

F O R E S T R Y  
IN  
P A N A M A

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# FORESTRY IN PANAMA

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## THE SITUATION

The need for initiating a program for administration, utilization, and conservation of the forest resource of Panama has been strongly emphasized during the past several years. Surveys and analyses of the general forestry situation have been made during the past three years as the preliminary to developing a basic forestry policy. Continuous efforts were made during the calendar year 1955 to initiate a national forestry program.

Based on the proportion of forest land to the total area of the country, forests can be considered as one of the Nation's most important resources. Total area of Panama is 17,600,000 acres of which it is roughly estimated 70 percent is forest land.

Although timber is a renewable basic raw material abundant in Panama, there is a general lack of appreciation of its value in the future industrial development of the country. Mountain water-source areas are being denuded without regard to the need of permanent water supply for irrigation of agriculture crops, hydroelectric power, and domestic consumption. Furthermore, almost all of the timber cut in land-clearing operations is destroyed by burning or left to rot in the forest.

It is a generally recognized fact that one of the principal reasons for the tremendous amount of waste and destruction of the timber resources of Panama is lack of knowledge of the qualities and possible uses of most of the woods which grow here. Of the several hundred species of trees which are found in the forests of Panama only a few of the high quality woods are marketable in the export trade and no more than 15 or 20 have found use in the local markets.

The lack of appreciation of the forest wealth of the Nation is dramatized by the complete absence of a forestry administrative department in the government, the lack of a single trained Panamanian forester in the country, and failure to implement the existing forestry legislation. The Panamanian Government has never had an organization or the facilities for administering their forest resources. Nevertheless, industries using timber for raw material are making an important contribution to the economy of the Republic.

The unrestricted and unplanned exploitation of timber resources is resulting in losses far beyond the simple waste of wood. New growth is not replacing the forest in accessible areas. Erosion and soil destruction caused by cultivation of forest lands, not capable of supporting permanent agriculture, are taking a heavy toll of the productive capacity of the land. Desirable well-known species are disappearing from the forest. These facts and many others point to the great need for immediate action to correct the situation before it is too late for recovery.

## THE FORESTS

Originally Panama was almost entirely covered by forest. A few small natural grass areas were probably scattered throughout the more arid areas but were insignificant in terms of area covered.

The arrival of settlers and the introduction of agriculture during the past three or four centuries have significantly altered the original vegetation pattern of the country, particularly in the Pacific coastal region. The combination of climate, elevation, soil factors, and the influences of man has so modified the vegetation on the Pacific slope that very little of the original forest conditions exist.

For purposes of describing the forest situation in Panama the country has been arbitrarily divided into three broad geographical regions. These are: (a) the Atlantic slope which is normally classified as the Tropical Rain Forest which covers the Caribbean watershed and part of southern Darien, (b) the Pacific slope usually classified as the Tropical Deciduous Forest and savanna which covers the Pacific watershed except the southernmost part of Darien, and (c) the highlands usually classified as Tropical Highlands Forest which are characteristic of areas of elevation 3,000 to 5,000 feet and higher.

### The Atlantic Forest Region:

The Tropical Rain Forest which is characteristic of the Atlantic slope also includes the southernmost section of Darien on the Pacific slope and covers approximately one-third of the total land area of Panama. This region covers

the entire Caribbean slope extending from Costa Rica to the Colombian border, a distance of approximately 400 miles and extends from the Caribbean seacoast merging into the Tropical Highlands Forest above the 3,000 feet contour level. The cordillera which divides Panama longitudinally is the principal boundary between the Atlantic and the Pacific forest types. In the southern<sup>ea</sup> eastern tip of Panama along the Colombian border, high rainfall and favorable climatic conditions have resulted in the Tropical Rain Forest characteristic of the Atlantic slope extending to the Pacific coast.

The Pacific Forest Region:

This region extends from the Pacific coast to the crest of the main cordillera, except in the high mountains approaching the Costa Rican border in western Panama and is estimated to cover more than 50 percent of the total land area of the country. In the mountainous section of western Panama, the forest types gradually change from deciduous to evergreen as the elevation increases, temperature decreases, and more rainfall occurs.

