71.

stock: they were in broad terms in a similar proportion of two-thirds coniferous and one-third non-coniferous. Coniferous accounted for 72% of the industrial roundwood removals while fuelwood was made up of 76% non-coniferous. The Nordic countries produce the largest share, one-third, of the regional total removals which is in line with the proportion of forest resources of that sub-region.

Table 6

Recorded Removals 1950 - 1970

	1950ª/	1960 ^a /	1970ª
· · · · · · · · · · · · · · · · · · ·	Marine Mily — and a second control of the second and a se	million m3 underba	ark
Total removals, of which	<u>293.9</u>	305.8	336.7
Coniferous removals	170.7	186.0	211.2
Non-coniferous removals	123.2	119.8	125.5
Fuelwood	121.7	93•5	68.4
Industrial roundwood	172.2	212.3	268•3
Sawlogs and veneer logs	97.8	117.7	143.7
Pulpwood	37.3	59•9	93.7
Other industrial wood	37.1	34•7	30.8

a Three year average

Table 6 shows over the twenty years period 1950-1970 the evolution of the composition by species and by assortment of the recorded removals in the European region. Over that period the average annual increase in total removals is approximately 2 million m³ ub. Within the total there are however marked differences between groups of species and types of assortment. Coniferous species accounted for almost the whole increase, while non-coniferous remained practically static with a consequent decrease in their share of the total volume. It is also of particular interest to observe the marked decline not only in fuelwood removals but more generally of other industrial roundwood not directed to the processing industries. Removals of fuelwood and other industrial roundwood - piles, poles and posts - decreased by over 60 million m³ ub as compared with the level of approximately 160 million m³ ub in 1950. Simultaneously roundwood for processing by industries, sawlogs, veneer logs and pulpwood, increased by over 100 million m³ ub (in twenty years) and reached in the early 1970s the record level of nearly 250 million m³ ub, 75% of the total volume removed.

Major trends by individual commodities over the period from 1950 to 1970 were the following:

Main increase in volume

Coniferous and non-coniferous sawlogs and veneer logs

Coniferous and non-coniferous pulpwood

Main decrease in volume

Coniferous and non-coniferous fuelwood

Coniferous other industrial roundwood

Some quick indications are given below on trends in removals in each sub-region.

The Nordic countries alone have increased their annual removals from 88 million m³ ub in 1950 to 112 million m³ ub in 1970 and thus accounted for more than half the increase of the regional total. Growth in sawlogs and veneer logs removals represented nearly two-thirds of the total expansion; a substantial increase in pulpwood removals was partly offset, and in fact made possible, by a decline in those of other small size roundwood, mainly fuelwood. Sweden provided the main share of the Nordic countries increase: its removals actually account for some 53% of the total and the current level of removals exceed the present sustainable production capacity of the forests of this country. Coniferous account for more than 80% of total removals in the Nordic countries; pulpwood constitutes half of the total, a share which illustrates the importance of the pulp and paper industries in the sub-region.

The European Economic Community's annual removals of nearly 80 million m³ ub account for one quarter of the region's removals. The ratio of removals to growing stock is the same (2.6%) as in the Nordic countries, but to net annual increment it is substantially lower and seems to indicate some degree of undercutting. In this sub-region the striking feature is the stability of total removals which were at a level even slightly lower in 1970 than in 1950, in contrast with the increases observed in all other sub-regions. This is clearly the result of a rapid reduction in fuelwood removals which have fallen to less than a third of their original volume, reductions which were not totally offset by the simultaneous increase of industrial roundwood removals. Industrial roundwood, at 68 million m³ ub, accounted for 85% of the total removals in 1970 after an annual increase of almost 1 million m³ ub since 1950. However the rate of increase was much stronger for pulpwood than for sawlogs and veneer logs; for non-coniferous than for coniferous industrial roundwood. Two countries, France and Germany, account for three-quarters of the total removals of the sub-region. France itself accounts for two-thirds of the total increase in industrial roundwood removals since 1950 with the sawlogs and veneer logs volume doubling and pulpwood tripling over the period; despite these increases the removals level in 1970 was still well below the annual increment. Fuelwood removals still represent a substantial, even if decreasing, volume in France and Italy.

In Central Europe removals amounted in 1970 to 16 million m³ ub or a relatively low ratio of 1.7% of the growing stock volume, as compared with the average 2.3% for the whole region. The difference with the annual increment level is also marked. In twenty years total removals increased by 3.5 million m³ ub as a result of a strong increase of the volume of industrial roundwood removals which however was partly offset by the reduction in fuelwood. Growth has been stronger for sawlogs and veneer logs than for pulpwood, much stronger for non-coniferous than for coniferous which, however, still accounts in 1970 for 90% of the industrial roundwood. The evolution of removals in Central Europe is strongly influenced by Austria as the share of this country amounts to three-quarters of the total: another important feature is the fact that two-thirds of Austria's removals are large-sized timber while pulpwood accounts for not quite 16%.

In Eastern Europe removals were at an annual level of 71 million m³ ub in 1970 after they had increased by some 10 million m³ ub over the previous twenty years. This level corresponds to about 1.8% of the growing stock and is among all sub-regions the one which shows more difference with the annual increment level. Industrial roundwood accounts for more than 80% of the total removals in early 1970s after a strong increase, especially in pulpwood, which however was partly offset by the reduction of fuelwood as elsewhere in the region. Removals of large-sized timber, sawlogs and veneer logs, of non-coniferous species increased by almost three times and reached 12 million m³ ub in the early 1970s. As a consequence of the rapid growth of non-coniferous industrial roundwood removals, the share of coniferous among industrial wood declined from over 80% to 65% in the last twenty years despite a substantial increase in volume. Poland and Romania account for more than half the sub-region's removals with coniferous strongly predominating in Poland, and the reverse in Romania. The fastest growth over the recent period was observed in Hungary.

Southern Europe's annual removals amounted to 58 million m³ ub in 1970 with fuelwood accounting for more than half of it, in sharp contrast with its small share of removals in

other sub-regions. Removals were equivalent to 2.1% of the growing stock, somewhat lower than the regional average. Removals in the sub-region were stable during the 1950s, followed by a strong increase during the 1960s, of 1 million m³ ub per annum. During the whole period removals of industrial roundwood doubled, and reached the level of 28 million m³ ub in the early 1970s. Stronger growth was for pulpwood which amounted to 6.5 million m³ ub in 1970, as compared to 0.9 million m³ ub in 1950, and for large-sized roundwood which more than doubled and reached 16 million m³ ub in 1970. The evolution of removals varied widely from country to country and particularly in the two countries with a dominating position in the sub-region's forest resources: from a marked level of over-exploitation in 1950 Yugoslavia's annual removals went down by 9 million m³ ub to an almost stable level of 17 million m³ ub. More than 60% of the total increase in Turkey's removals was accounted for by fuelwood, essentially coniferous fuelwood. Leaving aside Turkey's fuelwood removals, those of the remaining countries were actually reduced by one-third during the period 1950-1970, an evolution in line with that of the region.

