Parliamentary Assembly
Assemblée parlementaire
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COUNCIL OF EUROPE
CONSEIL DE L'EUROPE

Doc. 625
28 February 1957

Forestry situation in Europe

Report[1]
Committee on Agriculture and Rural Development
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1. 1957 - 9th Session - First part

A. Draft Recommendation[2]

The Assembly,

Considering :

that, from the economic standpoint, an afforestation or reafforestation policy, by permitting the rational use of " marginal " land, may enable the national income to be increased;

that, in some parts of the Mediterranean area, in hilly districts or in districts traversed by rivers, reafforestation is the most effective means of regulating the flow of water, eliminates danger of erosion and prevents floodings;

that, from the social standpoint, more abundant afforestation helps to prevent the flight from the land and, by increasing opportunities for employment, provides an effective method of countering under-employment in over-populated areas;

Convinced that these aims are of vital importance to the future of Europe and can only be achieved by a European Authority having a Forestry Fund at its disposal,

Recommends that the Committee of Ministers should draw the attention of the Governments concerned to the need for :

1. promoting a European forestry policy;
2. studying measures for standardising the forestry legislation of Member States;
3. setting up a specialised international institute to finance forestry investments;
4. providing technical assistance for European countries which so desire.

2. See 8th Sitting, 3rd May 1957 (draft Recommendation adopted) and Recommendation 135.

B. Explanatory Memorandum

1.

1. Early this year President Eisenhower presented to Congress various messages on the economic policy of the U. S. A. One of them, concerning agricultural policy, is of particular interest to us in connection with this report. This important document clearly shows the crisis prevailing in agricultural production in the United States. During the war the United States Government gave considerable encouragement to agriculture; large areas which had been previously used for other purposes, were placed under crops and this, allied with rapid technical progress, led to a considerable increase in production which was further stimulated by the Government guaranteeing farmers steady prices. Even when the period of emergency was over, the Government continued the same price policy, although market conditions had changed as a result of the fall in home consumption and exports. The disparity between supply and demand of agricultural produce gradually increased and the Government, which had undertaken to purchase such produce as could not be disposed of on the open market, was obliged to devote enormous sums to the purchase or financing of crops. In 1954 the Commodity Credit Corporation had spent 6,000 millions dollars for this purpose; by 30th November 1955, expenditure had reached 8.2 millions dollars and storage alone of the stocks of commodities piling up was costing the Government a million dollars a day[3]. Today the enormous stockpiles built up by the Government to maintain prices are weighing heavily on the market and depressing it; it is impossible to absorb those stocks on the domestic market or on foreign markets, since this would lead to serious economic effects upon both. The same state of affairs, albeit on a much smaller scale, obtains in Italy in regard to rice; during the early post-war years when food supplies throughout the world were very short, and indeed the situation was almost critical, Italian rice production provided a valuable source of supply for the domestic market, as well as for foreign countries, which competed for Italian rice at high prices. Italian rice producers were able to make considerable profits, but by 1948-1949, when the production of cereals had become more or less normal and domestic consumption and exports had fallen, the rice producers began to get into difficulty. For a time, however, they succeeded in overcoming their troubles, as a result of political complications arising in the Far East. The rice-growing area, which in 1948-1951 was almost 140,000 hectares, increased to 180,000 hectares in 1955, owing to the encouragement given by contract prices higher than those on the international market. This led to an accumulation of supplies for which no outlet could be found either at home or abroad. The problem arises, however, of reducing production by either limiting the area cultivated or restricting productivity, i. e., output per hectare. Let us now consider the solutions put forward by President Eisenhower to meet the crisis of over-production. The situation is very involved, since the disposal of surpluses on the domestic market—which would be facilitated by amending the law at present prohibiting sales at prices below the pegged rates—• would have too violent an impact upon national economy as a whole, whereas their export would upset international markets and eventually lead to the collapse of domestic prices. President Eisenhower proposes to reduce the areas under wheat, maize, rice and cotton and to give farmers a negotiable certificate in exchange, entitling them to draw upon Government supplies in quantities proportionate to the output of the land held in reserve. It will be seen that this no longer has anything to do with the normal distribution of farm crops, which come within the annual or periodic cycle of crop control in the light of technical and market requirements, as is the case in the growing of rice mentioned above[4]. Indeed, the directive has a much wider implication, namely that of a general diminution of the area sown. Having regard to the fact that, in the past, vast tracts of land were used for agricultural cultivation, which were more suited to other purposes, the directive proposes that these lands should now finally revert to their natural use, including that of timber growing. It is upon this important point that we propose to dwell. Even in the U. S. A., as for a long time past in Europe, the period of expansion of the area under crops is being succeeded by that of diminution and the abandonment of those lands of "marginal " economic value. The. reasons which have led to this in Europe are only too familiar, and there is no need for us to go into them here. The important thing is to find out whether they are likely to be temporary or permanent, in order that we may gauge future prospects. Forecasting economic developments is invariably a risky business, owing to the numerous factors which have to be taken into consideration, the extent to which those factors are interdependent and to which many of them are also imponderable. We believe it to be no exaggeration, however, to state that the trend which has been taking place in the past twenty or thirty years, even throughout periodical fluctuations, must be considered, by and large, to be irreversible. Indeed, this is borne out by general economic development. In several countries of Europe an increase in population has led to the breaking in of hitherto uncultivated and

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3. Bresciani-Turroni : Corriere della Sera, Milan, 1st February 195G.
4. It should, however, be noted that the Italian Ministry of Agriculture and Forests was obliged to publish a circular urging that an incipient practice of planting poplars in rice-beds be discontinued. Similar steps have been proposed in France.

unproductive land, to timber clearance and the laying out of pastures and meadows. The area sown has been increased as far as, and often beyond, the extreme limit of safety; the ever-increasing integration of national economies in international markets cannot but foster this trend, at least within the limits of rule-of-thumb planning. As stated by the Food and Agricultural Organisation in its publication : National Forestry Policies in Europe (1954), it is clear that land considered as marginal in a highly industrialised country, where the rural population is irresistibly drawn to the towns, would in no wise be regarded as such, either in a very densely populated country, even in its rural areas, or in a region where an extensive form of agriculture predominates. Our views on the general trends, however, are supported in the same admirable survey, which also states : " For Europe as a whole, however, the shift in the ratio of urban to rural populations and the intensification of farming methods tend to increase the area of land that may be regarded by owners as marginal. " The abandonment of " marginal " land is what is of particular interest to us. We must benefit by this experience by ensuring that this land is used in such a way as to avoid the deterioration or even exhaustion to which it is exposed from natural causes, and at the same time make it of economic value. It would be very interesting to have some idea of the extent to which this abandonment of marginal land has taken place in the various countries of Europe. Unfortunately, however, no general statistics are available on this subject, but some idea of the extent to which it has taken place can be seen in the case of France, where in 1950 land abandoned by agriculture amounted to almost 2 million hectares, and in that of Italy, where it at present covers an area of approximately 1 million hectares.

2. At the beginning of the century the American hydrographic expert Chittenden attributed mainly to land clearance and subsequent irrational farming the development of the widespread erosion which has taken place in the U. S. A. Vast areas were originally completely covered by forests, and there was a natural balance of hydraulic and geological conditions. With the progress and intensification of agricultural settlement, the forests were partially destroyed so that the land might be placed under crops, and underwent partial deterioration as a result of intensive and irrational use and grazing. Once the fertility of the soil was exhausted, the settlers abandoned the areas which were least suitable and either moved to other regions or confined their farming to the most fertile areas. This process was repeated periodically with the arrival, departure and return of settlers. The abandoned farms, deprived of their protective covering of trees, were exposed to the deleterious effects of the weather and were only partially reforested as a result of natural regrowth, this being hampered by the intensive cropping of animals. Though Chittenden in fact denied that forests have any influence upon river floods, he implicitly admits that they are effective against erosion. Recognition of their effectiveness is becoming increasingly evident from the trend of public opinion in the United States of America, which has gradually influenced the measures adopted by the authorities in that country. Hugh Bennett, the leading world authority on soil erosion, holds that the physical damage caused by upsetting the natural hydro-geological balance amounts to more than 1,000 dollars a year for the whole of the United States. It is obvious that, faced with such serious conditions, public opinion and the responsible authorities have long been concerned with finding more effective ways and means of remedying them. It is, however, understandable that, since settlement in the United States of America is of comparatively recent date, and demographic, agricultural and industrial development in that country even more recent (although very rapid), it was not until 1936 that fundamental conceptions of the necessary public i. e. national action led to the introduction of an organic legislative measure and that views on more suitable procedure are still a subject of debate twenty years later. Even in the U. S. A. the general view initially held was that major protective work against floods should be carried out in the lower part of the river and consist of the building of dykes and large artificial reservoirs. It is only in the course of recent years that the idea has gained ground that steps should be taken to deal with the evil at its source, since major protective works are effective for only a limited period, and that only planned adjustment in the higher reaches of the watershed area can eliminate or permanently control flood conditions. A decisive contribution has been made in this field by the very rapid development of an applied science of recent origin in America, namely, forest influences, and by the outcome of experimental research in this connection, which has been widely undertaken and put to valuable use during the past 30 years, following the setting up of numerous experimental stations specialising in the study of forest influences and having at their disposal considerable funds and adequate staff. Establishment of the experimental stations in question was provided for under the McSweeney-McNary Forest Research Act of 1928, when it was realised that there were little or no experimental data available on the effects of vegetation cover upon watershed control and soil conservation. The shortcomings became apparent when Congress was debating the Weeks Law of 1911 on the need to extend the area of national forests, which was finally approved not so much as a result of the protective properties of forests, of which there was insufficient proof, as of the inherent national need for wood.The evolution of public opinion towards a better understanding of the protective function of forests and greater knowledge of the beneficial effects of forest vegetation led to increased legislative action in this connection, the salient features of which were the Emergency Conservation Work Act of 1933, setting up the Civilian Conservation Corps (C. C. C), the National Industrial Recovery Act and the Tennessee Valley Authority Act. In 1934 Congress passed the Shelter-belt Project, not, however,

without lively debate, and finally, in 1936, this time without opposition following the disastrous floods of that year, the Flood Control Act was approved which, with its later amendments and consolidation, constitutes the present legal basis of federal action to provide protection against floods. In 1935 the Soil Conservation Service was set up under the Department of Agriculture with the following duties :

a. to provide technical assistance in connection with soil conservation and watershed control and soil utilisation and water supply;

b. to undertake research on the prevention of erosion and on watershed control and the rational use of the soil.

This Service was thereby responsible for the care of all land, including non-wooded areas, and for all estates, whether State-owned or not, duties which had hitherto been entrusted to the Forest Service, instituted in 1881, and the Department of Agriculture. These duties consisted in :

a. the protection and use of forest, water, forage, recreation and wild life resources of the National Forests;

b. research on forest products, grazing and watershed areas;

c. co-operation with individual States and private woodland owners for the purpose of forest protection and management.

