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P A P E R V

DEVELOPMENT OF FOREST INDUSTRIES

The FAO Contribution to this Symposium includes in addition to the one mentioned above six other papers entitled:

- I: The Economic Significance and Contribution of Industries based on Renewable Natural Resources and the Policies and Institutions Required for their Development.
- II: Some Essential Requisites for Industrial Development of Renewable Natural Resources.
- III: Food and Food Products Industries.
- IV: Industries Processing Agricultural Products other than Food.
- VI: Fisheries Industries.
- VII: FAO's Relations with Industry through the Freedom from Hunger Campaign.

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The Development of Forest Industries

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DEVELOPMENT OF FOREST INDUSTRIES

Summary

The paper provides an appraisal of the potential for forest industries development in Africa, over the next 10 years. An attempt is made to evaluate the rising demand for various forest products during the period between 1960 and 1975, touching upon questions relating to the development of new productive capacity and the contribution forest industries may be expected to make to overall industrial and economic development throughout the region.

After a brief survey, in Chapter I, of the main problems facing forestry and forest industries on the African continent, Chapter II goes on to evaluate the present forest resources, which cover roughly 23 percent of Africa's vast land area and constitute some 15 percent of the total forest resources of the world. Of Africa's total forest area comprising some 683 million hectares (2.6 ha. per caput), 194 million ha (28 percent) are estimated to be closed high forests (mostly concentrated in Western Africa), the remaining 489 million hectares (72 percent) being dry, generally open forests. In Western and Eastern Africa 69 million hectares (10 percent of total forest area) have been declared forest reserves. In 1963, plantations, that is man-made forests, covered some 2 million hectares ^{1/} of which approximately one million ha. were located in Southern Africa.

In the two subregions of Northern and Southern Africa with limited natural forest resources non-wood raw materials for the production of panel products and pulp and paper are likely to play an important role in the future.

Chapter III provides estimates of present and expected future demand for forest products, which may be summarized as follows:

	Annual Consumption (1959 - 1961)	Estimated future requirements (1975)
Sawnwood (million m ³)	4.00	7.09
Plywood and veneer (million m ³)	0.18	} 0.98 *
Fibreboard and particle board (million tons)	0.12	
Paper and paperboard (million tons)	0.83	2.21
Total in terms of roundwood raw material (million m ³)	11.24	22.68

* Total panel products in million m³

^{1/} Of which approximately: 0.65 million ha. were under coniferous species (mostly pines)
1.40 million ha. were under deciduous species (of which some 650,000 ha. were planted under eucalypts).

The last two chapters of the study are devoted to future prospects and development needs, and outline a program of action. In order to meet increasing domestic requirements by expanding local production, the investment needs of Africa's wood processing industries between 1961 and 1975 are estimated roughly as follows:

<u>Industrial sector</u>	<u>Estimated increase required in capacity by 1975</u>	<u>Estimated total investment required 1961 - 1975 (US dollars)</u>
Sawnwood	2 to 3 million m ³	60 million
Wood based panels	600,000 m ³	70 to 170 million
Pulp and paper	1.5 million tone	800 million

Thus, the investment required in new plants alone to 1975 is estimated to be in the order of one thousand million US\$, or roughly 100 million dollars yearly. It should be noted that these estimates relate only to new capacity aimed at satisfying increased requirements within Africa itself. They do not include capacities aimed at export. Nor do they take into account raw material extraction costs, roads, housing and community expenses, powerlines and other necessary outlays for infra-structural development, or for the further establishment of man-made forests.

The paper concludes by emphasizing the need to consider and to incorporate the planning of forest industries development within the framework of overall economic development programs. It points out the necessity to secure an adequate forest estate, the need for training and applied research and considerable improvement in the collection of data. Finally, attention is drawn to the Regional Advisory Group on Forest Industries Development which has been established by ECA and FAO, and the desirability of channeling towards this Group requests, as appropriate, for feasibility studies and pre-investment surveys, as well as for specialist advice and guidance.

THE DEVELOPMENT OF FOREST INDUSTRIES IN AFRICA

CHAPTER I - INTRODUCTION

1.1 Purpose

The purpose of this paper is to go some way to assess the potential of forest industries in Africa and the contribution that these industries may be expected to make to the overall economic and industrial development of the region over the next decade, 1965 to 1975. The study is restricted to primary products. The Inter-governmental Conference on Timber Trends and Prospects in Nairobi (September 1965) and the ECA Conference on the Harmonisation of Industrial Development Plans in East Africa in Lusaka (November 1965) dealt in considerably more detail than is possible in this paper with the rôle to be played by the Forest Resource and Non-Wood Potential of Africa in the developing industrialisation of the region and the findings of these two conferences call for careful study.

1.2 Sources

The sources ^{1/} from which the report has been compiled are:

"Timber Trends and Prospects in Africa"

Documentation prepared for the ECA/ETAO/FAO Conference on Pulp and Paper Development in Africa and the Near East ^{2/}

"Forest Industries Development in East Africa"

"The Rôle of Forest Industries in the Attack on Economic Under-development"

1.3 General

Africa contains within its borders a wide variety of forest conditions and an equal diversity of levels and kinds of use of wood and wood products. The resource runs all the way from the rich forests of Western Africa to those parts of

^{1/} For full details see under "References" given at the end of the report.

^{2/} This Conference took place in Cairo in March, 1965. The final report of the Conference and the background papers submitted are scheduled for publication in 1966.

Northern Africa which have little or no natural forest. Consumption of wood likewise extends from advanced applications of the more sophisticated paper, panel and other processed products to utilization in the round for fuel and rural building, a usage that still prevails over most of rural Africa. Because so much of the wood consumed in the region is used in this simple fashion, very largely outside the market economy, and because so much of the forest has not been brought into commercial use, the extent of both the forest resource and of wood production and wood use are but imperfectly known. The data which has been collected so far is often no more than tentative; nevertheless, on the basis of the information available it is possible to make a rough assessment of present forest resources, the production, consumption and trade in wood and wood products, to make tentative estimates of the needs of the region over the next ten years and to suggest in broad outline the general direction in which the wood industry should develop to meet these needs. It is hoped that it may serve as a guide to countries in harmonising and setting up national policies and plans for the effective development of the wood, and where necessary non-wood, resources in the wider setting of the needs of the region or sub-region. The study, of course, in no way approaches the detail that individual countries and groups of countries require in order to draw up and execute their policies and plans. Indeed, the paucity of data available at present for some countries sharply underlines the need for investigations at national and local levels.

Present patterns of supply and consumption of wood

1.1 The present pattern of consumption of wood and wood products in each of the four sub-regions of Africa as considered in this report ^{1/} is shown in Table 1. The

1/ The groupings of countries into sub-regions is as follows:

Western Africa: Angola, Cameroon, Central African Republic, Chad, Congo-Brazzaville, Congo-Leopoldville, Dahomey, Gabon, Gambia, Ghana, Guinea, Ivory Coast, Liberia, Mali, Mauritania, Niger, Nigeria, Portuguese Guinea, Senegal, Sierra Leone, Spanish Equatorial Region, Togo, Upper Volta.

Eastern Africa: Burundi, Ethiopia, French Somaliland, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Reunion, Rwanda, Somali Republic, Rhodesia, Sudan, Tanzania, Uganda, Zambia.

Northern Africa: Algeria, Libya, Morocco, Tunisia, U.A.R. (Egypt).

Southern Africa: Basutoland, Bechuanaland, S. Africa, South West Africa, Swaziland.

omirance, in terms of volume, of the largely rural, often subsistence, use of wood in the round is at once apparent. But it is the processed forms of wood which merit attention in this paper. Sawwood, plywood, particle board, fibreboard, paper and paperboard are vital producer and consumer goods for advanced, dynamic, industrial economies. Moreover, they are products of industries which can contribute importantly to achieving industrialisation and through it growth.

Estimate of growth

1.5 A measure of the extent to which more processed wood will be required as Africa's economy grows is given by the estimate of consumption in 1975 shown in Table 1. This estimate is based upon an assumed growth in the population of Africa from 259 million in 1960 to 372 million in 1975, and an average growth in gross product per caput during this period of two percent per annum. The regional requirements in 1975 associated with this growth in economic activity will exceed current consumption levels by some 1.3 million tons of paper and paperboard, three million m³ of sawwood and 600,000 m³ of wood-based panel products. In fact, growth in consumption of both paper and paperboard and panel products is expected to be faster than growth in economic activity, and sawwood consumption will rise nearly as fast as the latter. Consumption of other roundwood and fuelwood, on the other hand, is expected to grow at the same rate as population, or at a slightly slower rate.

Processed wood products

1.6 Processed wood products are also important because they are to a large extent still imported, and so must be paid for by scarce foreign exchange. Seventy percent of the paper and paperboard, 65 percent of the panel products and 45 percent of the sawwood consumed by the countries of Africa in 1959/61 were imported. These imports amounted to the sum of \$280 million a year, of which more than one-half was accounted for by paper and paperboard. The latter are products of an industry which is generally capital intensive and subject to significant economies of scale. The small market provided by most individual African countries, therefore, has not been sufficient to support domestic production - quite apart from the problems of the availability of

an appropriate raw material base, and of the necessary skills and capabilities to support such an industry. Outside Southern Africa and a few countries in Northern Africa, dependence on imports for supplies of paper and paperboard has been almost total.

Out-Flow of logs

1.7 The other element of the current pattern is in the export of wood from Africa. There is a massive outflow of logs. These nearly all come from Western Africa, which also exports considerable quantities of sawnwood and of plywood. The quantities of other forms of processed wood exported by African countries are smaller. Africa is, therefore, in the undesirable and anomalous position of having to import high-cost processed wood but of being able to export predominantly lower value raw wood.

Prospects and problems

1.8 By 1975 Africa will require a massively greater volume of wood, with much more of it than at present in processed forms - at current prices it would amount to 1500 million a year more processed wood than at present. Africa will also require wood for export - again preferably in high value processed forms. What are the prospects of supplying the quantities of wood involved? Can the industries necessary to process the required production be established? What problems will be encountered, and what are the implications for the policies and plans that must be formulated in order to bring this about?

Forest resource

1.9 The extent and nature of the forest resource which Africa has is summarised in Table 4 (and current annual removals in Table 5). Two major types of forest can be distinguished. About 200 million hectares, most of it in the Western sub-region, is closed high forest of a moist type containing a great diversity of species, of which only a limited number have yet found commercial applications. Though total wood volume in this type of forest may be quite high, commercial yields are usually low. Most of the rest of the forest area is savanna woodland and wooded steppe, mainly open formations with little material of sizes or qualities capable of supplying sawlogs. Yields from a unit area of this type of forest are therefore very low. Also worthy of

note are quantities of coniferous forest in the highlands of Eastern Africa. A very significant source of wood is the growing area of man-made plantations, of conifers, eucalypts and other species, notably in Southern and in Eastern Africa. In contrast to the natural forest, the rate of growth of these plantations is high. A small area of plantation can, therefore, ensure the sustained supply of the same volume of wood (though not necessarily in the same sizes or qualities) as a very much larger area of natural forest.

Future prospects

1.10 From the sum total of evidence at hand, it would appear that in the years to 1975 the great majority of the countries of Africa should be able to expand their local production of most forest products at least to an extent which should be sufficient to satisfy expected domestic requirements. In a number of countries the wood resource can be made to contribute to a far greater degree than hitherto towards the satisfaction of internal needs. It should also be possible to maintain and probably expand the volume of tropical hardwood exported. Even in some of the countries that are less well endowed with natural forest, production, particularly of plantation-grown wood, coupled with progressive industrialization, can almost certainly be carried to a level where exports of certain wood products, including pulp products, can be initiated or substantially expanded.