FUTURE SUPPLY POTENTIAL

Forests in the European region have been under heavy pressure from man for a long time and contributed substantially to the rural economies, either by providing additional land for cultivation or as a source of important products such as fuelwood and logs. Until recently there was not much concern about the capacity of the regional forest resources to meet Europe's timber requirements. After twenty-five years of very rapid growth of consumption of forest products which have seen the European region becoming gradually a net importer, even if not for a considerable volume as compared to total consumption, the outlook for future supply becomes of special interest: it has some important implications not only as far as forest policies, land use planning and forest management orientations within the region are concerned but also as the dependency on external sources of supply may mean interesting trade possibilities mainly for the developing countries in the tropics.

The future supply potential will be reviewed below on the basis of the forecasts which were set up by the countries of the region and which refer to the outlook of the national forestry situation up to the year 2000. Attention will be on changes in areas of forests, on the development of growing stock and increment volumes, and on the forecasts of removals. The outlook which arises for the forestry situation in the European region in 2000 will then be commented upon in the light of some main factors which may affect the future levels of supply.

Changes in Areas of Closed Forest

Table 7 shows for each of the European regions the areas of forest land and operable closed forest existing in 1970 and the equivalent forecasted areas in 2000. For the European region it appears that global increases of 9 million ha of forest land and 14 million ha of operable closed forest are envisaged during the next decades up to year 2000. If these increases of respectively 5% and 10% are effectively to take place, it is evident that the major increase in operable closed forest area will be possibly only by converting previously poorly stocked forest land into closed forest. In addition it could be that some of the increase in total forest land will not result in an enlargement of the area of operable forest, but will be either plantations with purposes other than wood production or natural extension of some woody vegetation over abandoned agricultural land.

The evolution of the forest area in the European region between 1970 and 2000 is largely marked by the changes which are forecasted in Southern Europe, notably in Spain. It is foreseen that in this sub-region the increase in area of operable closed forest will be almost six times that in forest land and will constitute most of the regional increase. Substantial areas of unproductive forest land and scrubland are planned to be converted into operable forests. It is noteworthy that in none of the sub-regions is a reduction of forest land, or operable closed forest, forecast. At a time when it could be expected that pressures increase for more forest areas to be removed from wood production, the Nordic countries are the only sub-region where operable closed forests are foreseen to increase more slowly than

TABLE 7

FORECAST CHANGES IN FOREST AREAS 1970 TO 2000 AND PLANTING OF MAN MADE FOREST

in Million ha

	·	Forest and	Planting	of man ma	de forest		Planting of operable man made forest				
	Year	other wooded	Cumu- lative	of which afforestation		Operable forest area	from 1950 to 1970 from 1970 to 2000				
			total since 1950	from 1950 to 1970	from 1970 to 2000		Total	of which conigrous		of which coniferous	
Nordic countries	1970 2000	57.9 61.0	5.51 15.71	0.55	1.32	50.5 51.2	5, 51	5.48	10,20	9.92	
European Economic Community	1970 2000	32.6 34.0	3,72 7.75	2.27	2.14	28.6 30.4	3.00	2,56	3.51	3,18	
Central Europe $\frac{1}{2}$	1970 2000	4.8 5.2	0.27	••	••	3.8 4.4	••		* *		
Eastern Europe 2/	1970 2000	27.7 29.9	6.66 13.55	1.33	1.15	25.1 27.4	6.32	·••	6.12	••	
Southern Europe 3/	1970 2000	51.7 53.2	3.14 5.51	2.18	0.38	29.6 38.1	3.08	2.49	3.14	• •	
Other Mediterranean countries	1970 2000	0.3 0.4*	0.07	• •		0.2 0.3*	0.05	••	E 4	••	
REGION	1970 2000	175 184	19.37	• •	• •	138 152		••	• •	• •	

 $[\]underline{1}/$ Information on planting refers only to Austria.

^{2/} Information on planting in Eastern Europe does not include the German Democratic Republic and Czechoslovakia.

^{3/} Information on planting in Southern Europe includes for the period 1970-2000 only Portugal, Turkey and Yugoslavia.

inoperable forest. However the effective evolution of forest land and operable closed forest over the other sub-regions could be rather different in the next decades as future land use orientations and availability of land for afforestation are still very uncertain.

Table 7 also presents for each sub-region the available information on planting of man-made forest in order to give some indication about its contribution to the evolution of the forest resources. Cumulative planting is shown since 1950 when statistical information is available in almost every country of the region. Figures shown for the period from 1950 to early 1970s correspond in practice to completed planting during that quarter of century while figures for 2000 include in addition the programmes communicated by countries for the last quarter of the century. It is probable that the cumulative totals by the end of the century contain some double counting of areas which may have been planted and replanted over the period under review.

Information shown for afforestation is not to be strictly compared with the evolution of the forest land area which is really the result of a balance between afforestation, natural extension of the forest and deforestation in favour of other uses of land. However this information provides at least a ground for comparison between two periods and an indication of trends, as well as of the relative share of afforestation in total planting within each sub-region. In the Nordic countries areas to be afforested are forecast to increase substantially in the next decade in contrast with the trend shown by other sub-regions where those areas are planned to remain approximately stable or even to decline as in Southern Europe. It is noteworty that, with the exception of the latter sub-region, in none of the other important groups of countries is a major change in the proportion of afforestated areas to cumulative planting forecast between 1970 and 2000.

Planting of operable man-made forest refers to plantations, afforestation or reforestation, which have no other predominant purpose than wood production. The information is presented on the basis of areas planted from 1950 to 1970 and planned from 1970 to 2000, and when information is available the area of coniferous is shown. The high proportion of coniferous among the species used in planting man-made forest in the Nordic countries is not surprising; the available information indicates that coniferous species also constitute the bulk of plantations in the European Economic Community and in Southern Europe. Furthermore in two sub-regions, the Nordic countries and Southern Europe, the area planned to be planted between 1970 and 2000 exceeds by far the forecast increase in area of operable forest and amounts to approximately one-fifth of total area at the end of the period. On the contrary it can be observed that the increase in area of operable closed forest in Southern Europe is much higher than the projected area of planting but this is mainly due to the fact that information on planting forecasts is not complete.

As far as the outlook of future supply potential in the European region is concerned forecasts of changes in the areas of closed forest and of man-made forest indicate an increase of some 14 million ha, or 10% of the area of operable closed forest. This is presumably mainly obtained by conversion of poorly stocked forest land through intensive plantation programmes. Projected planting of operable man-made forest for the period 1970-2000 shows a very marked predominance of coniferous species and will increase their share of forest resources. Some uncertainty remains however on the availability of suitable lands for conversion into operable closed forest and on the magnitude of pressures that may remove forest area from normal wood production operations.

Outlook for Growing Stock and Increment in Operable Forests up to Year 2000

Table 8 sets out the forecasts of the forestry situation in the European region up to year 2000, and at the end of each decade from the existing situation in 1970. In this subchapter attention will be concentrated on the outlook for growing stock and increment in operable closed forests and on major changes which are expected in the sub-region's situation.