Then came the Flood Control Act of 1936, largely founded on the view that the success of flood control measures depended upon remedial steps to be taken both upstream and downstream. It gave fundamental recognition to the fact that hydro-geological disorders endanger the welfare of the nation; it states that the study of flood control and the planned control of rivers and their receiving basins as far as their source is of national importance; it fosters local co-operation, while providing for Federal Government participation, with individual States and their responsible political institutions, in work connected with watershed control. It also specifies that federal measures for the study of catchment areas, the control of water-flow and the prevention of erosion are matters for the Department of Agriculture, whilst federal enquiries concerning the condition of rivers and other waterways and protection against flood damage and similar responsibiHties fall within the scope of the Department of the Army. To sum up, it may be said that in the U. S. A. preventive measures against soil erosion fall into two main categories :

3. Conservation, if required, of the vegetation cover wherever it is in jeopardy or insufficient; extension of such conservation to all land unsuitable for farming or in danger of being washed away. It is necessary to eliminate the causes of damage, the most important of which are :

(a) Fire.

This is one of the most serious causes of permanent or temporary destruction of vegetation cover. The degree of efficiency reached in America in connection with fire prevention and fire-fighting is very high. The organisation of fire-fighting is based on a dense and widespread network of fire-watching points in telephone communication with fire-fighting posts manned by teams of fire-fighters equipped with the most modern appliances. These arrangements by themselves, however, are not enough. Active publicity is carried out to induce the public to take all kinds of specified precautions against the outbreak and spreading of fire. To prevent the soil from being washed away in fire-swept areas, there are regulations requiring the sowing, if necessary from the air, of herbaceous plants which bind the soil as they grow until the forest vegetation is re-established from planted seeds, self-sowings or shoots sprung from the old stock. In forests exposed to the danger of fire and intensively exploited the regulations require that a suitable network of fire lanes shall be cut.

(b) Haphazard grazing and heavily taxed land.

The harmful effects of grazing are not to be found in the thinning out of timber stands as much as in the delaying or destroying of natural or artificial regeneration after fire or intensive use. There are no legislative restrictions upon grazing; action by Government authorities is confined to recommendations, which have already met with some success. Grazing has hitherto been forbidden or restricted only on Government property and in particularly critical situations.

(c) Irrational use of forests and irrational concentration of wood products.

In the U. S. A. the felling of timber is mainly governed by economic requirements. No legislative measures exist in this connection or are indeed contemplated, since the American citizen is fundamentally opposed to any restriction upon his personal activities. Few States have adopted any restrictive measures and in this field,

too, national and local government action is based upon publicity and the free distribution of technical and explanatory literature showing the damage caused by irrational exploitation and the economic advantage (to which the American public is more amenable) of using more rational methods.

4. We now come to the protection of farms against soil erosion by limiting cultivation to suitable land (not unduly steep) and taking appropriate planting and drainage precautions to prevent the soil from being washed away. This is certainly the main task in the prevention of erosion and is indeed the most important sphere of activity of the Soil Conservation Service. The fact that, on the one hand, increasing efforts are made to adapt crops to soil conditions and to control planting and drainage and that, on the other hand, there is no restriction upon the clearance of arable land nor any body empowered to take appropriate action, might make the long-term effectiveness of action taken under the Flood Control Act appear problematical. Any such fears on the part of the European observer would, at least in present circumstances, certainly be unwarranted if due consideration is given to the extent to which the United States citizen, even in rural areas, reacts to publicity, and his innate hostility to any kind of uneconomic measure, such as land clearance in unsuitable areas and where soil conditions are unfavourable. Nowhere in the United States of America do such conditions of extreme economic and social need prevail as to warrant undue exploitation of the land, whether they be those of dense population, insufficient land, or the impossibility of providing other employment for surplus manpower. The standard of living is high, there is plenty of land available, unemployed landworkers can be found work in industry and the density of population is barely 18.6 inhabitants to the sq. kilometre. Steps to improve the effectiveness of vegetation cover wherever it appears to be inadequate or jeopardised and to extend it to non-arable land or to land on which the soil is exposed to the danger of being washed away are among the preventive and remedial measures being taken.Among provisions of a general nature to facilitate and expedite the achievement of this aim may be mentioned Federal Government steps to purchase agricultural or forest land which has undergone deterioration for conversion to national forests. This action, initiated in 1911, is still being pursued

5. We have shown in some detail how public opinion in the U. S. A. has advanced concerning the usefulness of forests and has led to the gradual introduction of legislative standards, a process albeit more recent and much more rapid similar to that which has taken place in several countries of Europe in the course of the centuries. Europe, too, has been and still is continually devastated by more or less widespread floods. Although it is not humanly possible to prevent the recurrence of such floods, which are due to unforseeable and unusually widespread natural phenomena, scientists and technicians have been untiring in their efforts to familiarise themselves with these phenomena and to find ways and means of limiting the damage done by them. The greatest disasters, which have hitherto fortunately occurred at long intervals, have been caused by the over-flowing of rivers and flooding of the surrounding country-side, which has on occasion been very widespread Fluctuations, sometimes considerable, in the level of rivers, due to changing seasonal rainfall and the melting of snow, are, on the other hand, commonplace. Erosion, however, is a continuous and relentless process, with outbursts of violence alternating with static periods of a calm which is only apparent. It consists of the disintegration of the superficial layers of relief and the gradual descent of solid rock, etc., under the combined action of gravity and water. Typical of this is the action of mountain torrents which are to be found in the upper reaches and near the sources of all streams and rivers, wherever fairly steep declivities occur. Although these phenomena serve as a whole to govern the flow of streams and rivers, they must be considered separately, since the protective methods adopted against damage vary, as do also the prospects of successful prevention and protection. In the geologically oldest areas, that is to say, those in which erosion has been going on throughout the ages, river basins have now become wide plains or, as they are called by the American geophysicist Davis, " pine-plains "[5], meaning basins which lack any appreciable relief. In the case of the Volga, for instance, the greatest altitude reached, despite the immense area covered, is hardly more than 1000 feet. Erosion has ceased to take place and the waters of the whole river system are now clear. The river beds are stable, as are also the longitudinal sections. It is true that even the Volga occasionally overflows its banks as a result of the more or less rapid melting of the snows, but once the floods have subsided and the course of the river is contained within its banks, the rising of the river level can seldon have disastrous results. The position is very different in regions of broken relief. Since such relief is of more recent geological origin, erosion has been going on there for a, geologically speaking, comparatively short period and has not yet succeeded in wearing down the relief, but only in creating furrows. In such areas erosion is invariably very active. The more geologically recent the relief, the smaller is its resistance to the effects of atmospheric conditions and erosion by water. That is why, as may be seen in many Mediterranean countries, erosion has been and is continuing to be responsible for the displacement of large quantities of rock and soil. The movement of this material has led not only to the formation of wide and fertile plains, but also to the unbalanced nature of this material, which, as often in the case of rock and soil displaced and washed

5. The term used by Davis has been translated into French by De Martonne as « pene-plaine ".

down according to the carrying capacity of the river system, militates against stable conditions and unchanging river beds. Permanent vegetation cover, whether composed of herbaceous plants, shrubs or trees, affords powerful protection against all kinds of erosion by wind or water; it is a most effective means of preventing water run-off. Vegetation cover has a remarkable binding effect upon surface soil and, by helping to hold together the soil and debris on sloping land, it prevents the washing away of rock coverings and militates against the disintegrating action of frost and thaw. Experiments conducted by Wollny in 1900 showed that from soil with herbaceous cover and a gradient of 10° the amount of debris washed away each year by water amounted to only 130 grammes per sq. metre, compared with 834 grammes from bare soil, whereas the loss on a gradient of 30° was 500 grammes in the case of grassy soil and 3,104 grammes in that of bare soil. Comparative statistics recently compiled at the experimental station of Coweeta (North Carolina, U. S. A.), on the flank of an average mountain, showed that whereas water trickling down from untouched woodlands contained 8 units of solid matter, that flowing from cultivated land contained 23 units in the first to the fourth year of observation, 45 in the 5th and 6th years and 93 in the 7th. These data merely confirm what is unmistakably apparent upon the most cursory inspection, namely that water flowing from areas which are well covered by vegetation are invariably clearer than that which has come from barren land.It is therefore obvious that if land clearance or similar agricultural practices are not carried out with suitable precautions, they are likely to promote and accelerate erosion by wind and water. Vogt gives the following particulars of gradients and agricultural operations which may be undertaken on sloping land without exposing the soil to the risk of being washed away : on gradients up to 5% ploughing may be carried out in any direction; on slopes with an incline of 6°/0 to 10%, contour ploughing should be carried out; on gradients over 10°/o, routine work requires that terraces should first of all be built; up to 18°/0, the land may be used for permanent grazing or meadows; over 18°/0, no planting of any kind should be done except that of trees and shrubs. If we consider the enormous expansion which has taken place in the course of time in the area of mountain land used for the production of agricultural crops (especially in Mediterranean countries, but also in the Alps), to meet the essential food requirements of the dense rural population, it will be found that this has taken place at the expense of wooded or bushy areas, or of meadows and grazing lands, and to a large extent disregards the natural limits mentioned above. It is not, therefore, surprising that a direct consequence of this has beeii an increase in mountain torrents. The first to apply scientific methods to the investigation of mountain torrents and to ascertain their causes and suggest remedies were the French. In a work of historical interest, entitled Study of Mountain Torrents in the Department of the Hautes-Alpes, and published in 1841, Surell put forward and gave eloquent reasons for the following fundamental propositions :

5.1. Torrents cannot form in woodland areas;

5.2. Deforestation exposes the soil to the action of torrents;

5.3. Afforestation eventually does away with torrents;

5.4. Forest clearance leads to an increased flow of mountain torrents and may even lead to the re-appearance of old sources.

The se propositions have lost none of their validity with the passing of time, and Surell's teachings gave rise to a school which later successfully developed and applied them not only in France, but in all Alpine countries and eventually throughout the civilised world. Thus was born the science of co-ordinated forestry and water control. Later it was also able to avail itself of the results of experimental hydrological research conducted in Switzerland, Austria, Germany and, subsequently, in Japan and the U. S. A. by leading experts. To realise the extent of the initial outstanding success obtained in France, one need only recall the practical achievements and scientific work of Prosper Demontzey (1831-1898) " the man who re-forested the Southern Alps ", and the great work carried out by Paul Mougin (1855-1939), " the man who restored mountain soil and controlled torrents ". The methods evolved by Demont-zey, which have been studied and emulated by technicians in all countries which have been concerned with the problem, showed the proper importance to be attributed not only to forests, but also to grass and shrub cover respectively. The contribution made by scientists and technicians throughout the world in establishing the relation between water control and forest is indeed remarkable and the works which have been published on the subject would fill whole libraries. While it is true, however, that the effective protection given by forests against erosion is universally recognised, the relation between woodlands and floods is still debated and has given rise to widely differing views. Whenever great floods occur, they are almost invariably attributed to deforestation. Here attention must be drawn to the desirability of distinguishing between unusual occurences and those which cannot be considered as such.In the latter case the influence of the forest upon surface water run-off is summed up in the conclusions arrived at by Kittredge (1948) after careful study and analysis of a vast amount of documentary material :

6. The greatest surface run-off takes place in forests which intercept and transpire least water and, at the same time, reduce the evaporation of surface moisture and snow.

7. Surface run-off on forest soil is inversely proportionate to the degree of facility of infiltration, which is very great in moss-covcred soil and, generally speaking, in well preserved forests.

8. Surface run-off on woodland soil which has been stripped of moss is 7 to 70 times greater than that on land from which the moss has not been removed. This increase is very great:

8.1. on land of fine structure, such as clayey soil;

8.2. in the case of very heavy rainfall of more than 25 mm an hour;

8.3. the steeper the slope of the land.