Forest-diminishing asset

1.11 At the same time although Africa contains huge forest resources that are virtually untouched because of their location far from main consumption centres, the resources within short distances from rural and urban centres are being depleted, in some areas at a fast rate - a process due not just to the removals of wood for use, but equally, if not more so, to burning, grazing and cultivation. The aggregate loss in these ways each year is very substantial. The measures that need to be taken to counter it are twofold; the reduction of the wasteful use of the forests both by protecting them against haphazard destruction, and by putting to use a much greater proportion of the wood volume per hectare, both in the closed high forests and the dry forests, and by establishing man-made forests.

Fuller use of forest resource

1.12 In the countries with an abundant wood resource, measures are needed to make fuller and more efficient use of the wood. Wood can often be used domestically to replace certain imported materials, and a large domestic market for, say, sawnwood or plywood can also enhance the prospects for exports of these products. Exports should be to a far greater extent than at present in the form of processed wood products rather than logs, both to have as great a value as possible accrue to the producing country, and to allow it to use its raw material as a basis for industrialization. Domestic processing would have the further advantage of widening the range of species that can be used - a necessary step if fuller use is to be made of the forests and if costs are to be kept down. For example, secondary species can be used for core stock in plywood, and sawn, peeled or manufactured wood of lower valued species can often be shipped at a competitive price where logs, with the high proportion of waste they contain, cannot.

Improvement of techniques

1.13 More efficient techniques are needed throughout the range of activities involved - harvesting, handling, transporting, processing, freighting, etc. Nor does efficiency invariably mean large, modern capital-intensive units. Small, local markets, or a scattered resource, will often favour small-scale sawing. A better use of sawlog material as is available is particularly important in those countries where supplies are limited. Also, a resource such as much of the savanna forests, which may not be capable of supporting an adequate out-turn of sawnwood, may well suffice for the manufacture of particle board or fibreboard, products which can serve the same purpose as sawnwood in many uses.

Pulpwood plantations and non-wood resources

1.14 Plantation forests, which, as has been noted above, must form a source of wood of increasing importance, can also supply industrial wood raw material of types lacking in the natural forest - notably long-fibred wood for pulp. This is particularly large in the wood-rich countries of Western Africa, but might be provided by plantations of coniferous species or of bamboo. Plantation programmes of the sort

that would be appropriate for this rest very largely on selection of suitable sites and species - a field of enquiry that should be pursued increasingly in many parts of Africa. Development of the use of non-wood resources for pulp production in the region generally, and in those wood-deficient sub-regions in particular, needs to be given special and immediate attention, remembering the rapidly increasing demand for paper which is to be expected over the next ten years.

Scale of operations

1.13 Apart from provision of a suitable and adequate raw material base, attention must be paid to the problem of the scale of operation necessary, notably in the pulp and paper industry. There is considerable scope here for development on a wider than national scale, with harmonization of individual national developments and encouragement of intra-African trade. However, even where smallness of scale inhibits domestic primary production, much can be done in the way of import-saving at the secondary conversion level. In Western and in Eastern Africa, manufactured paper articles now imported could probably be produced locally, using imported paper and paperboard in relatively small manufacturing units calling for comparatively small capital investment.

External market possibilities

1.14 Development of wood-using industries in Africa should also take account of the growing external market possibilities. The FAO/UN study "European Timber Trends and Prospects - A New Appraisal 1950-1975" has indicated a sharp rise in demand in the future for the products made from tropical hardwoods of Western Africa. But attention should also be turned to less traditional markets - certainly North America and possibly also the centrally planned economies of the USSR and Eastern Europe. Attention also needs to be paid to other products, in particular pulp and paper. A growing world market for these products is expected, and external markets could provide the scale necessary to allow production while domestic markets are still small. Many parts of Africa appear to be exceptionally well endowed with sites capable of rapidly growing wood for pulping at an attractive cost. To harness this potential for such a complex industry as pulp and paper involves a whole range of further needs - of

capital, skills, organization, etc. But a beginning has been made, notably in Southern Africa, and the possibilities it offers warrant careful and close attention.

Planning and training needs

1.17 Opportunities for Africa in the wood and wood products field have been indicated briefly in this introduction. They are substantial and indicate many excellent prospects for expanding forest production, manufacturing and trade, many of which can and should be realized in the immediate future. But realization of this encouraging potential will depend in large measures on careful planning and on acquisition of the skills and expertise necessary to ensure the effective translation of such plans into practice. This in turn implies the need for much better data on the forest and wood-using sectors, and for attracting into these sectors adequate and appropriately qualified personnel. As the objectives of forestry in Africa are no longer predominantly conservationist in intent, and as industry changes from its initial predominantly extractive rôle, this will mean not just more trained people, but also more people with additional skills, not only people who are familiar with the particular disciplines of forestry and wood technology, but also those versed in planning, marketing and other specialized skills that will be needed as the sector is brought forward and integrated more fully into national and regional economies.

CHAPTER II - THE FOREST RESOURCE AND NON-WOOD POTENTIAL

2.1 General

Basic to any appraisal of the wood-using economy in Africa must be information on the forest resources of the region. The present chapter, therefore, sets out to assemble such data as are available, in order to build up a picture of the size, nature and distribution of the forests of Africa, and to establish how and to what extent they have been drawn upon to provide wood in the recent past.

2.2 The resource described here is not a simple one. The forests of Africa exhibit a wide diversity of type and concentration. They contain many hundreds of different species often in combinations which give the forests a highly complex structure. At the same time the category "forests" encompasses both areas endowed

with wood resources of a magnitude and richness paralleled in few other places in the world, and other areas where the forest is no more than a sparse open woodland. But the description of this varied and complex pattern has perforce had to be constructed from at best scanty data. Very little of Africa's forests have as yet been surveyed to determine their magnitude, content or rate of growth. The figures in this chapter are the best estimates than can be arrived at from the information available at present. Given the limitations of this information, the overall regional and sub-regional estimates have been confined to the basic measure of the forest extent, namely the area of forest and within it of major forest conditions. It is simply not meaningful at this time to try and establish the volume of growing stock or the rate of growth of Africa's forests as a whole - though this can, and has been, arrived at for certain parts of that whole.

2.3 Much, therefore, remains to be determined about the region's forest resources. Nevertheless the principal features and general orders of magnitude are already known. While individual figures deployed in this chapter will likely require substantial amendment as new data become available, it is unlikely that the general picture set out below will prove to require serious modification.

Geographic and economic distribution

2.4 Table 4 may serve to give a broad indication of the size, distribution and nature of the forest resource of the African region.

The forests of Africa cover an estimated 683 million ha. or 23 percent of the land area; the area of forest per inhabitant is 2.6 ha. The great majority of the forests is shared by Western Africa and Eastern Africa. In these vast, for the most part thinly populated, sub-regions, a high proportion of the land is wooded, and the per caput forest area is high also. Due to climatic and other factors, natural forests are scarce in Southern Africa, and even scarcer in Northern Africa; in the latter sub-region, both tree growth and human settlement are limited to narrow bioclimatic areas, in which forests have been subject to centuries of intervention by man and his domestic animals.

2.5 Table 4 shows separate figures for two classes of natural forest, viz.

(1) closed high forests, comprising types of forest that tend to have a high log content, and (2) other natural forests. In this context the term closed high forest is used to designate collectively (1) the moist tropical forests at low and medium altitudes (which are by far the most important group of closed high forest); (2) the montane forests of the tropics, as also the floristically akin, lesser group of temperate and sub-tropical evergreen forests in the extreme south of the continent; and (3) indigenous Mediterranean high forest of Aleppo pine, maritime pine, cedar, and deciduous oaks. The other natural forests comprise (1) the many different types of dry forest that cover vast areas of land south of the Tropic of Cancer; (2) the mangrove forests (which represent relatively small areas); and (3) indigenous Mediterranean forests other than those grouped with the closed high forests.

Closed High Forest

2.6 The closed forests cover some 194 million ha. and represent 28 percent of the forest area of Africa. Approximately 90 percent of the closed forest area is within Western Africa; it is these forests that yield the renowned export woods of the African continent. Most of the remaining closed forest is in Eastern Africa, with the largest areas in Madagascar and Ethiopia. In Western Africa and in Madagascar, nearly all of this forest is situated at low and medium elevations; in continental Eastern Africa there is a pre-dominance of montane formations, which include several major areas of conifers. Most of the coniferous growing stock of the natural forests of Africa appears to be concentrated in the Ethiopian highlands.

2.7 In Southern Africa the closed high forest is nowadays reduced to a small area, while in Northern Africa the forests that from an economic viewpoint may be likened to the closed forests south of the Tropic of Cancer, are for the most part seriously degraded.

2.8 The enormous resource represented by the closed high forests of tropical Africa is shared by a limited number of countries; eleven countries in Western Africa (from Liberia in the North to Angola in the South) and five in Eastern Africa (Madagascar,

Ethiopia, Tanzania, Kenya and Uganda), possess major areas. In these countries the closed forest constitutes a most important, and sometimes the only, source of industrial logs, and several countries are very large exporters of timber. The majority of the countries of tropical Africa, however, are less well endowed; the log content of their natural forests is either indifferent, or poor, or virtually nil.

Other natural forests

2.9 In each of the four sub-regions, the area shown under "other natural forests" is in excess, and except in Western Africa vastly in excess, of the area of closed high forest. To the south of the Tropic of Cancer most of the former class of forests consists of dry, generally open, woods of different types. Though at present rarely productive of industrial logs, the dry forests supply essential requirements in fuelwood and rural roundwood (hut poles, posts, etc.), while exerting important protective functions in many areas.

2.10 Much the same holds true of the "other natural forests" of Northern Africa, though the composition of the latter is entirely different from that of the dry forests to the south.

2.11 The prevalence of dry forest types is a characteristic feature of the African region. Here the ratio of dry forest to moist forest is very much higher than that of either Latin America or the Asian-Pacific region, and a much larger proportion of the forest area is swept by fires every year. While many of the trees, particularly in savanna woodland, are fire-tolerant to some extent, the repeated burning tends to stunt, and eventually to eliminate, the regrowth. Over a very large part of its huge area, the forest of Africa, is fragile indeed and its future is delicately poised.

2.12 Whereas natural forest of a high log content is of an essentially concentrated occurrence, forest of one kind or another that is capable of yielding fuelwood and rural roundwood is present in most inhabited areas of Africa. These are the most widely consumed products of the African forest. Since fuelwood and rural roundwood can rarely be transported over large distances, they are habitually short in many

densely settled districts.

Forest Ownership

1.12 In most African countries ownership of natural forest is vested in the State and other public entities, or else remains as yet to be determined. Private ownership is of little significance in Western and in Northern Africa. It is of some importance in Southern Africa and in several countries of Eastern Africa, including Rhodesia, where more than one-third of the forest area is owned by farmers, and in Ethiopia, where the greater part of the closed high forest is reported to be in private ownership, much of it in numerous small holdings.

Forest reserves

2.11 Within Western and Eastern Africa, the two subregions roughly coincident with the African tropics, some 69 million ha. of forest has been reserved so far for purposes of production, protection, or both. The forest reserves represent between 10 and 11 percent of the forest area and about 3 percent of the land area of the two sub-regions; the reserved area per inhabitant is little more than one-third of a hectare. These are very low averages in view of the wide range of conditions where forest cover is needed for protective reasons, and considering that the reserves are predominantly composed of savanna woodlands and other forest types of low log output and slow growth.

