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U. S. Hardwood Imports Grow as World Supplies Expand

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Rapidly increasing imports have captured a significant share of America's hardwood markets. Total imports of hardwood raw materials and building products are now four times as large as exports. Before World War II the U. S. was a net exporter of hardwoods, and imports were limited to high-quality mahogany and specialty logs and lumber.

Availability of large volumes of competitively priced imports has led to a doubling of U. S. consumption of hardwood plywood in the last 10 years. Lumber, principally from tropical areas, comprises an increasing share of the fine hardwood used in furniture and other manufactures. Though not covered specifically by this report, imports of wooden consumer products such as housewares, furniture, and sporting goods have also risen rapidly.

Though imports comprise only 7 percent of the present supply, they have contributed to the many difficulties of the American hardwood industry. Most imports are clear logs or products with defect-free surfaces. They have absorbed a large share of the market previously held by the best grades of American hardwood timber. Thus availability of low-cost imports has tended to reduce prices and profit margins on many high-quality domestic products. U. S. firms, particularly lumber producers, have traditionally depended on high-value grades for the largest part of their profits. Together with the scarcity of good timber, the increased competition has caused financial difficulties in some firms and discouraged output increases in others.

Hardwood imports are almost certain to continue rising. The U. S. still purchases only a small fraction of the hardwood in world trade. Supplies of timber cut in southeast Asia and West Africa, now mostly shipped to Europe and Japan, have expanded much more rapidly than U. S. imports. The potential output from tropical countries with developing forest industries is large relative to America's demand for fine wood. Many factors, however, will influence the rate of increase in imports. Among them are the potential demand in the U. S. and in other developed countries, and the growth of logging in the tropics. If species other than true mahogany (from Latin America), lauan (Philippine mahogany), and khaya (African mahogany) continue to gain popularity in the U. S., growth of imports may be rapid.

This report will discuss first the changes in the world hardwood trade; then, trends in U. S. imports of hardwood; and finally, potentialities of various foreign areas for increased shipments to the U. S. The analysis is based primarily on records of U. S. imports *(26)*,[1] world timber production and trade *(10,12)*, and world forest resources *(13)*. Regional analyses of timber trends and prospects have also been consulted *(7,9,15,16)*.

WORLD HARDWOOD TRADE

The increase in U. S. hardwood imports is part of a drastic shift in consumption and production patterns throughout the world.

Trends in the U. S. are Diverse

In 1947-48, the U. S. produced and consumed more than 40 percent of worldwide hardwood output.[2] The volume has since declined steadily (fig. 1).

Most of the 19-percent reduction in consumption—roughly from 9.8 billion board feet a year in 1947-48 to 8.0 billion feet in 1961-62—is due to losses in markets for low-grade hardwoods for crating and shipping boxes, railroad ties, and flooring. These losses have been partially offset by increased use for pallets and, more importantly, in manufacturing and paneling. The market for low-grade material has slackened considerably while the demand for clear wood has increased.

U. S. production has declined even more than consumption. The lumber and plywood indus-

[1] Italic numbers in parentheses refer to Literature Cited, p. 20.

[2] Volumes for major products have been converted to approximate roundwood volumes by applying the following equivalents per 1,000 board feet of logs:

Roundwood, 4.30 cubic meters	Plywood, 1.87 cubic meters (3,170 square feet, $\frac{1}{4}$-inch)
Lumber, 2.36 cubic meters	Veneer, 2.26 cubic meters (9,600 square feet, 1/10-inch)

Cubic meters are measured as solid wood at nominal product dimensions.

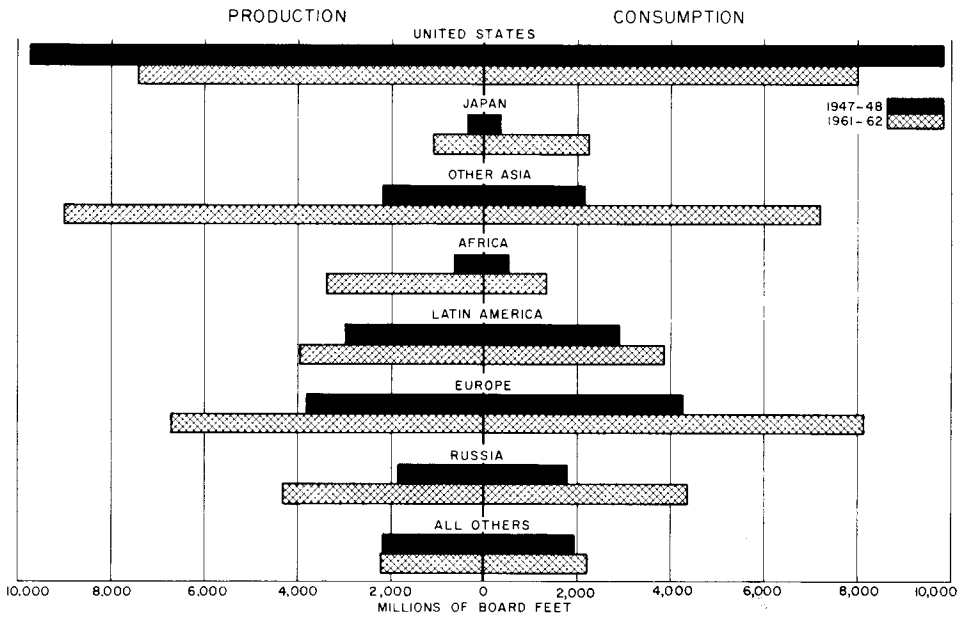

Figure 1.—*Hardwood production and consumption has expanded in world areas other than the U. S.*

tries face a growing scarcity of timber of sufficient concentration, size, and quality. The resources of the Ohio Valley and Lake States have been repeatedly high-graded, and a majority of upland hardwood stands in the Eastern United States contain only small, low-grade, or cull trees *(24)*. In the areas of greatest industry concentration—the Mississippi Delta, other southern river bottoms, and the southern Appalachians—the supply of prime timber continues to dwindle. As a result, timber prices have steadily risen, and those for veneer logs of the best grades are now extremely high. Overall, less than one-fifth of U. S. hardwood sawtimber is 15 inches d.b.h. or larger and of grades 1 and 2 *(27)*.

In the last decade timber shortages have caused substantial numbers of lumber and veneer operations to close. To stay in business many American firms have concentrated on expanding remanufacturing — for dimension stock, parts, flooring, and prefinished products —and on improving operating efficiency.

The U. S. has a plentiful supply of low- and medium-grade hardwood timber relative to the shrinking demand for products from such timber. It is the gap between the growing demand for high-grade hardwood products and our diminishing ability to supply them, at current world prices, that has encouraged imports.

The trend in imports has been toward manufactured products, rather than logs. A few American firms have opened up foreign operations to obtain logs for U. S. processing, but this course is less economic than it is for firms of other nations. Ocean transportation is more costly and less frequent from tropical ports to U. S. wood-processing areas than to Europe or Japan *(1)*. Higher American wages, as compared to those in primary or secondary producing countries, apparently are not fully offset by increased productivity. Except in the Philippines the U. S. has no long-established connections with former possessions having major hardwood resources. The business climate in Latin America has not encouraged capital investment in logging or wood products manufacture.

World Consumption Increases

In countries other than the U. S. and Canada, consumption of both fine and utility grade hardwoods has risen rapidly. Europe, which once used less than half as much hardwood as the U. S., now consumes more. Trends are similar to those in the U. S.—increased use of items like paneling and flush doors, but substitution of other materials for structural purposes, packaging, and mining *(16)*. As Europe has never had such high per capita use as has

prevailed in the U. S., increased demand resulting from economic growth has masked the effects of substitution. Similarly, large increases in consumption have occurred in Japan and other Asian countries, and moderate ones in Australia, Africa, and Latin America, and reportedly in Russia.

Industralized countries are generally finding that domestic forests can furnish only part of their hardwood demand, even though Europe, Japan, and Russia have increased the volume cut from native hardwoods by 75 percent or more. Many European hardwood forests are either being logged too heavily or are at the limits of allowable cuts. Japan has been liquidating hardwood stands and converting to softwoods.

Most industralized countries increasingly import both raw materials and finished goods. Western Europe now purchases abroad 18 percent of its total hardwood requirements, Japan 52 percent, and Australia and New Zealand 7 percent, and Russia 1 percent. In comparison, the U. S. imports 7 percent.

The bulk of the new hardwood supply is coming from southeast Asia and West Africa. In many countries—such as the Philippines, Malaysia, Ghana, Nigeria, and Cameroun—logging in the lush but highly varied tropical forests has greatly increased the supply of fine hardwoods. So far most tropical exports, financed by European or Japanese capital, have been log shipments. In 1961-62 shipments to Japan and western Europe averaged nearly 3 billion board feet per year—five times the total volume of U. S. imports.

Logging in the West Indies and Central America, the traditional U. S. sources of exotic hardwoods, has declined in the postwar period. South American countries, which increased their cut by 33 percent from 1947-48 to 1960-61, have used most of the additional volume themselves.

Supply From Tropics Grows

The vast increase in Asian and African timber cutting has been due to two factors: rapid mechanization of many logging and transport operations, and broadening of the number of species marketable for plywood.

In West Africa and southeast Asia, loggers have mechanized rapidly. In skidding, hand rolling and draft animals have given place successively to crawler and wheeled tractors. Though narrow-gage railroads are still operating in old areas, most loggers in newly opened regions use roads and diesel trucks. Loading, a problem with the very large, high-value logs, is often accomplished by mechanized cranes and lift-trucks. Some loggers in the tropics have equipment more powerful than any found in hardwood areas of the U. S. *(6,21)*.

Once American and European tractors and other equipment would not stand up in the tropics, but this situation is rapidly being corrected. Increasing experience with tires, maintenance, road construction, and supervision is steadily reducing costs and permitting logging of species and areas formerly considered inoperable. In lumber and plywood manufacture, experience is also being accumulated. Two very large modern sawmills are operating successfully in West Africa *(5)*.

The shift to plywood and veneer has helped develop technology for processing previously unused woods. In Europe and Japan, as in the U. S., markets for plywood and veneer have seen phenomenal growth, whereas those for solid cabinet and furniture lumber have expanded less rapidly. Many soft and readily turnable woods have been found suitable for plywood and cheap to manufacture *(3)*. The result has been a great expansion of exportable species.

Before World War II the export trade was largely in heavy woods for exposed portions of fine furniture and in lumber of medium density for general manufacture, paneling, and millwork. Today the bulk of the volume is in species suitable mainly for plywood or veneer, and which sell for half the price of cabinet woods. Among the major exports are many species with exotic names—okoume, obeche, sapele, abura, utile, agba, makore, doussie, azobe, iroko, and some 20 others. Some of these are species of secondary forests and abandoned fields, and their harvest thus does not deplete the reserve of high primary forests.

The Philippines and the Borneo provinces of Malaysia are fortunate in that a number of prevalent species are so similar they can be marketed either as lauan or apitong *(22)*.

Only a small part of the increased international trade is in woods with unique proper-

ties. Examples are teak from Burma and Thailand for ship decking and other uses, and lignum vitae from Central America and the West Indies for purposes requiring resistance to splitting. Similarly, American walnut for veneer is exported to Europe and Japan.