9. In the case of forest clearance a considerable increase takes place in the flow of water during the first two years after the felling of the trees; tree and shrub vegetation which then begins to grow on the land thereafter tends gradually to reduce the run-off, unless, of course, the source of water has dried up or been destroyed.

10. Surface run-off in untouched woodlands takes place only when there, has been heavy rain and it then reaches a maximum of 3 % of the precipitation, whereas in the case of slight rainfall it may be non-existent. On land which has been completely or partially cleared of timber, however, it may even exceed 60 % of the precipitation.

11. Besides reducing surface water runoff, forest help to delay its discharge into the waterways, thereby helping to control the ourflow. From these conclusions the beneficial effect of forests in controlling the flow of water is obvious. At this point the question arises whether this control is also effective in periods of exceptionally heavy rainfall accompanied by serious floods. Mountain chains and groups give rise to what is known as " relief " precipitation3, which is almost invariably that responsible for heavy floods. This rainfall is not as regular as that known as " convection[6] " rainfall; it may take place within fairly short periods and result in the precipitation of enormous quantities of water. The heaviest rainfall occurs in the highest mountain areas; in addition to the average yearly rainfall, rainfall lasting continuously for one or more days is likely to give rise to the heaviest floods. Data compiled by the Italian Department of Hydrography show that in some parts of the Alps and Apennines the heaviest daily rainfall (i. e., of a virtual duration of 24 hours), often exceeds 300 mm. and is sometimes as much as 500 mm., which is equivalent to the precipitation of 300,000 cubic metres or more of water to the sq. kilometre. Since this volume of water may fall on the soil within the space of a very few hours it is not difficult to imagine the enormous quantities of water flowing into the rivers and torrents on their way to the sea. During the flooding of the Po in 1951 the volume of rain water which fell between 7th and 12th November was more than 16,000 million cubic metres, corresponding to an average depth of 230 mm. over the whole area of the river basin (the basin of the river Po has an area of approximately 70,000 sq. kilometres). The greater part of this mass of water falls on the higher parts of the river basins, where the slopes and riverbeds are generally steeper; once it has reached the soil it gathers such speed that it has no difficulty in breaking up the land, displacing quantities of rock and earth which are sometimes enormous. Some idea of the extent of this relief rainfall may be gained from the following figures recorded at the time of the 1951 floods in Sardinia, Sicily and Calabria, when the rainfall in some localities amounted to :

in Sicily : 1,276 mm. in 5 days;

in Sardinia : 1,536 mm. in 4 days;

in Calabria : 1,495 mm. in 3 days, representing 116, 131 and 99 % of the average total rainfall per year in those localities.

During the disastrous floods which occurred in the Salerno district on 25th and 26th October 1954, the Salerno rainfall gauge registered a total precipitation of 500.4 mm. for a period of 8 1/2 consecutive hours, with a maximum rainfall for 2 hours estimated at 150 mm. per hour. The mean annual rainfall at Salerno is 1,332 mm. This means that within the space of 8 1/2 hours the equivalent of 37.5 % of the mean annual rainfall was recorded. There is, of course, no way of preserving intact effective vegetation cover subjected to such an overwhelming onslaught as to be comparable in violence with that of a volcanic eruption or an earthquake. It was, therefore, an easy task for hydrographers to dispel the illusions harboured by the uninitiated concerning the protection afforded by forests. It may be helpful to give, in chronological order, the views of the most qualified representatives. In a paper written in 1856, Possenti denied that deforestation could lead to an increase in floods. In this connection he pointed out : " From observations recently made in France it would appear that the idea of deforestation being responsible for an increase in floods is based on mere assumption and misleading appearances and not on well established facts. Belgrand, the engineer, in

6. Term used b y the French met ereologist Angot (1916).

two important works published in 1846 and 1852 on the upper Seine basin proved that the rate of flow of rivers and the more or less steady volume of water discharged by them depended almost entirely upon the geological structure of their basins and little or not at all upon the nature of local crops. He held that this was equally true of the effects of woodlands, meadows, grazing lands and vineyards and that their influence was little more than that of ploughed land, not as a result of their ability to control the flow and accumulation of water, but because they were less likely to be furrowed by its action. " In 1912, Fantoli expressed the following views in his report on hydrometrical data relating to the river Po : " Marked fluctuations in the flow of water in the valley of the Po at Pontelagoscuro cannot reasonably be attributed to the unnecessary deforestation carried out in the Po basin during the first twenty years or so of the century and considered as likely to have generally very harmful local effects, especially upon soil stability and economic conditions. " He estimated that at the time an area of 12,500 sq. kilometres (or about 18 %) of the Po basin was covered with forest and that very approximately the wooded area at the beginning of the previous century had been 18-19,000 sq. kilometres. He agreed that this decrease in the woodland area had had a " slight influence in the middle and lower reaches of rivers but did not appear to have had any in the upper reaches"; this, he claimed, fundamentally agreed with the results recorded and assessed in various ways in Europe and North America, where the radical geographical change may be observed in the course of less than half a century of whole river systems several times larger in area than our own. This led him to the following conclusion : " That is why I am a fervent believer in the usefulness of reforestation; its profound influence upon local soil stability is both beneficial and decisive and alone sufficient to encourage us to become firm supporters of this policy. But while all this is enough to make us friends of the forest, let us beware of claiming that it can have any notable quantative effect upon the flow of water of a large river and let us refrain from generalisations which do not stand up to close inspection. " In 1952, after pointing out the undeniably beneficial action of forests in protecting and consolidating slopes, De Marchi held that " had the Po basin been 'entirely covered •with forest at the time of the unfortunate events in November 1951, this would not have affected in any way the nature and course of the great floods, and the disaster which took place would have been just as inevitable ". Indirect and partial corroboration of this was provided by the Danube floods of 1954, if one bears in mind that the receiving basins of the Alpine tributaries of the Danube in which the floods originated are much more wooded than the basin of the Po and that the forests there are able to contribute more effectively to water control. Observations, measurements and findings, which it is not possible to record in detail here and are the outcome of experimental research undertaken in connection with many river basins, especially in America, have, according to De Marchi and others, shown that only in the case of small basins of not more than a few hundred sq. kilometres, in which forests cover from 60 % to 70 % of the total area, can there be any appreciable reduction in flooding; in larger basins in which forest covers only a very small part of the total area, the influence of woodlands upon great floods is almost negligible. An infinite number of views could be quoted on this subject since, as stated above, the influence of forests upon heavy floods has given rise to heated debate over the years between hydrographers and forestry experts. The hydrographers go somewhat beyond our own convictions; and we propose to do no more than state their views, since even if it were possible conclusively to show that they are mistaken—which our common sense tells us is not so—it is not clear what practical use could be made of it. It would, indeed, be childish and Utopian to wish to restore forest cover more or less as it existed before the settlement of man. However, we do not propose to let our passionate regard for forests obscure our reasoning powers and we are prepared to accept the conclusions reached by the hydrographic experts mentioned above. Though they make certain reservations with regard to the influence of woodlands upon floods, they agree that in normal conditions forests serve to control surface run-off; what is even more important, they are unanimously convinced, as are forestry experts throughout the world, that the basic function of vegetation cover in general and woodlands in particular is that of providing protection against erosion. This fully justifies the need to protect existing forests, restore their effectiveness where this has been impaired and undertake re-forestation wherever the morphology and structure of the land favour erosion. All this should, moreover, be undertaken on both protective and curative grounds, in conjunction with technical measures.

12. Where you have forest, you will have clear water, whereas forest clearance and the farming of land where trees formerly grew inevitably lead to greater erosion and muddy streams. It must, however, be borne in mind that man has largely contributed to the destruction or deterioration of woodlands, a direct outcome of which has been surface erosion, one of the initial causes of unstable drainage conditions, and that he is also responsible for the way in which the numerous and complex factors governing the ability of the soil to absorb the water on the land have been upset. Even more destructive than tree-felling and forest fires is the slow and continuous deterioration of the soil as a result of grazing, which may be described as enemy No. 1 of the effective protection and control exercised by most forests, especially in Southern Europe. The removal of moss is also very harmful in that it deprives the forest of one of the main features of its complex and admirable action in binding the soil. These harmful practices are fairly widespread in Southern European countries and are occasionally met with in more northerly areas, especially in mountain districts. They are a very obvious

outcome of a more or less serious economic depression. The countries concerned have made efforts to restrict or abolish these practices by issuing regulations; but no law can effectively prevent them, since restrictions would militate against the very livelihood of the local inhabitants. While it is true that in mountain areas no public measures can be taken for the general purpose of soil conservation without bearing in mind the need to restrict the specifically agricultural activities of the greater part of the local population, action taken in rural areas should be mainly directed towards reforestation and the improvement of grazing lands. In carrying out estate-planning in mountain areas, care should be taken to adapt production to general economic needs, but solutions should be encouraged which also take into account the suitable planning of rural areas. In this connection, it must also be borne in mind that the splitting up of private property in mountain districts has almost everywhere taken on rather alarming proportions and, in its direct bearing on over-population, is the main obstacle to any rationalisation of rural activities in those areas, thereby nullifying attempts to make technical, economic and social progress and prolonging and aggravating excessive exploitation. It is common knowledge that underproduction and unemployment cannot be made good by technical achievements, unless successful steps are taken to dispose of or at least reduce such serious obstacles to general progress. It would be a mistake to generalise this pessimistic view, since in districts where agriculture and grazing do not conflict with forestry, where forests continue to grow under favourable conditions and are primarily used for the production of industrial timber and where the raising of livestock is undertaken along rational lines and processing is carried out efficiently, the living conditions of mountain populations are satisfactory and there is no danger of the balance of soil conditions and water control being upset. Similarly, it would be wrong to pretend that mountain districts can provide a livelihood for an ever-increasing number of inhabitants without risk of impoverishing the soil, since the balanced conditions mentioned above can be maintained only if the population of such areas, in common with the number of livestock, is not unduly large. For a long time now, however, there has been increasing evidence, under the impulse of general economic development, of a healthy trend in all the hilly and mountainous areas of Europe and especially in those most subject to flooding and erosion. Rural economy in the mountain districts entered upon a critical stage at the middle of the last century. Up to that time there had been a continuous expansion of human activity towards higher land, induced by an increasing population which had led to many inhabitants seeking a means of livelihood in the cultivation of forest clearings and mountain pastures. This expansion of agricultural activity towards higher altitudes ceased[7] about the period mentioned above when, as a result of the development of communications, mountain districts were able to enter into close contact and carry on increasing trade with the surrounding areas. Previously, mountain districts had been obliged to engage in a restricted local economy and the produce of mountain farms had been almost exclusively used for local consumption. Once it began to form part of the general economy, the economic basis of mountain farming began to be upset and to give rise to a number of difficulties which led to the abandonment of those lands which were in an unfavourable economic position. Surveys and investigations undertaken between 1932 and 1936, including an inquiry into the depopulation of the Italian Alps, carried out by the National Institute of Agriculture, clearly showed that :

12.1. The depopulation of mountain areas in its various forms must not be considered alone, but as a wider and more complex occurrence indicative of a crisis which may be called a highland or rural crisis according to whether it is viewed from a particular or more general standpoint;

12.2. Fundamentally it consists of a gradual and more or less intensive social transformation, in the form of a large-scale migration of agricultural workers to other kinds of employment, in the same way as this has taken place in all modern civilised countries, as a result of a constant diminution of the relative and, indeed, often absolute number of agricultural inhabitants;

12.3. If we consider these developments in their age-old trend, they must be looked upon as a normal and physiological process like the formation and development of urban centres or centres of population of a mainly non-agricultural character.