Forest plantations

2.13 Compared to the natural forests, the man-made forests of Africa are small, but they represent a very significant, and in the case of several countries of Southern and Eastern Africa, an all-important, element of the forest resource. The plantations of the African region now cover approximately 2 million ha., and are being added to at a rate of more than 60,000 ha. annually. Approximately one-third of the plantation area of Africa is coniferous and consists mainly of pines. The broadleaved area, except in Western Africa, is composed predominantly of eucalypts, or of eucalypts and wattle (the latter species having been planted mainly with a view to tanbark production). Of the total area of man-made forest, an estimated 1.5 to 1.6 million ha. (including 550,000 to 600,000 ha. of coniferous and 950,000 ha. to 1 million ha.

of broadleaved plantations) consist of stands of fast-growing species, particularly Pinus patula, P. eliottii, P. radiata, Cupressus lusitanica, Acacia saligna, Eucalyptus saligna, E. grandis, E. robusta, Cassia and Brevillea. These plantations are managed on short rotations, ranging from 10 years or less for eucalypt coppice to about 40 years for some of the plantations managed for sawlogs. The annual growth rate per ha. is normally from 10 m³ to 20 m³, and not frequently 25 or more.

2.16 In Southern and Eastern Africa, which contain nearly all of the existing conifer plantations, the current tendency is to give even more emphasis than hitherto to coniferous planting, partly with a view to building up of a resource of long-fibre material for pulp and paper-making. These sub-regions contain areas where conditions for plantation forestry are exceptionally favourable. Apart from the accelerated growth rate that may be attained with exotic species, the labour input is often low by almost any standard. For instance, in Swaziland total input in the establishment of a conifer plantation can be less than the input for land preparation alone under the conditions prevailing in many plantation areas of Northern and Western Africa.

2.17 In a number of countries, both north and south of the Sahara, an appreciable amount of row-planting has been carried out in shelterbelts, in association with terracing, and so on. Though valuable mainly for their protective effects, the row-planting often constitute a useful source of wood.

2.18 More than one-third of the man-made forests of Africa were created by private individuals and organizations; in many cases the local forest department provided valuable assistance by supplying seed, planting stock, technical advice, etc. Practically all the plantations of Swaziland, and the majority of those of the Republic of South Africa, Rhodesia and Angola, are owned privately, as is a significant proportion of the plantations in several other countries (Madagascar, Congo-Leopoldville, Kenya, Tanzania, etc.) Ownership units range from farm wood-lots, to holdings of many thousands of hectares. In several countries the wood-lots, though small individually, constitute a significant resource in the aggregate.

Forest Removals

2.19 Africa's production of wood has been rising continuously, and during 1959-61 average annual removals (quantities of wood removed from the forest, and also from trees outside the forest) totalled an estimated 200 million m³. See Table 5. In Africa, as throughout most of the world, fuelwood is quantitatively the most important product of forests, but Africa's removals of fuelwood are particularly heavy in comparison to those of logs and other roundwood. Africa has about 16 percent of the total forest area of the world, but removals of fuelwood (chiefly in Western and Eastern Africa) during 1959-61, may have represented as much as one-quarter of world removals. By contrast, production of logs (which is centred in Western Africa) and of other roundwood (mostly rural roundwood harvested in Western and in Eastern Africa) accounted each for an estimated 7 percent of the corresponding world output. Of the logs produced in Africa, 1.6 to 1.7 million m³ were coniferous, with most of this production deriving from Southern and Eastern Africa. The total removals (200 million m³) may have represented as much as one-fifth of the wood produced in the world.

Non-wood fibrous raw material resources

2.20 In addition to the wood derived from natural and planted forests in the region there are other significant sources of fibrous raw materials. The most important of these in terms of supply and economic availability are bagasse, bamboo, esparto, papyrus, reeds, straw and sisal. With the exception of bagasse, and perhaps rice straw, where available quantities can be estimated on the basis of sugar and rice production, little is known about the extent of these resources. ^{1/}

^{1/} The available facts are summarised in ECA/BTAC/FAO/CONF SEC. PAPER II. "Appraisal of the Region's Fibrous Raw Material Supply, Economic Availability and Technical Suitability" submitted to the Cairo Pulp and Paper Conference in March 1965.

Bagasse

2.21 More than other non-wood raw materials, bagasse has lately come into focus as a potential source for pulp and building board raw material. The fact that bagasse is available in quantity and concentrated at one location as the residue from sugar cane milling operations makes it more attractive as a source of raw material than several other fibrous raw materials, where collection over a scattered area has to be arranged by the pulp, fibre or particle board mill.

2.22 In 1962/63 the total production of bagasse, calculated on the basis of reported sugar production, was about 3.6 million bone-dry tons, which is theoretically sufficient to produce 1.3 million tons of chemical pulp. Since bagasse is the sugar mill's prime source of fuel for power and steam it is clear that only a part of this large tonnage would be available for making pulp.

2.23 The economic supply of bagasse for pulping depends very much on the favourable location of the pulp mill in relation to the supplying cane sugar mills, the cost of fuel oil to replace the bagasse in the power and steam plants and the efficiency of these heating units.

2.24 The industrial production of cane-sugar increased during the fifties about six-percent-per-year in the whole of Africa. If the same annual increase continues during the sixties the total industrial supply of bagasse by 1970 will rise to 5.6 million tons per year and by 1975 may be expected to be 7.5 million tons per year.

Bamboo

2.25 In Africa bamboo has hitherto mainly been used by rural populations for building purposes and has had very little industrial use. The industrial use of bamboo would, of course, depend on the location and size of the growing areas. Only for a few countries do we have figures for the actual area of the bamboo stands; Ethiopia has some 500,000 ha. of bamboo stands, Congo (Leopoldville) some 250,000 ha. and Kenya some 190,000 ha. Bamboo pulp, generally, has good fibre length. Bamboo plantations could, therefore, become a valuable source of long fibre pulp, where coniferous pulp is not available.

Esparto

2.26 Esparto grass is found mainly in Algeria, Libya, Morocco and Tunisia. It grows wild over large areas of the countries and is generally harvested by hand, although some attempts have been made to mechanise the harvesting.

Earlier, almost all the esparto was exported to the United Kingdom and France, but during latter years several local pulp mills have been erected using esparto as the raw material.

Other non-wood raw materials

2.27 At present, the other non-wood raw materials do not seem to offer the same possibilities as industrial raw materials for pulp making as does bagasse. Papyrus and reeds are possible raw materials but growing, as they do, in swampy areas, harvesting presents a considerable problem.

2.28 Sisal already has an industrial use for rope making and its development for pulping is technically feasible; its use will depend on whether it is competitive with other raw material supplies.

2.29 So far as straw is concerned it must be remembered that large quantities are used for cattle fodder. Harvesting and transport difficulties between scattered farms and the pulp mill and storage are all factors which often prevent the large-scale use of straw as an industrial source for building board and pulp. In the UAR rice straw is already used on an industrial scale and if transport facilities and the collecting organization can be improved also in other countries, then straw could become increasingly important as a raw material source for pulping.

Summary of Resources

2.30 The various parts of Africa differ widely in the extent to which they are endowed with forest resources, and in the nature of those resources. Despite this diversity there are a number of points of general application that merit a further mention in summing up.

2.31 The most important is clearly the fact that large parts of Africa do possess extensive and often rich natural forests. This represents a resource of enormous potential, the effective realization of which must be a matter of principal concern.

2.32 There are also large parts of Africa that are short - often acutely short - of productive natural forest. A second major element of concern which arises is, therefore, the need for man-made forests in the region, in order to create a forest estate, or to renew or supplement the natural resource.

2.33 The third point is common to all parts of Africa, whether rich or poor in natural forest: namely, the fact that the resource is steadily shrinking. The extent to which it is being depleted and degraded - by uncontrolled shifting cultivation, grazing and burning, and by indiscriminate cutting - must be a matter of the utmost concern. In the areas rich in forest a valuable resource is in this way running to waste. In areas but thinly clad with tree cover, destruction of the latter often also destroys such productivity as these fragile lands possess. The intimate inter-relationships between agriculture and the forests are in Africa reinforced and underlined by the susceptibility of the soils of so much of the region to deterioration when unwisely stripped of necessary vegetative cover.

2.34 The nature of the demands that are likely to be placed upon the region's forest resources in the future, and consideration of the problems and possibilities that will arise, will be dealt with in subsequent chapters. But before turning from specific consideration of the forests, one further point needs to be made - namely the urgent need for more and better information about them. If solutions are to be found to the problems, and if the possibilities are to be realized, the extent, nature and yield of Africa's forests must be adequately inventoried and recorded.

2.35 The part which can be played by non-wood sources such as bagasse and perhaps straw, in the development of the pulp and paper industry is very important, particularly in the sub-regions which have limited timber resources. Kigali already has a use in high quality paper-making, but the prospects for other non-wood sources are at present not great as collection on a large scale presents considerable problems.

CHAPTER III - PRESENT AND FUTURE DEMAND FOR FOREST PRODUCTS

Growth of requirements for wood products

3.1 From the projections given in "Timber Trends and Prospects in Africa", requirements are expected to grow rapidly in the case of sawnwood, board products and paper and paperboard, but much less so for the roundwood products and the fuelwood. By 1975, regional sawnwood requirements are expected to exceed the current level by more than 70 percent, while Western Africa and Eastern Africa requirements are expected to be about twice as high as they are at present. In absolute terms the sawnwood requirements of Africa are likely to increase from the current level of about 4 million m³ to about 7 million m³ in 1975. Requirements for board products are expected to grow faster than those for any other product group - it is estimated that the increase will amount to 165 percent for Africa as a whole, and to nearly 200 percent for Northern Africa, where it is expected to be greatest (largely as a result of expanded usage of packaging veneer). The projections for paper and paperboard suggest that regional requirements will increase almost as fast as in the case of board products. Western Africa's requirements for paper and paperboard are expected to increase by more than 200 percent.

3.2 On a per caput basis, current consumption of sawnwood, board products and paper and paperboard within the region and the corresponding medium level projections of requirements in 1975 compare as follows:

	<u>1960/62 consumption per thousand in- habitants</u>	<u>1975 estimated requirements per thousand inhabitants</u>	<u>(1960/62 world consumption per thousand in- habitants)</u>
Sawnwood (m ³)	15.4	19.1	(109.9)
Board Products (m ³)	1.4	2.6	(9.8)
Paper and paperboard (tons)	3.4	5.9	(27.3)

While the implied growth in per caput requirements is great indeed, the 1975 levels indicated remain low indeed by world standards.

Future requirements for sawwood

3.3 From the projections given in "Timber Trends and Prospects in Africa" compared to the current consumption of sawwood, the 1975 requirements as indicated by the medium-level projection suggest, for Africa as a whole, an increase of some 77 percent; Western African and Eastern African requirements in 1975 are expected to be about twice as high as they are at present; for Northern Africa, the anticipated increase is about 74 percent, and for Southern Africa some 24 percent. Per caput consumption is expected to rise in all sub-regions except Southern Africa. For the region as a whole, the medium level projection implies an increase in per caput consumption of about 24 percent.

3.4 The end-use distribution of consumption in 1975 is certain to differ to some extent from the present pattern. Thus, in Western Africa furniture manufacture is likely to absorb a substantially higher proportion of sawwood than it does at present. For the Maghreb countries sawwood usage in packaging in 1975 is estimated to amount to 150,000 m³, which is actually somewhat less than the 1960-62 level of consumption. In the case of Southern Africa consumption of boxboards is likely to increase at a much slower rate than that of building timber and of sawwood used in furniture manufacture, while the usage of wooden sleepers is expected to decline.