Though most tropical logging is classified as "destructive" and is a cause of some alarm, opinions differ as to the long-run economic effects. Some is salvage cutting, removing stands from areas to be devoted to rubber, cocoa, or other crops. Some is on tracts that would have been lost to the shifting agriculture of native populations. Many tropical foresters believe that the only profitable way to manage the highly variable timber is to cut heavily and "enrich" the stands by seeding or planting, or to clearcut and establish solid plantations *(4,17)*.

Many tropical countries encourage timber shipments to diversify exports. This is one way to reduce dependence on the fluctuating world markets for agricultural products. Earnings from timber sales help pay for imports of consumer goods and equipment and supplies for economic development. Construction of roads and related transport facilities for the timber trade aids other development programs, and governments hope that growth of sawmilling and plywood manufacture will encourage additional manufacturing industries *(29)*.

Areas with moderately low-cost but technically proficient labor—such as Japan, Hong Kong, Taiwan, Italy, Belgium, and Israel—profitably import tropical logs, manufacture them, and export them as plywood or other products. Plywood output of these secondary producers has risen rapidly, because the advantages of technical and commercial development outweigh the benefits of cheap labor in most emerging tropical nations. Industralized countries also gain from utilizing mill residues for byproducts.

Prices, Freight, and Tariffs Important

Diversity of species and absence of generally applied grades complicate world price comparisons. The lack of grades also increases the uncertainty in trading, makes price negotiation difficult, and hinders the establishment of new markets.

Prices of hardwood logs declined after the early 1950's, but have recently been rising (fig. 2). Average log values obscure the sharp price increases for top-grade roundwood suitable for veneer *(11)*. Lumber, however, has risen steadily in price. As world output of plywood increased and technology improved, plywood prices tended to drop, particularly in the American market.

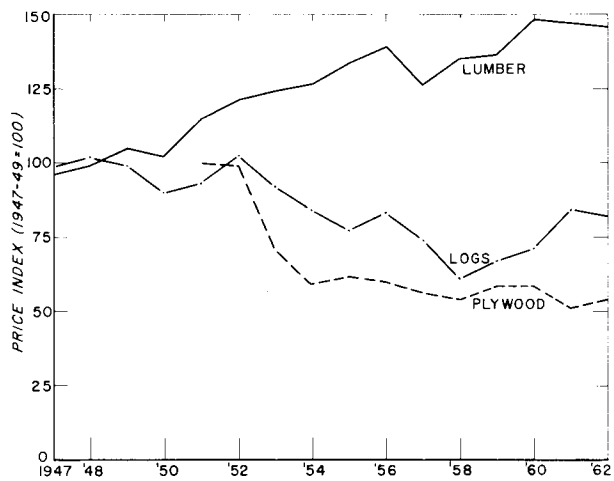

Figure 2.—*Average prices for imported plywood and logs have dropped, those for lumber have risen.*

The significance of these price trends depends on the relationships to competing domestic products. In Europe the price differences between high-quality imports and domestic logs and lumber have tended to narrow. The result has been a great stimulation of imports and their widespread substitution for native hardwoods *(3)*. In the U. S. prices of imports and of the best grades of domestic logs and hardwood lumber have both risen, with no pronounced changes in price relationships. The most notable change has been the sharp drop in the price of imported plywood, which has greatly expanded the plywood market.

Ocean transport costs are an important influence on hardwood prices. Rates for less than shipload quantities on scheduled freighters are tightly controlled by the international shipping conferences, which are cartels composed of the major companies serving particular trade routes. In the last 15 years the conferences serving principal tropical timber producing areas and Europe or the U. S. have raised rates in a number of sharp jumps. Confusion has

been created by capricious rate changes such as those made by the West Africa Lines Conference in 1958 and 1959 *(8)*.

Ocean freight charges depend on amount of trade between ports and the number and nationality of lines competing. Rates from Asian and African tropics are generally higher to the U. S. than to Europe. Additional freight economies are obtained by European and Japanese importers whose shipments of logs and lumber are large enough to enable them to charter vessels. Their costs are much below conference rates, particularly since the ships can often obtain bulk cargo for the return voyage.

Freight costs per unit of finished product are higher if the wood is shipped as logs rather than as lumber, veneer, or plywood, especially since rates are based on cargo volumes. Roughly 30 percent of a hold filled with logs is void, and additional space is occupied by wood that will become residues *(6)*. Squaring tropical logs prior to export, a practice dying out with the growing use of logs for plywood, reduced transport cost appreciably but wasted wood. Savings in freight are among the important reasons for the trend toward processing the timber near its origin.

At present, higher tariffs on manufactured products than on logs either partially or wholly offset differences in freight. Though most duties on lumber have been reduced, those on veneer and plywood still tend to make production in the tropics uneconomic *(14)*. In addition, most European countries grant preferential tariffs to former colonies and possessions. The preferential duties on timber from the British Commonwealth, which includes the major timber producing areas of Ghana, Nigeria, Burma, and Malaysia, give these countries an advantage in the United Kingdom. Former French and Belgian colonies in West Africa—Ivory Coast, Dahomey, Cameroun, Gabon, Congo, and the Congo Republic—have similar preferential status in the Common Market areas. Logging concessions, investments, and commercial connections established under colonial rule have also been preserved *(8)*.

U. S. duty rates on most hardwood items other than veneer and plywood are too low to affect trade. Logs enter free. Specific tariffs on lumber range from $1.50 per M b.f. for many species, including lauan, to $3.00 per M b.f. for balsa and teak. On seven species of hardwood lumber which are imported in small quantities, duties are 2½ percent of wholesale value. Strip flooring has a duty of 4 percent and block flooring 16-2/3 percent.

Duties on plywood, however, increase prices in U. S. markets substantially. They range from a low of 15 percent for birch to a high of 40 percent for Spanish cedar. Veneer rates are also levied as a percent of value—8 percent for birch and maple and 10 percent for all other species.

U. S. HARDWOOD IMPORTS

In recent years import trends have shifted substantially—in volume, source, species of wood, and the proportion in various stages of manufacture. Plywood and veneer, which contributed most of the postwar increase in imports, now comprise 55 percent of hardwood imports by volume, and 72 percent by value. Lumber imports have also risen substantially; log receipts rose and then fell. Though flooring and dimension have gained, they still constitute only 1 percent of imports. Figure 3 shows how these varying changes have altered the proportions of imports.

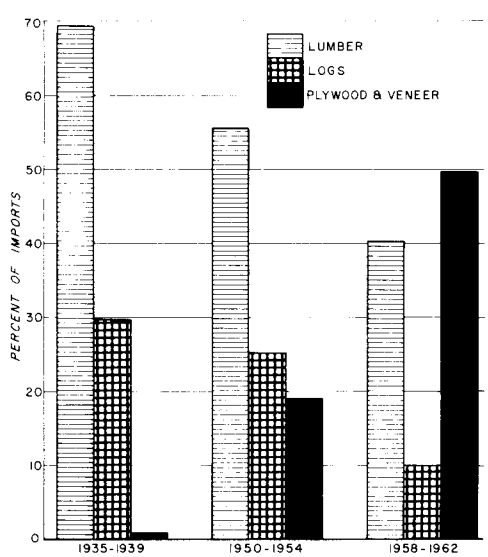

Figure 3.—*Plywood has eclipsed lumber as the major hardwood import.*

The rise of imports has been relatively steady, with fewer reversals from economic conditions than before the war. The recessions of 1949, 1952-53, and 1957-58 caused minor declines that were promptly reversed. Trends in imports of each product are tabulated in the Appendix.

Logs

Imports account for less than 1 percent of logs consumed by U. S. mills, but nearly all must be prime quality to justify ocean freight. Some U. S. firms at major ports have long specialized in cutting tropical logs. Though some log-importing plants have closed, additional mills have begun importing to supplement dwindling and expensive domestic supplies.

From an average of 37 million board feet in 1935 through 1939 log imports more than doubled within a few years after the war. After 8 years of irregular shipments, imports dropped 25 percent in the 1957 recession and declined more since. In 1963 the total was 54 million, nearly the low for postwar years. Year-to-year variations have been large, and appear attributable chiefly to logging conditions in producing countries and changes in trade policy. Annual shipments are not statistically related to prices of imported logs or of domestic or imported lumber or plywood. Nor are they connected with demand for hardwood consumer products.

The major areas from which the U. S. imports logs—Latin America, Africa, Asia, and Canada—have kept their relative positions in the dwindling market. Individual countries, such as British Honduras, Mexico, and several in the West Indies, have virtually ceased shipments. The major Latin American sources are now Columbia and Nicaragua. The drop in African imports is largely equal to the sharp reduction in shipments from Ghana. Figure 4 shows the 1963 pattern of log imports.

Shifting sources of log imports have led to a decreased percentage of both true mahogany from Latin America and khaya (African mahogany), largely from Ghana. Shipments of lauan and similar species increased rapidly from the end of the war to the mid-1950's, but then fell to less than one-fourth of the market as Japanese mills began to outbid the U. S. for Philippine logs. These declines have been partially offset by receipts from Columbia. Though the growing volume of expensive lignum vitae and teak is still only 1 percent of imported logs, the value now varies from 4 to 5 percent of the total.

Lumber

In the late 1930's the U. S. exported twice the volume of hardwood lumber that it imported. The situation is now reversed. Imports since the war have been triple those of prewar years and at present comprise nearly 5 percent of domestic consumption.

Each postwar recession broke the rise in lumber imports, but the largest influence on annual volumes has been furniture sales (fig. 5). Each 1-percent rise in furniture sales ap-

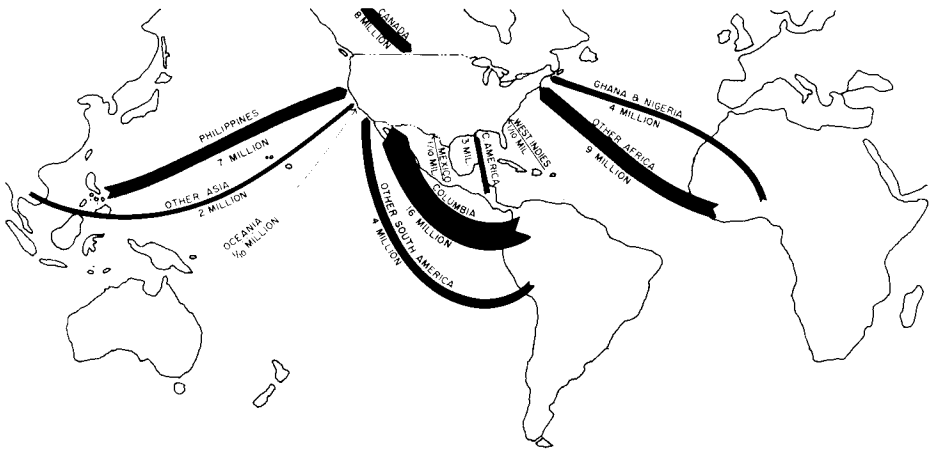

Figure 4.—*The pattern of log imports has changed little since 1948, despite the decline in volume.*

pears to be associated with a 2-percent rise in lumber imports. Rapid increases in prices of imported lumber, though, have limited the growth of sales. The average price of foreign woods rose 50 percent between 1947-48 and 1961-62; domestic hardwoods rose 18 percent. Analysis showed a 1.2-percent drop in imports for each 1-percent rise in the value of foreign wood relative to domestic.

