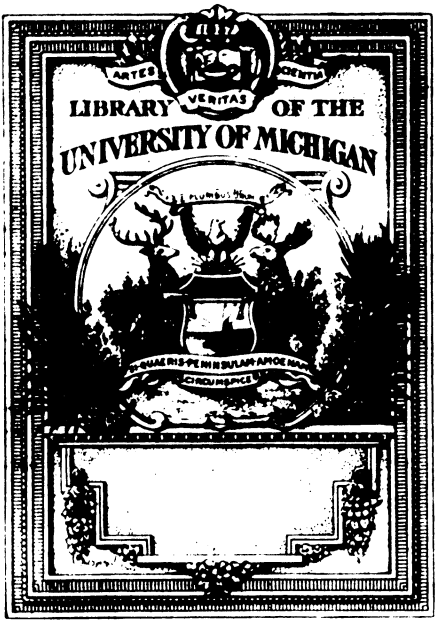
Report of the Philippine commission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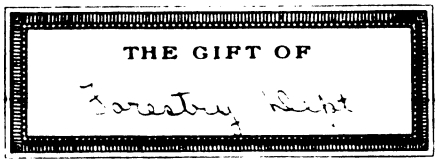

THE GIFT OF
Forestry Dept

APPENDIX J.

REPORT OF THE CHIEF OF THE FORESTRY BUREAU FOR THE PERIOD FROM JULY 1, 1901, TO SEPTEMBER 1, 1902.

TERMS USED IN THIS REPORT.

Almáciga	mastic.
Balao	vegetable oil.
Bejuco	rattan.
Breas	pitch.
Carbon	charcoal.
Cascalote	tan bark.
Cautchuco	rubber.
Goma elastica	rubber.
Copal	a transparent gum soluble in ether and essential oils.
Guta-percha	gutta-percha.
Resina	resin.
Sibucao	dyewood.
Tintoreas	dyewood.

LINEAR MEASURES.

Pie (Spanish foot) equals 0.91 foot English.
Punto (one-tenth part of Spanish foot) equals 1.09 inches English.
Meter equals 39.37 inches English.
Vara equals 33 inches English.

SURFACE MEASURES.

Hectarea equals 2.471 acres or 10,000 square meters.
Area equals 119.6 square yards.
Centiarea equals 1,550 square inches.

CUBIC MEASURE.

Pie cubico (Spanish cubic foot) equals 0.764 cubic foot English.
Cubic meter (46.83 Spanish cubic feet) equals 35.4 cubic feet English.

LIQUID MEASURE.

Ganta equals 3 liters or about 3.17 quarts English.

DRY MEASURE.

Ganta equals 3 liters or about 1 pound English of charcoal.

Local currency values at present rate of exchange, 2.35.
Peso equals 42½ cents United States.
Real equals 5 cents United States.
Cuarto equals 0.26 cent United States.
All moneys other than salaries of foresty officials mentioned in this report are in local currency.

MANILA, P. I., *September 8, 1902.*

The Honorable SECRETARY OF THE INTERIOR,
Manila, P. I.

SIR: I have the honor to submit herewith the report of the bureau of forestry for the period beginning July 1, 1901, and ending August 31, 1902.

During my absence on leave in the United States, from May 18 until December 1, 1901, the office was in charge of Capt. A. E. McCabe, at that time an inspector in

the bureau. While in the United States I visited, by authority of the Philippine Commission, the forestry schools at Yale, Cornell, and Biltmore, and conferred with the professors and students, with the object of securing graduates of these schools for the Philippine forestry service. The Yale and Cornell schools have each about forty students, each student having completed his college course before entering the school of forestry. The forestry school at Biltmore has but a few students, but their course of instruction is of a very practical character. The directors of these schools are able men, and each is assisted by a competent staff. From these schools must be drawn material for the technical work in the Philippines. Outside of these schools there are very few foresters in the United States; not enough to do the work contemplated by the Bureau of Forestry in Washington. However, I advertised the fact that foresters were wanted for the Philippine service at salaries of $2,418 per year, with all field expenses paid.

Arrangements were made with the Civil Service Commission in Washington to hold an examination in the United States on September 9 for candidates for our forestry service. This examination was equivalent to that held for the position known as "field assistant" in the Bureau of Forestry in the Agricultural Department at Washington. Five men, R. C. Bryant, Edward Hagger, Edward H. Hareford, William Klemme, and W. W. Clark, passed, and several candidates failed to pass this examination. Edward M. Griffith was transferred from assistant forester in the Bureau of Forestry, Washington, to the forestry bureau in Manila. Mr. Neely was transferred from a furloughed list in the Agricultural Department, Washington. Mr. Griffith entered as forester and Mr. Neely as manager of the timber testing laboratory. These men, with the exception of Mr. Griffith, and Mr. Clark, arrived in Manila, December 2; the latter two arrived several months later.