3.5 The medium-level projections imply that by 1975 Africa's annual requirements of sawwood will exceed current consumption by some 3 million m³, the additional requirements being distributed as follows:

Western Africa:	1,288,000 m ³
Eastern Africa:	798,000 m ³
Northern Africa:	738,000 m ³
Southern Africa:	260,000 m ³

In Western Africa timber will undoubtedly be available in adequate volume to match the increased demand within the sub-region; the rising demand will represent an opportunity for extending utilization to a wider range of species, and will no doubt facilitate the expansion of sawwood exports. But in Eastern Africa dependence on imports from outside the sub-region is likely to increase considerably unless a much greater use than hitherto is made of the available resources, including in

particular the extensive dry forests of the sub-region and the areas of closed high forest that are currently under utilized. In the case of Northern Africa the rise in consumption may offer trade opportunities to exporters in the surplus countries of tropical Africa, though the scope of such trade is likely to be limited by severe competition from European exporters. In Southern Africa where the output of plantation-grown saw timber is increasing rapidly, the current deficit in sawnwood will decrease steadily. By 1975 this deficit is likely to be overcome to a very large extent.

Future requirements for wood-based panels

2.6 The projections which have been made suggest that regional requirements in 1975, as indicated by the medium level estimate, will exceed current consumption by some 165 percent and that both total and per caput consumption will increase rapidly in all four sub-regions, the increase in total consumption ranging from 130 percent in the case of Southern Africa to nearly 200 percent in Northern Africa. For Africa as a whole, the medium level estimate implies a rise in per caput consumption of about 65 percent.

2.7 In the case of Western Africa, plywood, which is manufactured on a major scale within the sub-region, is likely to maintain, or even to increase, its current share in the total consumption of board products, while in the other sub-regions consumption of fibreboard and of particle board may be expected to rise faster than the plywood consumption.

2.8 It seems likely that fibreboard manufacture will be established before long in Eastern Africa, and that particle board plants will come into being in several countries of Eastern Africa and Northern Africa. The Southern African fibreboard and particle board industries are likely to grow considerably and to become more diversified. Consumption of packaging veneer in the Maghreb countries, which is expected to rise from the 1960-62 level of some 45,000 m³ to more than 160,000 m³ in 1975, should provide useful outlets for the cheaper grades of Western African peeler logs.

Future requirements of roundwood products and fuelwood

3.9 Whilst the subject of roundwood products and fuelwood is not the concern of this paper it should be noted that the estimated total consumption for the region by 1975 of roundwood products will be approximately 15 million m³ and of fuelwood will be some 228 million m³, these basic uses of the wood resource of the region still far outweighing all other uses.

Future requirements for paper and paperboard

3.10 The estimated total requirements for paper and paperboard by sub-regions can be seen in Table 6. Requirements for paper and paperboard are expected to rise steeply, on a per caput basis as well as in absolute terms, within each sub-region and sector; the greatest rate of increase is anticipated in the case of Western Africa, where packaging requirements for bananas are expected to create a new class of demand. Regional requirements will probably increase at a similar rate for newsprint, printing and writing paper, and industrial paper, and by 1975 overall requirements for paper and paperboard products within the African region are expected to be of the order of 2.7 million tons per annum, whereby most of the consumption will be distributed between Southern Africa and Northern Africa. As indicated earlier, production in these two sub-regions is currently expanding at a fast rate. Western African consumption will continue to be centred in the sector which includes Ghana and Nigeria, and that of Eastern Africa in the southernmost part of the sub-region. As far as the requirements of the home market and those of neighbouring countries are concerned, it is these areas that would seem to offer the best prima facie prospects for an early installation of pulp and paper production on an economic scale. With the development of the industrial use of non-wood resources, such as bagasse, for large scale pulp production it is anticipated that these sources of raw materials will play an increasingly important rôle in supplying the paper and fibreboard needs of the region.

Summary of present and future demands

3.11 The embryonic state of most of the wood using industries in Africa is in large part attributable to the present small size of the markets for processed wood products in the region. The nature, extent and expected growth in these markets will be

considered in the chapter following.

3.12 The industries' development has also been affected by the supply conditions they face. Thus, the major part of the region's sawmilling and plywood and veneer activity has grown up in Western Africa where the forest resource provides a highly suitable raw material for these products. The region's pulp and board capacity on the other hand has built up in Southern and Northern Africa, where a plantation-grown raw material base has been established.

Capital and Technical Skill

3.13 The supply of capital and of technical and managerial skills has also been important. Much of the industry, in particular the sawmilling industry, comprises small, poorly equipped units with staff inadequately versed in the necessary skills. To say this is not to underrate the important rôle of simple, small-scale labour-intensive wood working enterprises in Africa; a scattered raw material supply or a small, local market can often best be worked or served in this way. But, the development of wood-using industries even to the modest size justified by present markets is in general hampered by shortages: shortages of capital - as much for infrastructure and services as for equipment, and shortages of skills - skills in marketing and organisation as much as skills in processing techniques. Expansion of the industries will rest as much upon correcting these shortages as it will upon size of markets and an adequate raw material base.

Estimated future demand

3.14 If the underlying conditions assumed here of population and income growth, and of wood availability, are realised, Africa's annual requirements for the various wood products will have risen by 1975 to the equivalent of nearly 23 million m³ of industrial roundwood, about 15 million m³ of rural roundwood, and nearly 230 million m³ of fuelwood: the requirements being distributed between the different sub-regions in the manner recorded in Table 6.

At these levels, consumption would have risen between 1959-61 and 1975 by the following margins: fuelwood and roundwood by 29 percent (or nearly 55 million m³), sawnwood by 77 percent (3 million m³), wood-based panel products by 165 percent (0.6 million m³) and paper and paperboard by 146 percent (1.4 million tons). The relatively slow rise in consumption of fuelwood and roundwood still will mean very large additional quantities - more than an extra 50 million m³ a year of fuelwood and 4½ million m³ of roundwood. But it is the fast rise in consumption of processed wood products that will create the more significant changes in the wood economy.

Major expansion needed

3.15 To supply these additional quantities will require a major expansion of the region's capacity, or a heavy addition to the burden of the import bill for wood products. To produce this additional requirement of processed products within the region would call for an output of industrial roundwood in Africa 11 million m³ a year greater than in 1959-61, when the corresponding production amounted to about 7½ million m³. If on the other hand additional quantity of wood products consumed were all to be imported it would cost, at 1959-61 prices, more than \$600 million a year by 1975, on top of the \$290 million worth imported in 1959-61. Even if Africa continues to import the same proportion of its wood products requirements as it did in 1960, it would still add nearly \$400 million to its annual import bill by 1975, increasing it to a sum nearly two-and-a-half times as large as the corresponding bill for imports in 1959-61.

Conclusion

3.16 It is to be expected that Africa will continue to import some part, probably a considerable part, of its wood product requirements in 1975. But these figures do underline the need for meeting a higher proportion of the region's requirements from domestic production and give a rough indication of the orders of magnitude that are likely to be involved. If additional supplies are not called forth in adequate quantities, or only in response to a rise in the real price of wood products, then consumption will of course fall short of the levels estimated. If this were to come about, the region would in all likelihood be the poorer for being short of the wood products required for its development, and for having failed to adequately develop and use its wood resource.

CHAPTER IV - PROSPECTS AND RELATED DEVELOPMENT NEEDS

General

4.1 Since as yet most of the forest areas are imperfectly known, and the economy of the majority of African countries is still in the transitional stage any broad appraisal of the wood potential of Africa and of the prospects for utilizing this potential must perforce be tentative.

Future Prospects

4.2 In the preceding chapters an attempt has been made to present a summary of available data on the African wood sector and to provide an indication of future requirements for wood products. From the sum total of evidence at hand, it would appear that in the years to 1975 the great majority of the countries of Africa should be able to expand the output of the wood products at present derived from their forests so that domestic production will satisfy requirements for these products to the same, or a similar, extent as it does at present. In a number of countries the wood resource will permit carrying production further, making the forests contribute to a far greater extent than hitherto towards the satisfaction of internal needs. Production of wood for export may decline in one or two of the traditional exporting countries of Western Africa, while other countries with large areas of closed high forest, in Western Africa and elsewhere, should be able to supply increasingly both distant markets and deficiency areas within their respective sub-regions. Even in some of the countries that are less well endowed with natural forest, production, particularly of plantation grown wood, coupled with progressive industrialization, can almost certainly be carried to a level where exports of certain wood products, including pulp products, can be initiated or substantially expanded, as the case may be. However, in order to attain desirable production goals, while safeguarding or improving, as far as is reasonably possible, the overall potential of the forest resource, governments will have to implement policies based on well-balanced plans that are ambitious as well as realistic.

Basic Requirements

4.3 Essential prerequisites for such planning (which, in many respects, is bound to be a continuous process) include interalia (i) the collation, within each country, of basic data relevant to the forests and their products, and the gradual improvement of this data by such means as forest inventories, surveys of forest industries, surveys of wood-products consumption trends, and appropriate statistical coverage of the production of, and trade in, wood products; (ii) close liaison with planners concerned with the other sectors of the national economy; and (iii) integration of national plans into the regional and sub-regional context, with due regard to any opportunities that may exist for useful agreements with neighbouring countries, particularly in matters related to the processing of, and trade in, wood products. Above all else, the planning must make provision for attracting to forestry and the wood-products industries the right kind of men, and for giving them the necessary training. At present one of the most serious obstacles to progress is the shortage of trained personnel at all levels. In many countries, including several that possess large areas of valuable high forest in urgent need for development, forest departments operate with severely reduced, and habitually overworked, staffs.

The satisfaction of domestic requirements

4.4 The forecasts detailed in this study point to a rapid growth in wood products requirements; in the case of paper and paperboard, sawnwood, and board products, estimates corresponding to medium-level projections suggest that, by 1975, regional requirements will exceed current consumption levels by some 1.3 million tons for paper and paperboard, 3 million m³ for sawnwood, and 0.6 million m³ for board products. In terms of current prices these additional requirements amount to more than \$500 million, of which some \$300 million is represented by paper and paperboard. It has been seen that at present the consumption of paper and paperboard in the great majority of the countries of Africa rests in the whole,

or in the main, on imports, and that most countries depend heavily on imports of sawnwood, board products, or both. Whilst it may be neither practicable nor desirable for every country to strive for maximum self-sufficiency in all wood products, it seems very necessary that countries should endeavour to keep imports within reasonable bounds, and, secondly, that where it is possible import requirements should be satisfied in an increasing measure by means of trade within the Region.

Sawnwood - Prospects, High Forest Areas

4.5 In the case of sawnwood and of board products, the anticipated growth in domestic requirements should not present any difficult problems as far as the wood-surplus countries of Western Africa are concerned: in these countries, the additional log requirements for sawnwood and for plywood (which is likely to account for the greater part of the increase in the board-product consumption of these countries) can be met readily provided wider use is made of the currently under-utilized species of the mixed high forest, while expanded domestic sales of the lower grades of products are certain to be of great assistance in developing overseas trade in processed wood products (as might be also, in many cases, the growing opportunities for selling part of the cheaper grades to wood-deficient neighbouring countries). The position is likely to be similar in Madagascar and Ethiopia as soon as the considerable high forest resource of these two countries can be adequately developed. In the smaller areas of closed high forest found in the other countries of Western Africa and of Eastern Africa, growing domestic requirements should also make for a fuller utilisation of the forest, while in several countries (notably in Eastern Africa and in Southern Africa) man-made forests are certain to provide increasing volumes of industrial logs.

Sawn wood - Use of Low Grade Forest

4.6 Against these favourable prospects must be set the probability that in many countries of Africa that possess neither significant areas of tropical high forest nor major areas of forest plantations, the sawnwood supply position will deteriorate in the period to 1975, unless considerable effort is directed towards a fuller use of forests that have a low log content. By far the most important of these are the dry forests that cover such vast areas of tropical Africa: in a number of countries the whole range of technical and economic problems of sawnwood production in these forests warrants a thorough appraisal (and in some cases, reappraisal). Often surveys will be necessary to identify areas of promising timber content that are suitably located in relation to existing or projected transport facilities. In many areas logging and sawmilling may not involve any heavy investment in equipment, and should offer opportunities to small commercial enterprises or co-operative associations, while under certain conditions a combination of pitsawing and portable sawmilling might be envisaged. Much of the sawnwood thus produced may not be of a high quality, but will nevertheless be useful in satisfying essential local needs. And whereas, in a number of areas, the total cost will be relatively high for the type of material produced, the foreign exchange ingredient of this cost may prove sufficiently low to justify the encouragement of production.