The relation between the livelihood obtainable from the soil and the needs of the inhabitants is therefore shown to be essentially dynamic, as is also the " optimum " which should reflect the more favourable aspects of the balance sought. This gives rise to population shifts which are not due to population increase but to a diminution of output or to greater needs resulting from an improvement in the standard of living of the inhabitants or to a desire for such an improvement. The flight from the land may well, and indeed does, cause concern, because if it takes place too rapidly and on too large a scale, it may become disastrous; within reasonable limits, however, it is beneficial, provided the erstwhile landworker succeeds in finding other employment and does not, as is nowadays often the case, merely swell the number of employed. We shall have occasion to return to this particular subject later on. For the time being, the important point to be borne in

7. Not everywhere. The practice is still to be found in some Mediterranean areas, such as the Southern Apennines, Greece and Turkey.

mind is that in mountain areas forestry and grazing, especially the former, have, generally speaking, hitherto been replaced by the growing of crops which, in addition to causing the damage already described, has now become uneconomic; and that mountain farming intended to meet local needs must be considered as very much out-of-date in the light of general economic development. The tendency to abandon marginal lands is one which, viewed as a whole, might be considered as reversible only in the event of a return to autarky, which is obviously unwarranted in view of the present trend towards the liberalisation of trade and the establishment for the whole of Western Europe of a common market capable of being integrated in the world market; or if a policy in favour of mountain areas, to bolster their unprofitable economy, were pursued in the form of such large-scale and continuous Government aid as to be rather problematical, if not impracticable. The effect of this alternative would be not so much to stimulate productivity as to increase subsidies; this would place too great a burden on national budgets and would also have to be considered as prejudicial to the dignity of the inhabitants of mountain areas. The return to " natural conditions " in mountain areas, that is, to an economy founded mainly on forestry and grazing, as is now spontaneously taking place with the departure of landworkers, especially from the poorer lands, is something we should encourage and not hinder, concentrating upon forestry and grazing in order to preclude the recurrence of what has taken place in the past : let us ensure that healthy soil is no longer endangered or the stability of sloping land exposed to the disastrous effects with which we are familiar. The spontaneous trend referred to cannot, it is true, be considered as all-important for soil conservation. In countries like those bordering the Mediterranean it is obviously impossible, for physical, economic and social reasons, for forest areas to extend indefinitely; the preservation of existing forests and reforestation leading to their expansion must be subjected to proper control, especially in those hilly and mountainous areas where it is essential that land should remain available to agriculture. It should not, therefore, be expected that afforestation and reforestation can, in view of their fundamental purpose, suffice to achieve the results, which demand more comprehensive, effective and co-ordinated action. There is typical proof of this in Italy where 6 million hectares are composed of clayey soil and, in the hilly and mountain areas, planted with agricultural crops. Wherever highland areas are exposed to very harmful influences, even the technical difficulties of reforestation are almost insuperable since the top layer of soil on which the former forests grew has for centuries been swept away. We are not, however, concerned with methods of restoring damaged land, but wish to draw attention to the need to ensure the rational use of the soil. As we have already tried to point out, the maintenance and restoration of balanced soil and water conditions in economically under-developed and essentially rural territories present not only technical and financial problems; the success of any action to achieve these aims depends very lergely upon steps to reduce demographic pressure on the land. The problem is mainly one of finding employment for surplus rural population resulting from the need for redistribution of the population. Emigration from countries where surplus landworkers militate against the development of agriculture along modern lines (mechanisation, etc.) and improvement of living conditions might be co-ordinated with attempts to find a solution to another problem of worldwide importance, namely that of increasing agricultural productivity for the benefit of the large part of the world population still short of food; in both cases, this would help to do away with dangerous subversive movements brought about by lack of social progress. Too much land is still unproductive and the distribution of world population too irrational; on the one hand there is over-exploitation of the land, sometimes destroying its fertility, and on the other there is too much land to which no use is put; population is centered in towns of enormous size, whilst vast rural areas are left depopulated. Immigration countries are benefiting by the arrival of a new and productive population; their agricultural production is increasing, as well as, concurrently, their industrial and commercial output; their revenue from taxation is rising and their balance of payments improving. Population pressure on the land in emigration countries is diminishing and will lead to improved agricultural conditions there. Other countries are benefiting by a greater volume of trade, a better distribution of wealth, better balanced conditions between town and country and more stable social and political conditions. While it is true that present political considerations are beginning to extend beyond national frontiers to the world at large and are taking account of the close relations which nowadays exist among all countries, in the economic as well as in the social field, the problem of emigration should be looked upon, if not as the most important, at least as one of the most urgent problems to be solved for the attainment of peace and the welfare of mankind. With regard to the specific subject of this report, however, the afforestation of marginal lands does not weigh unduly upon employment and the standard of living of rural populations. Attention may be drawn in this connection to a passage contained in the FAO Report for 1954 on National Forest Policies in Europe, based on reports received by that Organisation Irom the various countries of Europe : " Thus, as has just been pointed out, the economic motive in the expansion of afforestation is closely linked to the social factors. The afforestation of bare land may have two different and even diametrically opposed effects on the rural populations, particularly evident in the reports on Portugal and Italy. On the one hand, afforestation particularly economic afforestation checks the exodus of rural populations to the towns and even, as can be seen in the report on Great Britain, brings workers back to the land. On the other hand, afforestation, and especially protective afforestation, carried out in over-populated regions, deprives the neighbouring inhabitants of part of their agricultural and pastoral resources and forces them

either to develop the productive capacity of other available land or, at times, as in Cyprus, to migrate elsewhere. In many European countries, however, the tendency is rather to endeavour to stabilise a decreasing rural population, which is still a further reason for economic afforestation. Thus, it is evident and this is a fact long since recognised in northern European countries with a very high percentage of area under forest that small rural communities can easily subsist on an economy based almost entirely on forest products and forestry operations. Moreover, it is all the easier to assure their subsistence, as the types of plantations suitable for economic afforestation require more frequent and thorough care : soil preparation, cleaning, early thinning and pruning. " It is necessary once and for all to dispose of the unfortunately widespread view that the forest does not provide work. It is, of course, true that where the forest is considered solely as an asset to be exploited, employment is provided only at fairly long intervals, when the felling of trees takes place. Where forestry is carried on intensively, however, considerable employment is provided by the need to promote the growth of timber and ensure its protection. Considerable manpower is employed in processing forest products. In suitably wooded areas the timber industry and allied handicrafts give rise to non-agricultural activities which would be welcomed in all under-developed and over-populated areas as a means of reducing unemployment and under-employment among rural populations, especially in mountain districts. During periods in which agricultural activity is at a standstill or undergoes a seasonal decline, forestry work, including the felling, clearance, carting and transport of timber provides employment for available manpower on the labour market. The harvesting and handling of forest by-products are sources of employment and income which cannot be neglected. In the Federal Republic of Germany, surveys show that State and other publicly owned forests employ about 18,000 forestry officials and trainees and 110,400 forestry workers, and that the number of permanent workers is increasing in nearly all the Lander. Privately-owned forests contribute to the means of livelihood of hundreds of thousands of people. The number of people partly or wholly dependent for their living on forests and forest products, including the wood processing industries, is estimated at 3.5 million.In Switzerland 20,000 people, or 2 per cent of all employed persons, are employed in the forests each year. The total wages earned by work in forests average 110 million Swiss francs a year (avalanche control work excluded), or 0.5 per cent of the total income of the Swiss nation. In Finland, in 1950, there were about half a million workers, or nearly half the total male rural labour force, working in forests or engaged in floating timber, either on their own account or for wages. This labour force worked 37.2 million man-days that year, which means that 24 per cent of working days in 1950 were accounted for by forestry operations and timber floating. The corresponding figure for all the male workers in rural areas was 16 per cent. The number of forestry workers of all kinds increased during the first half of the twentieth century, while that of skilled workers has been steadily diminishing. In Great Britain, the Forestry Commission has been giving its attention to the problem of repopulating and maintaining social services in areas of low population density, since these are the most suitable areas for afforestation. Huge areas of the 6.4 million hectares (16 million acres) of uncultivated land have already been planted and another 600,000 hectares (1,500,000 acres) are to be put under timber before the end of the century. In 1955 the Commission made provision for 699 houses for its 1,008 forest officers (69 per cent) and for 3,824 houses for its 13,400 forestry workers (29 per cent)[8]

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8. Reports of the European Forest Commission. F. A. O. A recent survey undertaken by Dr. Gaja [see Vol. 2 of the review Monti e Boschi, (Hills and Woods), Milan, 1956] in the Collio District of Brescia about 3,000 feet above sea level shows that forestry requires more manpower than permanent meadowland. The following statistics provide a means of comparison : Annual manpower needs per hectare of permanent mountain pasture : days hand-mowing of hay - 3.0 tedding - 2.0 carriage of hay to the farm by the worker - 0.5 grazing supervision in the autumn (one cowherd to 20 head of cattle) - 1.5 spreading of manure before winter once every three years, or once a year, over one-third of the surface - 1.5 raking in of manure residue in the spring - 0.5 harrowing and other agricultural operations - 1.0 Annual total 10.0 Annual manpower needs per hectare of forest for a period of 90 years : felling of 200 cu. m. (including intercalated felling) of resinous industrial timber (felling and preparation on the spot) at the rate of 2 cu. m. per day per worker 100.0 assembly (4 cu. m. per day) - 50.0 Removal by haulage or telpher ropeway to cart track, average distance 2 kms 80.0 loading, transport, unloading at sawmill at the rate of 4 cu. m. per day 50.0 sawing of 200 cu. m. of roundwood. A modern saw with several blades can cut 1 cu. m. of tree trunk into planks in 1 hour and is manned by 6 workers 150.0 stacking, selection, loading for transport to centres of consumption of 140 cu. m. of sawn timber; 1 worker can carry 4 cu. m. a day. . 35.0 clearing of branches and felling debris and their transport to destination (about 150 cwts. of fuelwood at the rate of 3 cwts. a day) 50.0 515.00 days - 515,0 Replanting after felling, i. e. planting of an average of 1,250 seedlings per hectare (providing for the renewal of half of the stock by artificial means to supplement natural regrowth, which must be assisted by the clearance of undergrowth and redressing of the soil) and fencing : Nursery plantation of three years old saplings 8.0 preparation of soil; cleaning and breaking up, at the rate of 250 sq. m. per day - 40.0 plantation of 1,250 seedlings - 40 per man per day after digging of small ditches - 31.2 fencing of cut - 12.0 forestry care during the following years equal to 25 % of initial installation needs - 22.8 Pruning and cleaning (including clearance and removal of resultant timber waste to destination) - 100.0 Supervision and protection of timber (40 days a year for a period of 90 years) - 360.0 Gathering of secondary products (1 day a year for 90 years) - 90.0 Total number of days for the whole period of 90 years 1,179.0 Total number of days a year (1,179 : 90) - 13.1 Comparison : Annual manpower need for permanent grazing land - 10.1 do for forestry - 13.1