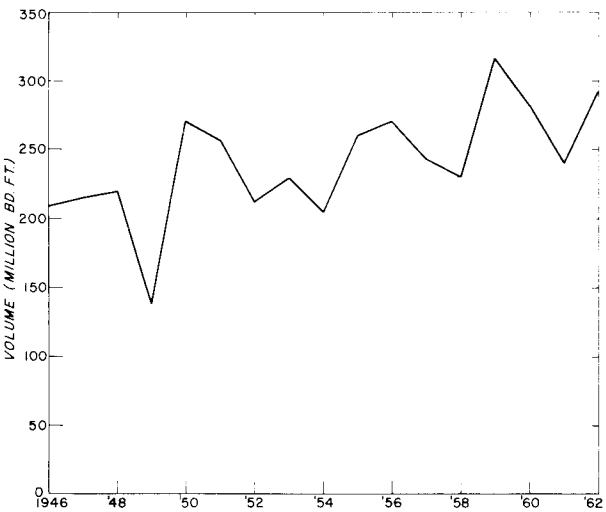

Figure 5.—*The rise in lumber imports is related to furniture sales, but has been dampened by increasing prices.*

Canada has long been the principal source of imported lumber, chiefly beech, birch, and maple. Both Canadian and American sawmills near the border often regard shipments to the other country as routine. Thus while the U. S. imported 123 million board feet from Canada in 1963, it exported 86 million to Canada. Figure 6 shows the 1963 pattern of lumber imports.

The increase in hardwoods has come mostly from southeast Asia, Africa, and northern South America. Though the Philippines have shipped lauan and similar lumber to the U. S. since before World War II, the Japanese entered the market in volume in 1954 with lumber sawn from Philippine and North Borneo logs. Japan now sells considerably more lumber than the Philippines. More recently other Asian areas have begun in-transit sawmilling. While the share coming from Latin America has grown, sources have shifted continually. Nicaragua and Columbia have increased sales; shipments from Mexico, the West Indies, and other Central American countries have dwindled. African lumber sources have also shifted. The share from the two major suppliers, Ghana and Nigeria, has declined while that from other West African countries has increased.

Up to 1952 birch, beech, and maple constituted half of lumber imports, but by 1958-62 their share had dropped to 38 percent. Some lumber of these species comes from Japan as well as from Canada. As the center of Latin American sources has moved to northern South America, the proportion of mahogany has declined and that of cativo and other species has increased. Similarly in lumber imports from West Africa, the shift in trade from Ghana to other countries has led to a decline in khaya. Balsa from Equador, once 5 percent of imports, has declined sharply.

Almost all of the large increase in shipments from Japan, the Philippines, and other Asian countries has been lauan.

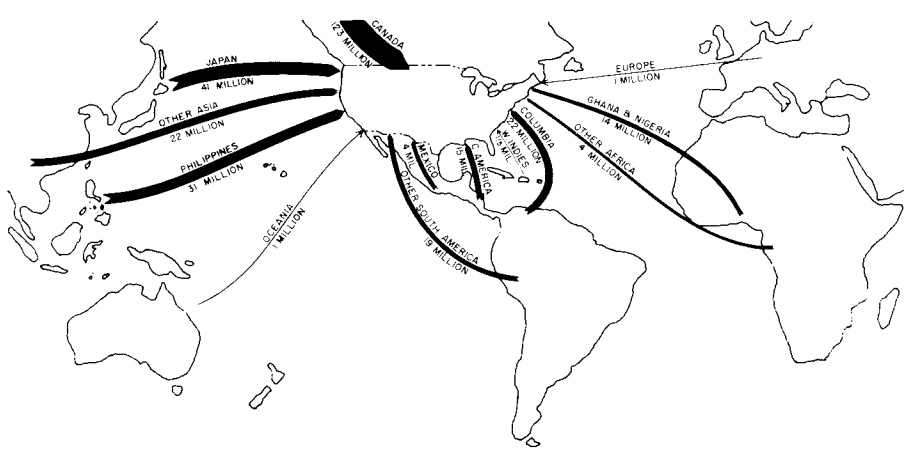

Figure 6.—*The increase in lumber imports is mostly from southeast Asia and Africa.*

Plywood

Plywood now accounts for half of the volume and value of hardwood imports. As figure 7 shows, the rise in shipments began in 1952 and has increased almost steadily. Imports have exceeded domestic output since 1957 and have supplied most of the rapid rise in U. S. consumption.

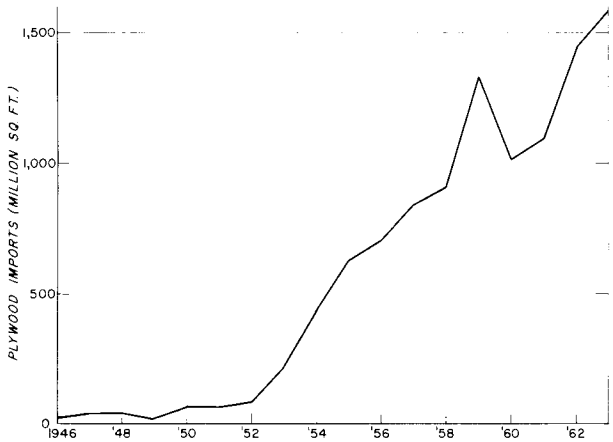

Figure 7.—*Plywood imports have furnished most of the greatly increased U. S. consumption of hardwood plywood.*

Despite a 20-percent tariff, exporters are able to deliver finished plywood at a price highly competitive with that of domestic sheets. The availability of inexpensive imports has helped create two major new markets—flush doors and interior paneling. Between 1947 and 1958 annual output of flush doors rose from a few hundred thousand to more than 15 million. The traditional panel door has been nearly supplanted. For interior paneling in homes and commercial structures, hardwood plywood has made significant gains on plaster and sheetrock, softwood plywood, hardboard, and knotty pine paneling.

The chief stimulus to imports has been the decline in wholesale prices from around $125 per thousand surface square feet in 1951-52 to $70 since 1957. Prices for domestic sheets have also declined, but not so rapidly. Since 1958 imports have varied with the level of construction expenditures.

Though imports have not caused domestic production to drop, they have depressed prices. Domestic plywood has long been able to sell at a premium over foreign types, but the differential has narrowed considerably.

Nations are competing vigorously for the booming U. S. market. In 1953 Japanese exporters launched their first big sales drive and increased shipments several times over those of the preceeding year. Japan again raised its share of the market in 1957, when it cut prices to $65 per thousand square feet, while sheets from other countires were priced at $110. Other exporters soon followed suit, and as a result Japan's share of U. S. imports has shrunk to 45 percent, though total volume has grown.

Japan's major competitors have been other Asian nations—principally Taiwan, the Philippines, and, in the last few years, South Korea and the Ryukyus (Okinawa)—which have all made sharp gains in sales. In 1963 Taiwan shipped 17 percent, the Philippines 16, and Korea 8 percent of plywood imports (fig. 8).

Canada and Finland supplied nearly all of the small import market of early postwar years.

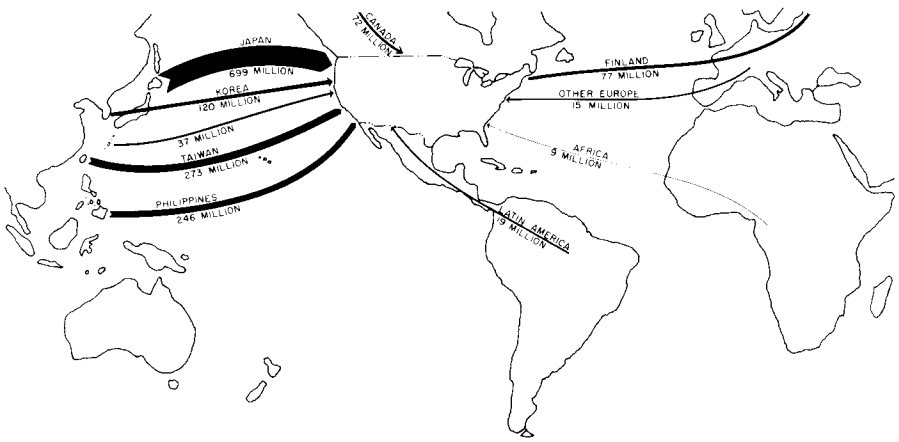

Figure 8.—*The great expansion of plywood imports has largely been from Asian nations engaged in in-transit manufacture.*

but could not long match prices set by Japan and other Asian countries. Surinam is the chief supplier of the small quantities imported from Latin America.

Asian mills, in Japan and elsewhere, peel mostly lauan or similar Dipterocarp timber imported from the Philippines, or more recently, from the Borneo areas of Malaysia. In 1962 these species were three-fourths of all imports. Japan also ships increasing amounts of plywood made from native-grown sen, birch, and other minor species. For the last several years Japan, the Philippines, Okinawa, and other Asian nations have made prefinished and printed plywood as well as natural panels.

With the decline of Canadian shipments, the proportion of birch among imports has dropped from 80 percent in early postwar years to less than 15 percent.

The share of species other than lauan, sen, and birch has slowly increased. Most has come from the fledgling plywood industry in West Africa. Plywood shipped by Italy, France, the Netherlands, Spain, and West Germany is made both from African logs and from lauan and teak from southeast Asia.

Veneer

Imports of hardwood veneer have also steadily increased, reaching an alltime high of 1.4 billion square feet in 1963. The rise has been nearly as steep as for plywood (fig. 9). Imports are used as faces for furniture, lumber and particle board cores, and plywood made in the U. S., but the trend in shipments is statistically related only to the furniture market. For every 1-percent increase in furniture sales between 1947 and 1962, veneer imports rose an average of 6 percent.

The pattern of veneer imports resembles that of plywood, except that the largest share comes from primary timber-growing countries.

As with plywood, Canada's once commanding share of the market has declined substantially. The primary cause has been competition from the Philippines and Japan, the present leading sources. Latin American shipments are also on the rise but comprised only 3 percent of U. S. receipts in 1962. European countries furnish small quantities of specialty veneers cut from logs grown elsewhere. The species of veneer exported by most countries are the same as the species of plywood.

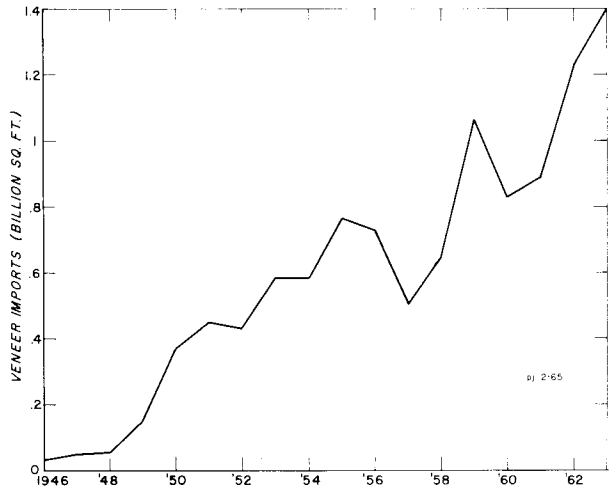

Figure 9.—*Imports of veneer, like those of lumber, are closely related to the growth of U. S. furniture sales.*

Flooring

Imports of hardwood flooring, negligible in prewar years, are still small relative to the total U. S. market. The business is marginal. Virtually all comes from Canada and is cut to the same pattern as domestic stock. The proportion from other countries has risen slightly in recent years. Shipments fluctuate widely from year to year, depending on home construction activity.