Sawn wood - Recommendations

4.7 "Forest Industries Development in Eastern Africa"^{1/}, a report submitted to the ECA Conference on the Harmonisation of Industrial Development Programs in East Africa at Lusaka in November 1965, set out a number of recommendations for the development of the sawnwood industry which whilst applying especially to Eastern

^{1/} Prepared by the FAO Regional Forestry Office for East Africa.

Africa have some general application throughout the whole Region and are given here:

1. The need to establish additional forest reserves is once more emphasized. Reconnaissance surveys and forest inventories should be carried out in forested areas where at present the data required for planning forestry development is not available.
2. The use of secondary and lower quality species for sawnwood should be developed. At the present time many sawmills restrict their cuttings to species which have a high degree of stability in the green state. Lumber seasoning should be further developed, not only to improve the quality of lumber but also to expand the use of less stable woods. The use of preservation methods should be developed to help to increase the use of less durable species.
3. Where it is feasible, the building of forest roads should be expanded to enlarge the area of accessible forest which can be economically exploited. Forestry development and the development of industries related to forestry should be given proper consideration when planning major road and railway development schemes.
4. By introducing modern equipment, and by the proper training of forest labour in its use, logging and transport costs can be reduced. The possibilities of improvement in this field have been fully demonstrated recently by a New Zealand bilateral aid scheme in Eastern Africa.
5. The use of portable and semi-portable saw-mills should be developed further so as to be able to work the smaller forest patches and more remote forest areas.
6. Considering the forecasts for domestic demand and future export prospects the development of plantation tree growing should be expanded. When planning plantation production the following points should be considered:

- a) Apart from trees for pulp production some areas should be planted with species that produce saw-log timber.
 - b) Trees intended for sawnwood (or veneer) should be pruned.
 - c) Large blocks of plantations are required to sustain a large sawmill enterprise, capable of developing an export market in sawnwood and supplying a large domestic market with properly processed timber.
 - d) Smaller plantation blocks can be planted close to the smaller population centres, to facilitate the provision of sawnwood for local markets.
7. To reduce unnecessary waste, the rational use of timber should be further developed. Amongst methods which might be recommended the following are given:
- a) Improvement of sawing accuracy.
 - b) Increasing the production of small dimension stock.
 - c) Introduction of finger-jointing of sawnwood to utilise short varying lengths of good quality timber.
 - d) Increased production of glued-laminated structural timber to make use of small size timber and low grade material.
 - e) It should be noted that the useful life of timber can be increased by preservation.
 - f) For structures, timber waste can be reduced by using seasoned timber which has higher strength qualities than green timber.
 - g) High quality timber should not be used for purposes for which a lower grade of timber is adequate.
8. Many of the mills in the region are of too small size. Steps should be taken within the industry to promote amalgamation of the too small mills into larger units and to establish cooperative operation in logging, seasoning and marketing. The allocation of new concessions could be so arranged to stimulate the merger of too small mills into units of competitive size.

9. The full export potential of saw log resources needs to be carefully developed, particular attention being paid to high-quality timbers, especially in the form of flooring-boards and strips, parquet flooring tiles and box-boards.
10. The study of suitable types of mill equipment for different environs should be undertaken and the results of these studies should be widely demonstrated.
11. The training programs for all grades working in the forest and allied industries should be expanded as a matter of urgency. Co-operation in the development of training schemes on a regional or sub-regional basis should be arranged. A limited number of sawmills should be set up which would be used to demonstrate new techniques. On-the-spot training in modern techniques should be considered a primary duty in all mills which are suitable for this purpose.
12. Grading rules for broadleaved and coniferous timber should be drawn up and coordinated throughout the whole region, if possible, but otherwise should be developed on a sub-regional basis.
13. Credit facilities should be made available to enable new units to be properly designed and to have sufficient working capital to operate efficiently. The need of working capital is particularly stressed for the proper seasoning of sawnwood.
14. It should be noted that excess milling capacity based on 8 working hours/day does exist and also that this can be increased by shift-working. The better use of present mill capacity should be more than sufficient to compensate for the expected decrease in pit-sawing and the closing down of obsolete mills.

Deficiency Areas

4.3 A natural adjunct of enquiry into ways and means of expanding sawnwood production in deficiency areas is the investigation of possibilities for using wood, either from natural forests or from the existing plantations, in the manufacture

of particle board, fibreboard, or both. Once such manufacture has been set up, these products, besides being employed in the uses for which they offer special advantages, might be made to go a long way in the substitution of scarce sawnwood components in building, furniture manufacture, and other uses. In some localities plantation-grown trees (such as those of certain eucalypt species) may provide a useful source of logs for plywood manufacture.

4.9 Looking further ahead, beyond 1975 and into the more distant future the importance of plantations is again stressed. There can be little doubt that, outside the zones of closed high forest, any production of sawnwood and board products (and, a fortiori of pulp) from local wood that is to contribute significantly to ever-growing requirements will have to depend increasingly on man-made forests. Thus, in most African countries the building up of the plantation estate to the limit of economic feasibility clearly constitutes a task of a very high priority.

Roundwood and fuelwood

4.10 The anticipated increase by 1975, in the requirements for roundwood products and fuelwood is unlikely to affect basically the overall supply position for these products, though it will create additional local shortages and will intensify existing ones near certain towns and in areas having a dense rural population.

4.11 Plantations aimed at supplying poles, fuelwood, or both, are very necessary indeed in many of the wood deficient areas in order to prevent existing shortages becoming increasingly severe with the passage of time. In addition, the setting up of facilities in the locality for the preservation of building poles, and kilns for charcoal burning will help considerably to relieve these shortages. In certain localities planting may be necessary to provide industrial fuels such as metallurgical charcoal.

Wood-based Panels

4.12 Plywood differs from particle and fibreboard in the respect that the first mentioned requires high quality logs as raw materials whereas the two latter types can be manufactured from low cost wood, wood waste and non-wood fibre resources such as bagasse. On the other hand all three types can to a certain degree substitute each

as far as end-use is concerned. This makes a final assessment of the development prospects confused and uncertain. All three groups will in the following be discussed collectively assuming that one m^3 corresponds to 1.6 tons.

Present position

1.15 The present situation can be summed up as follows:

Taken as a whole the production of building board in Africa more or less corresponds to consumption. Production is, however, very unevenly distributed, Western Africa having a large excess of plywood and Southern Africa a small excess of fibre-board and particle board production. Eastern Africa and Northern Africa are each producing far less than they consume.

Future needs

1.16 In Northern Africa the consumption is expected to rise from some 110 thousand m^3 in 1961 to about 340 thousand m^3 in 1975. As this sub-region produces only 10 percent of its needs, the rest being covered by imports, a theoretical capacity increase of some 320 thousand m^3 would be necessary to meet the entire demand by local production, a figure that seems highly unrealistic, given the unfavourable raw material situation in the area. Efforts should be made to utilize low-grade wood, waste and non-wood resources. At the same time, however, it should be realized that substantial quantities may have to be imported to satisfy this demand.

1.17 In 1959/61 Western Africa had a total production of wood-based panels of some 100 thousand m^3 , the local consumption being only about 60 thousand, the difference being exported. In 1975 local demand is expected to be in the range of present production. If total demand is to be met by local production, keeping exports at the present level, some 100 thousand m^3 of new capacity must be installed. Taking into account the present big production of sawn goods and plywood it should be possible to utilize waste to provide a large share of the needed raw material.

1.18 Production in East Africa covers, at present, only one seventh of demand. This demand is expected to reach 200 thousand m^3 by 1975. The forest resource in the sub-region can provide a sufficiently large raw material potential to anticipate the requirements for creation of an important wood-based panel products industry. To meet

future demand by local production would require an expansion in production of 190 thousand m^3 per year, however, it is expected that part of this future demand will continue to be met by imports.

4.17 Southern Africa differs from the other sub-regions in many respects. The wood based panel industry at present is already well developed and the whole region consists of one sole market, eliminating many of the marketing problems that smaller countries have to face. This sub-region is estimated to have a consumption of wood-based panels of 300 thousand m^3 by 1975 compared to some 130 thousand in 1959/61. If the present net export of 30 thousand m^3 is maintained, the needed capacity increase is likely to be in the order of 170 thousand m^3 .

Development Problems

4.18 The problems facing planners of the wood based panel industry in Africa are the vastness of the country, the big distances between consumption centres, the lack of transport in many areas and the small size of the internal market in many African countries.

4.19 Much can be gained from integration both of markets and of industrial enterprises (plywood - particle board, sawmill, fibreboard, etc.). Improved transport facilities will cut costs and allow bigger mills to be built with consequently better economy of operation. Some countries with adequate raw materials will be able to gain foreign currency by developing exports of wood based panels, particularly of plywood and veneer.

The Development of Overseas Exports in Wood and Wood Products

4.20 As has been indicated in a previous chapter, the outstanding feature of Africa's export trade in wood products has been the rapid growth of Western African exports, most of which are in the form of logs. The greater proportion of these logs are used in the importing countries in the manufacture of plywood and veneer, whilst a smaller proportion is made into sawwood. Projections of Europe's requirements in wood products imply a steep rise, in the period to 1975, in the potential demand for tropical hardwoods notably in plywood and veneer usage, and there is every indication that exports from the wood surplus countries of Western Africa (as also from areas such as Eastern Madagascar) can be greatly expanded provided sufficient suitable produce is made available at acceptable prices. It has been seen that, in the closed high forests of Western Africa, the growing stock of the currently preferred tree species is still very great. However, it is far from inexhaustible, and even if it should prove possible during a certain number of years to expand trade in these species, supplies are bound to fall off sooner or later; also it is clear that, with the rapid decline in the more accessible localities of the principal species in demand, rising costs due to greater distances of transport from the more remote areas will have to be compensated in some manner if exports are to remain competitive. This being so, it is now widely recognized that, in the long run, there can be no solution to the twin problem of diminishing supplies and rising costs

without a broadening of the species range of exports and, secondly a transfer, from the importing areas to the exporting areas, of a large proportion of the processing currently undertaken in the former. These objectives accord well with the general economic aspirations of the exporting countries, though it is obvious that their realization will not be an easy process.

Manufacture of processed wood for export

4.21 Given suitable conditions for local processing, exports of veneer that is destined for plywood manufacture, or sawwood, or of plywood or of decorative veneer, can result in substantial net savings as compared to log exports, through economy in freight, a fuller use of the lower qualities of logs, or a combination of factors. It would seem that, as far as veneer for plywood manufacture is concerned, many industrial enterprises in the importing countries are becoming increasingly interested in the possibility of manufacturing their veneer in Africa. Again, in the case of sawwood, the gradual concentration of the manufacture of furniture and joinery within enterprises of a relatively large size, in several of the importing areas, is likely to favour African exports by opening up possibilities for commercial links between major consumers on the one hand and sawmilling enterprises in the exporting countries on the other. Efforts to expand plywood exports would probably have to be directed mainly towards countries that already are major importers of plywood made of tropical woods, and in this connection any possibilities that may arise for expanding trade with the U.S.A. should receive very careful attention. In the case of packaging veneer, a product which constitutes a limited yet a significant and steadily increasing potential outlet for African wood, a low price is all important and manufacture will have to be almost invariably close to the source of the raw material.

Freight Handling

4.22 With the gradual shift of exports towards expanded trade in processed wood, there should be a growing scope for gearing production and trade to freight technology with a view to net savings through more efficient cargo handling.