While in the United States, authority was received from Manila to purchase an equipment for a timber testing laboratory, books and instruments for the bureau. Mr. Neely visited Philadelphia and made arrangements for the purchase and shipment of the laboratory equipment. Mr. Neely had been employed in the Agricultural Department as an assistant while that Bureau conducted an elaborate series of timber testing experiments. He was highly recommended by that Department for this position, and judging from the manner in which he has installed his equipment and inaugurated a systematic series of tests, it seems probable that in the near future, contractors, builders, and others interested in the strength, durability, and suitability of native woods will have some intelligible data to work upon in their selection of building material from the three hundred or more varieties of wood entering the Manila market.

In connection with the laboratory tests, a workshop has been started, in which every variety of native wood which can be secured will be worked up in one or more ways to show its most valuable use in the market. This will tend to solve the most difficult problem confronting the forester in the Philippines, viz, to induce the logger to take a great variety of tree species which are to-day considered of no value, simply from the fact that these species are not well known in the market.

A competent cabinetmaker from the United States is on his way to take charge of this shop, and it is intended to place under his instruction a number of the best Filipino wood workers and carvers, who will readily respond to such teaching. The famous wood carvings in the Jesuit Church in Manila and the beautiful work done in Paete illustrate the Filipino's skill and artistic sense. It is intended to make this workshop self-supporting and to encourage as much as possible this feature of the work of the bureau.

Several foresters employed in the Indian service have made application to enter this work in the Philippines, but the authority to employ foreigners in our civil service has not been granted. This office has made an unsuccessful effort to secure the services, for a limited period, of the Hon. Bart. Ribbentrop, who had accomplished such excellent results in the forestry department in India. The problems confronting the forestry officials in India forty years ago, when the service was in its infancy, were very similar to those now to be solved in the Philippines, viz, a great variety of unknown tree species, a large population per square mile, with easements of various kinds on public timber land, and a lack of accurate surveys and knowledge of boundaries. These problems were met and solved successfully by Mr. Ribbentrop, and it would save us much time, money, and annoyance to take advantage of his experience.

The restrictions imposed by what is known as the Spooner amendment to the Army appropriation bill, passed in March, 1901, continued in force until July 1, 1902, and were interpreted in accordance with the opinion of this amendment as given by the War Department. The opinion stated:

"This enactment permits the President of the United States to grant such temporary privileges as are 'clearly necessary for the immediate government of the islands and indispensable for the interest of the people.'"

All timber cut on public land is cut under license, and the amount cut has never, since the American occupation, met the needs of the people. The result has been that millions of feet of American pine and redwood and of timber from Borneo and Australia have been shipped in to meet a part of the demand. (See Appendix.)

The following dispatch stopped for a time the further issuance of licenses:

"WASHINGTON, D. C., *July 24, 1901—8.40 p. m.*

"TAFT, *Manila:*

"Secretary of War directs send by first available transport full and complete copies existing licenses granted by forestry bureau. Do not grant more licenses till you receive instructions. Report to date, and monthly thereafter, amount forest products taken from public or private lands, also amount imported and exported after May 1. Send two sample sets forms used in forestry bureau.

"EDWARDS."

The following dispatch was received in response to a request by Governor Taft to be permitted to grant gratuitous licenses:

"WASHINGTON, D. C., *September 21, 1901.*

"TAFT, *Manila:*

"With reference to your telegram of 17th September, Secretary of War authorizes further issue firewood and gratuitous licenses, especial care being taken in each case not to issue more than actual necessity demands. With reference to your telegram of 4th September, Secretary of War desires to know if practicable to insert in timber licenses limitation on amount to be cut thereunder. What do you advise as maximum?

"EDWARDS."

To which dispatch the following reply was sent:

"MANILA, *September 25, 1901.*

"SECRETARY OF WAR, *Washington:*

Greatest amount of timber cut one year by one person or company, 100,000 cubic feet. Commission thinks this small. Manila demand for lumber great. If limitation imposed, should not think 500,000 cubic feet for a year excessive.

"TAFT."