Effects on U. S. Industries

Imported lumber and flooring, being a small proportion of the total U. S. supply, affect domestic output and prices less than do rapidly changing markets, increasing operating costs, and declining raw material supplies. But with further widening of the gap between domestic demand and supply of fine lumber, a rapid increase in imports can be expected. And greatly enlarged volumes might produce efficiencies in exporting countries that would substantially improve their competitive position.

The effect on the small U. S. plywood industry, in contrast, has been substantial. The typical plywood firm is a small business producing about 13 million square feet per year and employing 50 to 300 men. All together, there are 130 plants, mostly east of the Missis-

sippi River, with an employment of 15,000. Evidence on the effect of imports comes mainly from reports of the U. S. Tariff Commission *(28)* on applications of the plywood industry for increased tariff protection. These applications were based on an escape clause, now no longer in effect, that provided relief for vital industries severely hurt by imports.

In 1955 the Commission reported that 40 percent of the companies submitting records operated at a loss in 1954, that net income was one-third that of 1951, and that employment was down 12 percent from 1948. In 1959 the Commission again found price declines caused by foreign competition. Profits had continued to fall, and 39 percent of the firms operated at a loss in 1958. The industry's proposals for tariffs and other restrictions were denied in 1955 and again in 1959.

To obtain relief under the Trade Expansion Act of 1962 it must be proved that the industry has been damaged by recent reductions in tariffs. But plywood tariffs have not been lowered for many years. The act allows duties on broad ranges of products to be reduced in return for concessions of other countries on American goods. Such concessions are generally made during negotiations under the General Agreement on Tariffs and Trade (GATT).

In the past decade, nearly 50 bills were introduced in Congress to limit competition from foreign woods. The most important would have (a) required imposition of quotas, (b) barred foreign products in construction insured by the Federal Housing Administration and the Veterans Administration, (c) required imports to be grade-marked within the U. S. and labeled as to country of origin, and (d) extended the Agricultural Marketing Act of 1937 to forest products, so as to give the Secretary of Agriculture power to regulate lumber imports *(20)*.

Several counter-arguments were used to defeat these proposals. Discrimination against the two biggest shippers, Canada and Japan, might bring retaliation, since U. S. sales to these countries exceed $5 billion annually. American hardwood industries are not at all infants, it was argued, and high tariffs or import restrictions would do little to remedy resource depletion, equipment obsolescence, management deficiencies, and inadequate marketing.

More important, reduction of tariffs not necessary for national security has been advocated by each Administration for 30 years in order to foster world trade, economic development, and peace. Under reciprocal trade agreements and membership in GATT, average tariffs have gradually declined from the high 1930 rates.

How imports affect U. S. timber resources is a matter of opinion. From one viewpoint, they deprive American stumpage holders of markets, lower stumpage prices, and if increased will threaten the future profitability of managing hardwood timber stands. Another viewpoint holds that imports will maintain markets for fine hardwoods while allowing American forest managers to retain enough high-quality growing stock to produce future crops. If domestic consumption in postwar years had all come from American timber, the resource—particularly southern hardwoods—would have been depleted even more severely than it was. Still more likely, markets may have been permanently lost to substitutes.

Faced with the prospect of continued intense competition, some plywood producers are taking constructive measures. A few firms have merged or consolidated with larger wood products organizations. These steps have allowed them to improve mechanization, log utilization, product development and marketing. Several firms have invested in overseas plants to furnish face veneers for application to domestic hardwood or softwood cores and backs.

PROSPECTS FOR HARDWOOD IMPORTS

U. S. experience with imports has mostly been with a limited number of species from a few countries. Present patterns give only a rough picture of the potential of foreign areas to supply hardwoods. Some traditional suppliers can scarcely maintain present rates of cutting; others are just beginning to develop capacity for logging and processing timber. Increases in imports will all come from tropical forests.

A decade ago, further sizable penetration into the American market would have required

large percentage increases in exports from tropical countries. But since the vast expansion of the world timber trade, even doubling U. S. imports would require only 26 percent larger shipments from southeast Asia and West Africa. Thus a diversion of large volumes of timber and wood products to the U. S., in response to favorable prices or market conditions, could easily be accomplished.

Resource and production statistics of the various countries are difficult to compare. Large areas of presently nonaccessible timber have been inadequately surveyed *(23)*. Timber harvest and production is frequently understated, particularly when reporting units are small and isolated. Despite the FAO's efforts to obtain uniformity in definitions, measurements, and reporting, substantial differences remain. Nevertheless recent statistics indicate potential supplies. The following discussions of possible increased trade from Asia, West Africa, and Latin America are largely based on FAO surveys of timber trends and prospects for these areas *(7, 9, 15)*.

Asia's Potential is Enormous

Hardwood production has risen faster in southeast Asia than in any other region. Between 1947-48 and 1961-62 timber cutting expanded fourfold, with most of the gain coming from three small areas: the Philippines, and the North Borneo and Sarawak provinces of Malaysia.[3] Only a small fraction of the increased timber output has been shipped, directly or indirectly, to the U. S.

Tropical forests in southeast Asia supply 13 percent of the world's hardwood raw materials, measured in roundwood equivalents. The bulk of the export volume comes from the rain forest that covers most of the Malay peninsula, Borneo, Sumatra, and the southern Philippines (fig. 10). This type merges with seasonal monsoon forests in southwest India, Ceylon, Burma, Thailand, eastern Indonesia, New Guinea, and northeast Australia. In heavily populated areas the forest has been extensively cleared for agriculture; in parts of Burma, Thailand, Malaysia, and the Philippines it is being logged for export; and elsewhere, as in

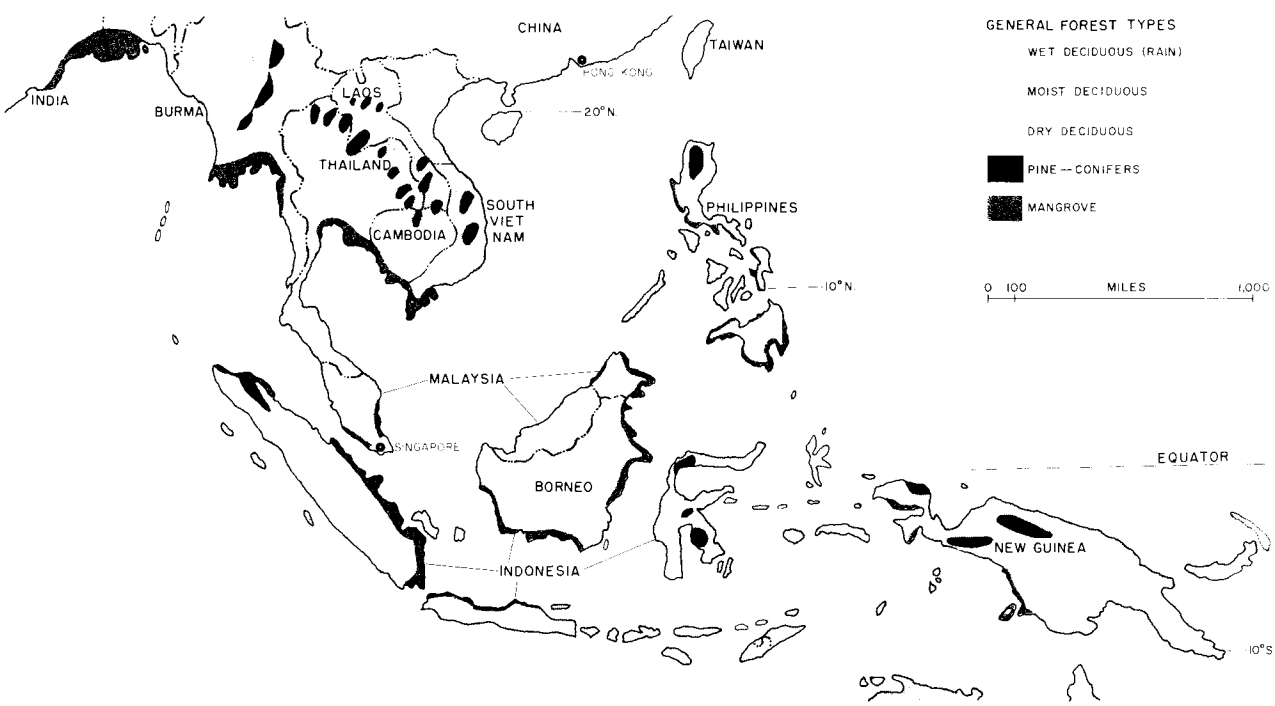

Figure 10.—*Extensive forests of southeast Asia are a probable source of increased hardwood shipments to the U. S.*

[3] In September 1963, the Republic of Malaysia was formed from the Federation of Malaya (a former British colony given independence in 1957) and the British possessions of Singapore, North Borneo, and Sarawak.

Sumatra, Borneo, and New Guinea, large areas are untouched and even unexplored.

Many timber stands have relatively high proportions of commercial species. In the Philippines, Borneo, and Malaysia the dozen or so species sold as lauan and another dozen known as apitong may comprise 30 to 40 percent of a stand's volume. In Burma, Thailand, and India teak and sal comprise a sizable proportion of stands being cut.

The total forest area of southeast Asia is extremely large (fig. 11). The mainland has 150 million acres developed for logging; the stands contain some 500 billion board feet of sawtimber. The marketable portion varies widely with timber type and location. Roughly the same amount of forest area has been opened for logging on the islands, but the remaining volume is nearly twice as great, or roughly 1 trillion board feet. The largest portion of the offshore timber is in Indonesia.

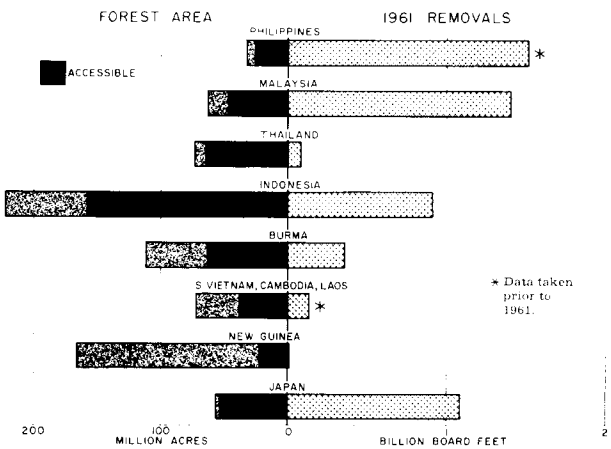

Figure 11.—*The Philippines, Malaysia, and Japan have higher rates of hardwood timber cutting, relative to resources, than other Asian nations.*

Considerable timber grows in the less populated areas that are accessible but in which no timber is now being harvested commercially. In addition there are large blocks of timber on inaccessible lands in New Guinea and the outer islands of Indonesia. These areas contain some 250 million acres of forest, half of which is estimated to be potentially commercial.

Immediate increases in output will have to come from more rapid logging of the forests now being cut and from areas classed as unexploited but accessible. Parts of Burma, Thailand, and the Philippines have been over-exploited, but immense forests have not been cut at all. In these places and elsewhere, general economic development may soon open up extensive new areas. Most nations are aware of the need to reserve forests and to plan logging to perpetuate the supply. But progress varies widely from country to country. Research on natural regeneration and plantations is well developed and has demonstrated that plantations can yield high volumes of export species on short rotations.