4.23 Industrialization of forestry

4.23 In many cases the industrialization of forestry may be expected to yield certain ecological side effects that appear to be associated with the lessening, through steady contact with industry, of the customary environmental isolation of forest labour in tropical areas. It has often been observed that this results in a considerable improvement of the overall efficiency of work, while a relatively large number of the forest workers develop qualities of inventiveness and enterprise that are in pronounced contrast to their previous condition.

Development of use of under-utilized species for export

4.24 The development of processing in wood-surplus countries is highly relevant to the problem of increasing trade in species at present exported in quantities that are small, or even negligible, in comparison with the availabilities in the forests.

4.25 Many currently under-utilized species of the closed high forest, including in particular a number of light to medium-weight woods, offer promising possibilities for export on a greatly enlarged scale, provided continuity of supplies can be assured and provided prices for these woods, either in the log or after processing, are attractive in comparison to those of the more popular species.

Paper articles

4.26 In Western Africa, and also in Eastern Africa, manufactured paper articles imported from abroad account for a high percentage of the total consumption of paper and paperboard. Many of the articles concerned could probably be produced locally using imported paper and paperboard. Most of the production would be in relatively small manufacturing units involving small capital investment. The development of these secondary conversion industries should be encouraged as the advantages are three-fold. Because of the small size of the units they would afford an opportunity for local investment or cooperative effort. The factories would provide a useful employment outlet. Such industries would offer immediate possibilities for savings in imports.

Pulp and paper

4.27 As far as pulp and paper and paperboard are concerned, considerable expansion of production has been achieved in recent years in Northern Africa and in Southern Africa, the two sub-regions that account for the greater part of current consumption and of the estimated future requirements, and there is every indication that production in these sub-regions will continue to grow at a satisfactory rate. In Southern Africa, extensive areas of man-made forest provide the base for an adequate expansion of pulp manufacture, while in Northern Africa domestic production of pulp will have to rely in the main on fibrous raw materials other than wood. However, in the Maghreb countries, longer-term planning of production, beyond 1975, may permit a measure of choice between raw materials such as esparto grass or crop residues, on the one hand, and plantation grown pulpwood on the other. There certainly exist areas where it is prima facie possible to create major raw material bases through afforestation, and this possibility should be taken into account.

In Eastern Africa, where the manufacture of pulp and pulp products is in its early beginnings, plans for setting up production based on plantation-grown wood are currently under consideration in several countries. To the extent that such plans may depend upon sales to other countries within the sub-region, a measure of co-ordination seems desirable in order to explore possibilities for complementary manufacture and to avoid unproductive competition.

4.28 Within Western Africa, consumption will in all probability continue to be centered in the sector of the sub-region which contains Ghana and Nigeria, and as far as local markets are concerned, it is this area that would seem to offer the best prospects for early installation of an economically viable plant for the manufacture of pulp and paper (such a plant is currently being built in Nigeria at Jebba). In the period to 1975, most though perhaps not all of the long fibre pulp needs of Western Africa will have to be imported, but it should be possible to obtain the rest of the furnish from the mixed tropical high forests and from plantations of broadleaved species. At the same time, development should continue with conifers and with

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bamboo should be intensified and should include the systematic seeking out of suitable sites for growing long fibre pulpwood.

Cairo Conference Recommendations

4.29 Particular attention is drawn to the following recommendations of the ECA/ETAO/FAO Conference on Pulp and Paper Development in Africa and the Near East, held in Cairo from 8 to 18 March, 1965:

1. The region's fibre resources, wood and non-wood, though unevenly distributed, are capable of sustaining most, if not all, of the required expansion in pulp production.
2. Many African countries are favourably endowed for the rapid creation of additional reserves of coniferous fibre at a very low cost, but further investigations are needed on the introduction of species to extend the range of planting sites.
3. The use of tropical hardwoods for the production of short-fibred pulp is promising, provided any proposed scheme is built on a thoroughly sound technical and economic basis.
4. These facts, taken in conjunction with the deteriorating wood resources/requirements balance in some of the advanced regions of the world, offer the prospect of successfully establishing in Africa, not only the additional capacity needed to supply the region's expanding requirements, but also an important export-oriented industry.
5. Non-wood resources such as bamboo, esparto and reeds have a rôle to play, as well as agricultural residues such as bagasse and straw. It would appear that of all the non-wood resources, bagasse has the greatest potential, industrially.
6. Since water is scarce in many parts of the region, particular attention needs to be given to water recirculation problems and effluent disposal. In particular, further research and investigation is required into the possibility of using the effluents as a fertiliser in water irrigation systems.

7. Another prerequisite in countries that do not have an existing paper industry is the proper training of workers and management staff for this work. The paramount importance of this aspect of a new project to ensure the ultimate success of the mill cannot be too highly stressed.
8. When reviewing the economic aspects of the production it should be stressed that in determining the feasibility of a pulp and/or paper mill in the region, not only the technical aspects but also the economics of production must be very carefully evaluated.
9. Further research into the development of refiner processes - semi-chemical, chemi-mechanical and mechanical is strongly recommended.
10. Recognition must be given to the great influence of the scale of operation on the economics of a project and also to the world trend towards larger manufacturing units. However, it must also be recognized that in the case of mills supplying local markets, which may be quite small, each individual development project must be very carefully evaluated on its own merits.
11. It is once more iterated that the growing need for pulp and paper in the region simply cannot be satisfied by rising imports, and, therefore, it is necessary to speed up the rate at which new pulp and paper capacity is being established in the region.
12. It is estimated that regional development of these industries should be able to cover two-thirds of local needs by 1970 and, looking forward to 1980, it is hoped that four-fifths of local needs will then be met by regional production.

Investment considerations

4.30 To achieve this level of production in the region the required investment in the pulp and paper mills, alone, will run at a rate of 50 million dollars a year up to 1970, and at a rate of 100 million dollars a year after that.

4.31 It will be necessary to weigh very carefully the relative advantages and disadvantages of alternative arrangements for financing this investment. The attention of national planning agencies, interested institutions, such as IERD, IFC,

IDA, African Development Bank, United Nations Special Fund and countries carrying out bilateral assistance programs in the region should be drawn to the urgency of and special opportunities afforded by, investments in this sector.

Inter-regional planning

4.32 Given the present small size of national markets in many of the countries of the region and the significant economies of scale in many branches of the pulp and paper industry, national self-sufficiency in paper in every country of the region will not represent optimum use of the region's resources. Governments of the region, therefore, should coordinate their plans for developing this industrial sector and related infra-structure. A special point is made here for the need to plan and develop transport facilities on an intra-regional basis.

CHAPTER V - A PROGRAM OF ACTION

5.1 From all that has gone before, what measures emerge that must be undertaken if these challenging prospects for harnessing Africa's forest resources as an engine of growth for the region are to be realised? In the first place, clearly there is an urgent need to know more about these forests. But rough though the picture may still be, it is sufficiently well understood for the major elements of a program of action to be quite clear - a program of action that needs to be initiated now by the Governments of the Region. These principal elements are summarised below. All are a matter of high priority.

Acquire qualified personnel

5.2 No plan or policy can hope to be effective unless there are the people qualified to put its measures into effect. Moreover the range of expertise required must not be underestimated. The objectives of forestry in Africa are no longer primarily conservationist in intent, and industry has a much wider role than its initial predominantly extractive one. The need now is not merely for more people conversant with the methods of forest management and wood technology, but also for engineers, technicians, marketing specialists, and those versed in the techniques of planning and the other specialised skills necessary to bring the sector forward and integrate it more fully into national and regional economies. The first step for each Government will be to make an assessment of its requirements for personnel, and to prepare and implement a program of education and training appropriate to meeting these requirements.

5.3 The key figure will still be the professional forester. Professional level forestry schools must be established in such numbers and locations as to adequately serve each of the different geographical and language groupings of countries in the region. Their establishment should therefore be co-ordinated. Schools to give professional training will be needed at the country level. But for some time

to come most countries in Africa will be short of the qualified personnel they need. To overcome this temporary need governments, institutions and industries in the developed countries should be encouraged to second people with the necessary expertise for service in Africa. Among the more important skills that could be made available in this way would be those of a teaching and administrative nature, to help build up the schools which in due course will overcome this shortage. African countries should also utilise the highly developed training facilities available in these countries for the advanced training, and training in specialized skills, that some of their personnel will require.

Need for Production Training

5.4 Particularly when considering the development of such an expensive, highly complex and sophisticated industrial establishment as a modern pulp and paper mill it cannot be too strongly emphasized that academic and institutional training is simply not enough. Special plans are needed to enable all grades of staff to gain both the theoretical background and also to acquire the necessary practical experience in their own particular skill within the fabric of a smoothly running production organization.

5.5 Whilst this aspect of training is particularly true in the pulp industry it applies generally in all the other branches of the timber industry. The prime importance of on-the-job training cannot be over-emphasized. There cannot be hard and fast rules about the best ways of developing this kind of training. Sponsoring of the management and training of a new industrial project by a consortium from one of the Advanced Timber Industry Countries is certainly one method. More discussions at a high level between Developing and Developed Countries on this matter, would appear to be desirable.

Secure an adequate Forest Estate

5.6 At the present time, the degree of abundance or scarcity of forests in African countries is still much more a reflection of their original resource endowment than of their actual need of and capacity for producing wood. There is an urgent need for establishing what size and pattern of forest estate is appropriate to both:

- (a) present and prospective demand - domestic and export, for wood and other products of the forest (wildlife, tourism, etc.) and,
- (b) the availability of land which could be best employed by using it for growing trees; and,
- (c) the balance between forest and agriculture needed to protect and sustain permanent agricultural production.

5.7 This must be established within the framework of an integrated land-use plan which takes account of the parallel needs and potentials of agriculture and the other competing uses of land.

5.8 To secure the forest estate required, it will be necessary to:

- (1) establish as forest reserves the land set aside for forestry and bring them under the desired management;
- (2) enact Forest legislation designed effectively to secure the forest reserves and protect them against unauthorized incursions and abuse;
- (3) establish an administrative service strong enough in numbers and training to enforce the legislation and ensure the management desired;
- (4) bring under control the designation and transfer of those other parts of the forest which are destined for agriculture or other uses. It is vitally important that the present large scale, indiscriminate destruction of the forest be curbed - that it proceed only as far and as fast as are called for by the planned extension of agriculture, settlement, etc. and that the merchantable timber from this land be not destroyed but harvested for use;

(5) establish such areas of plantation forests as are required to supplement or replace natural forest. Man-made forests have a particularly vital part to play in Africa, and this item - with its accompanying need for more investigation into species and methods of plantation - should figure prominently in the action programs of most African countries.

Improve Data Collection

5.9 The process of compiling this Study has pointed out the critical need - underlying all else - for a major effort to acquire a better knowledge of Africa's forest and forest products sector. Five types of information and data-gathering activity are called for:

(1) Forest inventory. An inventory must be made of the productive and potentially productive parts of the forest resources: the level of inventory activity being always geared to the particular potential of the part of the resource under survey.

(2) Statistical reporting. A system of accurately recording and reporting production and trade in forest products must be instituted and kept up.

(3) Market Surveys. A periodic survey must be made of the nature, location and evolution of markets - domestic and export - for wood products. Plans for producing wood and its products must take account of what they are to be produced for.

(4) Cost data. It is necessary to undertake enquiries to establish how much it will cost; to grow wood in plantations, to grow wood by treatment of the natural forest, to extract and transport the wood, to produce a given processed wood product in a certain location, etc. Cost data are as integral a part of planning the development of the wood resource as the quantitative data. They are basic to establishing the feasibility of producing wood and wood products in a country, and of determining the desirability of doing so.

(5) Availability and extent of non-wood fibrous resources for pulp making with the Region.