The authority to issue timber licenses was received as per the following dispatch:

"WASHINGTON, *October 22, 1901.*

"TAFT, *Manila:*

"With reference to your telegram of the 17th ultimo, Secretary of War again permits issuance timber licenses; in addition to previous restrictions grant but one timber license to each one bona fide individual applicant—not exceeding 30 in one province; cut under any individual license not to exceed 10,000 cubic feet; incorporated companies allowed 100,000 cubic feet—only 3 such licenses in each province. Licenses to expire not later than June 30, 1902.

"EDWARDS."

These instructions have been followed strictly.

On July 13, 1901, the following act of the Philippine Commission was passed:

[Act No. 165.]

"SECTION 1. Any person who desires to ship forest products of whatever sort to a foreign port shall produce to the collector of customs at the port of shipment a receipt from a forestry official showing that the forestry taxes on these products have been paid, unless such products are taken from private land the title to which has been properly registered in the office of the forestry bureau, Manila, in which case the shipper shall produce a certificate from a forestry official to this effect.

"SEC. 2. No collector of customs shall clear a vessel having on board forest products of any sort from any port of the Philippine Islands for a foreign port until the shipper of such products has complied with the provisions of section 1 of this act.

"SEC. 3. Every collector of internal revenue and every provincial treasurer in the Philippine Islands shall make to the chief of the forestry bureau an itemized monthly report of all moneys received by him for taxes on forest products, giving for each payment the date when made, the name of the payer, the number of the forestry official's order under which the payment is made, the nature of the product on which

the payment is made, the name of the province in which it was taken, and the amount of the payment.

"SEC. 4. The public good requiring the speedy enactment of this bill, the passage of same is hereby expedited in accordance with section 2 of 'An act prescribing the order of procedure by the Commission in the enactment of laws,' passed September 26, 1900.

"SEC. 5. This act shall take effect on its passage."

Enacted July 13, 1901.

This act was especially intended to reach the ports of Zamboanga, Jolo, and Siassi, where, prior to this, quantities of rubber, gutta-percha, and other forest products had been frequently shipped to Borneo, Singapore, and other ports without payment of the government charge.

This act also provided that provincial treasurers and collectors of internal revenue make monthly itemized reports to the bureau of forestry of all revenues collected by them on forest products.

On July 16, 1901, act No. 171 was passed, creating the positions of chief and assistant chief of the forestry bureau, and fixing the salaries of the same.

On August 1, 1901, forestry bureau stations were established at Zamboanga and Cotabato, in Mindanao, and at Jolo, and the forestry regulations enforced in that region. A Moro dato, Rajah Mudah Mandi, was appointed assistant forester and placed in charge of the station at Zamboanga.

On August 1, 1901, the island of Negros was organized under the forestry bureau, and stations established at Bacolod and Damaguete. Prior to this, the island of Negros had its separate forestry laws, and was not under the jurisdiction of this bureau. All forest privileges granted by this separate establishment have expired, and were renewed by this office as deemed advisable.

On September 6, 1901, act No. 222 was passed, creating the department of the interior and placing the forestry bureau in that department.

LOCATION.

The forestry bureau has its main offices in the intendencia, or treasury building, where are found the chief and assistant chief of the bureau, the division of forest management and inspectors.

Here are kept the correspondence and records, and are dispatched all manifests of forest products which arrive in Manila.

The bureau has rented a building and some adjacent ground on the site of the old Arroceros market, which is used as a timber-testing laboratory and workshop.

The botanical division is located in the building occupied by the bureau of agriculture at No. 155 calle Nozaleda. Desk room is set aside in the custom-house building for the inspectors and rangers in charge of all forest products arriving in the harbor or Pasig River.

DIVISIONS.

The work of this bureau is administered by various divisions, as follows:

Division of inspection, Albert E. McCabe, assistant chief; division of forest management, E. M. Griffith, forester; timber-testing laboratory and workshop, Samuel T. Neely, manager; division of botany, Elmer D. Merrill, botanist.

The division of inspection, under the assistant chief, Capt. A. E. McCabe, has charge of the work of the various forestry stations in the islands, and by correspondence and visits of inspectors regulates the work of the forestry officials, whose chief duties are to classify, appraise, and order payment on all forest products taken from public lands. The forestry officials in charge of stations forward all correspondence relating to forestry matters from their districts to the main office.

The work of each station is carefully noted between inspections and a record kept of each official's efficiency. The frequent correspondence with each station and the routine reports from the latter keep the main office constantly advised as to how the service is being managed at each station.

Each station furnishes the main office with the following reports:

Diary of operations for the month.