In the Philippines logging operations are larger and more mechanized than elsewhere in southeast Asia. Modern tractors, trucks, loaders, and even high-lead yarders are in wide use. Philippine forests are well suited to mechanical equipment. The lauans, apitong, tangile, and other commercial species average 18 to 20 M b.f. per acre. Much of the forest is near deep water where the logs can be picked up for shipment. These advantages have enabled the Philippines to export huge quantities of logs, mostly to the Japanese plywood industry.

Manufacture and export of lumber, veneer, and plywood from the Philippines is small but rising rapidly. The U. S. buys roughly three-fourths of the Islands' lumber exports—purchases rose from 1 million board feet in 1946 to 51 million in 1959. Since 1960 Philippine veneer has comprised one-fourth of the total imported by the U. S. and almost all of the lauan.

Up to now the Philippines have been handicapped by inadequate trade channels, lack of a universally recognized and applied grading system, frequently uneven quality control and packing practices, and heavy freight charges and infrequent sailings. Moderately high wages and high costs for equipment, service, and maintenance were handicaps prior to the Islands' currency devaluation in 1962. The proportion of normal duties levied on Philippine goods entering the U. S. has been increased *(22)*.

The Philippine Republic has considered an embargo or export quota on logs to Japan. Since the Japanese are the Philippines' best customers for logs and the sales provide needed foreign exchange, action will probably be delayed until the Philippines can more nearly compete in the manufacture of plywood and lumber *(22)*.

Much of the accessible Philippine forest has already been blocked into logging concessions and allocated to native and foreign firms. While many blocks will last for years new concessions are difficult to obtain. Hence, Japanese and other buyers of veneer logs are increasingly seeking virgin sources in North Borneo, Sarawak, and other southeast Asian areas. As production has grown, logging in North Borneo has greatly improved in efficiency. Tractor and high-lead skidding is supplanting older methods such as man-haulage of log-laden wooden sleds. Road systems have been improved, and heavy hauling equipment is often feasible. As in the Philippines, the incidence of commercial species in Borneo forests favors mechanization. Similar conditions may be present in the outer Indonesian islands and other areas.

Though the areas now forming Malaysia have rapidly increased hardwood logging and processing, shipments to the U. S. have declined. Malaysia's logs go mostly to Japan. Its lumber goes to Britain, Australia, and South Africa. With sufficient capital investment it could develop immense lumber and plywood industries.

Indonesia, which has a larger sawmill industry than either the Philippines or Malaysia, now exports little timber or processed products. With the largest potential supplies of hardwood in Asia, Indonesia could become a dominant lumber and plywood producer. In view of past economic and political trends, such development remains problematic.

Thailand, Burma, and India, as well as Indonesia, export large volumes of teak both as logs and lumber, of which about 1 percent comes to the U. S. Aside from being a valuable cabinet wood, teak is durable and noncorrosive to metal, thus suitable for numerous special purposes. Trees girdled 2 years prior to felling can be floated downstream during the rainy season from otherwise inaccessible areas. Though large acreages in southeast Asia are being managed or planted to teak, U. S. imports are likely to rise more slowly than for other woods.

As should be clear, much of the timber harvested in southeast Asia is processed outside the countries of origin. In 1962 Japan imported 1.5 billion board feet of hardwood logs, two-thirds from the Philippines and the remainder from Malaysian Borneo. These comprised roughly 55 percent of Japan's hardwood log consumption; the remainder was cut from domestic birch, beech, white oak, and maple forests. In hardwood lumber output Japan is second only to the U. S., and it has the world's largest hardwood plywood industry.

Japanese firms benefit from the geographic concentration of their plants and a large home market that provides ready sales for byproducts and lower grades. They have their own sources of equipment and repair and a supply of trained labor. Japanese vessels carry freight at least one-third cheaper than ships of less developed Asian countries *(1)*.

Japan consumes most of its production for housing, packaging, and furniture. It exports only 4 percent of the hardwood lumber and 23 percent of the plywood; about half the lumber and two-thirds of the plywood exports go to the U. S. The home market will probably increase more than 50 percent in the next 15 years, thus absorbing the bulk of future increases in processing capacity. It seems likely that development of other Asian nations will reduce Japan's advantages.

In recent years increasing proportions of the southeast Asian log exports have gone to Korea, Okinawa, Hong Kong, Singapore, and Taiwan. These newcomers to manufacturing-in-transit are just beginning to benefit from large-scale operations. Since their home markets are more limited than Japan's, they rely heavily on exports. Some 3 to 4 percent of southeast Asian logs, principally from Malaysia, are shipped to Europe; another few percent go to the U. S. As Asians become even more efficient in manufacturing, shipments of logs to the U. S. can be expected to decline, and those of lumber and plywood to increase.

Imports From Africa May Increase

Hardwood harvesting has developed as rapidly in West Africa as in southeast Asia. Heavy investments by English, French, and Belgian logging and importing concerns, increased accessibility, and wider species acceptability are responsible for the very rapid growth. Since World War II exports of logs alone, mostly to Europe, have increased fourfold. Volumes have roughly exceeded a billion board feet in recent years, mostly from Gabon, the Ivory Coast, Ghana, Nigeria, and the former French

Congo. In addition, some 200 million board feet of lumber and 240 million square feet of plywood and veneer were shipped annually in the past several years, and the rate is rising. So far, only 1 to 2 percent of the logs and lumber are shipped to the U. S.

Exports come primarily from the rain and semideciduous forests that extend several hundred miles inland along the Gulf of Guinea from Liberia across southern Ghana and Nigeria to Cameroun (fig. 12). A larger belt, 200 to 500 miles wide, continues to the center of the continent, straddling the equator from Cameroun and the mouth of the Congo to the highlands of east Africa. The total timbered area is about 340 million acres, or roughly the hardwood acreage of the Eastern U. S.

Though one-fourth of the forest area is presently regarded as accessible, only a portion of it is currently being logged. With improvements in transport the accessible area is rapidly being enlarged.

In virgin stands the species number in the hundreds and the merchantable trees of any one species may average from 0.1 to 10 per acre. Species distributions are quite erratic. *Khaya* and *Entandrophragnia* species, once in very heavy demand as African mahogany, are indeed sparse. Where they occur at all, avodire, okoume, obeche, limbo, azobe, and niangon are far more abundant. With 70 percent of the cut now in soft veneer woods, a sizable proportion of the virgin timber can be marketed.

Much of the land in populated areas is second-growth forest of soft, fast-growing species that invade abandoned fields. Some of these species are suitable for plywood. The original species reestablish themselves only slowly in the second-growth stands.

Some parts of the forest have been logged more heavily than others (fig. 13). The west-

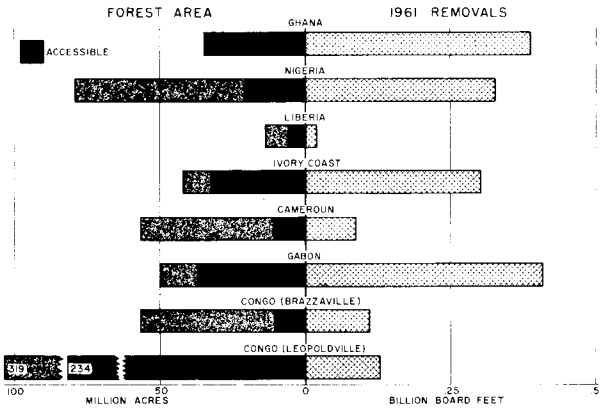

Figure 13.—*The relation of logging to forest resources varies widely in African countries.*

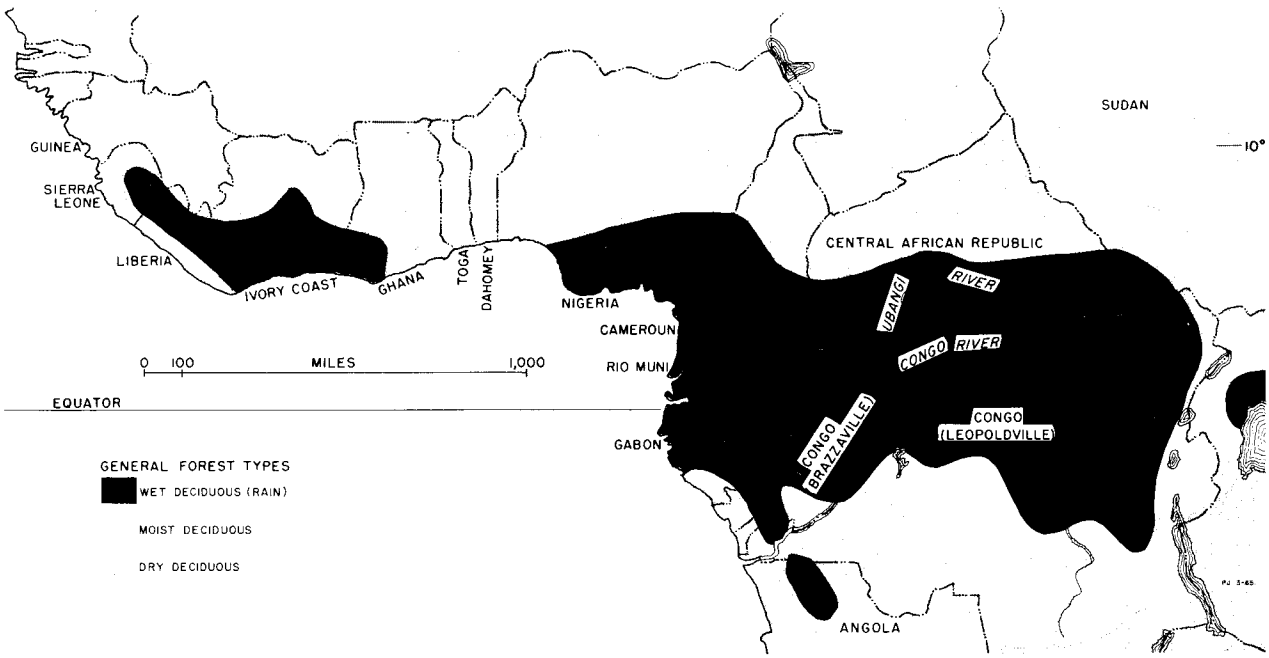

Figure 12.—*Hardwood forests in Africa are largely confined to a belt 10° on each side of the equator and west of the eastern highlands.*

ern sector from Guinea to Nigeria has only 14 percent of the area but produces 54 percent of the timber. The countries on the coast from Cameroun to Angola have 23 percent of the area but 32 percent of the cut. The remaining central African section has 63 percent of the land, but cuts only 14 percent of the total. These relationships give a good indication of the likelihood for expanding logging.

In particular, exports from the two former British colonies in West Africa, Ghana and Nigeria, may well be at their peak. Output in both is at five times the rate of the immediate postwar years, and modernization of logging has been particularly rapid. Lumber and veneer production has expanded in spurts and now consumes almost half the timber harvest. Plywood manufacture has also started.

The huge increase in log exports since the war has resulted partly from clearcutting of areas being converted to other uses. An increasing amount is obtained from selective logging in the permanent forest reserves. In a decade the entire forests of both countries are expected to be made accessible and to come under exploitation.

Nearly all of the 400 million board feet of logs that Ghana and Nigeria exported in 1962 went to Europe. Italy was the largest purchaser from Ghana, and West Germany from Nigeria. Though both Ghana and Nigeria belong to the British Commonwealth, England gets only a fourth of their logs. The lumber and plywood, however, go chiefly to Britain, because of larger tariffs in Common Market countries. In recent years exports from Ghana were disrupted by the government's attempt to control trading through a timber marketing board. Ghana was forced to give up the arrangement, but not before much of the trade went to other African countries *(2)*.