13. As already pointed out, the forestry problem is one of protecting existing forests, restoring their output and increasing their area; it cannot be considered as solely a problem of domestic policy. In this connection it may be noted that in its 1950 survey on Forest policy, legislation and administration, F. A. 0. stated : " It should, however, be noted that the protective action of forests is not necessarily limited by national frontiers. Apart from their influence on climate, very many great rivers of the world are international. Poor forest management in the basin or that part of the catchment area of a river or its tributaries in one country may, therefore, have most serious effects upon the other countries through which the river flows. Numerous international conventions govern navigation[9] or lumbering operations[10] on these rivers, and although, in recent times, conventions have also dealt with the use of water for agricultural or industrial requirements[11], it is surprising that nothing has been done to ensure proper implementation of the conventions, which is entirely dependent upon wise use of the soil in river basins and, above all, the proper care and maintenance of key-points within those catchment areas. Soil conservation is not, however, the sole function of forests; their economic importance is just as great, owing to the products, mainly timber, they provide. Indeed, in Europe the production of timber makes forests of not only national, but international importance. It is common knowledge that there is a general shortage of wood in Europe and that this position is unlikely to improve in the near future. The position in Europe has been clearly stated in the report published at Geneva in 1953 on Timber Trade, production and consumption in Europe, embodying the results of an exhaustive survey carried out by the F.A.O. We shall deal with this particular point later on but wish, at this stage, to refer to the additional uses of forests, which are also of both national and international importance. In the 1950 FAO treatise already mentioned, these additional uses are described as follows : " In addition to the two fundamental uses of the forest considered above, there are many secondary uses, some of which have long been recognised, whilst others have arisen as a result of modern needs and the development of civilisation and human knowledge. A notable feature is the increasing role played by the forest in its influence upon the health of urban populations as a result of the forest belts which ancient towns have striven to preserve in surrounding areas, a policy which is also being pursued by urban centres of more recent date. A classic example of the beneficial nature of such action is the improvement which has taken place in health conditions in France, following the afforestation of the " landes " and marshlands in the Atlantic coastal and South-Western districts of France. The exhausting strain of modern city life has made it necessary to reserve natural recreation areas for the use of city dwellers. Wooded areas are, of course, most suitable for this purpose and at the same time provide opportunities for hunting and fishing. Although in many parts of North America, vast national parks have been created, albeit for a somewhat different purpose, innumerable forests, organised along special lines, have been made available for recreational purposes. Lastly, the demands of modern life compel mankind to extend its activities to every accessible part of the globe[12]. These activities inevitably lead to profound changes in natural conditions, sometimes even resulting in the gradual disappearance of particular animal or vegetation species. It is logical that man should seek to preserve the memory of these natural conditions, as well as the framework of historical developments which have profoundly influenced his destiny, either for recreational purposes or for the benefit of scientific research which, if this precaution were not taken, would be deprived of any source of information on primitive natural conditions. These, then, are grounds justifying the creation of national parks and scientific, artistic and historical reservations, in which forests naturally play an essential part".[13] At this juncture, we, naturally, ask ourselves the following question. What legislative measures have European countries adopted with regard to forests? Below we give a brief outline of the national forest policies pursued in Europe[14]

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9. All international treaties on river control since the Treaty of Osnabrueck (12th to 24th October 1648).
10. The Treaty of Dorpat between the U. S. S. R. and Finland (14th September 1920).
11. The Peace Treaties of Versailles, Saint-Germain and Trianon, after the first World War. The Elbe Navigation Act (Dresden, 22nd February 1927). The Boundary Waters Treaty between Canada and the U. S. A. (11th January 1909).
12. "Another century like the last and civilization will bo facing its final crisis! ". Professor Osborn, Our Plundered Planet.
13. At its sixth session (Rome, December 1951), the Conference of F. A. 0 . adopted unanimously Resolution 26, the first operative paragraph of which reads as follows : " The Conference expressos its conviction that forests are an essential factor in the world's economic, social and physical wellbeing. Provided that they are wisely administered and exploited, they constitute a neverfailing source of products indispensable to man. With the improvement of general living standards and the rise in world population, the demand for these products is constantly increasing; and several countries, whoso own forestry resources are inadequate, are obliged to call on supplies from abroad. Moreover, since they provide, or are capable of providing, work for larger numbers of people, and are a source of raw materials for a wide range of industries, forests constitute an important factor in social stability and world progress. They also exercise a protective function in regard to soil, water-supplies and climate, and, consequently, have an influence upon agricultural economy, the development of hydro-electric installations and the general welfare of rural and urban populations, both in the country in which they are situated and in neighbouring countries. Their protective action, as well as their productive capacity, can be adversely affected by destructive and short-sighted practices. In order, therefore, to make use of forests to the greatest advantage both of individual countries and the world in general, it is essential that every country should pursue a sound policy in this matter.

1.1. Germany

The aggregate area of woods in the Federal Republic of Germany is 6.8 million hectares, or 28 % of the Federal territory. 30 % of the forests is owned by the State, the remainder belonging to co-operative societies and private owners.

The distribution between woodlands and agricultural land is generally speaking well balanced. Very many years of most careful and methodical reforestation have enabled a healthy and sound forest heritage to be built up.

Felling at ground level has never exceeded 1 % of the total area, with the result that there has never been any widespread erosion.

The position was less favourable during and after the last war, however, owing to the inroads made upon standing timber to meet the demand for wood.

Forestry legislation passed during recent years has clearly shown that efforts are being made to make good the damage caused by erosion (especially in Schleswig-Holstein, North-Rhine/Westphalia, the Rhineland-Pala-tinate, etc.).

The National Forest Administration Authority in Germany is a governmental department and the country as a whole is divided up into a number of functional sections.

Private woodlands are free of control, but the formation of forestry co-operatives is encouraged and given every assistance by the authorities. Germany is at present engaged in restocking its forests, in order to make good the inroads made by excessive felling during the war, and a forestry scheme has been initiated for this purpose. Research is now being carried on with a view to improving timber stands. A number of schools specialise in the training of forestry experts and other officials subsequently employed by the State Forest Administration Authority; other forestry educational establishments are concerned with the training of forestry workers.

1.2. Austria

Owing to the fact that Austria is a mountainous country, it must be borne in mind, when taking action to preserve and improve forests, that Austrian forests play an important part in protecting the productivity of agricultural land, preventing erosion and regulating run-off. A number of fundamental provisions of the Imperial Forestry Code promulgated in 1852, later supplemented by several laws in various federal lands, are still in force, namely :

1. Injunction against the clearing of forest land without official permission.
2. Obligation to reforest clear-cut areas.
3. Provision to preserve the forest area at approximately its present size.

The Forest Code also includes measures for classifying shelterbelts and protection of forests with restrictions upon the removal of moss.

The forest area in Austria is 3,156,000 hectares; 656,000 hectares are inaccessible and 2,500,000 exploited.

1.3. Belgium

Forests cover an area of 601,000 hectares, or 18 % of the territory, of which 48.13 % is the property of the State, communes and public institutions, and 51.87 % private woodlands.

The Waters and Forests Administration is attached to the Ministry of Agriculture. Subsidies up to 30 % are granted for reforestation carried out by the provinces, communes and associations of local authorities. The Ministry of Agriculture may in certain cases forbid abnormal or excessive felling in private woods and forests the preservation of which is in the public interest.

Laboratories at Ghent and Gembloux and the Institute of Agricultural Research at Louvain specialise in forestry research.

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14. These particulars have been extracted from documents placed at our disposal by F. A. O.

1.4. Denmark

The total Danish forest area comprises about 440,000 hectares, of which 33 % is State-owned, 4 % municipal forests and 63 % private forests.

The rather large proportion of the forest area owned by the State is due mainly to the extensive plantings on heaths and sand dunes undertaken by the State since 1790.

The State forests are administered by the Ministry of Agriculture. The owners of small woods have to some extent formed local associations through which they are able to engage forestry graduates as inspectors and technical advisers.

Two forestry associations assist and advise landowners desirous of undertaking reforestation.

A Nordic Forest Union has been formed to promote intra-Scandinavian (Denmark, Finland, Norway and Sweden) collaboration in forestry matters.

1.5. France

French forests extend over an area of 11,407,000 hectares, or 20.48 % of the territory. 13.6 % of this area consists of woods and forests belonging to the State and 64 % of private woodlands, the remainder belonging to depar-tements and communes.

The Waters and Forest Directorate is attached to the Ministry of Agriculture. France is divided into 44 Waters and Forests Conservancies, each of which is divided into inspection areas, cantons, districts and sub-districts. A National Forestry Fund was established on 30th September 1946, for the purpose of granting financial aid to forest owners.

The Decree of 30th December 1954 aims at encouraging the formation of afforestation and forest management co-operatives. Its purpose is to remove the obstacles at present encountered by people who desire to carry out afforestation or to maintain a regular forest management service, and it is an essential part of long-term forestry policy, intimately linked with the French Government's general economic and social policy.

The Ministry of Agriculture draws up plans for the rehabilitation and extension of forests and the improvement of stock. The National Forestry Fund is also responsible for fire-fighting equipment and facilities in forest stands of the Landes region of Gascony.

Steps are being taken at the present time to reduce the output of fuelwood in order to provide more timber for industrial purposes.

Under Articles 219 to 224 (inclusive) of the Forestry Code, clearing is prohibited without special permission of the Ministry of Agriculture.

With regard to afforestation and reafforestation, the Advisory Committee on Reafforestation is studying the technical and administrative problems involved by the reafforestation plan; in 1954 it devoted most of its attention to mechanisation of afforestation operations.

With regard to torrent and avalanche control, work in connection with the restoration and conservation of mountain soil under the Law of 4th April 1882 is carried out by the Government itself, by the land owners to whom Government subsidies are granted for this purpose and by means of protective measures prescribed by the law.

The main by-products are resin (the annual output of which is about 80 million litres) and cork (cork-oak plantations cover an area of about 25,000 hectares in France), the annual output of which is 95,000 quintals.

In 1950, there was a surplus of maritime pine on the French domestic timber market from South-Western France, where it had been necessary to fell all the stands burnt out in 1949. At the present time there is a surplus of hardwoods and a great shortage of softwoods.

There are four forestry high schools in France. Private owners of woods and forests have united to form trade unions in each provincial area or " department. "

1.6. Greece

The entire Greek forested area is estimated at 1,850,000 hectares. During the war Greek forests suffered considerable damage.

The Forest Service is headed by the General Directorate of Forests in the Ministry of Agriculture. The central service is responsible for 14 forest conservancies and 120 ranger districts. The Government Forest Service controls the exploitation of private woodlands. In cases where a forest estate is the joint property of more than seven owners, a cooperative society must be formed.

The main aim of Greek forest policy is to prevent irrational clearing and increase the wooded area as much as possible.

Since 1931 the Forest Service has also been engaged in afforestation as a means of watershed control.

During the financial year 1953-1954 over 6,500 hectares were afforested. Some 12 million trees were planted, mainly conifers.

In 1954-1955 the figure was 30 per cent higher.

In 1954, Greece imported 231,790 cubic metres of sawn-wood, 1,008,474 kilograms of lengths of board, 103,603 kilograms of wood for cabinet making and 1,301,963 kilograms of timber for barrel making.

Affiliated to the University of Salonica, is a forestry school for rangers.