TABLE 8

PROSPECTIVE SUPPLY POTENTIAL TO 2000

		O 11	Growi	ng Stock	Net an		Re	movals	Unit V	olume of
	Year	Operable closed forests	Total	of which coniferous	Total	of which coniferous	Total	of which coniferous	Re- movals	Net annual increment
	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	million ba		million m ³	ob		millio	n m ³ ub	m³ub/ ha	m ³ ob/ ha
Nordic countries	1970	50.5	4 246	3 577	135	111	112	92	2.2	2.7
	1980	50.4	4 116	3 580	137	113	118	102	2.3	2.7
	1990	50.8	4 078	3 575	140	117	121	106	2.4	2.8
	2000	51.2	4 032	3 446	149	125	126	111	2.5	2.9
European Economic Community	1970	28.6	3 002	1 496	104	58	78	40	2.8	3.6
	1980	29.1	3 153	1 610	113	65	78	44	2.7	3.9
	1990	29.8	3 398	1 792	122	71	92	53	3.1	4.1
	2000	30.4	3 686	2 014	136	81	102	58	3.4	4.5
Central Europe	1970	3.8	951	766	22	18	16	13	4.2	5.9
	1980	4.0	997	806	24	19	18	14	4.5	6.0
	1990	4.2	1 043	827	26	21	20	16	4.8	6.1
	2000	4.4	1 089	849	28	22	21	17	4.8	6.2
Eastern Europe	1970	25.1	3 906	2 303	104	64	73	40	2.8	4.1
	1980	25.9	4 061	2 474	110	70	78	43	3.0	4.4
	1990	26.7	4 370	2 763	116	73	83	47	3.1	4.3
	2000	27.4	4 565	2 974	120	78	89	53	3.2	4.4
Southern Europe	1970	29.6	2 501	1 218	87	47	58	26	2.0	2.6*
	1980	33.1	2 644	1 283	89	49	62	32	1.9	2.7
	1990	35.4	2 706	1 339	96	53	68	35	1.9	2.7
	2000	38.1	2 799	1 407	104	58	70	36	1.8	2.7
Other Mediterranean countries	1970 2000	0.2 0.3*	5 6*	4 5*	0.2 0.3*	0.1 0.2*	0.1 * 0.2		0.6 0.8*	0.8 1.0*
REGION	1970	138	14 700	9 400	451	297	337	211	2.4	3.3
	1980	143	15 100	9 800	474	316	352	235	2.5	3.3
	1990	147	15 700	10 300	501	337	383	257	2.6	3.4
	2000	152	16 300	10 800	536	364	408	275	2.7	3.5
of which Near East countries	1970	8.4	841	553	22	12	18	11	2.1	2.6
	1980	8.7	840	564	22	13	21	10	2.4	2.5
	1990	9.2	835	580	25	14	22	11	2.4	2.7
	2000	9.8	856	605	29	18	23	12	2.3	3.0
Europe	1970	129.4	13 860	8 890	429	285	319	200	2.5	3.3
	1980	133.8	14 240	9 190	452	303	331	225	2.5	3.4
	1990	137.7	14 860	9 720	476	323	360	246	2.6	3.5
	2000	141.7	15 420	10 190	505	345	385	263	2.7	3.6

NOTE: Detail may not add to totals due to rounding.

Some of the changes in reported area and growing stock which occured in the period from 1950 to 1970 result from improvements in inventory methodology and changed definitions, especially in relation to land classification. Despite this it is of some interest to compare the changes during that period with those forecast up to the end of the century. While the reported area of operable forest showed a statistical decrease of some 6 million ha before 1970, even if such a decrease did not in fact occur, forecasts show an increase of 14 million ha up to 2000. Simultaneously growing stock and net annual increment are forecast to increase by about the same amount in the period 1970 to 2000 as between 1950 to 1970. The forecast increase in growing stock is an approximate 1600 million m3 ob, or 11%, and that in net annual increment 80 million m3 overbark, or 18%. By 2000 growing stock in the European region should exceed 16 000 million m³ overbark and net annual increment approximately 530 million m3 overbark, according to forecasts. Given current trends in management and especially the predominant use of coniferous species in planting, it is not surprising that the growth of growing stock and annual increment of that group of species is expected to be much higher than of non-coniferous. By 2000 coniferous species should constitute more than two-thirds of the total growing stock and annual increment in the region's operable

With the exception of the Nordic countries, growing stock in operable forests is expected to expand between 1970 and 2000 in all sub-regions with the largest increases in the European Economic Community and in Eastern Europe of about 650 million m³ in each, thus accounting for more than 80% of the regional increase. Net annual increment is forecast to rise in all the sub-regions with a major increase in the European Economic Community of 30 million m³ overbark, accounting for a substantial 38% of the regional expansion; the rate of growth of annual increment is of a similar magnitude in Central Europe. Considering the changes in operable forest area, a major increase in growing stock and annual increment per hectare is forecast in the European Economic Community, from 105 m³/ha and 3.6 m³/ha/a in 1970 to 120 m³/ha and 4.5 m³/ha/a in 2000.

The major changes from 1970 to 2000 in the situations of each sub-region are presented below.

In the Nordic countries the area of operable closed forest could slightly exceed 51 million ha, after an increase which amounts to less than a quarter of the forecast expansion of the total area of forest land over the next thirty years. The decrease in growing stock, even if relatively small, 3% over the period, is unique in the whole region and it results from the special evolution in Sweden. The growth in the standing volume in Finland and Norway is not sufficient to offset a decline of Sweden's growing stock by 370 million m³ ob, some 16%, over the period between 1970 and 2000. The reason for this decline is to be found mainly in the rapid rise in removals which in the early 1970s exceeded the increment level. A slight decrease in Sweden's net annual increment is largely compensated for by a substantial increase in Finland and Norway, and the annual increment in the sub-region should have risen by 8% in 2000. A decrease of the share of non-coniferous species is forecast in Sweden and Finland with coniferous being in the whole sub-region almost exclusively used for planting.

In the <u>European Economic Community</u> a relatively small expansion of the operable closed forest is expected to take place which would bring the total area to 30.4 million ha by 2000. Italy and the United Kingdom should each account for one-third of the total increase, while France and Germany remain stable. Simultaneously substantial expansion of the volume of standing timber, over 22%, is forecast. Three-quarters of the total expansion is accounted for by coniferous species which will represent 55% of growing stock by the end of the period. Net annual increment will amount to 136 million m³ ob by the end of the century with coniferous accounting for nearly 60% as compared to 55% in 1970. Major changes are forecast in Ireland and the United Kingdom where as a result of intensive use of fast growing species in their planting programmes, the standing volume and annual increment of coniferous species will increase three times on average over the thirty years' period. In Italy growing stock and increment of non-coniferous is forecast to double between 1970 and 2000. However the predominant trend is for coniferous species to increase in importance resulting in a substantial rise in increment which in turn reflects a rising productivity of the forests in the sub-region, both in relation to growing stock as well as per unit area.

In Central Europe changes in forest resources between 1970 and 2000 are forecast to occur entirely in Austria since the forestry situation in Switzerland is expected to remain stable over the period. Thus the foreseen increases of 0.6 million ha in area of operable forest, 140 million m³ ob in standing volume and 5 million m³ ob in annual increment represent the changes in Austria alone. Growing stock per hectare will remain by far the highest in the region. In contrast with the trend observed in other sub-regions the forecast growth is higher for non-coniferous than for coniferous; coniferous remain however predominant despite a small decrease in their share of growing stock.

