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THE PROBLEM OF UNBALANCED SPECIES UTILIZATION
IN THE FORESTS OF GHANA AND NIGERIA

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THE PROBLEM OF UNBALANCED SPECIES UTILIZATION
IN THE FORESTS OF GHANA AND NIGERIA
AS IT RELATES TO THE NEED FOR ASSISTANCE
IN DETERMINING THE PROPERTIES OF LESSER USED AND UNUSED SPECIES

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Foreword

The Office of Science and Technology of the United States Agency for International Development has for some time been interested in the lack of balance in timber use in the tropical hardwood forests of the world. Relatively few of the thousands of different hardwood tree species are utilized to any extent. As a consequence there has been great waste of wood and the timber industries have not contributed as they should to economic development in that part of the world. The central question insofar as the Office of Science and Technology is concerned is whether lack of scientific information about wood properties and characteristics has contributed significantly to the underutilization. If it has, there is obvious opportunity to improve the situation by aiding in the acceleration of the necessary research.

There is disagreement among the experts in this matter. It has been the opinion of some that lack of scientific information has not been a crucial handicap and that other factors have played a larger part in the lag in utilization. For this reason, the U.S. Forest Service was asked to analyze the factors that underlie the imbalance of timber use in tropical hardwood forest and to state how desirable it may be to accelerate research on the technical and technological properties of the underutilized tropical hardwood species.²

This report summarizes the results of an appraisal by the Forest Service of the situation in Africa with particular reference to Ghana and Nigeria. It is based on brief visits with knowledgeable individuals in England, France, Italy, Ghana, and Nigeria. Authority for this travel is given in the Appendix. Similar appraisals have been made in South America and the Far East.

¹Maintained at Madison, Wis., in cooperation with the University of Wisconsin.

²Technical properties include such things as strength, shrinkage, and chemical characteristics. Technological properties include characteristics such as ease of drying, machinability, gluing, and treating.

Summary

The lack of knowledge of the properties of African woods has no doubt contributed to the underutilization of some species. It does not appear, though, to have been a critical factor. In other words, even if all of the properties information had been available, the utilization pattern would have been some but not much better than it is.

However, the world timber supply situation is growing tighter and countries like Ghana and Nigeria are making a more aggressive effort to improve timber utilization. Under these circumstances, information that may have been adequate yesterday is not today.

It is undeniable that there is a considerable body of information on the properties of many secondary African woods. Yet much of the data available is undeniably shallow; the information is based on a few tests from limited areas and can hardly be considered complete or reliable. Actually, much of the published data on secondary species should be considered as preliminary only. Also, there are many gaps in the knowledge of secondary woods which are presently preventing their being utilized. This is especially true for information concerned with processing and manufacturing. Development of a more complete and reliable body of knowledge about secondary woods in the African countries is critical to their being generally accepted for broader utilization both locally and on the world market.

There Is a Species Problem

Numbers differ in the several countries, but the timber utilization story seems to be the same throughout the tropical high forests of Africa. There are more than 1,000 tree species in Africa but only a handful of them are utilized to any extent. In Nigeria, for example, there are about 450 tree species (one authority says 560) of which 100 are believed to have industrial potential but only 33 have been exported in significant amounts. In Ghana there are said to be from 200 to 250 species of trees that grow to "commercial size," that is, above 1 foot in diameter, but only 28 have been exported in significant quantities.

These figures do not tell the whole story. Theo Erfurth points out that there are 52 species of timber exported from Liberia, Ivory Coast, Ghana, Nigeria, Cameroon, Gabon, Congo, and Zaire.³ In 1970, 80 percent of the exports were made up of 10 species and 44 percent were of only 2 species--okoume and obeche (table 1). Erfurth points out that normally between 5 and 30 cubic meters of timber are cut per hectare from stands averaging between 250 and 300 cubic meters per hectare. This leaves little doubt of the highly selective nature of the logging. Some species not exported are used locally, but this factor does not change materially the lop-sided nature of the utilization.

³"The Marketing of Tropical Wood, A. Wood Species from African Humid Tropical Forests," by T. Erfurth. Food and Agriculture Organization of the United Nations. Rome. 1973.

One result of this situation has been to draw down the supplies of the species in relatively heavy demand. Stocks of some species have been practically exhausted. This has happened to assemala (Pericopsis elata), which occurred only in limited amounts in the first place. Others such as sipo (Entandrophragma utile), the cut of which has climbed rapidly in the past 20 years, are beginning to become more rare.⁴ The Ghana Timber Marketing Board has virtually banned export of utile (Entandrophragma utile), afrormosia (Pericopsis elata), mansonina (Mansonina altissima), and African walnut (Lovoa trichilioides) logs. The volume of logs of an individual species that a single firm can export per month from Ghana has been limited to 5,000 tons. Both actions are direct reflections of shortages and anticipated shortages. Oddly enough, the expansion of utilization that has taken place is in itself a product of scarcity. For example, Nigeria was exporting timber from 13 to 15 species in 1962. It is now exporting about 33 species. The increase no doubt reflects in part the technical research and promotion done in the period, but it also indicates some substitution because of supply shortages.

It may be assumed that unless the pattern of use changes drastically, the list of species in short supply will lengthen in the next few years.

If it were simply a matter of taking a few species and leaving the rest otherwise intact, the situation would not be so bad. However, more often than not this doesn't happen. Africa's high forest is rapidly shrinking under the pressure of the demand for agricultural land, and the practice of shifting cultivation. Large volumes of wood are wasted in the land-clearing process. It seems safe to say that present logging practices result in a more rapid loss of forest to agriculture than if tree utilization were more complete on the acres logged. With highly selective logging practices, more area has to be opened up to meet industry requirements, which then provides ready access of the land to farmers.

Partial Utilization of the Resource Has Been Costly

The problem of underutilization of hardwood species is a matter of considerable concern to the African timber countries. According to Gutzwiller, forest products rank fourth among the agricultural exports, exceeded in value only by coffee, cocoa, and vegetable oils.² In Ghana, the value of forest products exports has been exceeded among the agricultural products only by cocoa. Forest products exports do not rank as high in Nigeria, but they are still important earners of foreign exchange.

Beyond this, of course, is the problem of domestic needs. The African countries with timber look to the forest resource in meeting critical housing and other developmental needs. Failure to make more complete use of the timber than in the past will handicap the achievement of these aspirations.

⁴Report on the Euro-Ivory Coast Meeting for the Promotion of Tropical Forest Species, Little Exploited or Not Exploited. Abidjan, Ivory Coast, Oct. 18-21, 1972.

⁵The State of Forestry in Africa, 1969-1971. R. Gutzwiller, Regional Forestry Officer in Africa. F.A.O., Accra, Ghana.

A Number of Factors Have Contributed to the Problem

The Erfurth analysis mentioned earlier lists 143 timber species in eight African countries (table 2). Fifty-two have been exported, and the other 91 are "species described in specialized literature." He notes that laboratory test data are apparently not available for 30 of these species. It may also be pointed out that not all of the laboratory tests made are necessarily complete and adequate. In some cases the tests are based on limited samples. An example in point is the test results published by a British laboratory on the wood called danta (Nesogordonia papaverifera). The standard tests were performed on two planks taken from an importer's yard. This hardly permits measuring the differences in characteristics as they are related to geographic origin, location on the tree, and other factors.