Within the Pacific forest is a large area classified as savannah which contains the large proportion of grassland with scattering bushy trees and drought resistance undergrowth. Although this area was at one time covered with a high forest of deciduous trees, favorable living conditions and suitability for agriculture have resulted in almost complete conversion from forest to agriculture. Centuries of overcropping, grazing, and burning have degraded the soil until much of this area is now generally unproductive.

The Tropical Highlands  
Forest Region:

This forest type is found in the higher mountains principally along the main cordillera near the Costa Rican border and in the higher mountains along the boundary between Panama and Colombia. The forests of this region are overgreen due to the lower temperature and higher rainfall and the absence of dry season. The rough topography and inaccessibility make the forests of this region the least important commercially.

## FOREST INDUSTRY

Like the other tropical forests in Latin America, activity in the forest industry in Panama has been based primarily on the exploitation of logs. Since early days, the timber industry has been principally the extraction of precious woods such as Mahogany and Spanish Cedar. These have been exploited for export principally to the United States of America.

In recent years, a small wood products manufacturing industry has developed in Panama. Although this has been based primarily on Mahogany and Spanish Cedar, the industry has gradually expanded to include several other species. Within the last few years increased demand for local construction timber has caused the introduction of 15 or 20 new species of timber into the local market.

Formerly the greater part of the lumber used in the Canal Zone and in Panama was imported from the United States of America. However, there is a definite trend both by the United States organizations and the Panamanian building industry to utilize locally manufactured lumber wherever practical. One of the major handicaps to expanding the use of locally produced timber is the quality and standard of manufacturing. Lumber from local sources is reported to be less desirable because of uncertainty as to quality and uses and the additional handwork necessary in fitting the material to size while, on the contrary, imported lumber is cut to exact dimension, has been well seasoned, is of dependable quality, and can be ordered according to well-known specified grades.



While early history of the timber manufacturing industry in Panama is somewhat obscure, it can be assumed that no sawmill existed prior to the construction of the Panama Canal. During the construction period practically all of the timber necessary for building purposes was imported from the United States. It is likely that a few small mills were established during the First World War. These cut Mahogany primarily, some for export in large planks and some for local use for the manufacture of furniture, doors, and interior finish in the building industry. During the Second World War there was a marked increase in the industry. Several new mills were established. More lumber was demanded locally for use in the Canal Zone. These demands lead to the installation of a few larger sawmills, one modern dry kiln, and a plywood factory.

Although the industry is gradually expanding, the amount of timber utilized is insignificant compared to the vast volume available from the extensive forests in Panama. It is roughly estimated that about ten million board feet of timber are produced annually in Panama. Today the forest industry in Panama consists of the following:

Sawmills: There are 75 sawmills operating in Panama ranging in size from a daily capacity of 20,000 board feet to only a few hundred. The largest and more efficient sawmills are located in Panama City. However, with the exception of three or four fair size mills, the Panama sawmill industry is characterized by small inefficient circular sawmills.

Following is a tabulation of the number of sawmills in each province. The data is based on a questionnaire survey conducted by SICAP's Survey and Planning Division.

NUMBER OF SAWMILLS IN THE REPUBLIC OF PANAMA  
BY PROVINCE - 1955

<u>Province</u>	<u>Number of Sawmills</u>
Panama.....	14
Chiriquí.....	16
Cocle.....	1
Herrera.....	21
Veraguas.....	4
Los Santos.....	6
Bocas del Toro.....	7
Darien.....	6
Colon.....	-
TOTAL	75

Processing Mangrove Bark:

Processing of Mangrove Bark is a small but important forest industry in Panama.

A factory owned and operated by the Man-Tan Chemical Products Company is located in Panama City. The process consists of pulverizing the bark of Mangrove trees (Rhizophora mangle) which is exported for use as a mud conditioner in drilling oil wells. This is a relatively new industry established about four years ago and has good possibilities for expansion as there is an abundance of raw material in Panama. Also it is reported that there is a rapidly expanding market for the product both for use in oil well drilling and extraction of tannic acid for leather tanning.

Utilization of the wood is a special problem connected with this industry since harvesting of the bark results in death of the trees. Some research and trials have been carried out to find economic uses for the Mangrove wood. This species was tested recently for piling in the Panama Canal but was found to be seriously attacked and damaged by marine borers. Tests for pulpability have been made by the Forest Products Laboratory of the United States Forest Service at Madison, Wisconsin. These tests indicated that the wood is worthy of consideration for the production of bleached sulfate pulp, although bleaching chemical requirement was high and strength properties are only fair compared to the more commonly used hardwoods. To a limited degree the wood is used in various countries for railroad ties, construction timbers, boat parts, firewood, and posts. In Panama it is the principal wood from which charcoal is produced. Extensive areas of pure Mangrove forest exist in the Darien Province, and any utilization of the wood would be an important contribution to economic development of the country.