In Eastern Europe the area of operable forest is forecast to reach to 27.4 million ha by 2000, a % increase, half of which will take place in Poland alone. It is estimated that the volume of standing timber will rise by some 660 million m³ overbark, or by 17%. The difference in increase in volume and area will result in a higher volume of timber per hectare, well above the regional average. Practically the whole increase in growing stock is coniferous, non-coniferous standing timber remaining almost constant at about 1600 million m³ ob and its share of the total declining from 41% in 1970 to 35% in 2000. Net annual increment is forecast to increase over the period by 16 million m³ ob, or 15%, with coniferous species accounting for 90% of this increase. Main changes are foreseen in Poland with an increase of 38% in standing volume and 18% in annual increment but substantial expansion is also foreseen in Czechoslovakia, in the German Democratic Republic and in Hungary. According to forecasts Poland would have the largest share, almost one—third, of forest resources in Eastern Europe by year 2000.

In Southern Europe there will be 38 million ha of operable forest in 2000 as compared to nearly 30 million ha in 1970. When related to the increase of only 1.5 million ha in the total area of forests and other wooded land the sizeable change in operable forest area reflects the intensity and magnitude of existing programmes in several countries and directed to the conversion into productive forest of land previously considered as inoperable wooded land. Spain alone accounts for nearly half the sub-region's projected increase in operable forest area with an annual expansion of 150 000 ha and the highest rate for any country in the European region. A strong expansion is also forecast in Yugoslavia but mainly concentrated in the current decade. The volume of standing timber in Southern Europe will increase by roughly 12% and reach 2800 million m³ ob by the year 2000, while the annual increment will grow faster, the rate being almost 20% over the same period, and reach 104 million m³ ob. As elsewhere in the region growth is more marked for coniferous which will account for just half the growing stock and 56% of the increment by the end of the century; however the use in planting of fast growing non-coniferous species, such as eucalypts, will also allow a substantial increase in standing volume and especially increment for this group of species. Major rises in volume of standing timber are forecast in Spain and in Yugoslavia, the latter accounting for half the total increase in the sub-region. The volume growth in annual increment over the period is expected to be largest by one-third in Turkey but substantial also in Spain and Yugoslavia. It is noteworthy that the increase in annual increment of coniferous timber in Spain and Turkey is expected to account for 90% of the increase in the whole subregion between 1970 and 2000.

Forecasts of Removals up to Year 2000

In addition to those of the forestry situation, Table 8 also presents the forecasts of removals in order to allow some comparison between the growth of the European region's forest resources and the evolution of the drain. This shows that a substantial expansion of the annual volume of removals is expected in line with the increases in volumes of standing timber and annual increment in the operable forests of the region. It is estimated that annual removals will increase by 71 million m³ ub, some 21%, over the early 1970's level and reach the volume of 410 million m³ ub by year 2000. This compares with a parallel forecast expansion of nearly 85 million m³ overbark, or 19%, in net annual increment. It is of particular interest even if expected to observe that the rise in annual removals of coniferous timber is estimated to account for 65 million m³ ub, or approximately 90% of the total increase in removals. Furthermore these additional coniferous removals underbark are the same volume as the overbark growth of the annual increment in this group of species, a

continued tendency for removals to come closer or even correspond to the increment level. In contrast, removals of non-coniferous timber are expected to increase by only 6 million m³ ub which amounts to only half of the forecast growth in annual increment during the same period. The annual volume of non-coniferous removals will be 133 million m³ underbark by 2000, according to estimates.

It is noteworthy that the ratio of removals underbank of net annual increment overbank is expected to rise only slightly by 2% to reach 77% over the next decades on average for the whole region. However the intensity of exploitation by unit area of operable forest should simultaneously rise from 2.4 m3/hz to 2.7 m3/ha at the end of the period. No information is available about the changes in assortment composition of the future removals: it seems reasonable to expect a further decrease of the share of fuelwood with some transfer to small size industrial roundwood removals. There is no indication about the future size composition of removals but it may be expected that unless substantial modification takes place in the economic conditions of forest production, large size timber, sawlogs and veneer logs, will keep a substantial share due to the associated higher profitability. Within the sub-regions, the major increase in removals volume is forecast in the European Economic Community of 23 million m3 ub or nearly 30% during the thirty-year period. Except the Nordic countries, all other sub-regions are forecasting a substantial expansion of over 25% with non-coniferous species removals growing faster than coniferous only in Central Europe. In the Nordic countries it is estimated that removals will rise by 14 million m³ ub or approximately 12%. This smaller increase may be related to the intensity of harvesting already reached in the sub-region, especially in Sweden. Major features in the removals growth in each sub-region will be presented below.

In the Nordic countries the evolution of removals is strongly affected by the forecasts made in Finland and Sweden where the annual volume of timber removed is to rise by only 5 million m³ ub in each country over the thirty-year period. Removals of coniferous timber will however grow much faster than total removals as non-coniferous are estimated to decline by 24% during the same period. This evolution is in fact due to Finland where it is estimated that coniferous removals will increase by 11 million m³ ub to 43 million m³ ub in 2000 and non-coniferous will decrease by 5 million m³ ub from 11 million m³ ub to 6 million m³ ub. In Norway and Sweden growth in removals will be almost entirely in coniferous with non-coniferous stable.

In the European Economic Community annual removals are forecast to increase by over 22 million m3 ub and to exceed 100 million m3 ub by the year 2000. The share of France is predominant as its removals are forecast to rise by 16 million m3 ub, or 72% of the total increase, and reach approximately 47 million m3 ub in 2000. This is however considered a peak level which may possibly not be further maintained. Substantial increases, at least in proportion if not in real volumes, are also forecast in Ireland and in the United Kingdom when young plantations will come into production. Growth in coniferous removals will be particularly marked as their share of total removals is to rise from 50% in 1970 to 57% in 2000. Increases in coniferous removals are forecast in all countries of the sub-region. A decline in non-coniferous removals is expected in all EEC countries except France. However the expected increase in France more than offsets the reduction elsewhere; French removals of non-coniferous timber are forecast to increase by 10 million m3 ub over the thirty-year period and reach 27 million m3 ub by 2000. They would then account for 61% of the non-coniferous removals in the sub-region as compared to 42% in 1970.

Removals in Central Europe are estimated to increase by over 5 million m³ ub, or 32% above the 1970 level, and to amount to some 21 million m³ ub in 2000. By that time coniferous will still constitute 80% of the total volume annually removed but, in contrast with other sub-regions, the major growth will be for non-coniferous with a 46% increase over the period as compared with 29% for coniferous. Austria with a major share of forest resources should account for most of the increase in volume of total removals but it is noteworthy that the expansion of non-coniferous removals is expected to take place exclusively in this country.

For Eastern Europe it is forecast that total removals will amount in 2000 to nearly 89 million m³ underbark, about 18 million m³ ub or 25% above the 1970 level. Coniferous should account for almost three-quarters of the increase and substantially increase their share to approximately 60% in the total volume with 53 million m³ ub. Nearly half of the increase in total volume in removals and in coniferous should take place in Poland which will account for 30% of the sub-region's removals by the end of the century. In every country coniferous removals are forecast to expand faster but, except in Bulgaria, growth in non-coniferous removals is also to be substantial.