Copies of manifests of all forest products classified, appraised, and whether or not paid for.

Report of all orders of payment issued and collections as evidenced by receipts from the provincial treasurers.

This latter report is compared with the monthly report of each provincial treasurer showing collections on forest products.

No forestry official is permitted to receive any money in payment of government valuation on forest products or for fines imposed. He merely issues an order of payment on the provincial treasurer and payment is made at the office of the latter, or to one of his deputies.

This division has also had charge of the inspection of private woodlands registered in this office. This class of work will, in the near future, be turned over to the division of forest management.

The division of forest management, under Mr. E. M. Griffith, a forester of ability and varied experience, has had field parties in the following places: Province of Bataan, island of Mindoro, province of Camarines, province of Tayabas.

The Timber-testing Laboratory and Workshop

Has been installed in one of the old buildings of the former market on Calle Arroceros, which has been repaired and fitted for that purpose. The building is an ideal one for a mechanical laboratory, being lighted by twenty-odd windows and doors and well ventilated. It is very conveniently situated on the Pasig River, whence, by means of a short canal, logs can be brought on cascoes to the doors of the laboratory

The building has a clear floor space of 90 feet by 30 feet, the floors being of concrete.

The southern end of the building is used as the office of the manager and for the exhibition of wood specimens. Along the wall at this end are a series of shelves, which contain small polished samples of several hundred Philippine woods, arranged according to their groups. Here, too, are large polished slabs of the best-known and most useful woods of the archipelago. It is intended to add to this collection until a sample of every kind of wood in the Philippines will be on exhibition.

The other end of the building is occupied by the mechanical laboratory, the equipment of which consists essentially of a machine for testing the strength of timber, and the wood-working machinery needed for preparing the specimens to be tested. The testing machine is one of the Tinius Olsen testing machines, of 200,000 pounds' capacity, on which tests for tension, compression, shearing, and cross bending can be made, the lower platform having been especially designed for the last-named test.

For shaping the specimens there is a saw table carrying a 20-inch circular saw, and a small hand planer. These machines are driven by a 10-horsepower upright engine, placed in the extreme northern end of the laboratory. Near the engine there is also a small dry kiln, heated by steam from the engine boiler. It is built of brick and concrete. It is 12 feet long, 6 feet wide, and 4 feet high, inside dimensions. The steam is carried directly at boiler pressure through two coils of 1-inch pipe, having 150 square feet of heating surface.

Besides the equipment for making strength tests, the laboratory has a pressure saturating machine, which has recently been patented in the United States and not yet put upon the market. The pressure saturating machine is one which injects any kind of preservative fluid into a piece of timber under great pressure. It thoroughly saturates the piece by filling all its pores with the fluid instead of affecting only the surface. Timber which is subject to attacks of the anay will be saturated with different preservatives and the preservative effect tested.

Connected with the laboratory on the east side is a shed 50 by 60 feet, which is used for storing timber to be tested later on. There are now on hand 100 varieties of wood from the Camarines, which were collected by one of the foresters of this bureau.

The procedure in making tests will be in the same lines as those which the United States Forestry Bureau followed in its study of timber physics.

Six-foot beams, about 4 by 6 inches in section, will be tested for cross bending and elasticity, after being seasoned in the dry kiln. The tested beam will then be sawed into blocks and tested for compression and shear. The amount of moisture will be determined in the case of each block and the specific gravity of the beam. From samples of each log there will be made a large number of compression tests on the green wood (above 33 per cent moisture), as this test is the most satisfactory of all.

Tension tests will be made only on special occasions, as it has been shown that timber never fails in direct tension, and the tests are not representative of any practical uses of the material.

The question of durability and resistance to the attacks of the white ant and other destroying insects is of great practical importance, but the tests for determining these qualities are difficult, and at best of a negative quality. The only practicable method is to place pieces of the wood to be tested where the white ant and other insects have free access to them and wait for results. Several attempts have been

made to cultivate colonies of white ants and surround them with various kinds of wood, but so far, owing to unfavorable conditions, the ants have not thrived. Experiments which will give any useful results in this direction must necessarily cover several years. It is possible to say that the white ants did not attack a certain piece of wood under certain conditions, but to be able to affirm that they would not attack a certain kind of wood under any conditions will necessitate experiments of various kinds covering a long period of time. This should be taken into consideration by persons who wish to have the effect of a particular preservative or paint tested.