Gains in log exports from either Ghana or Nigeria are not likely. It is probable that both will make a determined effort to increase manufacture of lumber and plywood. They would thus be able to mill low-grade portions of trees for the rapidly growing home market, and simultaneously expand their exports of quality products. But lumber and plywood sales face formidable European tariffs. If European trade restrictions are not eased and the British market cannot absorb increased imports, African manufacturers may try to shift exports to the U. S.

Exports from the French-speaking countries have potential for large-scale gains. Cameroun, Gabon, and Congo (Brazzaville) have been expanding log exports since the early 1950's. The Ivory Coast to the west has more recently become a major exporter. Still largely underdeveloped as timber exporters are the Central African Republic, Congo (Brazzaville), and Congo (Leopoldville).[4] All but Congo (Leopoldville) are former French colonies. Gabon gets 70 percent of its export earnings from timber, Congo (Brazzaville) 58 percent, and the others lesser but still important amounts.

Generalizations about the economic potential of African forests are difficult to make. The standing volume of species in current demand is declining rapidly within the more accessible localities. But areas not yet exploited are several times larger than those that have become exhausted. Surveys in several zones of Congo (Brazzaville) and the Central African Republic found commercial timber over vast areas. Logging is still largely in the coastal zone and in areas adjoining the railway lines, but permits for more remote regions have recently been requested.

The large logging concerns, nearly all European, are highly mechanized. The French areas cut about the same volume of logs as the English, but produce one-third the lumber.

A number of plywood plants operate along the Coast. Most are small, but one in Gabon, started in 1950, is among the largest in the tropics.

Moving production to the interior imposes large financial and organizational burdens on the governments and on the logging enterprises for new transport and other facilities. From studies in Gabon, more than 1,200 miles of roads, including a high proportion of roads for heavy traffic, will be required for commercial logging of the next large block of forest. To log the interior Congo basin will require large-scale improvements along the Congo and Ubangi Rivers.

In 1960 and 1961, 90 percent of the log trade of the four countries was with Europe—40

[4] Congo (Brazzaville) and the Central African Republic were parts of the former French Equatorial Africa; Congo (Leopoldville) was the former Belgian Congo.

percent with France, and 45 percent with other countries of the Common Market. The small lumber trade is nearly all with Europe. While plywood from Gabon is exported mainly to Europe, sales within Africa and to North America are also important. Gabon's veneers go mostly to Europe, but the larger volume from Cameroun and Congo (Brazzaville) is virtually all consumed in Africa.

Greatly expanded exports from French-speaking Africa are likely, but most of the additional output may go to Europe. European demand for veneer logs may increase 2 billion board feet by 1975. All will have to come from the tropics, and will have to include species not now considered merchantable. Large capital expenditures in African logging and transportation facilities will have to be made.

At the same time, these countries will strive for more local manufacture of lumber, veneer, and plywood. The upshot is likely to be extensive changes in tariffs and trade patterns, or else a unified West African policy for forcing the timber trade in manufactured products, or perhaps both.

Committed as they are to the European market, the West African nations are unlikely to contribute much to U. S. supplies in the near future. Nonetheless, only a small diversion of their trade would largely increase U. S. imports. Such a diversion could be brought about by favorable U. S. prices or less than expected growth of the European market.

Latin American Exports Unlikely to Rise Soon

The potential of Latin America to enlarge hardwood exports to the U. S. within the next decade is slight. Most of the accessible timberland has been high-graded or converted to agriculture. To make the vast forests of the Amazon basin and the Guinea highlands operable will require enormous expenditures. In most countries domestic consumption is keeping pace with increases in output. Restrictions on log exports have become numerous, but development of local wood processing industries is slow.

The principal sources were the forests that once covered the West Indies and Central America (fig. 14). Though mountainous terrain and wide variations in rainfall resulted in many timber types, the majority of fine

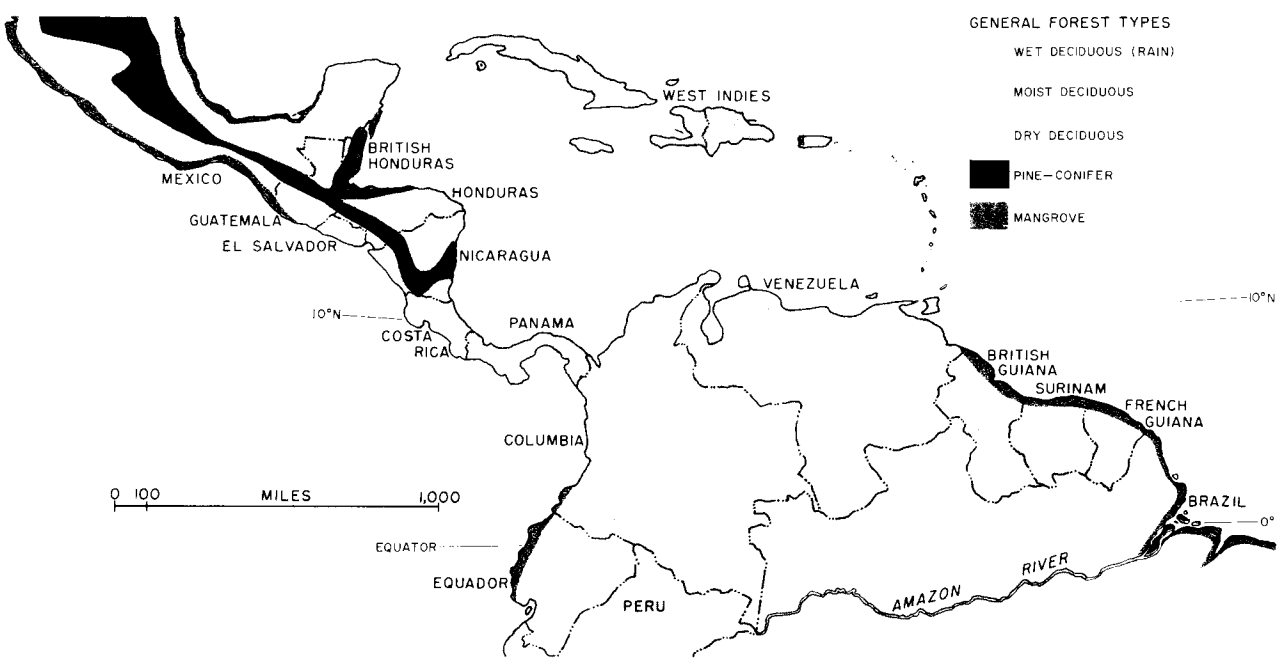

Figure 14.—*Latin American areas of significance to the U. S. timber trade surround the Caribbean and extend into the Amazon basin.*

woods came from moderately moist areas less than 2,000 feet in altitude and with 40 to 80 inches of rain annually. Only a few species were merchantable—mahogany, cedrela, guanacaste, rosewood, prima vera, and lignum vitae—and they were always sparse. Much of this land is now cleared, and produces most of Middle America's sugar cane, cotton, sisal, and beef.

Mahogany is still the mainstay of the export trade. Botanically there are three species whose wood is of nearly equal quality. *Swietenia mahogani*, found chiefly in the West Indies, is now largely exhausted. *Swietenia macrophylla*, the presently dominant commercial species, ranges from the Yucatan Peninsula of Mexico south through Central America into Columbia and the western Amazon basin. *Swietenia humilis* is a minor species found in less moist sites along the Pacific Coast from southern Mexico to Costa Rica *(25)*.

Rain forests cover a larger area than the moderately moist forests, but have less valuable species—cativo, crabwood, Santa Maria, virola, and balsa. Cleared alluvial areas in this forest produce bananas, cacao, and abaca.

The high elevations of Middle America have largely been cleared for coffee and crops needed to sustain the dense populations. Though the remaining highland timber includes pines, oaks, laurels, and other temperate-zone species, most of the wood cut is consumed locally.

The remaining areas of high-grade hardwoods in Mexico and Central America appear to be undeveloped pockets along both coasts. They are not easily accessible by water, and large investments in roads or other facilities will probably be required to extract the timber.

Prior to 1940 the timber in the West Indies seemed inexhaustible. After 1945 loggers not only cut selected species heavily for export but took most of the rest for domestic use—a practice that had developed when the war shut off shipments from the U. S. The result was the liquidation of almost all accessible forests and the curtailment of exports. Clearing of lowlands throughout the islands is now almost complete.

Forest types of western South America are determined by the Andes Mountains. Extensive forests occur on both moderate and very wet lowland sites along the Caribbean and Pacific coasts of Columbia and extend down to Ecuador. The high-altitude forests of the Andes have been extensively cleared from Columbia to Bolivia for coffee and other agriculture. Most of the remnant has been high-graded.

From the eastern slopes of the Andes, down the central Amazon valley to the Brazilian coast, is the almost unexplored Amazon forest. Dense rain forest also extends north across the Guiana highlands to coastal British Guiana, Surinam, and French Guiana, and apparently includes virola, crabwood, and greenheart, largely untouched. Timber in the Amazon and Guiana forest, which has only recently been surveyed, is apparently not so large or dense as that in the coastal forests or in Africa or southeast Asia *(18)*. Southern South America has broad areas of drier forest, and ribbons of dense stands along the coast and in the Andes. It contributes a small volume of hardwood logs and lumber to international trade.

Recent hardwood trade has been influenced not only by resource trends but by the divergent trade policies of the various countries (fig. 15).

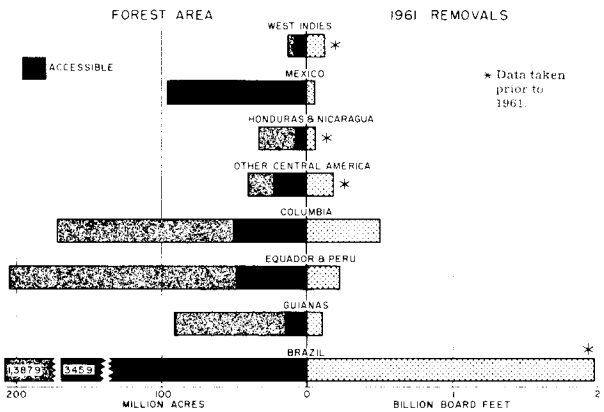

Figure 15.—*Current use of Latin American forests is high relative to acreage, except in countries with land in the Amazon basin.*

Mexico has sharply cut log exports by favoring processing in local plants. Though new sawmills have been built in the past 10 years, lumber exports have also dropped. The increased output is being absorbed by home markets that have expanded with Mexico's rapid economic growth. Fifteen years ago Mexico supplied most of the U. S. mahogany imports; it now furnishes less than 20 percent. Several large areas now inaccessible are to be opened up for

logging, but most of the cut will be used internally.

British Honduras, for years a principal supplier of hardwood logs, has also restricted exports, but has not achieved much increase in production and export of lumber. The colony is small and most of its forests are accessible and presently being exploited. In Guatemala, lumber production has also declined despite a ban on log exports. The country has sizable areas of inaccessible timber.

Costa Rica was an important log source until 1953, but now saws most logs for domestic markets. In recent years lumber has come to the U. S. from sawmills built jointly by American and Costa Rican businessmen. Untapped resources of high-grade hardwoods promise future increases in trade.