5.10 The effort devoted to improving the level of data collection must be a continuing one. The initiation of the process of developing the forest resource cannot wait upon the prior acquisition of a complete data base. Nor in most cases should it wait; enough is known to make a start. But if major, possibly irreversible, errors are to be avoided, plans and programs must be limited to what can be firmly based on what is yet known. A major part of such early development programs should therefore be devoted to improving knowledge about the sector.

5.11 These measures are clearly not exhaustive, but they represent the fundamental framework for a successful beginning. Nor does this effort have to start from scratch. Some countries are well advanced in putting into practice some at least of the measures advocated above; but many others have as yet got little further than making a start. For all countries in Africa it is true to say, the challenge and the opportunity are great; the response must be swift, decisive and imaginative.

Research

5.12 Too little is known about the forestry and wood-using problems peculiar to Africa, and too little effort is devoted to seeking their solution. Africa is still heavily dependent upon methods developed to meet quite different conditions. In an era of economic growth in which the momentum of that growth rests upon the continuous emergence of new technology this limitation could become critical. A more extensive research effort is required to adapt existing technology and develop new techniques appropriate to African conditions. In this effort the developed countries can and should make a major contribution. The Governments and great forest industries of these countries should seek to make available a greater part of their vast research facilities and resources to assist the expansion of the

research peculiar to Africa's needs. Such an effort could start now - with particular industries and institutions taking up particular problems. Subjects that require investigation include the following:

- (1) Widening the range of species used for sawnwood, plywood and veneer.
- (2) The economics and techniques of pulping hardwoods, both natural forest and plantation growths.
- (3) Techniques to use wood products more widely, in particular, in low-cost house construction.
- (4) Investigation into the organisation and training required for small scale industrial plants capable of producing wood products competitively for markets of the restricted size found in some countries of Africa.
- (5) Research into methods of work, and equipment to improve efficiency in harvesting and sorting out-turn from mixed tropical forests.
- (6) Investigate species and cultivation methods to enable plantations to be established in wood-poor areas, particularly the savanna zone.
- (7) Investigate the best species and cultivation methods and the economics of plantations to provide wood for industry, paying particular attention to the need for low-cost wood in the coastal regions of Africa to assist the development of export-oriented industries.
- (8) To investigate the economics and management methods required to raise the yield from natural forests.
- (9) Investigate methods to improve the out-turn of wood from the savanna and other open wood-lands, paying particular attention to the problems of maintaining the ecological balance in these areas.
- (10) Investigate the related problem of effluent disposal in pulp manufacture.

Expansion

5.13 Provision of wood to meet the traditional demands for wood for fuel and pole building material must continue to figure prominently in development considerations. However, the future of wood in Africa, as everywhere else in the world, will be increasing as the raw material for the whole range of the wood-using industries. The expansion of these industries will rest upon:

- 1) The growth of domestic demand for wood products used at present, and increased domestic production of those wood products currently imported.
- 2) Expanding the range of domestic uses of wood - substituting locally produced wood products for non-wood products at present imported.
- 3) Expanding exports of wood products - through growth in existing markets, penetrating new markets and above all by up-grading the present trade from exports of roundwood to exports of processed wood products.
- 4) By developing on a considerable scale a pulp making industry, using both wood and non-wood raw materials, to provide for the considerable increase in paper products expected to be required in the region and also to develop where possible an export to meet the ever-increasing world demand for pulp products.

Investment Effort

5.14 Throughout the following sections, the estimates that are given cannot and should not be taken as precise budgeting figures. They are intended solely to provide an idea of the order of magnitude of the investment required, if expanded requirements of wood products throughout the region between now and 1975 are to be met by increased production within the region.

The investment that will be called for, both in terms of capital and industrial skills, to achieve this four-fold expansion will be enormous. It seems reasonable to expect that for the first three items a large part of this investment could be

net from local sources. The fourth item, however, involves in many cases such vast sums in capital investment that external and financing and international loans are needed if these schemes are to come to fruition.

Sawnwood

5.15 During 1961/62 some 3 million m³ of sawnwood was produced in Africa. At the same time the region consumed slightly more than 4 million m³, the difference being met by a net import of about 1 million m³. By 1975 local consumption is expected to reach around 7 million m³. If this demand is to be satisfied by local production alone then the region as a whole would have to produce 4 million m³ more than in 1961/62. When trying to estimate what new saw milling capacity may reasonably be expected to be put into service by 1975, two facts have to be borne in mind:

a) whereas Western and Southern Africa will have no difficulties in finding the raw material resources for the necessary expansion, Eastern Africa, probably, and Northern Africa, certainly will have to rely to some extent on imports of sawnwood because of lack of saw logs.

b) the present sawmilling industry comprises a number of small, poorly equipped units and often operates considerably under full capacity. With a better supply of logs, improved technical and managerial skills and improved marketing, output could be much higher than it is at present. If existing mills operated on two shifts instead of one, then in all probability they could produce a considerable part of the increased requirements foreseen.

The two points mentioned above make it clear that estimates with regard to investment requirements in the African sawmilling industry, relative to 1975 should not be based on an additional capacity of 4 million m³. A rough estimate would be between 1.5 and 3 million m³. The investment per yearly m³ of output in the sawmilling industry varies greatly with size of operation, location, etc. Very approximately the average might be between US\$ 25 and US\$ 40 per yearly m³ of output.

In order to provide some idea of the order of magnitude of the investment required, it may be calculated that an increase in capacity from 1961/62 to 1975 of 2 million m³ at an average investment of US\$ 30 per yearly m³ of output would correspond to a total investment of 60 million US dollars, spread over 13 to 14 years.

Wood based panels

5.16 In 1961/62 Africa's total consumption of wood based panel products amounted to some 370,000 m³, and local production was estimated as being around 280,000 m³. By 1975 it is anticipated that consumption will have increased to 980,000 m³ which means that production at that time should be some 700,000 m³ greater than in 1961/62 if local demand is to be met but without any allowance export. Projections are not available showing the proportion of this increase separately for plywood, fibreboard and particleboard. Investment figures for the different types of mills differ considerably, making it difficult to give even a rough estimation of the amount of investment required. Some countries may develop a considerable export of plywood and veneer, possibly also fibreboard. Others, where there is a raw material deficit, may have to rely heavily on imports, except perhaps for particle board. If we calculate with an investment of between US\$ 100 and US\$ 250 per yearly m³ of output, then the total investment required between 1961/62 and 1975 would probably be between 70 million and 170 million US dollars, over a period of some 15 years.

Pulp and Paper

5.17 Secretariat Paper I "Review of Past Developments and Future Demand Estimates" prepared for the Cairo Pulp and Paper Conference shows that the average annual consumption (1960-1962) of paper and paperboard in Africa was nearly 0.90 million metric tons and that annual production in the region during the same period was 0.35 million metric tons. A tentative estimate of total expected requirements



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by 1975 of paper and paperboard is 2.42 million tons ^{1/}. Secretariat Paper V "Development Prospects and Investment Needs" suggests that by 1975 Africa alone (excluding the Near East) should be able to produce nearly 80 percent of its domestic requirements of paper and paperboard. This would imply a capacity increase of some 1.5 million tons, which together with capacity existing in 1960/62 would bring total capacity to some 1.9 million tons. The investment necessary to carry out this expansion programme (paper and paperboard capacity only, excluding pulp manufacture) has been estimated at US\$ 350 million spread over the period from 1961 to 1975. It has furthermore been estimated, taking into account available raw material resources, markets and infra-structure, that the production of pulp could be increased by some 1.4 million tons by 1975, which (together with capacity existing in 1960/62, 0.2 million tons) would bring the total to 1.6 million tons. The above mentioned expansion of the pulp industry would thus call for a investment of about 440 million US dollars. The total investment, therefore, in pulp and paper mills, alone, would thus amount to around 800 million US dollars, spread over 14 years, or roughly 60 million US dollars per year. The total investment foreseen for the development of forest industries in Africa between 1960/62 and 1975 are outlined in the table below. It must be emphasised, however, that the estimates shown relate only to capacity aimed at satisfying domestic demand for forest products. Additional investment which at the present stage cannot even be roughly estimated will be required for the development of export-oriented forest industry undertakings.

^{1/} This forecast corresponds to the higher estimate given in "Timber Trends and Prospects in Africa" of 2.49 rather than the medium estimate of 2.21 million tons.

Estimated investment requirements in forest industries to meet increased consumption in the region, 1961 to 1975

<u>Industrial Sector</u>	<u>Estimated increase required in capacity by 1975</u>	<u>Estimated total investment required 1961 to 1975 (US Dollars)</u>
Sawnwood	2 to 3 million m ³	60 million
Wood based panels	600,000 m ³	70 to 170 million
Pulp and Paper	1.5 million tons	800 million

Basic Development

5.18 On top of this considerable expenditure further substantial investments will be required to expand conservation work, development of forest inventories, development of new plantations, development of forest roads and adequate connections to the main arterial routes of the country or sub-region.

Conclusions

5.19 The onus of promoting and guiding this development will remain with the Governments of the region. Governments will need to:

- 1) Coordinate inter-regional plans to secure a rational development of industries so that they serve markets of a size permitting economic scales of operation.
- 2) Provide, where appropriate, the social overhead capital works, such as roads, which are the framework within which industry operates.
- 3) Determine forest fees, export levies, taxes, etc. to encourage domestic processing and use of wood products to the desired degree.
- 4) Ensure the quality of wood products, e.g. by establishing grading rules and ensuring adherence to these rules.

5) Encourage, and where necessary participate in, the setting up of bodies which can effectively promote new market outlets and organize the process of marketing. Particular attention should be paid to the widening of the range of species marketed.

6) Negotiate to remove tariff and other trade barriers in importing countries which create difficulties for the expansion of exports of processed wood products from Africa.

7) Create conditions which will encourage all sources of capital and skills to participate in the development of the different sectors of the forest industry to the fullest extent.

Above all, the principal task of Governments must be to ensure that the complex of wood-using industries is of a size and structure which conforms to, and is fully integrated with the plans for overall economic development.

ECA/FAO Advisory Group on Forest Industries Development

9.20 In examining this report and reviewing development of the forest industries sector, the Symposium on Industrial Development in Africa no doubt in particular will wish to comment on the action program outlined. It will probably also wish to draw the attention of member governments to the regional Advisory Group on Forest Industries Development which has already been established by FAO and the Economic Commission for Africa and to the desirability of channeling towards this Group requests, as appropriate, for feasibility studies and pre-investment surveys, as well as for specialist advice and guidance.

Table 1. Annual consumption of wood products in Africa in 1959-61 and estimated requirements in 1975

	Sawnwood	Panel Products	Roundwood Products	Fuelwood	Paper and Paperboard
	(million m ³)				(million tons)
<u>Current consumption</u>					
Western Africa	1.10	0.06	4.9	80.4	0.08 ^{a/}
Eastern Africa	0.82	0.07	4.8	89.6	0.11 ^{a/}
Northern Africa	(1.00) ^{a/}	(0.11) ^{a/}	0.4 ^{a/}	4.4 ^{a/}	0.31 ^{a/}
Southern Africa	1.08 ^{b/}	(0.13) ^{b/}	1.8 ^{b/}	2.5	0.39 ^{a/}
African Region	4.00	0.37	11.9	176.9	0.89 ^{a/}
<u>Requirements in 1975</u>					
Western Africa	2.39	0.15	6.6	105.2	0.26
Eastern Africa	1.62	0.20	6.6	113.6	0.28
Northern Africa	1.74	0.33	0.7	6.2	0.81
Southern Africa	1.34	0.30	1.5	3.4	0.86
African Region	7.09	0.98	15.4	228.4	2.21
Index African region (current consumption - 100)	177	265	129	129	246

^{a/} Consumption in 1960-62

^{b/} Consumption in 1959

Source: FAO/BCA Joint Study on "Timber Trends and Prospects in Africa", 1965.