1.7. Ireland

In 1951 the total area held by the Forestry Department was 227,750 acres of which 46,520 acres were considered unplantable. Woodlands in private ownership now amount to less than 100,000 acres, but new forests planted cover 140,450 acres.

Government forest policy provides for the planting of 1,000,000 acres of additional forests, over a period of 40 years. It is estimated that 1.200.000 acres, or 7 % of the total area of the country, could be afforested. Ireland has particular need of softwoods.

The Forestry Service is a division of the Department of Lands.

An owner wishing to fell trees must request official authorisation to do so. In addition, the Forest Authority makes replanting grants of £10 per statute acre.

Ireland, as a whole, is less than 4,000 feet above sea level. There are no masses of mountain land. Heavy falls of snow are comparatively rare and mountain torrents do not constitute a serious problem. The need for protective forest is therefore limited.

A new School for Forestry has been opened and another is being built. These will take 20 students a year for a three-year course.

1.8. Italy

The fact that 40 % of the land surface of Italy is hilly is responsible for the existence of numerous torrents which, in times of flood, cause heavy damage to lowland crops. The geological features of watershed (schists, dolomites, marls and pure clays) worsen the situation and contribute to surface erosion and landslides, causing the riverbeds to rise. This is one of the major causes of floods. One of the main tasks to be carried out in Italy is, therefore, that of controlling the water run-off and preserving protective vegetation of mountain slopes.

The Forest Act of 1923 lays down rules governing forest exploitation, grazing and the changing of crops and directs public and private activity towards the extension of silviculture. Additional acts relating to forestry were passed in 1933 and 1950, including, in particular, the Act for the Development of Southern Italy. The Law of 25th July 1952 (No. 991) on mountain districts was implemented in 1953-1954 by the granting of loans to private individuals and to land improvement bureaux for establishing wood-processing industries in mountain areas and for improving private dwellings. 4,383 million lire were paid out for these purposes during the period. To sum up, the aims pursued by Italian policy are the following : the preservation and parcelling out of forest property, extension of afforestation control of the water run-off; soil conservation.

The aggregate area of forest land is 5,648,000 hectares, of which 64 % is privately-owned, 33 % owned by local authorities and 2.6 % owned by the State.

The State Forestry Corps is under the authority of the Minister of Agriculture and consists of a national directorate and 14 regional inspectorates.

At present, most of the cost of forestry work is borne by the State, which also contributes up to 50 % of the funds granted to reforestation co-operative societies. Local authorities are required to reinvest part of the proceeds of timber sales for the improvement of mountain pastures and publicly owned rural property.

Over-population and the need for greater food supplies have obliged rural populations to grow more fruit and vegetables and, in some cases, to clear woodland areas for this purpose. In Southern Italy and in the islands the cultivation of land on hilltops is common.

Research is at present being undertaken to find ways and means of preventing this abuse and supervisory authorities have taken steps to tighten their control. Other measures have been undertaken in connection with fire control, although statistics show that the number of fires has greatly decreased since 1949.

Restrictions have been placed upon the marketing of timber. The output of timber fell in 1953-1954 by about 1,150,000 cu.m. compared with 1952-1953. On the other hand, nearly 16,000 million lire were spent in 1953-1954 upon afforestation and the improvement of timber stands and on rationalising forest watercourses.

The Italian woodworking industry is at present unable to meet domestic requirements, Its equipment is modern and several mills ensure reduction and utilisation of waste.

The living conditions of the forest worker are particularly unsatisfactory. Available manpower exceeds current labour requirements, due to cutting restrictions and the seasonal character of felling operations. Many of these workers therefore follow other occupations during the rest of the year or seek employment abroad. Although in some parts of Northern Italy, and even in Lucania and Calabria, the existence of local industries ensures better living conditions, the picture changes completely where demographic pressure is heavy. There, a struggle emerges between the food emergency and forest resources, the inhabitants, in their great need, being driven to clear woodland areas in order to grow food crop.

Training of forest graduates is undertaken in the Faculty of Forestry at the University of Florence and forestry officials of the State Forestry Corps are usually chosen from among the graduates of the Faculty by means of a competitive examination.

1.9. Luxembourg

The total wooded area of Luxembourg is 81,000 hectares, of which 2.6 % is State-owned, 60.5 % in private ownership, 34.7 % belongs to communes and public institutions and 2.2 % to the Crown.

The Forestry administration draws 19 million Luxembourg francs under the ordinary budget, offset by 16 million francs receipts. 2 million francs are allocated under the extraordinary budget for the acquisition of woodland property.

The forest policy pursued by the Luxembourg authorities has two objectives, namely (a) to increase State forest property and (b) to protect private woodlands by preventing overfelling.

1.10. Norway

A very large proportion of the forest area (7,500,000 hectares, of which 800,000 hectares are inaccessible) of Norway is in private hands. Ownership percentages are as follows :

Private woodlands - 70.9 %

State forests - 11.1%

Woods owned by stock companies in joint ownership, etc - 9.6 %

Public commons - 5.4 %

Communal forests - 3 %

A characteristic feature of forest ownership is forest commons. These are large woodland areas in which the local inhabitants have the right to fell timber for domestic use.

The Department of Forestry is under the jurisdiction of the Ministry of Agriculture and headed by a Director-General.

Forest owners manage their woodland properties themselves with the help of district forest officials. Up to one-third of the cost of forest upkeep is borne by the State.

Regulations require forest owners to set aside funds for reinvestment in their forests, for such purposes as the building of roads, silvicultural work, etc.

In the years 1948 to 1950 inclusive, the average total felling amounted to 10 million cubic metres of timber a year. In 1951 the volume of timber felled was only 6 million cubic metres. Efforts are now being made to increase the utilisation of saw-mill waste. Consumption of fuelwood is decreasing as a result of a growing supply of electric power.

In 1954 production of paper and paper pulp reached a record level. Production of sawnwood, on the other hand, dropped by 5 to 10 per cent.

An effort is being made to overcome the labour shortage by improving the living conditions of forest workers. Higher education in forestry is given at the Department of Forestry of the Agricultural College of Norway.

1.11. Netherlands

Increasing population has led to neglect of forestry. All fellings are subject to Government approval and reforestation of cut areas is compulsory.

Changes have taken place in forest ownership, owing to the transfer of some privately-owned woods to State ownership.

The Forestry Division of the Federation of Agriculture is responsible for liaison between the Forest Administrative Authority and forest owners.

Considerable damage was done to Netherlands forests (250,000 hectares) during the war and 21,000 hectares are now being replanted.

Domestic production covers only 12.5 % of total requirements.

The training of forest officials and foresters in undertaken at two forestry schools situated at Wageningen and Arnhem respectively.

The Netherlands Government grants subsidies of up to 50 % of the cost of reforestation schemes.

A Forestry Board has been set up and a census has been made of all woodland above 1 hectare in area.

On the other hand, the conversion of coppices into full grown woodland is proceeding comparatively slowly (400 hectares) in relation to the total area to be converted (30,000 hectares).

In 1954-1955 the prices of domestic softwood was from 6 to 12 florins higher than the year before.

1.12. United Kingdom

The area of woodlands in Great Britain is 3,448,362 acres, of which 18 % or 623,031 acres is under the management of the Forestry Commission. The remainder (82 %) is held by private owners and local authorities.

Under the Forestry Act, 1945, forest policy in Great Britain came under the Minister of Agriculture and Fisheries and the Secretary of State for Scotland.

Territorially, Great Britain is divided into 11 forest conservancies, each with its own technical staff.

Various organisations, known as forestry committes or societies, are responsible for looking after the interests of private woodland owners.

The formation of co-operative societies has been encouraged by the Government by means of grants and guarantees. The Forestry Commission, which consists of ten Commissioners appointed by Royal Warrant, has its own budget, which is submitted to Parliament for approval.

Broadly speaking, conservation of soil presents no problem in Great Britain. Fire protection arrangements enable outbreaks of fire to be detected at an early stage and ensure the prompt intervention of fire-fighting facilities.

Control over timber felling was instituted in 1939 and ceased in 1954.

In 1954, approximately 24,000 persons were employed on forestry work in Great Britain, 13,600 by the Forestry Commission and 10,400 in private woodlands.

The development plan continues but has been slowed down somewhat by the difficulty experienced in finding the necessary land for reafforestation. The area of State forests has been increased by new acquisitions.

About 90,000 persons are employed in the timber (saw-milling, etc.) industries.

Four universities grant university degrees or post-graduate diplomas in forestry. In addition to higher education facilities, there are vocational training schools for forest rangers and foremen.

Grants from the Forestry Fund are made to the forestry departments of various universities in the United Kingdom for research and the compilation of statistics. From time to time Commonwealth forestry conferences are convened by the Forestry Commission. The sixth Conference took place in Canada in 1952

The position in Northern Ireland is rather special, since the wooded area there amounts to only 2 % of the land area one of tlie most sparsely wooded in Europe.

Government policy is to purchase additional land for reforestation; the physical geography of Northern Ireland, however, is such that forestry does not need to play an extensive role in soil conservation, since there is little danger of erosion.

1.13. Sweden

The total forest area is about 23 million hectares or about 57 % of the total land area. 24 % of the forest area belongs to the State, 26 % to private companies and 50 % to private persons.

The Swedish Forest Service is placed under the authority of the Ministry of Agriculture and is responsible for ten districts and 106 supervisory areas.

Higher education in forestry is given at the Royal College of Forestry and the Forest Research Institute. There are five forest schools for the training of forest guards, forest wardens and provincial forest rangers.

A number of forestry associations are responsible for the maintenance and management of the great private forests.

1.14. Turkey

Turkish forest policy is governed by two factors, namely :

a. forests in Turkey are inadequate to meet the needs of the nation;

b. the living conditions of forest workers are poor.

As a result, Turkish forest policy is at present directed towards the conservation, rehabilitation and extension of existing forests.

The aims of this policy are as follows :

th e protection, improvement and development of existing forest resources;

th e extension of woodlands;

the rational exploitation of forests;

a public information campaign to inform the people of the influence of forests on their health and well-being;

th e improvement of living conditions of forestry workers;

co-operatio n with the inhabitants of woodland villages in the protection of forests.

The area covered by private forests is less than 1 % of that of all forested lands.

Afforestation is carried out by forest development commissions in accordance with schemes drawn up in the various development areas each year. These development areas are of 100 to 2,500 hectares each. In 1951 afforestation was carried out over 20,000 hectares and the present programme provides for the afforestation of 5,000 hectares a year.

The Faculty of Silviculture of the University of Istanbul provides training for candidates for the higher posts in the Turkish Forestry Service.

Active steps are now being taken to encourage reforestation. A bill setting up a Forestry Service and a Forestry Bill were passed in 1937 and remain the basis for the implementation of this policy. In 1950/1951 a law was enacted for the protection of forests against damage by grazing livestock.

Climatic conditions play an important part in the rehabilitation of forests, and the failure of afforestation shemes is mainly due to drought.

Several European countries possess remarkable forestry legislation, but this is not enough to ensure the effective conservation of forests. Laws must be implemented to the full, both in letter and in spirit.

No one can objectively deny, for example, that Italian forest law is good, even though it be open to criticism on account of its unduly liberal provisions relating to private woodlands, ft has, however, never been fully implemented, least of all during the past ten years, because the body responsible for this particular task was given other onerous and unfamiliar duties which precluded it from carrying out its essential activities. The,duties in question no doubt have some connection with forestry, since, particularly in the mountains, agriculture, stock raising and sylviculture are interdependent. The present system, however, ultimately subordinates forestry to other questions. To be in a position to carry out its duties properly, the authority referred to should be given technical assistance and additional staff.