Erfurth's analysis, fully supported by the observations of others, leaves no doubt that there are still many blanks and inadequacies in the information on workability, shrinkage, finishing characteristics, strength, and durability of African woods. He does not attempt to weigh the total significance of the information lack, but it is no doubt important.

At least five other factors have had much to do with the long delay in getting more complete utilization of the African hardwood timber.

First has been the lack of interest on the part of the consumers and conservatism on the part of the timber agents who were marketing the logs and lumber. Consumers satisfied with African mahogany or African walnut or some other species of lumber have felt little incentive to try something new if they didn't have to. Likewise, timber agents or brokers have been essentially agents of the buyer and have felt no particular responsibility to promote unrecognized species. There have been some notable exceptions to this in recent months which will be mentioned later.

Second has been the lack of necessity on the part of the log-producing concerns. They have been able to operate successfully and operate at the level they desire, selecting only the more valuable species.

Another contributing factor is that the African industry has been developed around large-diameter logs. (Consider that the minimum-diameter cutting limit on the Ghana forest reserves at present is 42 inches.) Many of the little-used or unused species do not get very large. If these are to be used, there must be both a modification of attitudes and equipment.

Lack of complete and accurate resource statistics has been a big handicap to balanced utilization. Some areas have been cruised 100 percent, but these are what in the United States would be called "timber sale cruises" rather than broad management inventories for regions of a country. Ghana has a reasonably accurate inventory of the forest reserves--but only for the "important" species. It has little idea of the timber volume outside the reserves. A survey of the timber resources of Nigeria is currently under way to remedy a weak inventory situation. In fact, most of the African timber countries are completely lacking in or have insufficient data regarding the growing stock and its composition to do proper utilization and management planning.⁶

⁶See footnote 5.

Uncertainty as to the supply of many of the lesser known species has been an important deterrent to their use. One British timber company promoted a demand for Cordia but was chagrined to discover that it was unable to supply a sizable quantity on a continuing basis. There is little incentive to develop a use for a species when there is question as to the amount that can be supplied with consistency and for how long. It is becoming increasingly urgent for this reason, among others, to have adequate inventories.

A final factor, that has not received much attention, is the past absence of pressure from the log exporting countries to encourage or force more complete utilization. For example, part of the price for the preferred species might be the utilization of a specified volume of secondary species. It may be properly argued that such pressures are hard to apply in a buyers' market such as existed over much of the past. Nevertheless, in recent months at least, such control of the market as buyers exercised was in some part attributable to the failure of sellers to assert themselves.

Under these circumstances it is difficult to argue that lack of technical and technological knowledge has been a critical factor in the species problem. Nor can it be said that the situation would be much different today if all the information had been available. However, this conclusion is hardly relevant to the future as some very important changes are taking place. In the first place, a generally tightening world timber supply situation is removing some of the roadblocks to better utilization. Secondly, the African countries have reached a turning point with regard to the management of their timber resources. Thirdly, attitudes are changing in the industrial countries dependent upon tropical woods.

The Changing Situation in Ghana

Ghana's aspirations for improving its economic and social position with timber depend primarily on 5 million acres, more or less, of high tropical hardwood forest. The word "high" is used to exclude the open savanna forest of relatively little value for industrial wood. Information about the high forest is sketchy because not all of it has been inventoried, and even where surveys have been made, information on timber volumes is incomplete. For example, the records do not indicate how much volume there is of each of the low-value species.

The tropical high forest of Ghana was once far more extensive than it is today. Loggers have ranged far and wide removing valuable hardwood timber. They have generally been followed by settlers who have destroyed most of the remaining trees, farmed for a few years and then moved elsewhere. In the process, vast areas of tropical forest have been transformed into what can best be described as lush brush fields dotted with palms and remnant hardwoods and with small farm plots of corn and other crops scattered through it. About 3.8 million acres of high forest have been saved; that is, they have been set aside for timber production in forest reserves (table 3). Agriculture has been effectively excluded from these reserves, the only threat to them being illegal timber cutting which still

persists. In 1968 there was an additional 1.2 million acres of relatively undisturbed high forest remaining outside the forest reserves. This area is constantly shrinking, of course, in the wake of logging and farm clearing. However, there are still many large trees scattered throughout the logged-over area. Half the sawlogs and veneer logs produced still come from nonreserved forest lands. In 1968, it was estimated that the forest outside the reserves would be cut over in 6 to 10 years. Present thinking is that the production of sawlogs from the outside areas will continue at the present level for another 10 or 15 years before tapering off.

It has been "conservatively" estimated that the standing timber in Ghana amounts to 10 billion cubic feet. According to FAO statistics, 359 million cubic feet of timber were cut in 1970, up 41 percent from 1966. An overwhelming part of that timber cut was and is fuelwood burned directly or converted into charcoal (fig. 1). Due to population increases, this is the most rapidly rising segment of timber consumption. Sawlog and veneer log production in 1970 was 55 million cubic feet, 13 percent more than in 1966. A disturbing aspect of the situation is that the records show that domestic manufacture of timber declined about 8 percent in that period. This has been contrary to Ghana's objectives of increasing the proportion of home manufacturing--that is, to export fewer logs and more lumber, plywood, and other manufactured products. Since 1966, log exports have increased 61 percent, whereas lumber exports were up only 18 percent in 1970 over 1966. Plywood and veneer exports rose 65 percent, but they are only a small segment of the total exports.

Exports, 1970
(Million cubic feet)

Logs	27.0
Lumber	8.5
Plywood and veneer	0.8

These data indicate that the domestic consumption of manufactured products was about 15 percent less in 1970 than in 1966, which is certainly not the direction that the country has wanted to go.

Steps taken in recent years by Ghana have been to arrest the shrinkage of the forest resource and to use the forest it has reserved in a manner that will help the country overcome the substantial economic and social difficulties it faces as a developing nation. These steps fit into three broad categories: Management to sustain the flow of high-quality logs, raising foreign exchange earnings, and expanding domestic use of forest products.

Many foresters in the Tropics despair of being able to perpetuate the high forest with its most complex array of ecological and silvicultural problems. They feel that clearing and planting with a selected few species is the most viable solution to the management dilemma. Nevertheless, Ghana has embarked on a program to manage the wild forest for continuing yield or at least to greatly extend the life of the remaining natural high forest. Although some planting has been done in the past, this program has been

allowed to lag in order to concentrate the total effort on management of the 3.8 million acres of reserved high forest.

Present strategy is to cut completely through the forest in the next 15 years, removing the overmature trees. A minimum girth limit of 11 feet has been established. In other words, only trees above 11 feet in circumference or 42 inches in diameter are to be removed the first time around. Presumably, the openings thus made will be small enough that vines and pioneer weed trees will not grow rampant and choke out desirable young growth. It would be presumptuous of us to pass judgment on the long-run soundness of this management approach, but it can be endorsed as a means for stretching the resource and buying much needed time.