In contrast to other countries, Nicaragua has been increasing shipments to the U. S. Since 1957 it has been the major supplier of mahogany logs. More recently, it has begun to export lumber. Both Nicaragua and neighboring Honduras have substantial volumes of unexploited timber, but will require large-scale investments to log it. Less than a fourth of the forests in either country are presently accessible.

In Panama transportation improvements have opened up formerly inaccessible areas and made possible sizable log shipments—chiefly mahogany—to the U. S.

In the past decade Columbia has become the biggest single exporter of logs to the U. S., supplying 27 percent of the total. Columbia also has rapidly expanded sawmill production. It now cuts 1.5 times as much hardwood lumber as all of Mexico and Central America, and substantial amounts are sold to the U. S. The harvest is mostly cativo and other hardwoods; relatively little is mahogany. For the immediate future Columbia has greater potential for expanding shipments to the U. S. than do other Latin American countries.

Considering the extent of the forest resources, surprisingly little timber is cut for export in the rest of northern South America. Shipments from Brazil, long a small exporter of mahogany logs from the Amazon interior and of mahogany and other cabinet lumber, have been slow to develop. Venezuela, British Guiana, Peru, and, in the last few years, Ecuador, have shipped only small quantities of mahogany and other logs and lumber to the U. S. Log shipments from other South American countries are practically nil. Ecuador is the major supplier of balsa, for which demand has been decreasing; from 1950-1954 to 1958-1962 shipments dropped one-third.

Future developments in Latin America are highly problematical. Mahogany from the upper Amazon basin may offset decreasing shipments from Central America. South American mahogany has harder texture than Central American, grows larger, and once sold for higher prices *(30)*. But for Amazon mahogany to become available in large quantities will require enormous outlays that are unlikely to be incurred for timber alone. Columbia, Ecuador, Peru, and Bolivia have been jointly building a road system to open up vast Amazon areas for general development. The system will take years to complete, but should make appreciable timber available for export.

The two factors that have let southeast Asia and West Africa expand timber cutting rapidly are generally lacking in Latin America. First, few stands have as much as a fourth of the volume in merchantable species. Markets have yet to be developed for soft veneer species of the kind that predominate in the exports of the other tropical regions. Second, the light cuts per acre and other difficulties have prevented mechanization. Thus the returns from timber harvesting have discouraged both local and foreign investment.

Canadian Shipments to Decline

Before and shortly after World War II Canada was the principal source of the then much smaller volumes of U. S. hardwood imports. Recently shipments have declined in the face of competition from Japan and elsewhere.

Imports of Canadian logs have dropped to one-third those of the early 1950's. Similarly, lumber shipments have fallen from almost 200 million board feet in 1950 to about 125. Though U. S. sales of Canadian plywood expanded in the midfifties, they have since declined. Canada's share of U. S. veneer imports has shrunk from 96 to 49 percent.

Imports from Canada will continue to be substantial for some time, but the trade is likely to decline further. Canadian production of hardwood lumber, like that of the United

States, declined substantially in the last decade. Harvest of saw logs for all purposes in 1961 and 1962 was less than half the record set in 1952. Though current rates of cutting are less than 1 percent of the resource, the best timber is already gone.

European Exports to Stay Small

The cut of European hardwoods, which rose in the postwar period, has nearly all been consumed domestically. U. S. imports of European logs have virtually ceased. Lumber and veneer imports have increased, but volume is small. The biggest lumber suppliers are Denmark, which exports maple, birch, and beech, and West Germany, which ships cabinet woods cut from tropical logs.

Finland was formerly a substantial supplier of plywood to the U. S., but her sales have been hurt by Japanese and other competition. Recently the Finns have sought to regain markets by manufacturing exterior-grade birch plywood *(19)*.

SUMMARY

Once a substantial hardwood exporter, the U. S. now imports a significant portion of its requirements. Since 1947-48, plywood purchases—primarily from Japan and other Asian sources—have multiplied fortyfold to 60 percent of total consumption. Lumber imports, from tropical countries and Canada, have increased 39 percent, or to 5 percent of the U. S. market. Log imports remain erratic.

A major reason for the increased hardwood imports has been the growing shortage of U. S. supplies of high-quality timber. The resulting high prices, and other factors such as high wages, have severely disadvantaged American manufacturers.

Elsewhere, potential for production of fine hardwoods is rapidly expanding. In both southeast Asia and West Africa large new areas of tropical forests have been made accessible. In logging, many firms have mechanized to a greater extent than in U. S. hardwood regions. Tropical lumber and plywood production has also made significant gains. Large areas of timber will become accessible in future decades, and desirable species can be rapidly grown in plantations.

Though Asian and African timber firms are still preoccupied with the rapidly expanding markets in Europe and Japan, they will be able to ship large quantities to the U. S. if prices are favorable. U. S. plywood and lumber imports are now generally processed from tropical timber in Japan and other industrialized countries. In the future they may well come directly from mills in the tropical countries where the timber is harvested. Latin America's long-range potential for increased trade depends on government policies and regional development.

Thus, rapidly increasing imports of hardwood plywood and lumber may be expected in coming decades. The availability of large quantities of foreign products at competitive prices will limit sales of U. S. hardwood manufacturers and discourage expansion of processing. Programs to grow U. S. hardwoods must be based on anticipated stumpage prices not greatly exceeding those currently obtained.

LITERATURE CITED

1. Anonymous.
   1963. The Philippine plywood industry. Natl. Hardwood Mag. 36(12): 60-61, 63-65, illus.

2. ————
   1963. U. K. market in 1963. South. Lumberman 207(2585): 148, 150, 152, 156.

3. Aubreville, A.M.A.
   1960. Le potentiel des forêts tropicales dans l'economie mondiale du bois d'oeuvre (feuillus). Fifth World Forestry Cong. Proc. v. 2, pp. 1069-1075, illus.

4. Bartlett, H. H.
   1956. Fire, primitive agriculture, and grazing in the tropics. *In* W. L. Thomas, Jr., ed., Man's role in changing the face of the earth, pp. 692-763. Chicago: Univ. Chicago Press.

5. Buckle, D. H.
   1959. Timber operations in West Africa. Unasylva 13: 3-11, illus.

6. Cermak, F. I., and Lloyd, A. H.
   1962. Timber transportation in the tropics. I.—Short distance or minor transportation. Unasylva 16: 75-103, illus. II.—Long-distance or major transportation. Unasylva 16: 140-160, illus. III.—Transportation by water and air: loading timber. Unasylva 16: 207-218, illus.

7. Economic Commission for Africa and Food and Agriculture Organization.
   1964. African timber trends and prospects. Preliminary report on western Africa and Equatorial East Africa. 212 pp. Addis Ababa: United Nations.

8. Economic Commission for Europe.
   1963. Report to Secretariat on the trade in tropical wood in Europe up to 1962. ECE Tim working paper No. 7, 41 pp. Geneva: United Nations.

9. Economic Commission for Latin America and Food and Agriculture Organization of the United Nations.
   1963. Latin American timber trends and prospects. 117 pp., illus. New York: United Nations.

10. Food and Agriculture Organization of the United Nations.
    1956-63. Yearbook of forest products statistics. Rome: United Nations.

11. ————
    1958. World forest products statistics. A ten-year summary, 1946-1955. 197 pp., illus. Rome: United Nations.

12. ————
    1958. Commodity report — hardwoods. Unasylva 12: 183-191.

13. ————
    1960. World forest inventory, 1958. 137 pp., illus. Rome: United Nations.

14. ————
    1964. Expansion of exports of forests products from developing countries. Unasylva 18: 3-11.

15. ———— and Economic Commission for Asia and the Far East.
    1961. Timber trends and prospects in the Asia-Pacific region. 224 pp., illus. Geneva: United Nations.

16. ———— and Economic Commission for Europe.
    1964. European timber trends and prospects—a new appraisal 1950-1975. 233 pp., illus. New York: United Nations.

17. Haig, I. T., Huberman, M. A., and Din, U Aung.
    1958. Tropical silviculture. v. I. FAO forestry and forest products studies No. 13. 190 pp., illus. Rome: United Nations.

18. Heinsdijk, D.
    1961. Forest survey in the Amazon valley. Unasylva 15: 167-174, illus.

19. Jones, A. E.
    1964. Plywood business booms—United Kingdom. Forest Indus. 91(1): 118, 194.

20. Josephson, H. R.
1964. Legislation relating to foreign trade in forest products. Paper presented at ann. meet. of the Appl. Sect., Soc. Amer. Foresters, Feb. 7-8, 1964, Asheville, N. C.

21. Le Ray, Jean.
1963. Forest roads in the tropics. I.—General characteristics, roads on compacted soil, and planning for alignment. Unasylva 17: 89-112, illus. II.—Construction works, use and maintenance of equipment. Unasylva 17: 145-167, illus.

22. Meyers, R. M.
1963. The utilization of Philippine mahogany in the United States. Econ. Bot. 17: 233-237, illus.

23. Nyyssönen, Aarne.
1962. Aerial photographs of tropical forests. Unasylva 16: 3-12, illus.

24. Putnam, J. A.
1964. The plight of southern hardwood resources. Forest Prod. Jour. 14: 319-321.

25. Record, S. J., and Hess, R. W.
1943. Timbers of the new world. 640 pp., illus. New Haven: Yale Univ. Press.

26. United States Bureau of the Census.
1946-1963. United States imports of merchandise for consumption. Reports FT 110.

27. United States Forest Service.
1965. Timber trends in the United States. U. S. Dept. Agr. Forest Resource Rpt. 17, 235 pp., illus.

28. United States Tariff Commission.
1959. Hardwood plywood—report on escape-clause investigation No. 77 under Section 7 of the Trade Agreements Extension Act of 1951, as amended. 63 pp.

29. Westoby, J. C.
1962. Forest industries in the attack on economic underdevelopment. Unasylva 16: 168-201, illus.

30. Williams, Ichabod.
1963. Peruvian mahogany. Natl. Hardwood Mag. 37(8): 38-39, 44-45, 47, 51.

APPENDIX

Table 1.—*U. S. imports of hardwood logs, 1946-1963*

(In million board feet)

Source	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Canada	4.6	9.2	11.3	11.1	16.4	19.2	13.2	17.6	11.6	13.2	13.1	8.7	6.3	6.6	8.2	5.6	6.0	8.1
Latin America																		
Mexico	7.7	7.0	2.6	2.2	2.8	3.3	2.8	1.9	1.3	.7	2.2	2.2	1.0	.1	(1)	.1	.1	.1
West Indies	.5	.4	.6	.2	.6	.4	.4	.4	.2	.4	.3	.6	.2	.2	.1	.1	.1	.1
Central America	15.1	21.7	30.1	16.2	25.1	20.8	20.8	17.0	11.9	13.8	11.5	10.2	14.3	4.4	4.7	6.5	7.2	3.1
South America	3.1	5.1	3.4	2.6	1.6	4.1	.9	4.6	9.5	13.2	19.5	16.4	15.6	13.1	19.6	13.5	21.9	20.3
Total Latin America	26.4	34.2	36.7	21.2	30.1	28.6	24.9	23.9	22.9	28.1	33.5	29.4	31.1	17.8	24.4	20.2	29.3	23.6
Asia																		
Japan	..	..	..	(1)	(1)	(1)	(1)	(1)	..	(1)	..	(1)	(1)	.3	(1)	..	(1)	(1)
Philippines	.1	2.0	11.6	7.6	20.7	40.8	20.6	32.5	29.5	33.8	35.1	32.6	17.6	21.4	16.2	9.0	12.7	7.0
Other Asia	.1	.1	.1	(1)	.1	.2	.1	1.4	2.1	4.7	3.3	1.4	1.0	4.6	3.6	.7	3.0	1.8
Total Asia	.2	2.1	11.7	7.6	20.8	41.0	20.7	33.9	31.6	38.5	38.4	34.0	18.6	26.3	19.8	9.7	15.7	8.8
Africa																		
West Africa (formerly British)	27.6	30.3	34.1	13.6	36.3	31.3	14.9	22.7	14.8	16.8	21.5	7.8	8.0	7.4	7.8	4.2	3.8	4.3
West Africa (formerly French)	1.1	4.1	2.4	.5	2.0	3.3	1.2	12.7	11.3	22.1	13.2	9.7	9.5	11.8	17.4	8.0	6.1	7.9
Other Africa	1.2	3.7	5.7	2.0	3.1	3.7	1.6	.8	.4	.6	.8	1.1	.1	2.3	2.1	.5	1.0	1.0
Total Africa	29.9	38.1	42.2	16.1	41.4	38.3	17.7	36.2	26.5	39.5	35.5	18.6	17.6	21.5	27.3	12.7	10.9	13.2
Europe	.1	(1)	(1)	(1)	(1)	(1)	.1	(1)	.1	(1)	(1)	.2	(1)	.6	.1	.1	(1)	(1)
Other	(1)	.1	.1	(1)	(1)	..	.1	..	..	..	..	(1)	(1)	..	.4	.4	.3	.1
Grand total	61.2	83.7	102.0	56.0	108.7	127.1	76.7	111.6	92.6	119.3	120.5	90.9	73.6	72.8	80.2	48.7	62.2	53.8

[1] Negligible.