The financing of particular operations (voluntary reforestation, the formation of companies with State, provincial and municipal participation, pest control and the improvement of pastures) has always been inadequate.

That action taken has fallen short of requirements is shown by the fact that there has been a continuous decline in both the area and quantity (volume of standing timber) of forest plantations.

It is noted, for instance, that official statistical data relating to the area of Italian forests do not always correspond to the true position. On 31st March 1952, this forest area was given as 5,648,000 hectares. But how much of this area may be truly considered as effective and productive forest? And has not much of that area become, in reality, more or less wooded pastures or productive, or even unproductive, fallow land?

This state of affairs is of vital significance. If the volume of timber extracted from the forests is divided by the " official " area, a yearly average is obtained of 2 to 2.2 cubic metres per hectare. If, on the other hand, the total volume of timber extracted is divided by the area of truly productive forest, the quotient is almost double. Does this not mean that the amount of timber used is excessive? At such an average rate of extraction, how long will it be possible to go on using timber without unduly thinning Italian forests and jeopardizing their productivity?

It is also apparent that the area hitherto devoted to reforestation in Italy is very small. According to official statistics for the years 1867 to 1950, a total of 83 years, the area reforested in Italy was 197,240 hectares; the present average is therefore 2,346 hectares, which is very little when compared with domestic needs.

Nor can it be said that the management of State-owned forests is entirely satisfactory. A part of these forests has not so far been the subject of any practical planning; and even where such planning has taken place, it is not always followed. In many State-owned forests, State-owned and State-managed sawmills have been established. Unfortunately such industrialisation has not led to the technical improvement of farming, but to some disturbing disadvantages (excessive use of timber, localisation of extraction in the best forests and in the most accessible areas, disregard of forestry planning). Generally speaking, the capacity of the sawmills exceeds the increase in forests.

The reason for inserting these comments on Italy is to confirm what has already been stated, namely that it does not suffice to have good legislation : that legislation must be fully, continuously and rigorously implemented. Where this is not done, the position should be put right by the prompt intervention of an international body.

Such intervention is all the more necessary, since in countries in which demagogic trends of a political or economic nature prevail in connection with social reform or in the routine implementation of the law, it is invariably the forest which gets the worst of it. The forest is an asset upon which it is easy to draw whether by means of municipal or public estates in order to balance budgets, which are always too liberal in providing for expenditure (political propaganda) or by means of private estates, to raise funds for more profitable investment, or to meet liabilities (very often inherited with the estate) or taxation, or to incur unproductive expenditure.

The restrictions imposed by the law, or rather by the competent authorities, do not suffice to retrieve the situation, especially in view of political action, which invariably pursues a policy of laisser faire.

A determined policy is needed at a high level, enforceable by an international body having powers of control.

As for present trends in European forestry policy with regard to reforestation, we are merely reporting here the findings embodied in the 1954 FAO publication already referred to, which appear to us to be of great interest.

One point, however, is worth emphasising. Prior to the war and in any case at the beginning of this century, afforestation, save in a very few countries, was directed toward stabilising the soil, preventing erosion, improving the water regime, and protecting the land against damage caused by wind or avalanche. At the present time, however, afforestation is directed to a much greater extent toward purely economic aims. This does not imply that the importance of afforestation from the different standpoints mentioned above is overlooked. It is, however, probable that, were it possible to differentiate between afforestation projects realized in recent years mainly for economic utility, and those undertaken for protective purposes, the former would undoubtedly preponderate over the latter.

It is interesting to seek out in the reports submitted by the countries, the reasons for this state of affairs and its consequences. What we shall call " economic afforestation " is primarily and fundamentally due to the awareness of all European Governments that their needs in wood have increased and have to be met, as least as largely as possible, from their own resources. This does not mean that any of them aim at being entirely self-sufficient. Wood is a raw material with too diversified a range of properties for any one country to aspire to grow all the species covering that range. It may be said, however, that it is Europe as a whole which feels the need for having larger quantities of timber, and consequently both exporting and importing countries attach great importance to the extension of wooded areas by afforestation.

However, in a continent where private ownership is as widespread as it is in Europe, it would obviously be difficult unless by coercive methods which are never resorted to for economic afforestation to interest private owners in the work of afforestation when conditions are not particularly suitable. True, an attempt has been made to attract such elements to afforestation by means of subsidies, tax exemption, or in other ways. All of this would still be insufficient if the owner were unable to anticipate a worthwhile return from the land devoted to forestry, aware as he is of the constant rise in the price of timber in the past, its increasingly developed and diversified uses, and the increasing demand.

While the advantages of afforestation for the private owner are usually greater than they may have been, for example, at the beginning of this century, the relative advantage of this form of land utilization as compared with other possible agricultural uses, varies from country to country. It is usually the marginal farming land which is afforested.

The effects of the predominance of economic afforestation are quite as marked as its causes are easily discernible.

The most striking effect is, of course, the intensive use of quick-growing species. The importance attached to the poplar in nearly all European countries justifies F. A. O.'s efforts to give the most effectual support possible to the International Poplar Commission, which, in its own province, has already achieved important results. The expansion of eucalyptus plantations in southern Europe also encourages an action that has already been envisaged. The extensive use of conifers, however, is the most noticeable feature of economic afforestation in Europe, which is easily explained by the fact that softwood is the main shortage in Europe. Sometimes, of course, conifers have to be planted when the nature and conditions of the soil are suitable only for certain unexacting species, that is to say, the conifers. There is also the fact, especially in countries with an Atlantic climate, that none of the native broadleaved species can yield wood of any value, or, in any event, it will take a very long time to raise them. However that may be, there seem to be only two countries, Switzerland and Yugoslavia, where hardwood species are used more than conifers in plantations.

It is also noteworthy that it is only in the reports of these two countries that concern undoubtedly shared by the majority of European foresters has been expressed about the gradual restoration of the absolutely stable natural forest suited to site conditions on the land to be afforested. It would seem that in many countries, where, through afforestation, it is intended to achieve something that will last more than two or three generations, the result is expected to be attained by entirely artificial methods, the high cost of which is justified by the short rotation and the big volume of wood ready for cutting at the end of the cycle and during successive thinnings. Although sometimes it is. hoped that the exotic species introduced will regenerate naturally, this is only of minor importance. There is obviously a certain danger in the fact that the land now being afforested will be periodically stripped of its forest cover and that the re-establishment of the forest will depend entirely on the financial resources and will of the landowners. In general, it is definitely a case of marginal land for which a different use may appear more profitable in 30-60 years. However, the disappearance of these forests now established from scratch, would, if it became widespread, undoubtedly provoke the risk of an acute depression in the industries eventually set up to utilize their raw material, and a critical situation for the populations depending on these industries.

It may be partly to avert this danger that in many countries the new stands are established on land acquired by the State and that, in others, more rigid legislation is being introduced, requiring natural or artificial regeneration after cutting.

14. We have purposely left to the end of this report consideration of the problems connected with the timber supply position in Europe, which is clearly inadequate to meet demands. In this report a number of fields have been touched upon in which, for reasons stated, international co-operation is essential, but we are convinced that the most important argument of all is that founded on shortage of timber. This is borne out by tha authoritated conclusions arrived at as a result of the widespread survey carried out by F. A. 0. and the Economic Commission for Europe, the results of which are in a study jointly published by those organisations in 1954 in Geneva, entitled : European Timber Trends and Prospects. It appears to us to be unnecessary to quote here statistical data in support of these conclusions, since reference may easily be made for further details to the extremely well-documented publication mentioned[15]. The conclusions of this Study are as follows. " Europe' s timber problem as revealed by this Study can be summed up in two figures. Even with a slow rate of economic growth and at unchanged prices, Europe's demand for industrial wood by 1960 can be expected to reach 210 million cubic metres, whereas according to present programmes European production will not exceed 155 million cubic metres. Since demand and supply must in the end balance, the prospective gap compels European Governments to choose between two alternatives. The first is to limit production according to present plans; in that case consumption must fall to the level of supplies (i. e. production plus imports). The other alternative is to aim at raising production and supplies to the level of Europe's prospective needs. To believe that the first alternative corresponds to doing nothing would be wrong. On the supply side, even the maintenance of industrial wood production at the planned figure involves the continuation of the very systematic efforts which have been made in Europe for over a century to conserve the continent's forest resources and to ensure that annual fellings do not exceed estimated growth. On the demand side, the increasing shortage would force Governments, especially in importing countries, to decide whether consumption should be limited by direct restriction or by rising prices. In other words, a decision to adjust consumption to production requires some action by Governments and represents a definite policy. It is therefore important that the implications of such a policy should be fully realised. If Europe's exports of wood products to overseas destinations are not to suffer, its own consumption will have to fall to about 155 million cubic metres compared with the 195 or 225 millions that would be needed at unchanged relative prices[16]. Part of this reduction would take the form of a lower consumption of those end-products, such as newspapers, in whose manufacture no convenient substitute for wood is readily available; and part would take the form of a substitution of other materials for wood. In the first case, there is a direct loss of welfare; in the second, the cost depends partly on the technical suitability of other materials in the end-uses in which they are substituted, and partly on the ease with which additional supplies of them can be obtained. As a result of this substitution, new techniques would be developed and new tastes and habits acquired; these would make the adjustment easier for the community at large. They could not, however, be expected to disappear if, later on, increased supplies of wood were to become available and seek a market. All these consequences would follow whether prices were allowed to find their own level or whether Governments directly restricted consumption; the effect of restrictions, as contrasted with a free market, would be to alter the proportions in which the fall in consumption was shared between different end-uses. By limiting imports, also, a Government (particularly if the country is a large importer) could hope to damp down the rise in prices to some extent and so lessen the strain on its balance of payments, but only at the cost of a fall in consumption greater than the average.

15. Tables 1 to 5 appended to this report contain extracts from the more important statistical data.
16. After allowance is made for a moderate level of imports from other regions.