In 1970, the logs, lumber, and other timber products exported from Ghana were valued at U.S. \$39 million. This revenue was partially offset, however, by imports of \$7 million of wood-based products, primarily pulp and paper. High priority has been assigned to increasing the \$32 million net import balance during the coming few years. Action has been along four lines: Increasing the unit value of the exports, encouraging broader use of species, shifting the emphasis from log exports to exports of manufactured products, reducing dependence on wood-based products from other sources.

The Ghana Timber Marketing Board has been the prime mover in this effort. It has been given wide authority to act by Legislative Instrument 661, which states in part:

- "(1) The object of the Board shall be to regulate the marketing and exporting of Ghana timber of all kinds and species whether log or lumber and to secure the most favorable arrangements for the purchase, grading, export and selling of Ghana timber and to assist in the development by all possible means of the timber trade and industry in Ghana.
- "(2) Without prejudice to the generality of subparagraph one of this paragraph the Board shall have power under this subparagraph to do all or any of the following things:
 - "(a) to control and supervise production for export and exporting or sale in Ghana of all types of timber, and wood products;
 - "(b) to control the number of timber mills and factories and their siting;
 - "(c) to declare species of timber that should be turned into finished and semi-finished products for export or for use in Ghana or for both;
 - "(f) to stabilize prices of, and secure the most favorable returns for logs, lumber and other wood products;

"(g) to assist, generally, in the development of forestry, the timber industry and trade and also to direct the felling of species in accordance with current market trends."

A central thought of the Timber Marketing Board in developing its strategy has been to establish "a national market front" to put Ghana in a better bargaining position in its timber trade. In the past, the individual timber producer dealing with agents with strong ties to the buyers have not, in the estimation of the Board, secured the best possible return to Ghana nor a broad enough use of species. The authorities listed above have provided the controls necessary to do this.

Direct negotiations between the buyer and the timber producer are no longer permitted. All export sales of logs and manufactured products must be handled through licensed agents who in effect become arms of the Marketing Board. This arrangement is expected to eliminate underinvoicing (a practice that has been freely admitted) and questionable transactions which deprive Ghana of income and reduce her foreign exchange. Strong central leadership should also minimize price fluctuations and stabilize prices at higher levels. Minimum price lists are supplied agents by the Ghana Timber Marketing Board.

Another justification for centralized control is the belief that overseas agents have not in the past made a real effort to promote less-known species. Available evidence strongly supports the contention of the Marketing Board that the failure to utilize the secondary species more heavily is in good part attributable to lack of promotion and effective pressure to utilize these species. A case was cited where a sales agent obliged to sell a less-known species to get his quota of preferred timber did remarkably well. He obtained a price of \$263 per cubic meter for the secondary lumber in comparison with \$312 for prime species.

Ghana's hope for expanding timber exports lies primarily in greatly extending the list of species exported. The Ghana Timber Marketing Board has taken several steps to achieve this. An almost complete embargo has been placed on the export of logs of four primary species. The individual export company may not ship out more than 5,000 tons of any one species in a single month. Both rulings are intended to direct greater attention to less-used species.

The net import balance can also be improved by reducing the substantial importations of pulp and paper products. Ghana, therefore, is actively exploring the possibility of developing a pulp and paper industry to use a miscellaneous assortment of hardwood species. The technology for hardwood pulping is available but information on the pulping characteristics of Ghana hardwoods is not.

One desire of the Timber Marketing Board is to greatly reduce log exports with a commensurate increase in the local manufacture and export of lumber and plywood. About half of Ghana's timber products exports are in the form of logs today.

	<u>Exports, 1970</u>
	(Million U.S. \$)
Lumber	16.7
Plywood and veneer	<u>3.1</u>
Subtotal	19.8
Logs	<u>19.5</u>
Total	39.3

To get full benefit from such a shift will require upgrading of manufacturing facilities and practices. At present, with the notable exception of several larger mills, production inefficiencies and incomplete utilization are nullifying some of the benefits of domestic manufacture as an alternative to shipping logs.

We were told that of a standing tree in the forest, about 25 to 30 percent of the volume gets into lumber. The other 70 to 75 percent has been lost through poor logging and sawmill practices. Some of these wasteful practices can be attributed to inadequate equipment. For example, in Ghana we watched workers split beautiful, clear, 5-foot-wide African mahogany boards with an axe because the gang-ripsaw could not handle such wide material. Most waste, however, results from a lack of related industries which could utilize slabs, scraps, and edgings. The butt portion of many large trees is left in the forest because of the buttresses. This means it is not uncommon to leave to rot a log 12 to 15 feet long, often having a 4- to 5-foot diameter, simply because it is not round in cross section. Certainly these could be used if there were reconstituted wood industries.

Ghana has no history of wood used for home construction as has the United States. This is a natural outgrowth of the difficulty of a non-industrial society in using big trees and of the poor performance of most untreated wood under tropical conditions. The native peoples of West Africa have traditionally built their permanent homes of wattle covered with mud, topped by a thatch roof. Wooden shelters, of untreated poles, were erected but they were looked upon only as temporary quarters. To the native West African, wood was considered to be a short-lived material that was soon destroyed by fungi, termites, or other destructive organisms.

With the introduction of concrete by Europeans, it was easy for the African people to switch to this new material. Metal roofs replaced thatch because they were more permanent, although less cool under the tropical sun. Poles and posts were also made of concrete or metal. These are very expensive, but have a long service life.

On the other hand, African workmen are inexperienced in building with wood and to put up a wooden structure is still a very slow process. As a building material, wood was generally not acceptable and, except for a few prime species, not esteemed. One species whose wood has always been valued, however, is Chlorophora excelsa, called "odum" in Ghana and "iroko" in Nigeria. This wood is quite resistant to destructive organisms, and probably because of this is thought to contain magic or juju.

Like most of the African countries with timber, Ghana is trying to break with the past in this respect by building more wooden homes to relieve pressing housing problems. This is likely to be an uphill struggle both in getting market acceptance and in upgrading the quality of material available. Government leaders hope to increase the popularity by building middle-class homes of wood for prestige reasons and by use of wood in public housing.

It will be very difficult to meet a much enlarged domestic demand for properly manufactured wood. Much of the wood used domestically has been poorly manufactured and improperly dried, factors designed to insure unsatisfactory performance. Both upgrading of lumber manufacture and greatly expanding wood treating facilities will be required. Considerable effort will also be necessary to make a greater quantity of timber products available for local use. One reason for low domestic timber consumption is that lumber is priced beyond the reach of most Ghanaians. That portion of the industry geared to the export market has been unwilling to cut lower value species with a smaller profit for the local market. To help relieve this situation, a state-owned sawmill company has been established to produce for domestic needs. Also, exporters are being forced to divert part of their lumber to local markets. For every 1,000 cubic feet of lumber exported, 100 board feet must be sold in the domestic market. Government timber depots are being established throughout the country to take this output and to make properly sawed, properly dried lumber available for local consumption at reasonable prices.