Plywood Factory:

There is one plywood factory in Panama

City which has been in operation for approximately ten years. For a more detailed description see discussion under Trends of Progress During Calendar Year 1955 - "Panama Forest Products Plywood Factory".

Furniture Manufacturing:

Although no census of the furniture manufacturing industry is available, it is a well established business in Panama. Most of the furniture is handmade, and there are innumerable small shops engaged in this business. While the major production centers are in Panama City and Colon, some furniture is produced throughout the <sup>re</sup>public with small factories in the larger towns such as Santiago, Penonome, Chitre, and David. Mahogany and Spanish Cedar are the principal woods for this purpose.

Building Industry:

During the early construction period of Panama City and Colon buildings were made almost entirely of wood. This created a substantial demand for lumber imports. However, a wave of disastrous fires as early as 1914, which wiped out entire blocks of the cities, resulted in public action against wood as a building material. Between 1917 and 1920 the policy of zoning and building restriction was established. This practically eliminated the use of wood as a general construction material within the metropolis. However, the effects on over-all demand is rapidly becoming less important as rural development increases throughout Panama.

Practically all of the locally cut lumber is used in the building industry.

Although there is no way of knowing the quantity of material used for this purpose, it probably amounts to several million feet per year. Until recently this market was supplied primarily by imports. However, a few local species

of Panama's wood are gaining acceptance by the industry and is gradually replacing the imported material.

Exportation of Logs:

Cutting of Mahogany logs for export to the United States of America has been the principal forest industry since the beginning of forest exploitation in Panama. Although local uses for Mahogany are increasing, export of logs still represents the principal forest activity in Panama. Despite the fact that the more accessible forests have been exploited, the high prices which were paid for Panama Mahogany continue to encourage this business.

Panama Canal Zone:

According to a recent report of the Panama Canal Company, a notable increase was shown last year in the purchase of native lumber and forest products. Total purchases were more than triple the value of such products bought in either the fiscal year 1953 or 1954. Forest products purchased from Panama in 1954 amounting to \$50,000 reached \$166,000 in value in 1955. All plywood now being purchased for use by Panama Canal units is being obtained in Panama. In addition, contracts for a considerable supply of native lumber were awarded to five principal suppliers last year. Hardwood lumber from Panama's forests is extensively used in general maintenance of Canal Zone buildings. The types of lumber include chiefly Mahogany, Cativo, Maria, Cedro Amargo, and other Cedar varieties.

TRENDS OF PROGRESS DURING CALENDAR YEAR 1955

The wide variety of activities and numerous requests for advice and assistance during the past year indicate a stepped-up interest in forestry matters and show significant progress toward the development of a basic forest policy for Panama. The most important of these activities are summarized below:

Initiating Forestry Program: Continuous efforts were made during the calendar year 1955 to initiate a forest program in Panama. A conservation committee composed of several influential Panamanians and headed by a member of the National Assembly has played an important part in stimulating interest in a forestry program. The efforts of this committee have been largely responsible for the new forestry law to be presented for consideration by the National Assembly. The greatest problem in connection with initiating the program immediately upon adoption of the new legislation will be to find a Panamanian qualified and willing to accept the responsibility of the forestry office.

Forestry Legislation: New forest legislation initiated during calendar year 1954 was finally drafted and will be presented at the 1955-1956 session of the National Assembly. Assistance and advice was given by SICAF in the formulation and preparation of the bill which consolidates past forest legislation, adds new measures, and provides for necessary implementation. One of the most important features

woods in the recently established Wood Testing Laboratories of the Division of  
dated a program for the testing of Panama.