The present force of the laboratory consists of the manager, an engineman, and two carpenters. This force will need to be greatly increased to do all of the work which is mapped out. The estimate for funds for the coming quarter provides for six skilled laborers and additional equipment in this division. If approved, the work contemplated will be pushed ahead rapidly.

Personnel.

	Salary, U. S. currency.		Salary, U. S. currency.
Authorized July 1, 1901.		*Authorized Aug. 31, 1902*—continued.	
4 foresters	$2,400.00	1 botanist	$1,200.00
1 inspector	1,800.00	1 manager workshop	1,200.00
1 botanist	1,200.00	6 assistant inspectors	1,200.00
10 assistant foresters	600.00	6 assistant inspectors	900.00
80 rangers	300.00	10 assistant foresters	600.00
1 chief clerk	1,200.00	25 rangers	420.00
1 translator	1,200.00	40 rangers	300.00
1 law clerk	900.00	1 chief clerk	1,800.00
1 record clerk	900.00	1 law clerk	1,400.00
1 woodworker	a.75	1 record clerk	1,200.00
Special agent (Dr. Sherman)	b1,800.00	1 translator	1,200.00
		1 accountant	1,200.00
Authorized Aug. 31, 1902.		2 stenographers	1,200.00
		4 clerks	900.00
Chief of bureau		2 clerks	600.00
Assistant chief	3,000.00	6 clerks	300.00
Manager timber testing laboratory	2,400.00	2 carpenters	240.00
6 foresters	2,400.00	1 woodworker	a.75
4 inspectors	1,800.00	2 messengers	150.00
1 collector	1,400.00		

a Per day. b Temporary.

NOTE.—The botanist in bureau of agriculture ($2,000) is also assigned as botanist of forestry bureau, in addition to the botanist at $1,200.

Since July 1, 1901, the following losses to our force have occurred

By resignation: 1 forester, 9 rangers, 3 clerks, 2 messengers.

By transfer: 1 inspector, 1 clerk, 1 ranger.

By death: 1 assistant forester, 2 rangers.

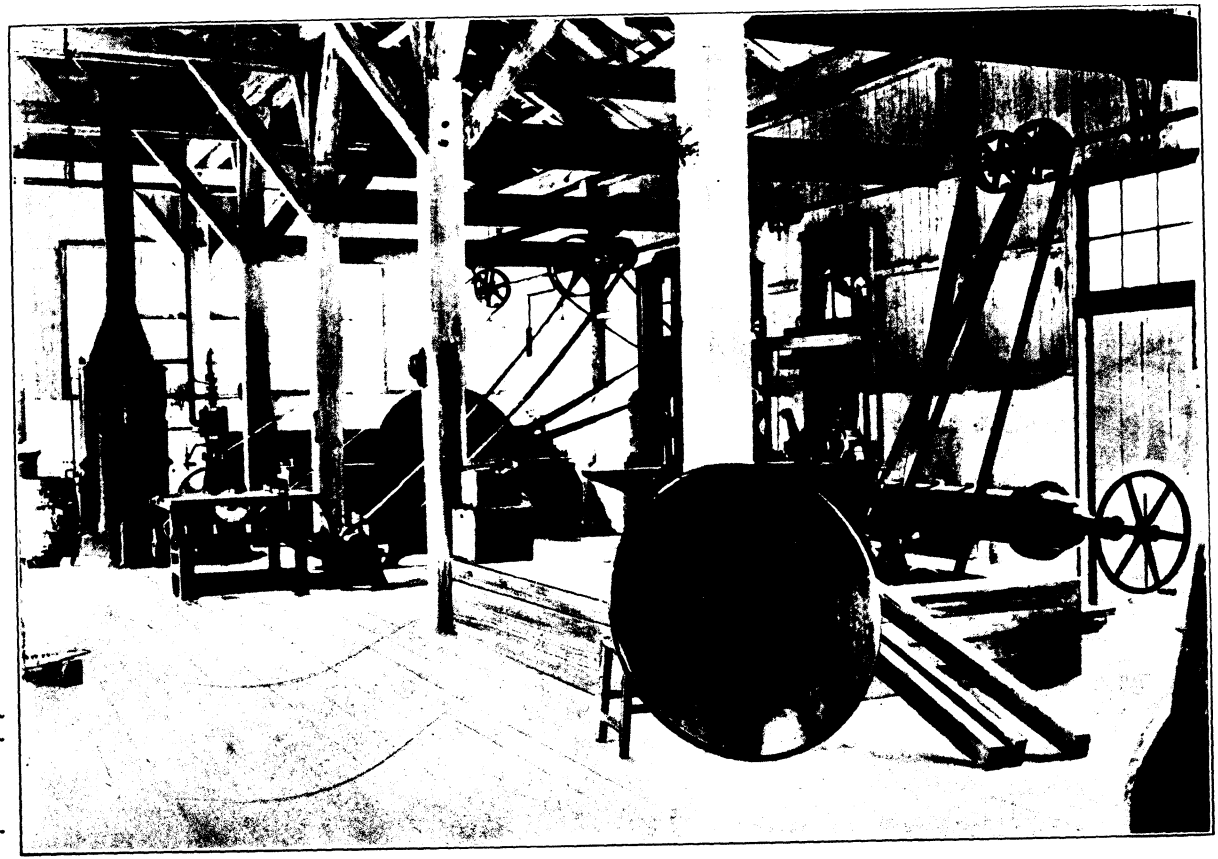
Discharged for cause: 1 collector, 1 assistant forester, 17 rangers, 2 carpenters, 1 messenger.