The Ghana situation may be summarized this way: Timber is recognized as a most important asset in improving the welfare and income of the country. There is still a sizable volume of high-quality forest remaining, and the Government of Ghana has seized upon every opportunity to reduce the leakage of benefits because of exploitation from without, unethical practices, inefficiencies, and lack of interest in Ghana's welfare. The government has in fact moved rapidly along the lines mentioned. How well it may succeed remains to be seen. In any case, it has done well in diagnosing the problems and in taking positive action to deal with them.

The Changing Situation in Nigeria

Nigeria has 23 million acres of forest reserves. However, most of that area is in the savanna and has only limited utility for timber production.

Area of Forest Reserves in Nigeria

(Thousand acres)

Savanna	18,263
Rain forest	4,789
Mangrove	54
	<hr/>
	23,106

The rain forest, or high forest, area of 4.8 million acres represents Nigeria's primary timber base for the future, although as in Ghana, about

half of the timber cut for industrial purposes is presently coming from areas outside the forest reserves.

Two points are particularly significant. One is that though the population of Nigeria is almost eight times greater than in Ghana (63 million as compared with 8 million), the reserved forest area is only 26 percent greater than Ghana's 3.8 million acres. Secondly, partly as a result of a greater population pressure, Nigeria's forest has been more heavily cut over than Ghana's. Apparently only a very small part of the original high forest remains that has not had some trees removed. These two differences have to some extent forced a different type of forest management on Nigeria than that which Ghana has adopted.

Statistics by the Food and Agriculture Organization of the United Nations indicate that the timber cut in Nigeria rose about 11 percent from 1.8 billion cubic feet in 1966 to 2.0 billion in 1970.⁷ Most noteworthy is the fact that all of the increase was in fuelwood. These data show that the total cut for industrial purposes declined 5 percent in that period.

Total timber demand is expected to continue to rise and it is anticipated that the use of industrial wood will increase sharply also. The importance of the forest as a source of material, employment, economic balance, and foreign exchange seems to be well understood. Much thought and planning have gone into the matter of how to capitalize on the opportunity. Not to be forgotten is the fact that timber production and manufacture is the second largest industrial employment source in Nigeria.

The National Forestry Development Committee has estimated that the total timber consumption in Nigeria will climb to 2.5 billion cubic feet by 1975 (including exports). A total consumption of 96 million cubic feet of industrial wood in 1970 is expected to climb to between 150 and 170 million by 1985 (table 4), and double these figures by the end of the century.

The above demand estimates include the import of paper and paper products from other countries. In 1970, these imports when reduced to roundwood equivalents were equal to 10 million cubic feet of timber. Potentially, most of Nigeria's paper product needs could be met from domestic timber. The country is unnecessarily dependent upon other manufactured wood products too, such as pencils, rulers, axe handles, shovel handles, broom handles, sporting equipment (bats, field hockey sticks, etc.), toothpicks, police clubs, and match sticks.

Consumption of timber-based products in Nigeria can and must rise substantially if the country is to achieve its economic and social goals.

⁷Timber cut, product, output, and export statistics prepared by FAO, presumably from Nigerian data, differ greatly from data in recent Nigerian analyses. It appears that the FAO data are generally low. However, they do permit some comparisons of differences and trends not otherwise possible. They have been used with this in mind.

The per-capita consumption of industrial wood is very low. If the FAO statistics are correct, it is only one-third as large as in Ghana on a per-capita basis.

More and better housing is seriously needed. The activities of an expanded economy will require increasing quantities of wood products ranging from writing paper to railroad ties.

Exports of logs, lumber, and plywood which FAO statistics show to have declined substantially between 1966 and 1970 are projected to increase from 18 million cubic feet in 1969 and 12 million cubic feet (roundwood equivalents) in 1970 to 40 million in 1985.⁸ There seems to be no question that the demand will be greater for exports, but it is apparently a moot point whether Nigeria will be willing to spare that much wood in 1985. It is not under the same pressure to export timber as Ghana because oil exports provide a healthier foreign exchange situation.

A more urgent need probably is to reduce the heavy dependence on foreign timber. According to FAO statistics again, the value of the logs, lumber, and plywood exported from Nigeria in 1970 was only one-third of the value of the wood product imports which were mainly paper and paperboard. Allowing for the possibility of considerable errors in the data, the comparison still shows, for a timber-rich developing country, an unhealthy dependence on overseas timber. This situation has been pinpointed as one to be changed through the development of a pulp and paper industry and particleboard and pressed board industries using domestically produced hardwoods.

If Nigeria is to realize its objective of greatly increasing the contribution of the forest to the economic and social well-being of the nation, it will have to act decisively along three lines:

- (1) Stepping up the forest management effort;
- (2) Upgrading the manufacturing industry;
- (3) Improving and increasing the use of domestic timber products.

One need is to prevent further encroachment on the forest reserves by shifting agriculture and instead to expand the area dedicated to timber growing to the extent feasible considering agricultural needs. Only 2 percent of Nigeria is in high forest within forest reserves. This is much less than at one time felt necessary.

Nigeria plans to manage some of its high forest in a manner similar to what Ghana is doing--that is, by selective logging. However, Nigerian foresters have had some bad experiences with this method. In many cases fairly heavy partial cuts have created such big breaks in the tree canopy that vines and light-loving weed tree species have taken over the land, excluding the desirable trees. It is for this reason that the main emphasis in Nigeria today is on clearcutting and then planting a relatively few species, some of them exotics. The yields anticipated in these plantations are from 200 to 400 cubic feet per acre per year, which is a lot of wood. Recent figures indicate that about 150,000 acres of timber have been planted in Nigeria, and one stated objective is to have 1 million acres of plantations by 1985.

⁸"Development of Forest Plantations," National Forestry Development Committee, Federal Department of Forestry, Ibadan, Nigeria.

Like Ghana, Nigeria has an uphill task in upgrading its timber industry for the production of a better product more efficiently, with less waste. One recent estimate is that for every 1,000 cubic feet sawn into lumber the waste that occurred that could have been avoided was worth from U.S. \$200 to U.S. \$500. The problem of low product quality is probably even more costly in the long run.

Some measures to make more effective use of the timber resource will be relatively easy to put into operation. Such things as finding more domestic species suitable for railroad ties and the replacement of concrete utility poles with long-lasting domestic species of timber are cases in point.

In contrast, the big and extremely difficult task will be to get more wood used in building construction. This requires overcoming the traditional bias against wood and a history of wasteful use of wood. As in Sierra Leone, Ivory Coast, Gabon, Congo, Zaire, Kenya, and Tanzania, prefabricated housing is being produced on a commercial basis. The lumber exposed to decay and insects is being treated with preservatives to assure long life. This effort is said to have been successful as a business venture in Nigeria, but has not yet made much of a dent in the housing problem. To start with, the principal market was for military barracks during the civil war and more recently for government and business buildings.