Whatever the policies pursued by individual Governments, a shortage of wood (as of any other material) is bound to cause various difficulties for consumers. The outlook for the producer is no less serious. Markets for forest products will contract and some will disappear. Under the pressure of an exceptionally sharp price rise, overcutting may be stimulated, bringing the danger of a serious depletion of growing stock. The other alternative requires a deliberate effort to increase Europe's timber production and its imports from other regions. The most natural way in which European Governments can hope to secure any considerable increase in imports is by trying to remove the existing obstacles to trade between the U. S. S. R. and Western Europe. Maximum imports from the Soviet Union might raise Europe's total supplies of industrial wood by about 10 per cent—not more; but in the important category of sawn softwood their effect would be considerably greater. In general, like any other additional supplies, they would help to maintain consumption and limit the rise in the relative price of wood. This in its turn would affect the lengths to which it might be worth while to push a policy of vigorous investment in Europe's own forests. From this point of view, therefore, a clarification of the prospects of obtaining supplies from the U. S. S. R. is extremely desirable. Europe's imports from other regions have never satisfied more than a small proportion of its requirements; but efforts to increase its own production may reasonably be expected to contribute substantially towards alleviating the threatened shortage. In this Study, the various measures which might be taken, and which in their entirety we have called a dynamic forest policy, have been carefully examined; and the conclusion was reached that these measures are capable of adding as much as 45 million cubic metres to Europe's supplies of industrial wood by 1960 and very much larger amounts towards the end of the century. It must be remembered, however, that most of the measures that make up a dynamic forest policy involve considerable expense and investment in one form or another. The opening up of less accessible forest areas will require the provision of more forest roads; reforestation involves heavy annual expenditure as well as the acquisition of the necessary land, the organisation of the necessary seed supply and the training of skilled personnel; many small forest owners will not carry out more extensive thinnings unless the advantages have been explained and a market is readily available for the small-dimensioned wood which they yield; forest inventories can only be made by experts. In general, then, both the equipment and the personnel of the forest services would have to be expanded, and large funds would have to be invested in stocking forest areas and improving communications. Part of this expenditure may be expected to be borne by private owners, particularly the larger ones; but a considerable proportion will inevitably fall upon Governments. All these expenses can be justified, even on purely financial grounds, by the prospective level of wood prices. However, a distinction must be drawn between importing and exporting countries. In importing countries, the total investment involved under a dynamic forest policy is likely to be small in relation to their total resources, and the additional wood supplies will be certain to find a market. Their only problem will be to decide exactly how far such a policy should be pressed. Exporting countries, on the other hand, will need some assurances about markets if their forest policies are to be as expansionist as is economically desirable; and they may also need help in financing the necessary investment. It should not be impossible to work out arrangements by which both the costs of the investment and the profits from it can be shared between importers and exporters, and by which the former will have some guarantee of supplies and the latter of markets[17]. Without them, the full benefits of a dynamic forest policy, which is in the interests of both, will not be realized. Part of this policy, it must be remembered, consists in the location of pulp mills and wallboard factories where supplies of pulpable material (including hardwood and sawmill waste) will be available. These will not be built unless they can rely on markets for their products, and in some countries technical assistance may be needed in order that the problems connected with the pulping of hardwoods may be satisfactorily solved. Nor can full advantage be taken of the technical economies of combining pul pand paper-making in a single continuous operation if the tariffs of importing countries discriminate unduly against imports of paper rather than pulp. It is clear, then, that not all the problems posed can be solved by individual and national action alone. This applies not only to trade and the relations between consumers and producers, but even to many of the essential measures that go to make up a dynamic forest policy. Each measure advocated, however feasible and sound it may appear, will be faced with obstacles which have hitherto prevented its adoption. No magic wand will make them disappear. If they are to be removed, bold international decisions, followed by specific and concerted international action, will be required. These decisions are beyond the scope of this Study, which has been deliberately confined to an exploration of the technical possibilities of modifying trends in production, consumption and trade in order to achieve a reasonable equilibrium in Europe's timber situation. No attempt has been made here to show what machinery would be needed and what procedures should be adopted to carry out the various measures which according to this Study appear both possible and necessary. But are these efforts really needed? Is the prospective gap between supply and demand not merely a matter of speculation? It might be argued that all estimates of the future are unsafe and that the forewarnings of the timber world in the past have not always been realized. The free play of economic forces has always in the end equated consumption and supplies.

17. The timber equipment loans sponsored by the ECE Timber Committee provide a good illustration of such an arrangement.

Why not rely on those forces to do so again? Without doubt, an equilibrium of sorts will be reached if events are left to themselves; its implications have been fully considered in the course of this Study. This solution, however, has been rejected because it is contrary to the objectives of the United Nations and to the interests of Europe. The need for a dynamic forest policy is based essentially on two fundamental considerations. First, there is the danger of a trough in European timber production lasting for the next twenty or thirty years, after which time forest production is likely to increase again. It would be most regrettable if at that time the output from one of Europe's most important natural resources were not to find a market. Secondly, a sound forest policy must look beyond 1960. If our calculations are not entirely wrong, they show that Europe's timber consumption tends to rise at an average rate of 2 per cent per annum. It is important to ensure that forest production rises at a similar rate. Even if an increase in relative timber prices has to be accepted during the next decade, it is clearly undesirable that such increases in relative prices should go on for ever, from decade to decade. It seems possible to raise Europe's forest output through a dynamic forest policy sufficiently to meet prospective increases in consumption over the next decades. However, in view of the time it takes trees to grow, it is necessary to plan now for a future forest output twice the present size, since such an output will be needed if requirements are to be met at the turn of the century and beyond. We are Hearing the end of the first hundred years of industrial forest use. Hitherto the primary responsibility of the European forester has been to ensure that the yield from the next rotation of Europe's forests shall not be smaller than when they were first taken into use. This task has on the whole been successfully carried out. From now on, however, it is no longer enough to maintain a stable forest output. Europe needs a fundamentally different forest policy, designed to raise output from year to year to match rising consumption. This is the new task and the great challenge which faces European foresters, forest industries and Governments. »

15. We hope that in this report we have succeeded in showing that the forest problem is in most respects a European problem. The problems to be solved are urgent, and European forest policy must include firm and rapid measures to expedite and increase efforts to achieve the general and important objectives outlined. There is no time to be lost. F. A. 0. has made it clear that far-reaching decisions must be taken at international level, followed by effective international action. We believe that it is not enough for existing international bodies to formulate wishes and recommendations. More direct, determined and effective action must be taken. It is necessary :

to set up a European common market for timber;

to unify the legislation of the countries of Europe at a common level for matters of common interest;

to co-ordinate and supervise by the most efficient means rational implementation of directives of common interest;

to finance forestry operations of common interest;

to provide advisory and technical forestry assistance to countries needing it;

to integrate all forestry activities wherever this appears necessary.

We are convinced that these tasks of vital importance to the future of Europe can be carried out only by a European authority (in conjunction with an international forestry bank) along the lines of the European Coal and Steel Community.

Appendix APPENDICES

TABLE I - Present distribution of European Productive Forest Area

Country	TOTAL (million hectares)	PERCENTAGE under conifers
Finland	20.70	77
Norway	6.10	86
Sweden	22.90	77
Total- Northern Europe	49.70	78
Bclgium-Luxembourg	0.62	35
Danmark	0.35	57
France	11.29	27
Germany	9.72	70
Irenland	0.09	50
Netherlands	0.25	69
United Kingdom	1.31	45
Total-North-western Europe	23.63	45
Austria	2.80	76
Czeekoslovakia	3.98	65
Poland	6.47	88
Switzerland	0.92	75
Total-Central European Conifcrous Belt	14.17	78
Bulgaria	3.08	11
Greece	0.60	64
Hungary	1.11	6
Italy	5.62	20
Portugal	2.46	47
Spain	12.50	36
Rumania	6.70	24
Yugoslavia	7.84	20
Total-Soutli and South-eastern Europe.	39.91	27
Turkey	10.00	65
Total-Europe	137.41	56

TABLE II - Consumption of industrial wood in Europe in 1935-1938

COUNTRY	AVERAGE ANNUAL apparent consumption in cubic metres roundwood equivalent (Total in millions)
Finland	6.30
Norway	4.70
Sweden	10.70
Total - Northern Europe	21.70
Austria	3.85
Czeekoslovakia	5.75
Poland	6.20
Rumania	4.55
Yugoslavia	5.45
Total-other exporting countries	25.80
Belgium- Luxembourg	5.05
Denmark	3.05
France	13.20
Germany	42.65
Irenland	0.90
Netherlands	5.40

COUNTRY	AVERAGE ANNUAL apparent consumption in cubic metres roundwood equivalent (Total in millions)
United Kingdom	37.35
Switzerland	2.10
Total-North-western Europe	1.00
Greece	0.80
Hungary	2.30
Italy	7.40
Portugal	1.35
Spain	2.60
Turkey	0.75
Total-other importing countries	16.20
Total-Europe	173.40

TABLE III - Actual consumption of industrial wood in Europe in 1935-1938,1948 and 1950

COUNTRY GROUPS	MILLION CUBIC METRES COUNTRY GROUPS roundwood equivalent		
1935-1938	1948	1950	
Northern Europe	21.7	21.9	22.6
Other exporting countries	25.8	26.0	28.7
North-western Europe	109.7	78.5	93.3
Other importing countries	16.2	20.4	23.5
Total Europe	173.4	146.8	168.1

TABL E IV - Trade of European countries in 1950 in industrial wood and its products (million cubic metres roundwood equivalent)

COUNTRY	DOMESTIC production of industrial wood	NET exports (+) or net imports (—)	NET exports as percentage of production	NET import as percentag e of apparent consumption
Finland	25.10	+ 16.82	67	
Sweden	23.80	+ 19.08	80	
Austria	6.19	+ 4.50	73	
Norway	6.94	+ 2.91	42	
Poland	9.43	+ 0.84	9	
Rumania	6.50	+ 1.04	16	
Czeekoslovakia	7.90	+ 1.20	15	
Yugoslavia	9.54	+ 2.20	23	
Portugal	1.35	— 0.05		4
Bulgaria	1.80	— 0.18		9
Turkey	0.69	— 0.28		29
Germany	28.90	— 1.28		4
Spain	2.50	— 0.32		11
Switzerland	1.74	— 0.53		23
France	11.42	+ 0.28	2	
Italy	4.57	— 3.73		45
Danmark	1.01	— 2.82		74
Belgium- Luxembourg	1.95	— 3.11	61	
Hungary	0.80	— 1.22		60
Netherlands	0.40	— 5.42		93
Greece	0.21	— 0.85		80

COUNTRY	DOMESTIC production of industrial wood	NET exports (+) or net imports (—)	NET exports as percentage of production	NET import as percentag e of apparent consumption
Irenland	0.07	— 0.96	93	
United Kingdom				
3.03	— 19.20		86	
Total Europe	155.84	+ 8.92	6	

TABLE V - Estimated requirements of industrial wood by end-uses in Europe in 1960 (if relative prices revert to the pre-Korean-war level)

END-USE	MILLION CUBIC METRES roundwood equivalent	MILLION CUBIC METRES roundwood equivalent 1950	MILLION CUBIC METRES roundwood equivalent 1960 (A)	MILLION CUBIC METRES roundwood equivalent 1960 (B)
European consumption (excluding plywood and wallboards) : All construction	66.5	75.2	70.7	
of which :Housing	20.4	25.0	25.0	
Non-residential construction.	13.6	20.0		16.0
Rural use	24.0	22.5		22.0
Transport, communication,furniture and woodworking	32.6	40.8	34.8	
Mining	17.0	21.6	20.0	
Parkaging	25.5	41.5	32.5	
of which : Wood packaging	13.7	16.4		
Paper, board packaging	11.8	25.1		
Printing and writing paper of which :Newsprint	13.7	16.4		
Textiles and other pulp products.	6.9	11.2	9.6	
(A) If European gross product 50 per cent higher than in 1950.	(B) If European gross product 20 per cent higher than in 1950			

END-USE	MILLION CUBIC METRES roundwood equivalent	1950		MILLION CUBIC METRES roundwood equivalent	1960	(A)	MILLION CUBIC METRES roundwood equivalent	1960	(B)
Total -Europe	163.1			214.7			188.3		
Consumption of plywood and wallboards	5.0			9.0			8.3		
Total European consumption.	168.1			223.7			196.6		
Exports to overseas	13.0			13.0			13.0		
TOTAL European requirements.	181.1			236.7			209.6		
(A) If European gross product 50 per cent higher than in 1950.	(B) If European gross product 20 per cent higher than in 1950								