The work of this bureau has grown steadily and will undoubtedly continue to grow for many years. The best material for our technical force, as stated above, must be secured from the forestry schools in the United States. One or two seasons' field experience in the United States would be of great value to such graduates contemplating work in the Philippines. Such men will be employed usually in technical work, viz, making working plans in districts where logging companies contemplate operations.

The administrative work of this bureau is done by 4 assistant inspectors, 10 assistant foresters, and 65 rangers.

All of the stations (42) beyond Manila are filled by Filipinos.

All officials of this bureau are in the classified civil service. Those who were employed in the bureau at the time of the inauguration of the civil-service law were taken into the civil service without examination, but are now required to pass an examination before being considered eligible for promotion. All the Americans in the service but 2 are now eligible for promotion, and all but 21 Filipinos. Six Filipinos took the examination and failed. Fifteen Filipinos have not taken any examination. All are urged to study the English language, and some knowledge of this language will be required in all future promotions.



INTERIOR FORESTRY BUREAU TIMBER-TESTING LABORATORY, MANILA.

INTERIOR FORESTRY BUREAU TIMBER-TESTING LABORATORY, MANILA.

The field parties are usually composed of 1 forester, 1 inspector, 1 clerk, 1 botanist or collector, and about 5 to 10 natives as cooks, carriers, tree namers, calipermen, guides, and laborers. The maximum expense for this extra native force is $65 gold per month for each field party.

The inspector destined for technical work will serve for a few months under a chief of party, and he will then, if practicable, be given a party and promoted to the grade of forester if results obtained by his party are satisfactory.

This bureau finds great difficulty in securing desirable inspectors. The graduates of the Cornell, Yale, and Biltmore schools are few in number, and attractive work offered them at home gives us but very few for the Philippines.

An examination for 6 forest inspectors for technical work in these islands was held in the United States June 10, but the result of the examination is not yet known.

We need at once at least 12 young men with college training as a basis and some training in forestry, such as is given in Minnesota and at Berea, Ky. These men are needed for the administrative work of the bureau. Their training in these islands would begin with about one month's work in Manila, followed by several months with field parties in that part of the archipelago where they would eventually be stationed as inspectors in charge of a group of stations covering a territory comprising half a dozen or more provinces. These men would begin their service with a salary of $1,200 per year and allowances for all actual and necessary traveling expenses.

The botanist, Mr. Elmer D. Merrill, who is also botanist for the bureau of agriculture, is assisted by Mr. Regino Garcia, a botanist and artist, with more than thirty-five years' practical experience in every region of the Philippines. Simeon Garcia, a son of Regino, and one other native also assist in that division.

A collector of forest botany has been authorized, and a competitive examination for this position has been held in the United States, the result of which is not yet known to this bureau. The collector will be given several men to assist him in his work, and as there will be four to eight parties in the field in different parts of these islands the work of collecting should progress rapidly.

The division of botany will be assisted in its field and office work by other employees of the bureau as required.

A request has been made on the Civil Service Commission in Washington to select 6 men as scientific aids.

The positions of "scientific aids" have been created in this bureau with the idea of giving instructors in botany in the United States who wish some experience in tropical conditions, recent graduates who may wish to collect data and material for thesis work for advanced degrees, forestry students, etc., an opportunity to become familiar with the botanical and forestry features of these islands, and at the same time aid in solving some of the many problems that confront us. To the botanist this field is especially attractive, for the flora of many sections is practically unknown, in spite of the great amount of work done by Blanco, Vidal, and others, and the large collections by Cuming, Loher, etc.