The Changing European View

The limited discussions we had in Europe indicate some ambivalence with regard to the need for additional research into the technological and technical properties of underutilized African species. The tropical wood supply situation has apparently not become as critical as it has in the eastern United States. Although there has been some shift to Singapore and Malaysia, large volumes of wood are still coming from Africa. To be sure, supplies of traditional furniture woods in the form of logs, lumber, and veneers have slowed somewhat in recent times, but they are still adequate. The supply of wood moving to Europe is presently strong enough that businessmen can still operate under very exacting specifications and most consider buying mainly the traditional mahogany-type woods. Even supplies of prime veneer logs are still good, so that furniture and paneling are mostly made from sliced veneer, while all rotary-cut material is considered suitable mainly for utilitarian purposes. With this situation, we found little interest in little-known secondary woods among business people. This is also reflected in the attitudes of staff members of the English and French forest products laboratories. Basically, they are of the opinion that enough is known about tropical woods and further testing would not increase the marketability of a little-known wood. It is true that plywood mills have gone considerable distance in using secondary species, primarily for core stock.

The United Africa Company has been selling utility plywoods (general construction) by color class for some years. They have been using a number of species. This company has been attempting to encourage the use of wood for house construction in both Nigeria and Ghana by producing "An economic

scheme of interrelated permanent wall and roof units made of chemically preserved hardwoods and plywood which can be arranged easily and quickly to provide an unending variety of buildings." One result of this effort, which is more advanced in Nigeria, has been to increase the number of species used because living units are being sold rather than any particular kind of wood.

On the other hand some organizations in Europe, notably the Timber Research and Development Association and the United Africa Company (a British concern) are attempting to gather more information about certain species to group them in strength classes. The program grew out of the effort to promote the use of Celtis species for construction purposes. It soon became apparent that the supply of celtis is not sufficient by itself to meet the demands that timber research and promotion might generate. The effort then was redirected to developing strength groupings of structural woods so a user would specify his strength requirements rather than order a specific species. Accomplishment to date has included the identification of a high-strength category of hardwoods for which eight species and species groups have qualified. This is called the H-Super Group:

Celtis	<u>Celtis spp.</u>
Ekki	<u>Lophira alata</u>
Essia	<u>Combretodendron africanum</u>
Okan	<u>Cylicodiscus gabunensis</u>
Opepe	<u>Nauclea diderrichii</u>
Sterculia	<u>Sterculia rhinopetala</u> and <u>S. oblonga</u>
Tali	<u>Erythrophleum spp.</u>
Apa	<u>Azalia spp.</u>

Perhaps the fairest way to summarize the situation is that the European companies and laboratories appear somewhat more complacent about the species problem than the African countries because they are not, as yet, as adversely affected. However, there are signs that concern is increasing and that it will become greater in time.

There Is Clearly a Need for More Information

With the development of a more favorable market, there is a need for additional information. That there is much more to be learned about many species cannot be disputed. In addition to those species that have not been tested at all, there are others for which the information is fragmentary and inadequate. Documenting the utility of a tree species covers a wide range of factors relating to strength, workability, appearance, chemical content, gluing characteristics, and many more things.

In discussions with staff members of the wood laboratories in Ghana and Nigeria, the following list of properties and characteristics was developed for which they contend there is little or no information available. This is especially true for the secondary species, and in many cases this situation causes them to be overlooked for certain types of utilization:

Gluing
Machining
Nailing and screwing
Seasoning
Ease of accepting preservatives
Natural durability

Ease of finishing
Turning
Simple chemistry
Charcoal
Veneering
Bending

For example, in Ghana, the railroads currently use only five species of wood for ties. If more were known about the natural durability and treatability of other species, more of them could undoubtedly be used. Furthermore, this type of information is critical to the development of local wood-using industries, such as furniture and flooring plants. A good example of research developing an economic potential for a secondary species is found in the concrete-wood studies done at Kumasi, Ghana, a project sponsored by Canadian International Development Agency. This is a new product made by combining shredded wood materials, which they call wood wool, with cement. The resulting product is a building board that also combines the favorable characteristics of both materials. Excellent results were obtained using Musanga cecropioides, which is presently in the "weed tree" classification. It is a very short-lived, intolerant species that is among the first to dominate abandoned field or cutover areas.

In addition, neither country has any reconstituted wood industries, and tests on native species pertaining to the production of pulp, fiberboard, and particleboard also need to be done in anticipation of these industries.

At this point in time, therefore, a program of research to fill in the gaps of knowledge concerning characteristics, properties, and performance of Ghanaian and Nigerian timber seems well justified.

Whether the necessary testing has a higher or lower priority than other areas of activity has to be a matter of judgment. A. M. Oseni, Director of the Federal Department of Forestry in Nigeria, states that the problem of efficient use and processing is more important than the use of more species.⁹ This is no doubt true because Nigeria enjoys a larger domestic market than Ghana and in some localities relative timber scarcity is increasing the demand for secondary species. There is nevertheless inadequate demand for secondary timber in Nigeria. The waste of wood for reasons of nonuse can be only a shade less important than wastage by mismanufacture.

In Ghana, where the emphasis is on management of the existing natural forests, information which will permit the marketing to be compatible with the character and composition of the forest is absolutely essential.

Forestry leaders in both countries have pointed out, correctly, that it is not enough merely to add to the store of knowledge. At the same time, it is necessary to develop expertise in each country so that it can make the most of what is known. Ghana and Nigeria apparently have made substantial

⁹"Factors Affecting the Development of Forest Industries in Nigeria,"
A. M. Oseni. Third Annual Conference, Forestry Association of Nigeria.
Nov. 1972.

progress in upgrading technical skills in the forestry field, with the help of FAO, USAID, and other such agencies. There is still a lot to be done. This suggests first that the work required to fill the knowledge gaps regarding local woods should be done primarily within the two countries. Secondly, technical help should be provided in setting up well-rounded programs for obtaining the information as rapidly and accurately as possible.

Technical Capabilities

Nigeria has a testing laboratory in the Federal Department of Forest Research in Ibadan. Ghana has a laboratory at the Forest Products Research Center in Kumasi. The labs have two outstanding characteristics in common:

(1) The professional staff interviewed seemed capable and covered the range of fields necessary to carry on a comprehensive testing program for secondary species. However, there is no depth within the staff. Usually in each project there is only one scientist, trained in Europe or North America, and several technicians. In other words, competent, well-trained individuals are present, but few in number.

(2) Good testing equipment is lacking. The test machines are mostly old and in poor shape. The humidity rooms, growth chambers, etc., seemed barely adequate. Improved testing equipment and facilities, at least in the mechanical area, are critical to both laboratories.

Identification of tree species should be no problem. Botanists have worked on the African flora since early colonial times and numerous comprehensive taxonomic works are available. The local botanists are well trained in taxonomy and even district foresters readily give the scientific binomials for their trees. Identification in the forest is usually done by examining a piece of bark knocked off with a machete or the wood under the bark since the leaves are difficult to reach or even see. Kew Gardens in England has an excellent African collection and any questionable material can be sent there for positive determination. In Ghana the most competent forest botanist is reported to be F. S. Cudjos, and in Nigeria C. F. A. Onochie enjoys this reputation. Both men trained at Kew Gardens, England.