The University of Panama during 1954 ini-

Studies of Properties of Panama  
Woods:

week Forestry Short Course in Puerto Rico during March through May 1956.  
being offered by the International Cooperation Administration for the seven-  
prospective student to take advantage of another forestry scholarship that is  
at the State University of Michigan. An effort is now being made to find a  
awarded to Augusto E. Zambrano by SICAR provides for four years of training  
time a forestry scholarship was awarded to a Panamanian. This scholarship  
step was taken in the field during this calendar year when for the first  
the central government level. No one has been located to date. An important  
and interested in assuming the responsibility of forest administration at  
the past few months to locate at least one Panamanian who would be qualified  
of forestry is completely lacking. A concerted drive has been made during  
This is especially important in Panama since trained personnel in the field  
basic training and education program as a first step in program development.  
1955 has been placed on the road for a

Technical Forestry Education:

Continuous emphasis during calendar year

Favorable action will be taken to adopt the new law early in 1956.  
immediate implementation. At the close of 1955 the prospects are good that  
Some funds have already been approved for calendar year 1956 to provide for  
est service with an office of forestry in the Ministry of Agriculture.  
of the proposed law is that it would authorize the establishment of a for-

Engineering and Architecture. During the calendar year 1956 a much broader program of study of Panama woods has been planned. In co-operation with the University of Panama, the Instituto de Fomento Economico (IFE) has provided funds for the study of several local woods. SICAP provided technical advice and assistance in connection with this program. A detailed plan was submitted to the University for this study covering the following points:

a. Review of Previous Work

The importance of reviewing, analyzing, and interpreting the information already available was emphasized, and the various agencies which have already carried out tests of Panama woods were listed. It was recommended that a careful review of all published material, together with personal interviews with individuals familiar with previous work which has been accomplished in this field be made prior to carrying out additional investigations.

b. Laboratory Tests

It was suggested that a program for testing and evaluating the physical and mechanical properties of a few woods be carried out concurrently with the review of available information as a means of orienting and familiarizing the students selected to make these studies with the procedure and problems involved. A list was supplied of the woods for which complete statistical information has been published by the Yale University. These included the following list of Panama woods:

Guayacán (*Tabebuia guayacón*)  
Amarillo or Margusta (*Astronium graveolens*)  
Cedro Espino (*Ombacopsis quinata*)



Vaco (*Magnolia sororum*)  
Laurel Blanco (*Cordia alliodora*)  
Cedro Granadino (*Cedrela tonduzii*)  
Espavé (*Anacardium excelsum*)  
Almendro (*Coumarouna oleifera*)  
Cedro Batea or Possum Wood (*Hura crepitans*)  
Cativo (*Prioria copaifera*)  
Courbaril (*Hymenaea courbaril*)  
Roble Blanco (*Tabebuia pentaphylla*)

In addition, some studies have been made on test samples from other countries of species also common to Panama. These include the following four species:

Caoba (*Swietenia macrophylla*) sample from Central America  
Cedro Macho (*Carapa guianensis*) from Brazil and Surinam  
Ceiba (*Ceiba pentandra*) from Venezuela and Colombia  
Goncalo Alves (Zorro) (*Astronium gravecoleus*) from Venezuela and Honduras)

It was further suggested that initial studies by the University should be confined to the woods which have already found limited local use in Panama, but for which no technical data is available. The following list of woods was proposed:

Sigua Amarillo	Guayabo
Sigua Canelo	Nazareno
Bambito Blanco	Cacique
Bambito Colorado	Cenizo
Cedro Amargo	Macano
Cocobolo	Nispero

#### c. Interpretation and Publication

Although considerable information is available as a result of previous studies of Panama woods, this, to be of most value, must be translated and interpreted in terms of conditions which prevail in Panama. It was pointed out that one of the important phases of the study should be to make

available as much of the information as possible in common usable terms for evaluating the merits of a wood for its particular use and that separate information pamphlets be published for each wood for which information is available.

d. Outside Training

To supplement the training which could be provided by the University of Panama it was suggested that the students selected to participate in the study be sent to Puerto Rico or other established wood research center for a training period of approximately six months. Puerto Rico is proposed as a good possibility since the United States Forest Service is now carrying out practical studies of Puerto Rican woods at their Tropical Forest Research Center and, in addition, has the advantage that English is not required.

e. Coordinate Studies with Other Agencies

Due to the fact that several agencies have at one time or another carried out studies of wood properties of Panama woods, the importance of coordinating the work of the University in order to avoid duplication and to supplement information whenever possible was emphasized. The principal agencies were listed including the United States Navy Research Laboratories at Rodman, Canal Zone, where an extensive program is being planned for the testing of the resistance of the Panama woods to marine borers; Yale University, School of Forestry, where a special department is maintained for the study of tropical woods; and the United States Forest Service Wood Products Laboratories at Madison, Wisconsin.

f. Identification of Woods

The importance of positive identification of woods as a primary requirement of the study was emphasized. It was pointed out that identification is the link between investigations and applications of results, and in order to translate the technical data into usable terms identifying characteristics recognizable by industry must be determined. It was recommended that a cooperative agreement be worked out with one of the wood products research laboratories for assistance in this phase of the study and that the possibility of obtaining the cooperation of the United States Naval Research Laboratories be investigated.