Because of rounding, values may not add to totals.

Table 2.—*U. S. imports of hardwood lumber, 1946-1963*

(In million board feet)

Source	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Canada	170.2	166.5	170.6	94.7	187.3	154.5	115.1	127.6	92.1	117.0	103.0	105.6	85.9	118.6	110.0	94.8	122.9	123.4
Latin America																		
Mexico	10.6	12.8	12.5	8.8	16.5	16.5	13.9	10.9	5.5	5.6	3.8	4.8	4.3	3.4	4.7	4.8	7.4	4.3
West Indies	1.3	1.5	.2	.1	.1	.2	.3	.4	.1	.2	.3	.2	.1	.1	(1)	(1)	.2	(1)
Central America	8.3	16.9	9.1	3.8	3.4	5.5	4.2	5.2	5.3	7.9	11.8	11.8	9.7	13.1	14.3	14.0	16.5	15.4
South America	14.0	10.7	8.3	9.9	13.5	21.3	15.5	15.2	12.6	13.0	15.1	20.3	24.1	26.7	32.4	26.6	32.4	40.9
Total Latin America	34.2	41.9	30.1	22.6	33.5	43.5	33.9	31.7	23.5	26.7	31.0	37.1	38.2	43.3	51.4	45.4	56.5	60.6
Asia																		
Japan	..	..	.3	.7	9.2	8.0	7.7	16.1	38.8	52.7	62.8	40.2	48.4	72.4	52.9	42.5	52.0	41.0
Philippines	.4	.6	9.0	15.2	29.5	39.6	48.4	42.7	40.0	47.1	47.4	39.0	44.8	51.3	37.2	30.6	32.6	30.6
Other Asia	.2	1.3	.6	.5	.5	.6	1.3	1.5	.6	4.9	6.1	12.3	6.1	14.3	14.5	14.4	21.7	22.0
Total Asia	.6	1.9	9.9	16.4	39.2	48.2	57.4	60.3	79.4	104.7	116.3	91.5	99.3	138.0	104.6	87.5	106.3	93.6
Africa																		
West Africa (formerly British)	.1	3.7	5.2	2.2	4.7	6.5	3.5	6.2	5.7	7.8	11.6	4.4	4.1	10.5	9.5	8.2	10.5	13.9
West Africa (formerly French)	...	..	(1)	..	(1)	..	.1	.1	.3	.3	1.1	.9	.4	1.2	.6	.5	1.1	2.8
Other Africa	..	.1	.2	.4	1.9	2.0	1.1	2.2	2.6	2.8	5.4	1.8	2.3	2.9	2.8	1.5	2.2	.9
Total Africa	.1	3.8	5.5	2.6	6.6	8.5	4.7	8.5	8.6	10.9	18.1	7.1	6.8	14.6	12.9	10.2	13.8	17.6
Europe	.	..	(1)	.4	.6	1.1	.5	.1	.1	.1	.2	.3	.1	.9	.8	.3	.7	.8
Other	.1	.4	.4	.2	.3	.2	.4	.3	.1	.1	.2	.4	.5	.7	.9	1.0	1.1	.9
Grand total	205.2	214.5	216.4	136.9	267.5	256.0	212.0	228.5	203.8	259.5	268.8	242.0	230.8	316.1	280.6	239.2	301.3	296.9

[1] Negligible.

Because of rounding, values may not add to totals.

Table 3.—*U. S. imports of hardwood plywood, 1946-1963*

(In million square feet, surface measure)

Source	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Canada	8.2	22.9	39.5	16.8	50.0	47.1	57.1	50.8	71.1	99.3	81.2	64.4	42.4	60.2	43.0	42.1	56.6	71.9
Latin America																		
Mexico	1.9	2.7	.8	.4	.6	.3	.7	1.3	3.2	3.6	.4	1.8	6.0	8.6	2.5	1.4	1.3	1.2
West Indies	.	(1)	.	.	(1)	.	.	.	.	.	.1	.2	.	(1)	.1	...	...	..
Central America	.	..	..	..	.	.	.1	1.9	.2	1.4	.9	1.7	.6	4.4	1.7	2.5	.7	1.2
South America	.7	.1	.9	.7	5.4	1.6	2.6	4.5	4.3	3.9	3.9	5.5	5.2	16.7	9.5	13.9	13.7	16.4
Total Latin America	2.6	2.8	1.7	1.1	6.0	1.9	3.4	7.7	7.7	8.8	5.3	9.2	11.8	29.7	13.8	17.8	15.7	18.8
Asia																		
Japan	..	...	(1)	.9	.3	3.7	17.3	105.0	289.0	428.6	527.2	679.8	669.6	810.9	688.3	660.5	740.3	699.1
Philippines	.	.	(1)	.1	.3	(1)	.1	.5	1.5	9.8	14.9	33.2	97.4	213.6	118.8	153.4	214.4	246.7
Other Asia	.	.	(1)	.1	..	.	.1	.8	1.2	.8	1.4	4.6	27.3	58.5	50.0	148.1	314.1	442.2
Total Asia	.	...	(1)	1.1	.6	3.7	17.5	106.3	291.7	439.2	543.5	717.6	794.3	1,083.0	857.1	962.0	1,268.8	1,388.0
Africa																		
West Africa (formerly British)	...	..	..	...	...	...	...	.1	.	...	(1)	.1	..	(1)	...	...	...	...
West Africa (formerly French)	...	...	..	...	.	...	..	..	(1)	.5	.	..	..	(1)	.	...	..	...
Other Africa	.	..	..	..	(1)	.2	.6	3.5	5.3	10.4	13.8	10.9	15.6	25.8	16.7	14.6	13.8	9.1
Total Africa	.	..	..	..	(1)	.2	.6	3.6	5.3	10.9	13.8	11.0	15.6	25.8	16.7	14.6	13.8	9.1
Europe	13.6	11.5	1.1	.7	1.5	3.3	6.0	51.0	51.7	62.5	52.3	40.4	46.3	125.1	83.2	58.6	83.7	92.4
Other	.	..	.	(1)	.	..	..	...	6.2	6.9	9.3	3.9	.9	4.0	.2	2.4	.4	(1)
Grand total	24.4	37.2	42.3	19.7	58.1	56.3	84.6	219.4	433.7	627.6	705.4	846.5	911.3	1,327.8	1,014.0	1,097.5	1,439.0	1,580.2

[1] Negligible.

Because of rounding, values may not add to totals.

Table 4.—*U. S. imports of hardwood veneer, 1946-1963*

(In million square feet, surface measure)

Source	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Canada	27.6	44.8	53.2	174.2	348.5	396.5	402.4	511.7	524.1	674.6	621.0	373.7	455.6	559.9	472.3	516.0	638.4	684.6
Latin America																		
Mexico	..	1.0	..	..	(1)	..	.3	(1)	2.1	6.1	7.3	4.8	1.3	4.3	5.2	5.8	3.5	1.7
West Indies	..	..	(1)	..	..	.2	.3	.4	.4	.5	.4	.3	.3	.3	..	..	..	..
Central America	..	..	.	..	2.3	7.4	5.3	.6	.	.3	(1)	4.1	5.6	6.2	5.9	8.8	16.9	14.3
South America	(1)	..	.1	.1	(1)	.6	.1	(1)	..	.	..	(1)	.2	10.3	11.3	13.0	22.3	47.2
Total Latin America	(1)	1.0	.1	.1	2.3	8.2	6.0	1.0	2.5	6.9	7.7	9.2	7.4	21.1	22.4	27.6	42.7	63.2
Asia																		
Japan	..	..	(1)	.3	.5	2.0	.6	.3	.3	.3	3.3	7.4	82.2	225.4	19.9	1.9	5.7	3.9
Philippines	..	.	..	.	.1	.	.3	21.0	28.6	49.7	51.4	69.7	70.7	174.1	205.0	223.7	295.6	391.0
Other Asia	..	..	..	..	..	..	..	(1)	.1	1.2	1.5	.1	.5	.3	.3	11.3	13.0	60.1
Total Asia	..	..	(1)	.3	.6	2.0	.9	21.3	29.0	51.2	56.2	77.2	153.4	399.8	225.2	236.9	314.3	455.0
Africa																		
West Africa (formerly British)	..	..	..	..	2.4	6.0	1.9	3.6	.8	.1	..	..	..	..	..	..	(1)	(1)
West Africa (formerly French)	..	..	..	..	..	..	..	..	.2	..	..	(1)	..	.2	..	..	..	..
Other Africa	..	..	..	..	1.0	25.8	13.9	41.3	23.2	28.9	38.9	37.8	29.5	57.5	98.1	96.0	168.7	146.8
Total Africa	..	..	..	..	3.4	31.8	15.8	44.9	24.2	29.0	38.9	37.8	29.5	57.7	98.1	96.0	168.7	146.8
Europe	.1	.1	.3	.3	7.1	4.6	2.9	4.4	3.1	2.8	5.3	4.7	4.3	25.5	22.8	18.2	68.1	48.2
Other	.3	1.6	.7	..	.1	.1	..	.1	1.2	.9	..	.1	.2	.1	.1	.1	.1	(1)
Grand total	28.0	47.5	54.3	174.9	362.0	443.2	428.0	583.4	584.1	765.4	729.1	502.7	650.4	1,064.1	840.9	894.8	1,232.3	1,397.8

[1] Negligible.

Because of rounding, values may not add to totals.

Siegel, William C., and Row, Clark.

1965. U. S. hardwood imports grow as world supplies expand. South. Forest Expt. Sta., New Orleans, La. 25 pp., illus. (U. S. Forest Serv. Res. Paper SO-17)

Once a substantial exporter of hardwood, the U. S. now goes abroad for 60 percent of its hardwood plywood and 5 percent of its lumber. Expanding world timber trade and scarcity of good domestic timber indicate further increases in imports.