If U.S.A.I.D. undertakes to provide equipment and to finance testing programs in either or both of these countries, it should also plan to provide expert guidance for the purpose of developing the most effective programs possible. Such technical leadership skills could be obtained from the U.S. Forest Products Laboratory or from one of the universities.

**Table L. ROUNDWOOD AND SAWWOOD EXPORT, BY WOOD SPECIES, 1951, 1961, 1970 -
SIX WEST AFRICAN COUNTRIES (Ivory Coast, Ghana, Nigeria, Cameroon,
Gabon, and Congo)**

No.	Pilot name	ROUNDWOOD 1000 m3(r)			SAWWOOD 1000 m3(s)		
		1951	1961	1970	1951	1961	1970
1.	Okoumé	328	1147	1642	8	4	2
2.	Obeche	369	1166	1168	29	75	76
3.	Sipo	22	329	573	1	48.	94
4.	Sapelli	62	180	264	18	47	45
5.	Acajou	249	208	226	32	47	57
6.	Makoré	38	151	208	1	5	12
7.	Mansonia	4	26	184	0.3	2	9
8.	Ilomba	14	43	184	-	0.2	1
9.	Tiama	32	84	165	1	4	18
10.	Limba	32	227	122	0.3	4	0.2
11.	Dibetou	12	17	83	2	7	7
12.	Kosipo	1	5	82	-	0.5	9
13.	Niangon	18	65	64	-	10	9
14.	Kokrodua	-	54	62	-	39	38
15.	Aniegré	-	-	61	-	-	0.1
16.	Iroko	32	60	58	1	6	44
17.	Doussié	3	56	53	-	5	14
18.	Framiré	10	24	48	2	9	6
19.	Antiaris	4	50	44	-	1	0.3
20.	Ozigo	7	28	40	-	-	-
21.	Guarea	8	25	38	1	9	3
22.	Koto	-	-	37	-	-	0.2
23.	Azobe	16	27	36	-	12	33
24.	Tola	42	3	30	7	-	0.1
25.	Ceiba	-	11	30	-	-	3
26.	Bubinga	1	3	30	-	-	1
27.	Tchitola	3	43	30	-	19	9
28.	Abura	127	83	29	0.5	1	2
29.	Moabi	-	3	21	-	0.1	2
30.	Padouk	-	1	17	-	0.1	0.3
31.	Avodiré	10	8	5	0.2	-	0.2
32.	Mutenye	-	0.5	4	-	-	-
33.	Eyong	-	1	3	-	-	-
34.	Zingana	0.3	7	3	-	0.1	0.1
35.	Angoung	0.3	2	3	-	-	-
36.	Dabema	4	0.1	2	0.3	0.1	1
37.	Igaganga	-	1	2	-	-	-
38.	Olon	0.5	3	2	-	-	-
39.	Niové	0.2	1	2	-	3	3
40.	Kotibé	1	2	2	0.2	1	1
41.	Canarium	8	4	2	-	-	-
42.	Movingui	0.4	2	1	-	1	0.3
43.	Alone	-	-	1	-	-	-
44.	Bilinga	5	5	1	3	5	5
45.	Okan	-	-	1	-	-	0.3
46.	Pau rosa	-	0.3	0.5	-	-	-
47.	Tali	-	0.1	0.4	-	-	-
48.	Mukulungu	-	-	0.2	-	-	-
49.	Ebiara	-	-	0.1	-	-	-
50.	Naga	-	0.1	0.1	-	-	-
51.	Ebony	0.3	-	0.1	-	0.1	0.2
52.	Ovoga	0.3	1	0.1	-	-	-
	Other wood species	47	59	68	5	16	23
		<u>1513</u>	<u>4218</u>	<u>5732</u>	<u>113</u>	<u>381</u>	<u>530</u>

Table 2.. Wood species exported from eight African countries, 1951-1961 and 1970

A. Wood species listed in 1951, 1961 and 1970 export statistics

No.	Pilot name	Scientific name	LIB	IVC	GHA	Occurrence		GAB	CGO	ZAI
						NIG	CAM			
1.	Okoumé	AUCOUMEA KLAINIANA						+	+	
2.	Obeche	TRIPLOCHITON SCEROXYLON	+	+	+	+	+		+	
3.	Sipo	ENTANDROPHRAGMA UTILE	+	+	+	+	+	+	+	+
4.	Sapelli	ENTANDROPHRAGMA CYLINDRICUM	+	+	+	+	+	+	+	+
5.	Acajou - Mahogany	KHAYA IVORENSIS	+	+	+	+	+	+	+	+
6.	Makoré	DUMORIA AFRICANA	+	+	+	+	+	+	+	+
7.	Mansonia	MANSONIA ALTISSIMA		+	+	+	+		+	
8.	Ilomba	PYCNANTHUS ANGOLENSIS	+	+	+	+	+	+	+	+
9.	Tiama	ENTANDROPHRAGMA ANGOLENSE		+	+	+	+	+	+	+
10.	Limba	TERMINALIA SUPERBA	+	+	+	+	+	+	+	+
11.	Dibetou	LOVOA TRICHILIOIDES & SP.	+	+	+	+	+	+	+	+
12.	Kosipo	ENTANDROPHRAGMA CANDOLLEI	+	+	+	+	+	+	+	+
13.	Niangon	TARRIETA UTILIS	+	+	+			+		
14.	Kokrodua	AFRORMOSIA ELATA		+	+	+	+		+	
15.	Aniègré	ANINGERIA DOMBEY & SPP.		+			+			
16.	Iroko	CHLOROPHORA EXCELSA	+	+	+	+	+	+	+	+
17.	Doussie	AFZELIA BIPINDENSIS & SPP.		+	+	+	+	+	+	+
18.	Framiré	TERMINALIA IVORENSIS	+	+	+	+	+			
19.	Antiaris	ANTIARIS AFRICANA	+	+	+	+	+	+		+
20.	Ozigo	DACRYODES BUETTNERI						+	+	
21.	Guarea	GUAREA CEDRATA	+	+		+	+		+	
22.	Koto	PTERYGOTA MACROCARPA		+			+			+
23.	Azobé	LOPHIRA ALATA	+	+	+	+	+	+		+
24.	Tola	GOSSWEILERODENDRON BALSAMIFERUM				+	+	+	+	
25.	Ceiba	CEIBA PENTANDRA	+	+	+	+	+	+	+	+
26.	Bubinga	GUIBOURTIA TESSMANNII & SPP.					+	+		+
27.	Tchitola	OXYSTIGMA OXYPHYLLUM				+		+	+	
28.	Abura	MITRAGYNA CILIATA	+	+	+	+	+	+		+
29.	Moabi	BAILLONELLA TOXISPERMA					+	+	+	+
30.	Padouk	PTEROCARPUS SOYAUXII					+	+	+	+