Panama Forest Products  
Plywood Factory:

The Panama Forest Products Plywood Factory represents one of the most important timber utilization industries in Panama. Since resumption of production approximately two years ago when the factory was purchased from the United States Plywood Company, good progress has been made in overcoming operational problems such as the need to organize and develop a satisfactory work force, difficulties in obtaining an adequate and continuous source of logs, need of establishing a firm export market, and high import dues levied by the United States on finished and semi-finished plywood, (Import duties charged by the United States on this type of material are reported to be 20 percent of the selling price.)

Almost all of the plywood used in Panama is now produced by this factory. This

industry is very important to the economy of Panama since it provides a stable source of employment and a good livelihood to several hundred people, is an additional source of revenue for the government, and gives a highly efficient use of a basic raw material which otherwise would likely be wasted.

Along with sales of the well-known woods, the company is promoting the introduction of new species on the United States market. One new wood recently introduced and gaining acceptance on the United States market is Cabimo (*Copaifera chiriquensis*). Other woods now being used in the manufacture of plywood at this factory include Mahogany (*Swietenia macrophylla*), Gativo (*Prioria copaifera*), Espavé (*Anacordium excelsum*), María (*Calophyllum rekol*), and Cedro Espino (*Bombacopsis quinata*).

Forestry Report for the  
International Bank:

In recent months SICAP was asked to prepare a forestry statement in connection with an industrial survey which was being made by the International Bank. Material advice and assistance were provided for the preparation of this report.

Ecological Survey of the  
Republic of Panama:

In calendar year 1955, the general survey of the forestry situation in Panama was continued. SICAP made arrangements with the Organization of American States for an ecological survey of the country. This survey, initiated in

1954, was completed during the present calendar year by Dr. L. A. Holdridge and Gerardo Budowski, Foresters. A report was prepared describing in general terms the characteristics of the ecology of Panama together with a generalized map outlining the vegetation zones of the country. This survey will be useful as a guide in the event a general land-use survey is to be made of Panama.

Cooperation with Panama Canal Company:

Panama Canal Company requested information from SICAP relative to some of their timber acquisition problems. Information was supplied concerning the local species which might be suitable for use in the Canal Zone operations for railroad ties and general construction lumber. Increased interest in the useability of Panama woods has resulted from the recent policy included in the new United States-Panama agreement which requires that local sources of material be used to the greatest extent practical in the operations of the Canal Zone.

Use of Orey wood for Production of Paper Pulp:

Several meetings were held with representatives of a newly organized company who are interested in investigating the Orey (*Campnosperma panamensis*) forests of the Bocas del Toro region to determine their suitability as a source of raw material for pulp and paper industry. Preliminary analysis of this species of wood by the United States Forest Service Wood Products Laboratories at Madison, Wisconsin, indicates that it is suitable for the manufacture

of paper pulp. However, adequate surveys have not been made to determine whether or not there is an adequate source of the timber available for such an industry. The company was advised by SICAP to make additional surveys prior to spending more money or effort in promoting such an enterprise.

Forest Survey of Fort Clayton:

During the past year the Office of the Engineer, United States Army Caribbean, solicited the advice and assistance of SICAP in the preparation of a Forest Management Plan of the Fort Clayton reservation. Trips were made with members of the Office of the Engineer to the forest area for this purpose. An excellent report has been prepared by this office entitled "A Survey of the Timber Resources, Fort Clayton, Canal Zone". The report contains an analysis of the local forestry situation and the management problems connected therewith and is a significant contribution to the knowledge of the forestry situation in Panama. A copy has been placed in the SICAP library.