In Southern Europe removals are forecast to increase by over 12 million m³ ub during the thirty-year period and reach almost 70 million m³ ub by year 2000. Two factors may affect the growth of removals in the sub-region in the coming decades: fuelwood still accounted for more than half of total removals in 1970, being still especially high in Turkey; a faster decrease in fuelwood consumption could modify substantially the forecast evolution of total removals. Furthermore the improvement of infrastructure and accessibility of the forest resources has an important role for the future availability of timber. According to forecasts the faster expansion of removals is to take place in Spain which will account for almost 5 million m³ ub, or 40% of the rise in the sub-region. In this country coniferous removals should nearly double over the next thirty years. As a result of the faster expansion of coniferous in total removals the share of non-coniferous removals in the sub-region is to decrease from 55% in 1970 to 48% in 2000. Southern Europe will then be the last sub-region for coniferous to become predominant in removals.

Factors which may affect the Future Supply Levels

This may be the time to raise the point of the comparative evolution of the wood supply as shown by the removals forecasts and of the forest resources mainly characterized by the forecast standing timber and its increment volume. It will then be easier to identify some of the main factors which may influence positively or negatively the future supply levels by the turn of the century.

A global approach to a comparison of the different elements of a dynamic evolution of the wood supply and forest resources would normally have to be based on the examination of changes in growing stock due to the balance between growth and drain. The latter may occur both by natural causes giving rise to natural losses, and by human intervention mainly as fellings. Growth expressed as annual increment is measured in all countries with a variable degree of accuracy but it cannot be taken as equivalent to potential cut which may be defined as the volume of wood which could be felled in a given time with consideration of the sound development of the forest resources and to which actual cut could be directly compared.

As no information is available on potential cut it is difficult to estimate the real impact of removals on growing stock with due consideration to increment. However, as a tentative indication based on the available information, table 9 presents the make up of the difference in volume and composition between gross annual increment overbark and removals underbark from 1950 to 2000. The difference is shown first in volume for each sub-region, then the total volume for the European region is broken down between its main constituting elements; natural losses make the difference between gross and net annual increment before bark and then harvesting and transport losses are taken into account. Then a residual volume makes the difference with the reported forecast level of removals and would give a rough indication of what could be the gap between actual removals and potential removals if potential cut was equal to net annual increment. This would be the case of a "normal forest" with a regular age class distribution. Under such conditions, the residual volume would also correspond to the change in growing stock resulting from the balance between additions to and withdrawals from the standing timber.

DIFFERENCE BETWEEN GROSS ANNUAL INCREMENT OVERBARK AND REMOVALS UNDERBARK

AND POSSIBLE EFFECT ON GROWING STOCK, FROM 1950 TO 2000

IN MILLION M³

	1950	1970	1990	2000
Difference between gross annual increment overbark and removals underbark				W. Carlotte and Ca
by sub-region, Nordic countries	51	32	27	30
European Economic Community	11	34	40	43
Central Europe	3	6	6	б
Eastern Europe	24	36	38	35
Southern Europe	13	32	32	38
European Region, total	<u>102</u>	141	143	<u>152</u>
Natural losses	21	26	25	26
Difference between net annual increment overbark and removals underbark	<u>81</u>	<u>115</u>	<u>118</u>	<u> 126</u>
Bark	48	59	65	70
Difference between net annual increment underbark and removals underbark	<u>33</u>	<u>56</u>	<u>53</u>	<u>56</u>
Felling and transport losses	29	32	34	36
Difference between potential and actual removals underbark a/ European Region	÷ <u>3</u>	+ <u>24</u>	+ <u>19</u>	4 <u>21</u>
by sub-region, Nordic countries	+17	-6	-9	- 7
European Economic Community	-15	+5	+7	+7
Central Europe	-	+2	+1	+1
Eastern Europe	+ 5	+14	+13	+10
Southern Europe	- 4	+9	+6	+10

A residual figure which would give a rough indication of the difference between potential and actual or estimated removals if potential cut could be equal to increment. This difference is also the balance volume between additions to and withdrawals from the growing stock; sign + or - indicates a resulting increase or decrease in the growing stock volume.

NOTE: Detail may not add to totals due to rounding.

Table 9 shows two significant features at the European region level:

- a) Removals are and, according to forecasts, will remain at a level slightly below the net annual increment potential;
- b) During the period 1970-2000 the difference between gross annual increment overbark and forecast removals underbark will stay at approximately 140-150 million m³, of which 85 to 90% comprises bark and natural, harvesting and transport losses.

The variations of the residual volume do not show a clear trend at the regional level but provide some interesting indications when broken down by sub-region. There is a clear change in the situation of the Nordic countries where from 1970 forecast removals are expected to exceed the increment potential of removals with some overcutting at least in Sweden. In the rest of Europe, notably in the European Economic Community and in Eastern Europe, forecast removals are expected to remain substantially below the increment potential.

The outlook emerging from the different elements of the forestry situation in the European region is that of a wood supply which remains somewhat below the potential of the forest resources in a region where volume of net imports of forest products is increasing and could double over the period 1970 to 2000, even if it represents only a complementary amount as compared to total supply from the region itself. It is therefore of special interest to conclude this survey by giving some attention to the main factors which may influence the future levels of wood supply, whether positively towards an increase or negatively by affecting the physical or economic conditions of operations. Among these factors which may have an outstanding immediate impact on wood supply are: fuller use of available wood fibre, ownership structure and institutional aspects, financial and fiscal incentives, labour, environmental factors, extra regional trade and development policies. These factors which are not comprehensive will be briefly commented upon below.

With present harvesting and utilization techniques a substantial volume of wood and bark is left in the forest. As shown in table 9, it amounted in 1970 to an estimated volume of nearly 120 million m³; this volume represents a reserve of raw material which provides the possibility of appreciably increasing recovery of wood fibre. The technology already exists in the form of whole stem and whole tree logging and part of that reserve could certainly be brought into use. There are evident economical limitations due to marginal cost and even physical restrictions related to the effect on the nutrient cycle and to ecological constraints of the extent of possible recovery but the fuller use of available wood fibre constitutes undoubtedly the more immediate potential increase in supply over the next decades: it is estimated that it could increase the total removals by some 4% over the basic forecast in 2000.

In many European countries the privately owned forests are characterized by the scattered nature of a large number of small holdings with inadequate or non-existent management and poor use of the forest potential. In some Nordic countries, Sweden especially, considerable progress has already been achieved in establishing marketing and management cooperatives with substantial benefit for the owners and for the mobilization of the available wood supply. Making allowances for the difficulties in extending such experience and the inevitably slow rate of progress, it seems that the development of owner cooperation could have a considerable impact on the productivity of the small privately owned forest in the market economy countries of the European region.