Abbreviations

LIB	-	Liberia
IVC	-	Ivory Coast
GHA	-	Ghana
NIG	-	Nigeria
CAM	-	Cameroon
GAB	-	Gabon
CGO	-	Congo
ZAI	-	Zaire

No.	Pilot name	Scientific name	LIB	IVC	GHA	Occurrence				
						NIG	CAM	GAB	CGO	ZAI
31.	Avodiré	TURREANTHUS AFRICANA	+	+	+		+	+		+
32.	Mutenye	GUIBOURTIA ARNOLDIANA						+	+	+
33.	Eyong	ERIBROMA OBLONGA		+		+	+	+	+	
34.	Zingana	MICROBERLINIA BRAZZAVILLENSIS					+	+	+	
35.	Andoung	MONOPETALANTHUS HEITZII & SPP.						+		
36.	Dabema	PIPTADENIASTRUM AFRICANUM	+	+	+	+	+	+	+	+
37.	Igaganga	DACRYODES EDULIS						+		
38.	Olon	FAGARA HEITZII	+					+	+	
39.	Niové	STAUDTIA STIPITATA					+	+	+	+
40.	Kotibé	NESCGORDONIA PAPAVERIFERA	+	+	+	+	+	+	+	+
41.	Canarium	CANARIUM SCHWEINFURTHII	+	+	+	+	+	+	+	
42.	Movingui	DISTEMONANTHUS BENTHANIANUS	+	+		+	+	+		
43.	Alone	BOMBAX BREVICUSPE & SP.	+	+			+	+		
44.	Bilinga	NAUCLEA TRILLESII	+	+	+	+	+	+	+	+
45.	Okan	CYLICODISCUS GABUNENSIS			+	+	+	+		
46.	Pau rosa	SWARTZIA FISTUZOIDES						+	+	+
47.	Tali	ERYTHROPHLEUM IVORENSE		+	+	+	+	+	+	+
48.	Mukulungu	AUTRANELLA CONGOLENSIS					+	+	+	+
49.	Ebiara	BERLINIA BRACTEOSA & SPP.		+			+	+	+	
50.	Naga	BRACHYSTEGIA NIGERICA & SPP.		+		+	+			
51.	Ebony	DIOSPYROS SPP.		+	+	+	+	+	+	+
52.	Ovoga	POGA OLEOSA				+	+	+	+	
B. <u>Other wood species described in specialized literature</u>										
53.	Adjouaba	DACRYODES KLAINEANA		+						
54.	Afina	STROMBOSIA PUSTULATA		+	+	+				
55.	Akak	* DUBOSIA VIRIDIFLORA					+			
56.	Alen	* DETARIUM MACROCARPUM					+			
57.	Alep	DESBORDESIA PIERREANA					+	+		
58.	Angu	CYNOMETRA ALEXANDRI							+	
59.	Angueuk	ONGOKEA GORE		+				+	+	+
60.	Apobeaou	* BREVIA LEPTOSPERMA		+				+		+
61.	Apomé	CYNOMETRA ANANTA		+						
62.	Assas	* BRIDELIA AUBREVILLEI		+				+		
63.	Beli	PARABERLINIA BIFOLIOLATA						+		
64.	Bodia	ANOPYXIS KLAINEANA	+	+				+		
65.	Bokanga	AMPHIMAS SPP.								+
66.	Bomanga	BRACHYSTEGIA LAURENTII					+	+	+	
67.	Bushaie	* LEBRUNIA BUSHAIE								+
68.	Camwood Afr.	* BAPHIA NITIDA & SP.			+					
69.	Copalier	GUIBOURTIA COLEOSPERMA								+
70.	Coula	COULA EDULIS	+	+				+	+	+

No.	Pilot name	Scientific name	Occurrence							
			LIB	IVC	GHA	NIG	CAM	GAB	CGO	ZAI
71.	Crabwood Afr.	CARAPA PROCERA & SP.								+
72.	Diambi	GUAREA THOMPSONI & SP.		+		+				+
73.	Diania	CELTIS BRIEYI								+
74.	Difon	MORUS MESOZYGIA & SP.		+	+	+				+
75.	Divida	SCORODOPHLOEUS ZENKERI					+	+	+	+
76.	Ekaba	TETRABERLINIA BIFOLIOLATA					+	+	+	
77.	Emien	ALSTONIA CONGENSIS & SPP.	+	+	+	+	+		+	
78.	Esege	MAESOPSIS EMINII					+			
79.	Essessang	RICINODENDRON HENDELOTII		+	+	+	+	+	+	+
80.	Essia	* COMBRETODENDRON AFRICANUM		+	+	+	+	+	+	+
81.	Essoula	* PLAGIOSTYLES AFRICANA					+	+		
82.	Evène	BRACHYSTEGIA MILDENBRAEDII					+	+		
83.	Eveuss	KLAINEDOXA GABONENSIS & SPP.	+					+		
84.	Evino	VITEX PACHYPHYLLA					+	+	+	
85.	Eyong	ERIBROMA OBLONGA & SP.		+		+	+	+		
86.	Eyoum	DIALIUM FLEURYI & SPP.	+				+	+	+	+
87.	Faro	DANIELLIA THURIFERA & SPP.	+	+		+		+	+	+
88.	Fou	MANILKARA LACERA	+	+						
89.	Gheombi	* COPAIFERA LE TESTUI						+		
90.	Gola	TETRABERLINIA TUBMANNIANA	+							
91.	Gombe	DIDELOTIA LETOUZEYI					+			
92.	Haplormosia	* HAPLORMOSIA MONOPHYLLA		+		+	+	+		
93.	Izombé	TESTULEA GABONENSIS					+	+		
94.	Kanda	BEILSCHMIEDIA HUTCHINSONIA & SPP.	+				+	+	+	+
95.	Kasinga	* DRYPETES SPP.								+
96.	Kassusu	* MACROLOBIUM MACROPHYLLUM								+
97.	Kiasoso	* PENTADESMA LEHRUNII & SPP.	+							+
98.	Kibakoko	* ANTHONOTHA FRAGRANS								+
99.	Kumbi	* LANNEA WELWITSCHII		+			+		+	
100.	Landa	ERYTHROXYLUM MANNII		+			+	+	+	
101.	Limbali	GILBERTIODENDRON DEWEVREI & SP.		+		+	+		+	+
102.	Longhi	CHRYSOPHYLLUM SPP.		+			+	+	+	+
103.	Lusambya	MARKHAMIA LUTEA & SPP.								+
104.	Mafamuti	PIPTADENIA BUCHANII								+
105.	Manil	* SYMPHONIA GLOBULIFERA						+	+	
106.	Mayo	MONOPETALANTUS LETESTUI & SP.					+	+		
107.	Mepepe	* ALBIZIA GUMMIFERA		+			+		+	+
108.	Niama	CALPOCALYX HEITZII						+		
109.	Moambe	ENANTIA CHLORANTHA & SPP.					+	+		
110.	Mubala	PENTACLETHRA MACROPHYLLA		+					+	+
111.	Mubangu	* JULBERNARDIA SERETII							+	+
112.	Mukarati	* BURKEA AFRICANA				+				
113.	Mukunari	CORDIA MILLENII & SPP.						+		+