The salary of the "scientific aids," $25 gold per month, although indeed very limited, is deemed enough for the purpose, as those who are appointed receive all their traveling expenses to Manila, and as a large portion of their term of service here will be spent in the field, with all expenses paid, it is believed that, under existing conditions, the salary will be ample to pay all other ordinary expenses.

Field outfit, botanical presses, species sheets, driers, etc., and all other material necessary for making thorough botanical collections, will be furnished by this office, but one set of all collections made is to be deposited in the herbarium of this bureau and one set is to be deposited in the United States National Herbarium (the remaining sets to be distributed according to the discretion of the collector), with the recommendation that, if possible, sets be sent to the Kew Gardens, in England, and to the leading botanical institutions in the United States, the Gray Herbarium, New York Botanical Gardens, St. Louis Botanical Gardens, and Cornell and Yale schools.

Those who are appointed to these positions in this bureau will be assigned to one of the several field parties with directions to make thorough botanical collections, with special reference to the subjects which they have selected or which have been assigned to them.

According to the line of work, appointees may be transferred from one party to another in various parts of the islands as their work progresses.

At the present time there are field parties in the province of Tayabas and the island of Mindoro; work is contemplated in the near future in the provinces of Zamboanga, Bataan, Bulacan, and Negros. These field parties afford an excellent opportunity for making thorough botanical collections, as all the details, equipment, transportation, food, labor, etc., are settled by the forester in charge of the party, and the working botanist will have his entire time in which to make collections and

take notes. To anyone familiar with Philippine conditions it is evident that this matter of having all details arranged is of the greatest advantage.

Selections of "scientific aids" will be made by the Civil Service Commission in Washington, to whom all applications should be addressed.

At present the herbaria of the bureaus of agriculture and forestry are united, and although now rather small, material is fast accumulating, and very soon we shall have a good working collection. It was especially unfortunate that the very valuable Spanish collections, classified by Vidal, with the collaboration of Mr. Rolfe, of the Kew Gardens, and containing much valuable material, the collections of Vidal and other Spanish botanists, and a partial set of Cuming's Philippine material, were entirely destroyed by fire in the autumn of 1897, together with a very valuable reference library. The botanical garden in Manila is very poorly situated and is a botanical garden in name only. At present it serves as a city park, and probably will for all time.

LIBRARY.

Our reference books are at present comparatively few, but the list below will give some idea of those available, to which should be added a practically complete library on the Gramineae, the personal property of F. Lamson-Scribner. Additional essential books will soon be ordered, and while it will be some time before we can hope to possess a reference library by any means complete, yet this department will be built up with our collections.

Bentley & Trimen, Medicinal Plants, 4 vols.
Bentham, Flora Hongkongensis.
Bentham & Hooker, Genera Plantarum, with Duranda Index.
Blanco, Flora de Filipinas, 1837.
Blanco, Flora de Filipinas, 1845.
Blanco, Flora de Filipinas, 4 vols. text, 2 vols. plates, edition of 1880, with Fern. Villars, Nov. Appendix.
Blume, C. L., Museum Botanicum Lugduno-Batavium, 2 vols.
Blume & Fischer, Flora Javae, 4 vols.
DeCandolle, Prodromus, 17 vols., with Buck's Index.
DeCandolle, Monographiæ Phanerogamarum, 9 vols.
Engler & Prantl, Naturlichen Pflanzenfamilien.
Hasskarl, Filices Javanicæ.
Hooker, Flora of British India, 7 vols.
Hooker & Jackson, Index Kewensis.
Horsfield, T., Plantæ Javanicæ Rariores.
Jackson, Guide to the Literature of Botany.
Kunth, Enumeratic Plantarum, 5 vols.
Kuntze, Revisio Generum Plantarum, 3 vols.
Kurz, Forest Flora of British Burma, 2 vols.
Louiero, Flora Cochinchinensis, 2 vols.
Maffei, Principales Especies Arboreo-Forestales de Filipinas.
Pritzel, Thesaurus Literaturæ Botanicæ.
Roemer & Scholtes, Systema Vegetabilium, 8 vols. with Mantissæ, 3 vols.
Rolfe, R. A., On the Flora of the Philippine Islands.
Smith, J., Enumeratio Felicium Philippinarum.
Trimen & Hooker, Flora of Ceylon.
Vidal, Flora Forestal de Filipinas, with atlas of 100 plates.
Vidal, Phanerogamæ Cumingianæ Philippinarum.
Vidal, Revision de Plantas Vasculares de Filipinas.
Watt, Dictionary of the Economic Products of India, 6 vols.
Willdenow, Species Plantarum, 6 vols.