Financial and fiscal incentives are undoubtedly an important factor in making private investment in forestry attractive, otherwise the long period required for forests to mature and the low real rate of return make such investment relatively unfavourable. In many European countries financial assistance to private forest owners by public authorities played a major role besides direct investment made by national forest services and other public bodies in past decades. It appears that an appropriate fiscal policy may have a substantial impact on the forestry sector not only to attract investment in new planting and in production infrastructure but also through the tax system to bring timber to the market which would otherwise be left in the forest beyond the silvicultural or economically optimum age.

In such a densely populated region as Europe, production of wood may be in strong competition with non-wood goods and services which the forest is capable of supplying though their value is difficult to measure and which provide a substantial contribution to the environment and quality of life. It is possible that in the more densely populated areas of Europe pressure will grow for setting more forest areas aside from normal commercial operations for recreation or protection purposes. This would reduce the area of forest under normal operation conditions and consequently may reduce the level of wood supply. Rapidly increasing pressure on the forest to provide environmental benefits should draw more attention to the importance of multiple use management of a renewable resource capable of providing simultaneously wood production and non-wood benefits in a joint and complementary function. With such an approach to management the effect on the total wood supply is however not expected to result in a substantial reduction of capacity for wood production.

In Europe over the recent decades, the increasing scarcity of labour in forestry has been offset by improvements in productivity together with growing mechanization and a radical transformation of the working conditions in the forest. Despite some effort through the governmental policies of many countries to stabilize the rural population, labour availability for forest operations is a widespread concern in most countries of the region. A further increase in mechanization raises several difficulties among which more important could be the availability of specially trained workers and the required specific conditions of operation such as terrain, type and size of operations, cost and price relationship. It can be expected that the problem of labour and mechanization will increasingly constrain operation in the European forests towards the end of the century as a limiting factor for removing the supply from forests which are least favourably located from the point of view of cost.

Other factors such as land use or silvicultural techniques may also influence the future levels of supply but their effect would probably be more evident in the longer run than the next decades. Among the factors with possible influence that have been reviewed, the fuller use of available wood fibre, the institutional aspects and ownership structure, and the financial and fiscal incentives are expected to have a positive impact on the future supply levels. On the other hand they may be affected negatively by an increased demand for the non-wood benefits of the forest and by the labour and mechanization situation. It is extremely difficult to estimate the net effect of these factors on the forecast level of supply, estimated at 410 million m3 in 2000. A reasonable expectation could lie with a moderate increase of some 20 million m3, or 5% over that level as a result of foreseeable stronger impact of the favourable factors: total removals in the European region could thus reach approximately 430 million m3 by 2000. The effect of the influencing factors could however result in a higher or in a lower volume depending on the interplay of positive and negative effects.

It should be noted that even at that level the wood supply within the European region remains well below the forecast level of demand. Despite a high degree of uncertainty about the extent to which wood supply in the region can really be further expanded, it appears that in any case, Europe will be depending on a substantial complementary supply from extra-regional sources. The future availability of supply from these sources is still more uncertain as it lies with the possibility of the major exporters, notably in the tropical regions, to expand their production from their forest resources. Future development policies are to play an important role especially in dealing with the establishment of quick growing species plantations and of wood processing industries in the tropical regions, which could have some impact on the external supply to Europe. On the other hand it may be expected that the insufficient availability of wood supply from external sources, whether in terms of volume and assortment or because of too high a cost level, could act as a strong incentive to mobilize the full resources of the European region with national policies aiming at using all factors which may serve that purpose.

APPENDIX

TABLE 1

LAND USE IN 1970

	Clo	sed Fores		Other	Forests wooded	and other land	1		Land	Land area	
	Total	Per caput	% of tot øl land	wooded land	Total	% of total land	Agri- cultural land	Other land	Total	Per caput	
	million ha	ha.	%	milli	on ha	%		million h	a	ha	
Nordic Countries	51.3	3,06	46	6.7	58.0	52	9.8	44.8	112.5	6.7	
Finland Iceland	18.9	4.10 0.02	62 -	3.6 0.1	22.5 0.1	74 1	3.2	4.8 7.6	30.5 10.1	6.6 49.1	
Norway Sweden	8.3 24.1	2.15 2.99	27 58	0.6 2.4	8.9 26.4	29 64	0.9 3.4	21.0 11.4	30.8 41.1	7.9 5.1	
European Economic Community	30.5	0.12	20	2.1	32.6	22	98.7	19.2	150.5	0.6	
Belgium Denmark France Germany Fed. Ireland Italy Luxembourg Netherlands United Kingdom	0.6 0.5 13.6 7.2 0.3 6.3 0.1 0.3 1.6	0.06 0.09 0.26 0.11 0.09 0.11 3/ 0.02 0.03	20 12 25 30 4 21 31 8 7	1.7 -0.1 0.3	0.6 0.5 13.6 7.2 0.3 8.0 0.1 0.3 2.0	20 12 25 30 4 27 32 10 8	1.5 2.9 36.8 13.4 4.8 17.4 0.1 2.6 19.0	0.9 0.8 4.5 3.7 1.8 4.0	3.0 4.2 54.9 24.3 6.9 29.4 0.3 3.4 24.1	3.0 0.8 1.0 0.4 2.3 0.5 <u>a/</u> 0.2 0.4	
Central Europe	4.7	0.34	38	0,1	4,8	39	5.8	1,7	12.2	0.9	
Austria Switzerland	3,7 1.0	0.49 0.16	45 25	ō. 1	3.7 1.1	45 27	3.8 2.0	0.8 0.9	8.3 4.0	1.1 0.6	
Eastern Europe	26.8	0.26	28	0.9	27.7	29	60.6	8.7	97.0	1.1	
Bulgaria Czechoslovakia German DR Hungary Poland Romania	3.6 4.4 · 2.7 1.4 8.5 6.2	0.42 0.30 0.16 0.13 0.26 0.30	32 35 26 15 28 27	0.1 0.1 0.2 0.1	3.7 4.6 2.9 1.5 8.5 6.6	33 36 28 16 28 29	5.9 7.1 6.3 6.9 19.5 14.9	1.5 0.9 1.4 0.9 2.5 1.5	b/11.1 12.6 10.6 b/9.3 30.5 22.9	1.3 0.8 0.6 0.8 0.9	
Southern Europe	30.5	0.28	16	21.1	51.7	30	72.0	50.0	173.6	1.6	
Greece Portugal Spain Turkey Yugoslavia	2.5 2.8 9.7 8.1 7.4	0.28 0.33 0.28 0.23 0.36	19 32 19 11 30	3.2 0.2 4.4 12.0 1.3	5.8 3.0 14.1 20.1 8.7	44 34 28 26 36	4.3 4.8 20.5 27.3 15.0	2.9 1.0 15.4 30.0 0.7	12.9 8.8 50.0 77.5 24.4	1.5 1.0 1.4 2.1 1.1	
Other Mediterranean countries	0.3	0.07	8		0.3	9	1.0	1.7	3.0	0.8	
Cyprus Israel Malta	0, 2 0, 1 -	0.27 0.02	19 4 -	- - 	0.2 0.1 -	19 5 -	0.6 0.4	0.1 1.5	0.9 2.0	1.4 0.6	
REGION	144.1	0.29	26	31.0	175.0	32	247.8	126. 0	548.9	1.1	

a/ Included in Belgium.