Instituto de Fomento Economico  
Forestry Nursery:

Another project on which consultation was provided during the year is the forestry nursery maintained by the Instituto de Fomento Economico. This nursery provides ornamental and shade trees to meet requirements of the Landscaping Department of the Housing and Rehabilitation Section of the Instituto de Fomento Economico. This nursery is located on the outskirts of Panama City, in Bethania, and produces several hundred thousand excellent quality Mahogany and Cedar. This project is of interest to SICAP since

seedling production in excess of the Instituto de Fomento Economico landscaping requirements has been offered for distribution to the Agricultural Extension Service and 4-S Youth Clubs for local planting programs.

Fifth Latin America Forestry  
Commission Meeting:

During the period October 4 through 15, 1955 the Food and Agricultural Organization of the United Nations sponsored the Fifth Conference of the Latin America Forestry Commission in Caracas, Venezuela. Although Panama did not officially participate, the writer, as a member of SICAP, upon request of the Secretary of Agriculture acted in an unofficial capacity. An important contribution to the conference was made by Panama through submission of an official report on the forestry situation in Panama by the Ministry of Agriculture, Commerce, and Industry. Panama's interest in the conference received favorable comment. A complete set of reports and documents relative to the conference was forwarded to the Minister of Agriculture.

SICAP Demonstration Plantation:

During the calendar year 1955 a small demonstration plantation of Mahogany (*Swietenia macrophylla*) and Cedar (*Cedrela mexicana*) was established near Chitre in the rich cattle producing area of the Azuero Peninsula. One hundred one-year old seedlings of each species were planted in connection with a broad program of introduction and propagation of improved pasture grasses. The primary objective of establishing the tree plantation was to emphasize to the local farmers and cattle ranchers the importance of shade trees in pasture

lands and to demonstrate proper methods of planting.

SICAP Tree Nursery:

Plans were formulated during 1954 by the SICAP for the development of coffee and cacao propagation nurseries in the highly developed agricultural zones of Penonome in Central Panama and Concepcion in Chiriqui. An important phase of this program was to produce forest tree planting material which would not only provide shade trees for the cacao and coffee plantations, but as a source of planting stock for farmers interested in establishing windbreaks around their fields, live fence posts, shade trees for pastures, farm-wood lots for fuel, lumber, etc. It was proposed to utilize the local 4-S Youth Clubs in expediting the forest tree planting phase of the program. Initial progress was attained during the calendar year 1955 in developing the nurseries and in obtaining a supply of seeds.

Decay and Termite Resistance Tests of Panama Woods:

An important study of the resistance to decay and termite attack of ten Panama woods is being conducted in the Canal Zone by the United States Forest Service. The study was established early in 1952 by the Forest Insect Laboratory of the United States Forest Service, Gulfport, Mississippi in cooperation with the Office of the Engineer, United States Army at Fort Clayton. Tests consist of placing 1" X 6" X 12" boards in contact with the ground. Follow-up examination have been made each year.



The following is a list of the woods involved in the study:

Cativo	<i>Prioria copaifera</i>
Nune	<i>Hura crepitans</i>
María	<i>Celophyllum longifolium</i>
Spanish Cedar	<i>Cedrela odorata</i>
Mahogany	<i>Swietenia macrophylla</i>
Sigua	<i>Nectandra</i> sp.
Cedro Granadino	<i>Cedrela</i> sp.
Amarillo	<i>Terminalia</i> sp.
Cedro Espino	<i>Bombacopsis Fendleri</i>
Espavé	<i>Anacardium excelsum</i>

Results obtained at the end of two

years showed Cedro Espino superior in

both tests, being 90% free of termite attack and 30% free of decay. María and Mahogany rated second and third respectively. The other seven species showed little or no resistance to either decay or termite attack. The final examination made near the end of the fourth year showed all but Cedro Espino severely damaged by both termites and decay. The practical conclusion is that, to be used successfully for construction purposes in humid areas, these species must be treated with termite and decay resistant chemicals.

A LOOK TO THE FUTURE

Forests, potentially the source of one of Panama's most important basic raw materials, are being destroyed at an alarming rate. In every section of the country which has been made accessible by roads, the forests are being cut and burned to make way for agriculture. For each tract of forest land cleared for agriculture thousands of board feet of timber are destroyed. To check this trend national planning for the utilization of the nation's basic resources is urgently needed.