<u>No.</u>	<u>Pilot name</u>	<u>Scientific name</u>	<u>Occurrence</u>							
			<u>LIB</u>	<u>IVC</u>	<u>CHA</u>	<u>NIG</u>	<u>CAM</u>	<u>GAB</u>	<u>CGO</u>	<u>ZAI</u>
114.	Musase	ALBIZIA FERRUGINEA & SP.		+	+				+	+
115.	Musisi	* MICHELSONIA MICROPHYLLA								+
116.	Mutundu	* FUNTUMIA LATIFOLIA								+
117.	Nemba	* HOLOPTELEA GRANDIS								+
118.	Nganga	CYNOMETRA HANKEI						+		+
119.	Obéro	* PICRALIMA NTFIDA & SP.						+	+	+
120.	Oboto	MAMMEA AFRICANA		+	+	+	+	+	+	+
121.	Odoko	SCOTTELLIA CORIACEA & SPP.		+		+				
122.	Oguomo	LECOMTEDOXA KLAINIANA						+		
123.	Ohia	CELTIS SOYAUXII & SPP.		+	+	+				+
124.	Okuro	ALBIZIA ZYGIA			+	+				+
125.	Olonvogo	FAGARA MACROPHYLLA		+			+	+	+	+
126.	Onzabili	ANTROCARYON KLAINIANUM		+			+	+		
127.	Ossimiale	* NEWTONIA LEUCOCARPA						+		
128.	Ovangkol	GUIBOURTIA EHIE	+	+				+		
129.	Ozouga	SACOGLOTTIS GABONENSIS		+		+		+	+	+
130.	Paletuvier	* RHIZOPHORA SPP.		+			+		+	
131.	Parasolier	MUSANGA CECROPIOIDES		+			+		+	
132.	Podo	PODOCARPUS GRACILIOR & SPP.								+
133.	Rikio	UAPACA GUINEENSIS & SPP.		+			+	+	+	+
134.	Safukala	DACRYODES PUBESCENS & SP.						+	+	+
135.	Senan	* PROTOMEGABARIA STAPFIANA		+		+				
136.	Sabu	* CLEISTOPHOLIS PATENS		+		+				
137.	Sougué	PARINARI EXCELSA	+	+					+	
138.	Tani	* CRYPTOSEPALUM STANDTII					+			
139.	Tsanya	* CORYNANTHE PANICULATA					+	+	+	+
140.	Wamba	* TESSMANNIA AFRICANA & SPP.								+
141.	Wawatima	STERCULIA RHINOPETALA		+	+	+	+			
142.	Wengé	MILLETIA LAURENTII & SP.					+		+	
143.	Zing	TOUBAOUATE BREVIPANICULATA		+			+	+		

* Laboratory tests not available

Table 3. Ghana Forest Reserves -- 1968

(Thousand acres)

Item	: Productive	: Unproductive	: All Reserves
High forest:	:	:	:
Under working plans	: 2,146	: 736	: 2,882
Not yet planned	: <u>366</u>	: <u>583</u>	: <u>949</u>
Total	: 2,512	: 1,319	: 3,831
Savanna woodland	: <u>--</u>	: <u>1,008</u>	: <u>1,008</u>
All Forest Reserves	: 2,512	: 2,327	: 4,839

**Table 4.--Timber product consumption in Nigeria in 1970
and projected requirements in 1985**

(Million cubic feet, roundwood equivalent)

Item	:	1970	:	1985
Lumber	:	40	:	58
Wood panels	:	1	:	1
Paper and paperboard	:	10	:	52
Other roundwood	:	<u>45</u>	:	<u>59</u>
Total	:	96	:	170

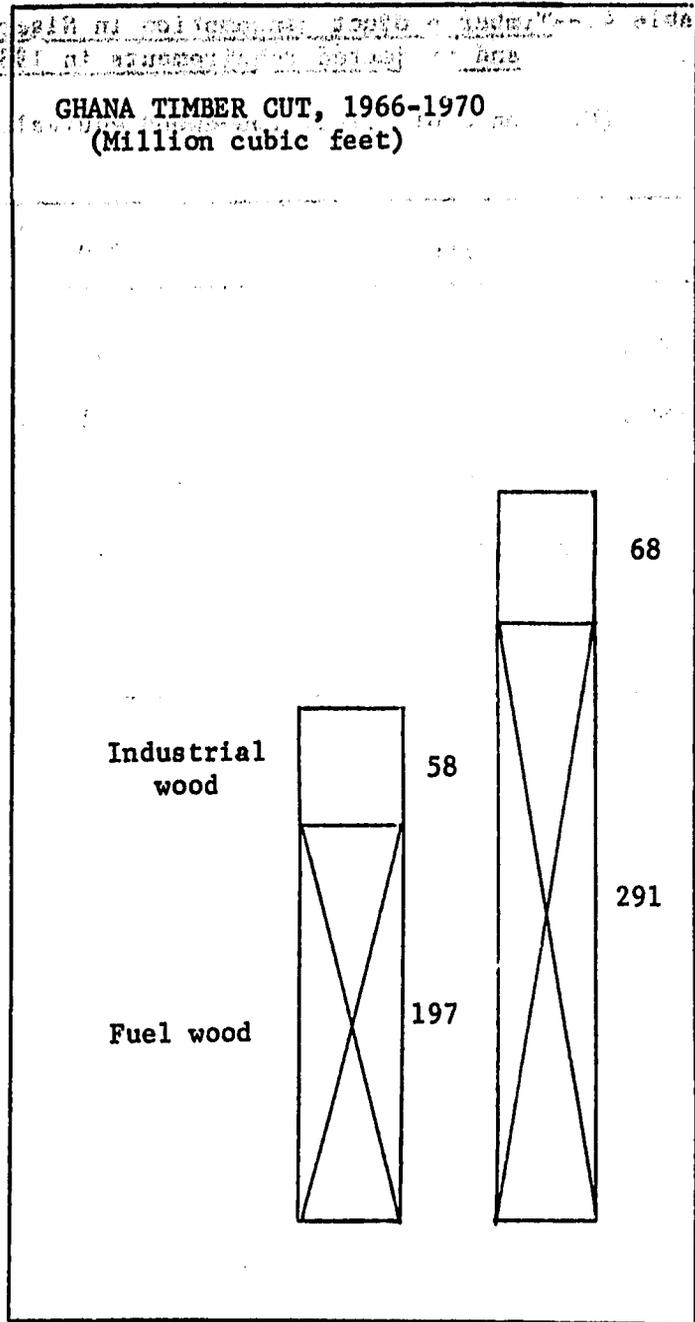


Figure 1

Appendix

Authority

The trip was made under a Participating Agency Service Agreement between the Agency for International Development and the Forest Service, U.S. Department of Agriculture. The PASA Control No. is TA(AJ)2-73. The PASA was approved for AID on November 29, 1972, and for U.S.D.A. on December 13, 1972.

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