NOTE: Detail may not add to totals due to rounding.

b/ Areas of water are included.

TABLE 2

OPERABLE CLOSED FOREST AREAS IN 1970

	CLOSED FOREST						
	Ope	rable					
	Total	% of total area	Inoperable	Total area			
	million ha	%	mil	lion ba			
Nordic countries <u>a</u> /	50.5	98	0.8	51.3			
Finland Norway Sweden	18.7 8.3 23.5	99 100 98	0.2 - 0.6	18.9 8.3 24.1			
European Economic Community	28.9	95	1.6	30.5			
Belgium Denmark France Germany Fede Ireland Italy Luxembourg Netherlands United Kingdom	0.6 0.4 13.2 7.1 0.3 5.3 0.1 0.2 1.6	100 96 97 98 96 85 100 22	- 0.4 0.2 - 1.0 -	0.6 0.5 13.6 7.2 0.3 6.3 0.1 0.3 1.6			
Central Europe	3.8	82	0.9	4.7			
Austria Switzerland	2.8 1.0	77 97	. 0.8	3.7 1.0			
Eastern Europe	25.1	94	1.7	26.8			
Bulgaria Czechoslovakia German DR Hungary Poland Romania	3.2 3.7 2.7 1.3 8.4 5.9	89 83 98 92 92 99	0.4 0.7 - 0.1 0.1 0.3	3.6 4.4 2.7 1.4 8.5 6.2			
Southern Europe	29.6	97	0.9	30.5			
Greece Portugal Spain Turkey Yugoslavia	2.3 2.8 9.3 8.1 7.0	92 100 96 100 96	0. 2 - 0. 4 - 0. 3	2.5 2.8 9.7 8.1 7.4			
Other Mediterranean countries	0.2	77	0.1	0.3			
Cyprus Israel Malta	0.2	87 56 -	-	0.2 0.1 -			
REGION	138.1	96	6, 0	144.1			

a/ Operable forests in Nordic countries include the following areas:

Finland: 600 000 ha excluded from commercial exploitation. Norway:1-464 000 ha: beyond limit of economic exploitation. Sweden:1 378 000 ha: bayond limit of economic exploitation.

Their growing stock and annual increment are however reported within the operable forest. NOTE: Detail may not add to totals due to rounding.

TABLE 3

GROWING STOCK AND ANNUAL INCREMENT IN OPERABLE CLOSED FOREST

	Operable	G	ROWING S	тоск Тоск		NI	ET ANNU	AL INCRE	MENT	
	forest	Total	Per unit area	Coniferou	Non~ coniferous	Total	Per unit area	% of growing stock	Coniferous	Non- coniferous
	million ba	million m3 ob	m ³ /ha	millio	ı m ³ ob		m3/ha/a	%	million	m ³ ob
Nordic countries	50.5	4 246	84	3 579	667	134.72	2.7	3.2	110,74	23.98
Finland Norway Sweden	18.7 8.3 23.5	1 445 513 2 288	77 62 , 98	1 188 425 1 966	257 88 322	55.78 15.64 63.30	3.0 1.9 2.7	3.9 3.1 2.7	44.24 12.50 54.00	11.54 3.14 9.30
European Economic Community	28.9	2 900	100	1 478	1 422	103.50	3.6	3.5	56.87	46.62
Belgium Denmark France Germany Fed. Ireland Italy a/ Luxembourg Netherlands a/ United Kingdom a/	0.6 0.4 13.2 7.1 0.3 5.3 0.1 0.3	71 45 1 307 1 022 15 286 13 20	117 115 99 145 56 54 160 72 73	40 22 481 722 13 114 2 16	31 23 826 300 2 172 11 4 53	2.62 2.30 41.40 34.00 1.85 14.02 0.40 1.20 5.72	4.3 5.1 4.89 6.9 4.9 4.3	3.7 5.1 3.2 3.4 12.3 4.0 3.1 5.5	1.52 1.50 18.00 25.80 1.63 2.60 0.14 1.03 4.64	1.09 0.80 23.40 8.20 0.22 11.42 0.26 0.17 1.07
Central Europe	3.8	951	249	766	185	22.48	5.9	2.4	18,24	4.25
Austria Switzerland	2.9 1.0	681 270	239 278	580 186	101 84	17.29 5.19		2.5 1.9	14.66 3.57	2.66 1.62
Eastern Europe	25.1	3 906	156	2 303	1 603	103.50	4.1	2.7	63.83	39.66
Bulgaria Czechoslovakia German DR Hungary Poland Romania	3.2 3.7 2.7 1.3 8.4 5.9	264 801 350 174 1 049 1 268	83 217 131 133 125 216	90 598 257 14 857 4 87	174 203 93 160 192 781	6. 47 15. 75 13. 20 6. 80 34. 38 26. 90	2.0 4.3 4.9 5.2 4.1 4.6	2.5 2.0 3.8 3.9 3.2 2.1	1.99 11.63 11.10 0.50 28.88 9.74	4.48 4.12 2.10 6.30 5.50 17.16
Southern Europe	29.6	2 501	84	1 218	1 283	86.58	2.6*	3.2	47.27	39.31
Greece Portugal <u>a/</u> Spain <u>a/</u> <u>b/</u> Turkey <u>a/</u> Yugoslavia <u>a</u> /	2.3 2.8 9.3 8.1 7.0	150 166 436 836 913	65 59 47 103 130	75 84 259 549 251	75 82 177 287 662	4.00 8.22 30.03 21.89 22.44	1.6 2.9 	2.7 4.9 6.9 2.4 2.1	1.82 6.61 20.72 12.39 5.73	2.18 1.61 9.31 9.50 16.70
Other Mediterranean countries	0.2	5	25	4	1	0.17	0.8	3.1	0.12	0.05
Cyprus Israel	0.2 (0.04)	3 2	20 47	3 1	1	0.06 0.11	0.3 2.5	1.8 5.4	0.06 0.06	0.05
REGION	138.1	14 509	105	9 348	5 161	451	3.3	3.0	297	154

a/ The following countries have reported the volumes of standing timber outside the forest as indicated below, in million m³ ob.

	Sta	nding timber	outside forest
	Total	Coniferous	Non-coniferou
Italy	68	14	54
Netherlands	2	-	2
United Kingdom	34	4	30
Portugal	2	1	1
Spain	66	39	27
Turkey	90	44	46
Yugoslavia	133	18	11.5

Except for Netherlands and the United Kingdom net annual increment is related to the total volume of growing stock inside and outside the forest: unit volume of increment cannot be calculated in these cases.

 \underline{b} / Fuelwood is not included in growing stock and increment.