Table . . . Annual production, imports, exports and consumption of processed wood products in Africa, 1959/61 (in million units)

	<u>Production</u>	<u>Imports</u> a/	<u>Exports</u> a/	<u>Consumption</u>
<u>Western Africa</u>				
Sawnwood (m ³)	1.56	0.06	0.52	1.10
Plywood and veneer (m ³)	0.16	0.01	0.14	0.03
Fibreboard and particle board (tons)	-	0.02	-	0.02
Paper and paperboard (tons)	-	0.08	-	0.08
Total in terms of wood raw material (m ³)	3.52	0.43	1.39	2.56
<u>Eastern Africa</u>				
Sawnwood (m ³)	0.71	0.30	0.19	0.82
Plywood and veneer (m ³)	0.01	0.01	-	0.02
Fibreboard and particle board (tons)	-	(0.02)	-	0.03
Paper and paperboard (tons)	0.01	0.09	-	0.10
Total in terms of wood raw material (m ³)	1.47	0.94	0.38	2.05
<u>Northern Africa</u>				
Sawnwood (m ³) b/	(0.09)	(0.91)	-	(1.00)
Plywood and veneer (m ³)	0.01	0.08	-	0.09
Fibreboard and particle board (tons)	-	0.02	-	0.02
Paper and paperboard (tons)	0.12	0.21	0.04	0.29
Total in terms of wood raw material (m ³)	0.56	2.70	0.12	3.14
<u>Southern Africa</u>				
Sawnwood (m ³)	0.54	0.58	0.03	(1.08)
Plywood and veneer (m ³)	(0.02)	0.01	-	(0.03)
Fibreboard and particle board (tons)	(0.09)	-	0.03	(0.06)
Paper and paperboard (tons)	0.18	0.20	0.02	0.36
Total in terms of wood raw material (m ³)	1.87	1.78	0.19	3.46
<u>Grand Total</u>				
Sawnwood (m ³)	2.88	1.85	0.73	4.00
Plywood and veneer (m ³)	0.20	0.12	0.14	0.18
Fibreboard and particle board (tons)	0.10	0.05	0.03	0.12
Paper and paperboard (tons)	0.31	0.58	0.06	0.83
Total in terms of wood raw material (m ³)	7.44	5.87	2.07	11.24

a/ The import and export figures include the small volume of trade within the sub-regions and within the region.

b/ Average figures.

Source: FAO, Study on "Timber Trends and Prospects in Africa", 1965

Table 3. Composition of African trade in wood products in 1959-61

	Logs c/	Sawnwood d/	Plywood and veneers	Fibre- board and particle board	Paper and paper- board	Pulp and waste paper	All wood products
	- annual quantity in 1000 m ³			- annual quantity in 1000 tons			(Annual value in millions of US \$)
<u>Imports</u>							
Western Africa	35	62	13.3	15.7	77.08	0.3	38.27
Eastern Africa ^{a/}	14.2	299	12.9	17.8	92.26	5.1	50.87
Northern Africa	195.3	914	84.2	15.9	209.38	52.3	121.70
Southern Africa ^{b/}	25	578	13.6	1.9	197.64	18.1	78.42
African region	269.5	1,853	124.0	51.3	576.36	75.8	
idem in millions of US \$	8.67	91.44	15.35	6.31	158.35	9.44	289.26
<u>Exports</u>							
Western Africa	4,443.6	517	141.3	-	0.67	-	166.08
Eastern Africa ^{a/}	15.7	192	0.8	-	4.55	0.5	13.75
Northern Africa	0.3	0.8	0.8	-	37.80	14.4	11.69
Southern Africa ^{b/}	3.3	27	0.8	35.2	14.60	71.8	20.80
African region	4,462.9	736.8	143.7	35.2	57.62	86.7	
idem in millions of US \$	120.58	44.93	14.01	3.20	16.89	12.71	212.32

^{a/} Excluding trade between the countries composing the former Federation of Rhodesia and Nyasaland.

^{b/} Excluding trade within the sub-region

^{c/} Including roundwood products.

^{d/} Including sleepers.

Source: FAO/ECA joint study on "Timber Trends and Prospects in Africa", 1965

Table 4. Areas of forests in Africa 1958/63 *

	<u>All forests</u>	<u>Natural forests</u>		<u>Man-made forests</u>
		<u>Closed high forests</u>	<u>Other forests</u>	
----- million hectares -----				
Western Africa	406.9	173.7	233.0	0.2
Eastern Africa	250.8	18.0	232.2	0.6
Northern Africa	9.1	1.6	7.3	0.2
Southern Africa	15.8	0.3	14.5	1.0
African region	682.6	193.6	487.0	2.0

Table 5. Average annual removals of wood in Africa, 1959/61 *
(in million m³)

	<u>Sawlogs, veneer logs and logs for sleepers</u>	<u>Other roundwood</u>	<u>Fuelwood</u>	<u>Total</u>
Western Africa	7.9	4.9	80.4	93.2
Eastern Africa	1.5	4.8	89.6	95.9
Northern Africa ^{a/}	0.1	0.3	4.4	4.8
Southern Africa	1.5	2.8	2.5	6.8
African region	11.0	12.8	176.9	200.7

^{a/} Averages for 1960/62

* Source: FAO/ECA joint study on "Timber Trends and Prospects in Africa", 1965.

Table 6. Africa: annual consumption in 1959/61 and estimated requirements in 1975 for processed wood products a/

(in million units as indicated)

	Annual consumption 1959-61	Estimated requirements 1975
<u>Western Africa</u>		
Sawnwood (m ³)	1.10	2.39
Plywood and veneer (m ³)	0.03	(0.15 b/
Fibreboard and particle board (tons)	0.02	0.26
Paper and paperboard (tons)	0.08	0.26
Total in terms of wood raw material (m ³)	2.56	5.85
<u>Eastern Africa</u>		
Sawnwood (m ³)	0.82	1.62
Plywood and veneer (m ³)	0.02	(0.20 b/
Fibreboard and particle board (tons)	0.03	0.28
Paper and paperboard (tons)	0.10	0.28
Total in terms of wood raw material (m ³)	2.05	4.42
<u>Northern Africa</u>		
Sawnwood (m ³)	(1.00)	1.74
Plywood and veneer (m ³)	0.09	(0.33 b/
Fibreboard and particle board (tons)	0.02	0.81
Paper and paperboard (tons)	0.29	0.81
Total in terms of wood raw material (m ³)	3.14	6.67
<u>Southern Africa</u>		
Sawnwood (m ³)	(1.08)	1.34
Plywood and veneer (m ³)	(0.03)	(0.30 b/
Fibreboard and particle board (tons)	(0.06)	0.86
Paper and paperboard (tons)	0.06	0.86
Total in terms of wood raw material (m ³)	3.46	5.74
<u>African region</u>		
Sawnwood (m ³)	4.00	7.09
Plywood and veneer (m ³)	0.18	(0.98 b/
Fibreboard and particle board (tons)	0.12	2.21
Paper and paperboard (tons)	0.83	2.21
Total in terms of wood raw material (m ³)	11.24	22.68

a/ Sub-regional figures may not add to regional totals due to rounding.

b/ Total board products in million m³.

Source: FAO/ECA joint study on "Timber Trends and Prospects in Africa", 1965.

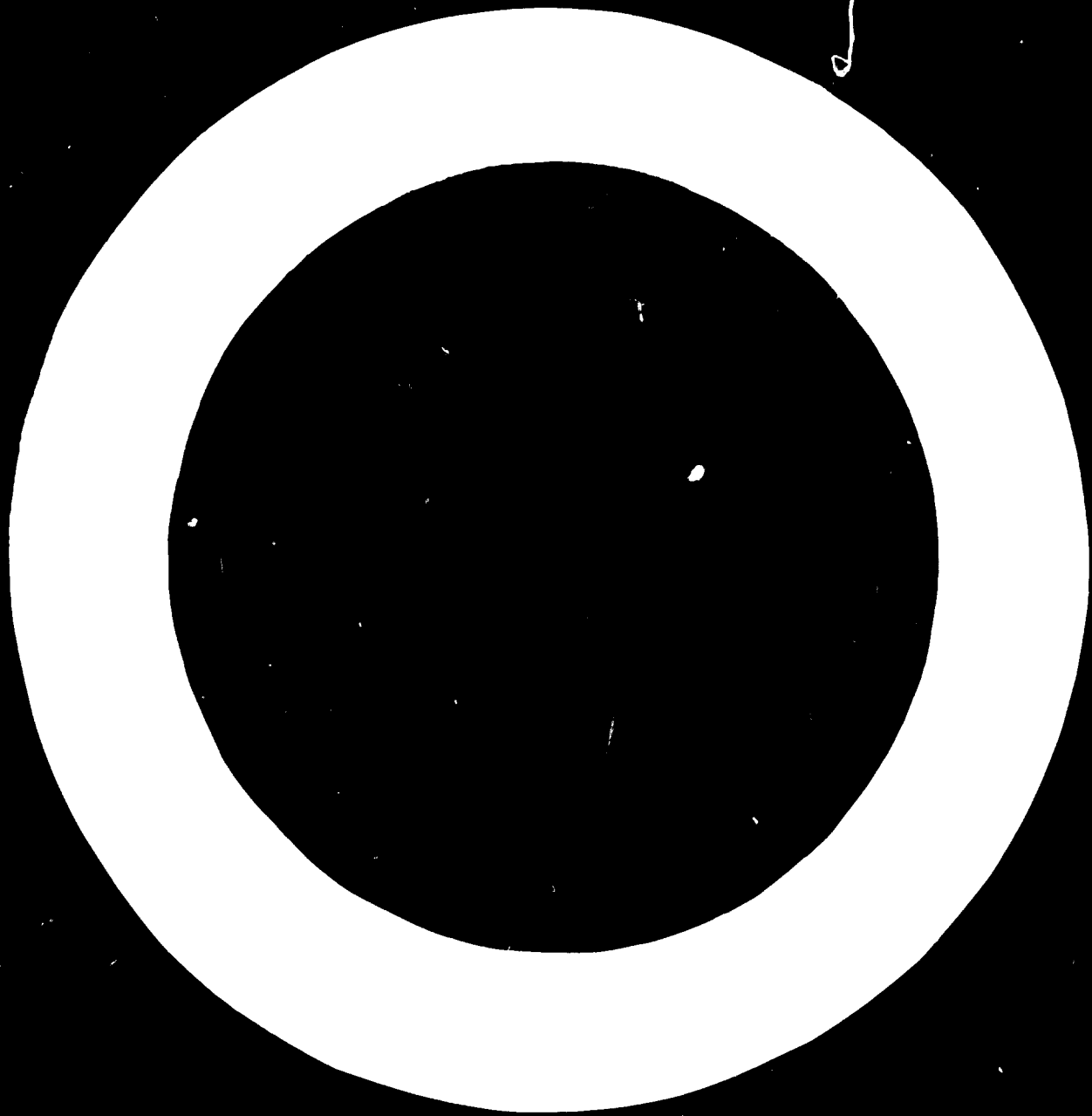
Table 7. Forest Plantation areas in Africa 1961 - 1964

<u>Sub-region</u>	<u>Conifers</u>	<u>Broadleaved</u>		<u>Total</u>
		<u>Eucalypts</u>	<u>Others</u>	
	----- areas in 1000 hectares -----			
Northern Africa	31	170	31	232
Western Africa	1	62	150	213
Eastern Africa	162	255	190	607
Southern Africa	461	169	373	1003
<u>Total for Region</u>	<u>655</u>	<u>656</u>	<u>744</u>	<u>2055</u>

Source: Secretariat Paper II (Appraisal of the Region's Fibrous Raw Material Supply) ECA/ETAO/FAO Conference on Pulp and Paper Development in Africa and the Near East, March 1965.

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