Development of a road system in Panama generally has been followed by expansion of agriculture into the forests. Recent construction of a stretch of road into the rich forest zone of the Cerro Azul region gives striking preview of what can happen to Panama's forests when they are made accessible. Even in advance of construction, settlers move into areas along proposed routes in search of new lands to cultivate.

The forests of Darien are next in line. Darien, the southeastern province of Panama bordering the Republic of Colombia, is an exceedingly rich timber area and contains a large percentage of the remaining commercial forests of Panama. Heretofore, beyond the reach of mass colonization due to inaccessibility, agriculture has made only a few incursions into the forests of Darien. These are confined to small clearings along the banks of the rivers which have been made by the natives for the production of subsistence crops of rice, corn, bananas, etc. However, this situation cannot be expected to be maintained for many more years since current road

building programs include Darien and more area will inevitably be cleared for agriculture and pasture. The key to the timber conservation problem is in establishing industries to utilize the principal species of woods now growing in the potential agricultural zones. Unless markets are available, the timber which must be cut in this process will be destroyed rather than utilized. A concerted effort should, therefore, be made to investigate the wood utilization potentialities of the woods of Darien.

The major handicap to timber utilization in Panama is lack of local markets. The small population of less than one million people and their traditional habits of living result in a low per capita consumption of lumber. The local economy cannot absorb and pay for any substantial quantity of timber. Only the precious species can be exported under present conditions. With increased exploitation must also come increased sales locally and abroad. Large volumes of ordinary wood must be marketed in order to place the industry on a sound economic basis. This will require a definite sales program based on production of high quality and regular supplies of well-cut and conditioned lumber, veneer, plywood, and other products for export.

The logical, practical solution to the forest conservation and utilization problem in Panama is the establishment of intergraded forest industries. Based upon the supply of raw materials available the outlook for establishing such an industry in Darien is favorable. A conservative estimate of the gross timber volume indicates that there are at least 20 to 30 billion board feet of timber in the Province of Darien. It is obvious,

therefore, that the supply of timber is more than adequate to support a substantial forest industry on a permanent sustained basis. Such an industry could include sawmills, a veneer and plywood factory, a pressed board plant, a pulp and paper mill, a match factory, remanufacturing plants for the production of boxes, crates, furniture, doors, production of charcoal, railroad ties, mine timbers, etc.

For the broadest utilization of Panama's extensive forest resources a forest industry should be developed in conjunction with a soundly planned agriculture. This should be the basis for future development and colonization. Agriculture coordinated with forest industry development would tend to assure the wise utilization of one of Panama's most abundant and most promising raw materials.

BASIC MEASURES REQUIRED IN THE INITIAL FORESTRY PROGRAM

To implement such a program, leadership at the central government level is indispensable. The major obstacle at the present time is the absence of a forest administrative office in the Panama government organization. An effective and permanent organization on a level consistent with the other administrative units of the government is needed. Since forestry is a phase of land use management and timber is a self-perpetuating crop of the soil, the administration of forest resources should be the responsibility of the Minister of Agriculture. Consequently, the most needed first step of a forestry program in Panama is the creation of an office of forestry in the Ministry of Agriculture, Commerce, and Industry.

The following five measures are suggested as a basis for initiating a forestry program in Panama:

1. Create an administrative office of forestry in an appropriate department of the government. The Ministry of Agriculture, Commerce, and Industry is recommended as a logical place for this office.
2. Adopt a new forest law which will consolidate existing forest legislation and add new features, the most important of which would be to assign the responsibility for administration of the forests of Panama to the Minister of Agriculture, Commerce, and Industry.
3. Investigate the properties and uses of Panama's timber in order to determine which are suitable for industrial uses in a national program for improving utilization of wood and other forestry resources.

4. Initiate an education and extension program to inform the public concerning the economic importance of Panama's forest resources and arouse general interest in forestry matters.

5. Expand the program of forest education through which Panamanian students are sent abroad to study forestry subjects in order to prepare a nucleus of trained personnel adequate for the administration of Panama's forest resources.

Should the necessary action be taken to establish a forestry administrative office by the Panamanian Government consideration should immediately be given to including forestry in the United States Technical Assistance Program in Panama and the addition of a technical forestry specialist to the staff of United States consultants. In the meantime, continued advice and guidance of a trained forest technologist familiar with government organization and administration will be desirable to expedite development of the forestry department, formulate a national forestry policy, and initiate a basic forestry program.