NOTE: Detail may not add to totals due to rounding

APPENDIX

TABLE 4

REMOVALS IN RELATION TO ANNUAL INCREMENT IN 1970

Перина да са интерна до 1888 г. посто с от 1888 г. посто посто посто посто посто посто посто посто посто посто 1	Net annual	REMOVALS b/					ì		
	increment underbark	Fellings	- Total	Industrial roundwood	Fuelwood	Coniferous	Non- coniferous	% of net annual increment	% of growing stock
				million m3	ub			ub	ob
Nordic countries	115.3	121.0	111.8	100.0	11.8	91.6	20.2	97.0	2,6
Finland	48.0	48.7	44.1	36,3	7.8	31.8	12.3	91.9	3.1
Norway Sweden	13.2 54.1	9.1 63.2	8.7 59.1	7.9	0.8	7.8	0.9	65.9	1.7
3 Meden	34.1	03.2	59.1	55.8	3.3	52.1	7.0	109.2	2.6
European Economic Community	93.0	87.0	78.3	67.6	10.7	39.8	38.4	84.2	2.6
Belgium	2.4	3.0	2.7	2.5	0.2	1.7	1.0	112.5	3.8
Denmark	2.1	2.4	2.2	2.1	0.1	1.3	1.0	104.8	4.9
France	37.3	33.1	29,8	25.5	4.3*	14.0	15.8	79.9	2.3
Germany Fed.	30.6	30.9	27.8	26.0*	1.8*	18.6	9,2	90.8	2.7
Ireland	1.6	0.4	0.4	0.3	~	0.3	~	25.0	2.7
Italy	12.6	12.1	10.9	7.1	3.8	1.3	9.6	86.5	3.1
Luxembourg	0.4	0.2	0,2	0.2	-	0.1	0.1	50.0	1.5
Netherlands	1.0	1.0	0.9	0.9	-	0.6	0.3	90.0	4.5
United Kingdom	5.0	3.8	3.4	3,1	0.4	2.0	1.4	68.0	2.2
Central Europe	20.2	17.9	16.1	14.0	2.1	13.0	3.0	79.7	1.7
Austria	15.6	13.4	12.1	10.8	1.3	10.2	1.8	77.6	1.8
Switzerland	4.7	4.4	4.0	3.2	0.8	2.8	1,2	85.1	1.5
Eastern Europe	90.5	78.5	72.8	58.8	14.0	40.5	32.3	80.4	1.9
Bulgaria	5.7	5.8	5.1	3.9	1.1*	1.5*	3.5*	89.5	1.9
Czechoslovakia	13.8	13.9	13.5	12.0	1.5	10.1	3.4	97.8	1.7
German DR	11.6	8.0	7.2	6.7	0.5	6.0*	1.2*	62.1	2. i
Hungary	6.0	5.4	5.0	2.5	2.5	0.2	4.7	83.3	2.9
Poland	29.2	20.1	18.3	16.6		15.0	3.3	62.9	1.8
Romania	24.2	25.3	23,8	17,1	1.9 6,5	7.7	16,1	91.7	1.8
Southern Europe	73.5	64.0	57.6	27.8	29.8	26.1	31.5	78.3	2.1
Greece	3.8	3,2	2.9	0.5	2.3	0.7	2.2	76.3	1.9
Portugal	6.7	6.9	6.2	5.4	0.8	4.5	1.7	92.5	3.7
Spain	24.6 €/		13.7	7.0	6.6*	5.8	7.9	55.5	2.7
Turkev	17.8	19.8	17.8	5.0	12.8	10.7	7.2	33.3	1.9
Yugoslavia	20.6	18.9	17.0	9.8	7.2	4.5	12.5	82.5	1.6
Other Mediterranean countries	0.14	0.16	0,13	0.10	0.03	0.07	0.06	92.9	2.6
Cyprus	0.05	0.06	0.05	0.03	0.01	0.04			1.7
Israel	0.09	0.09	0.08	0.07	0.01	0.02	0.06	88.9	4.0
REGION	392.7	368,6	336.7	268.3	68.4	211.2	125.5	85.7	2.3

Estimated fellings equal removals plus harvesting losses. Estimates of harvesting losses are available for the Nordic and Eastern European countries. For other countries it was estimated that harvesting losses were 10% of the felled volumes.

NOTE: Detail may not add to totals due to rounding.

b/ 3 year average, 1969-71.

<u>c</u>/ Fuelwood is not included.

TABLE 5

PROSPECTIVE SUPPLY POTENTIAL IN 2000

	Operable	Growing	Stock	Net annua	l increment	Remo	ovals
	closed forest	Total	of which coniferous	Total	of which coniferous	Total	of which coniferous
	million ha		million n	13 ob		millior	ı m ³ ub
Nordic countries	51.2	4 032	3 446	148.6	125.4	126.1	110.7
Finland Norway Sweden	19.5 7.7 24.0*	1 505 627 1 900	1 309 537* 1 600	68.6 19.0 61.0	58.3 15.9* 51.2	49.1 12.0* 65.0	42.7 10.8* 57.2
European Economic Community	30.4	3 686	2 014	136.0	80.9	101.9	57.9
Belgium Denmark France Germany Fed. Ireland Italy Luxembourg Netherlands United Kingdom <u>a</u> /	0.6 0.4* 13.3 6.9 0.5 6.0 0.1 0.3 2.2	100 50* 1 430* 1 134 66 580 16 24* 286	60* 28* 650* 814 61 166 5 18* 212	3.7* 2.6* 46.8 35.2 6.0 24.6 0.5 1.3* 15.3	1.8* 24.1 26.8 5.8 4.6 0.3	3, Ö* 2, 3* 46, 8 30, 0 2, 2 9, 0 0, 3 1, 0* 7, 3	2.0* 1.6* 19.7 22.2 2.1 3.3 0.1 0.8* 6.1
Central Europe	4.4	1 089	849	27.6	21.6	21.3	16,8
Austria Switzerland	3.5 1.0	819 270	663* 186	22.4	18.0* 3.6	16.3* 5.0	13.0* 3.8
Eastern Europe	27.4	4 565	2 974	119.7	78.4	88.8	52.8
Bulgaria Czechoslovakia German DR Hungary Poland Romania	3.4* 3.8* 2.8* 1.7 9.5 6.2	270 830* 410* 205 1 450 1 400	130 620 315 40 1 219 650	7.0 19.0* 14.5 9.2 41.0 29.0	3.5 14.5 12.3 * 1.1 34.9 12.1	5.9 16.0 10.0 7.2 26.2 23.5	2.9* 12.0* 8.5* 0.9 21.2 7.3
Southern Europe	3-8.1	2 799	1 407	103.6	57.8	73.9	38.4
Greece Portugal Spain <u>b</u> / Turkey Yugoslavia	2.5* 3.5 13.0 9.6 9.5	170* 209* 510 850 1 060	86* 120 311 600* 290	4.4* 9.3 35.9 28.9 25.1	2.2* 7.0 24.8 17.4* 6.4	8.7* 6.7 23.0 12.5 <u>6</u> / 18.0	1.7* 4.8 10.9 10.0 5.9
Other Mediterranean countries	0.3*	6*	5*	0.3*	0.2*	0.2*	0.2*
REGION	151.8	16 177	10 695	535.8	364.3	412.2	276.8

a/ Except for exploited forest, all forecasts are for Great Britain alone, excluding Northern Ireland.

NOTE: Detail may not add to totals due to rounding.

b/ Fuelwood is excluded from all volumes except removals.

E/ Fuelwood is excluded from the removals forecast. In calculating total removals for Southern Europe however it was estimated that fuelwood removals in Turkey will remain at a level of about 10 million m³ up to 2000.