The use of a thoroughly equipped laboratory for morphological work is offered by Dr. Coulter of the Manila Normal School. The government laboratories are now available for any special work on gums, gutta-percha, alkaloids and other vegetable products found in the islands.

With our small library and herbarium, and the short term of service (ten months) of the "scientific aids," it is hardly to be expected that results can be worked up in Manila, other than a preliminary report, but the more complete report will be made after return to the United States.

A set of all collections will be deposited in the United States National Herbarium, and, so far as possible, material will be supplied to the leading botanical institutions in the United States. To our present knowledge, the Philippine material now in the United States consists of the plants of Wright's United States exploring expedition at the Gray Herbarium, and probably also the Philadelphia Academy of Natural

Sciences and the New York Botanical Gardens—a partial set of Cuming's collection at the Gray Herbarium, a set of A. Löher's Philippine material at the United States National Herbarium, and some of Haenke's material, on which Presl's Reliquiæ Haekeaneæ was based, at the St. Louis Botanical Gardens. In Europe the most complete collection of material is at the Kew Gardens, consisting of the plants collected by Cuming, Löher, and the only complete set of Vidal's collections in existence.

In addition to the opportunity for travel and a year's experience in the tropics, in a practically unknown country from a botanical standpoint, it should be borne in mind that in Manila one is within comparatively easy reach of the famous botanical gardens at Buitenzorg, Java, at Singapore, and at Hongkong, each with a magnificent collection of growing plants from all portions of the tropics, extensive botanical collections and fine botanical libraries, the facilities of which, through the kindness of their directors, have been offered for the use of those American botanists who are working on the Philippine flora.

Mr. Merrill is under orders from this bureau (departed September 2) to visit the botanical gardens at Buitenzorg and Singapore. He will take with him a collection of botanical material for identification, and will also arrange for future collaboration at these places.

On July 1 of last year the following stations were established:

Angeles, Pampanga.
Aparri, Cagayan.
Arayat, Pampanga.
Aringa, Union.
Baguio, Benguet.
Batangas, Batangas.
Calumpit, Bulacan.
Cebu, Cebu.
Guianyangen, Tayabas.
Iloilo.
Laoag, Ilocos Norte.
Legaspi, Albay.
Lingayen, Pangasinan.
Lucena, Tayabas.
Malabon, Rizal.
Mariveles, Bataan.
Orani, Bataan.
Pasacao, Camarines.
San Fernando, Pampanga.
San Fernando, Union.
San Pedro Macati, Rizal.
Subig, Zambales.
Tacloban, Leyte.
Tarlac, Tarlac.

Stations on August 31, 1902.

Angat, Bulacan.
Aparri, Cagayan.
Arayat, Pampanga.
Bacolod, Occidental Negros.
Batangas, Batangas.
Cadiz Nuevo, Occidental Negros.
Capiz, Capiz.
Cavite, Cavite.
Cebu, Cebu.
Cottabato, Mindanao.
Cuyapo, Nueva Ecija.
Dumaguete, Oriental Negros.
Guinayangen, Tayabas.
Iligan, Isabela.
Iloilo, Iloilo.
Jolo, Jolo.
Laoag, Ilocos Norte.
Legaspi, Albay.
Lingayen, Pangasinan.
Lucena, Tayabas.
Malabon, Rizal.
Masbate, Masbate.
Misamis, Misamis.
Nueva Caceres, Camarines.
Orani, Bataan.
Pasacao, Camarines.
Pasig, Rizal.
Romblon, Romblon.
San Fernando, Union.
San Isidro, Nueva Ecija.
San Jose de Buenavista, Antique.
Santa Cruz, Laguna.
Santa Cruz, Zambales.
Sorsogon, Sorsogon.
Subig, Zambales.
Surigao, Surigao.
Tacloban, Leyte.
Talavera, Nueva Ecija.
Tarlac, Tarlac.
Tayug, Pampanga.
Vigan, Ilocos Sur.
Zamboanga, Zamboanga.

Orders have recently been issued to establish stations at Alcala and Claveria in the province of Cagayan.

REGULATIONS.

The recent legislation by Congress continues in force the present forestry regulations, but a careful revision of same is necessary and is now being prepared for consideration by the Philippine Commission by a board consisting of the chief and assistant chief of the bureau, three foresters, and one inspector. The present regulations have been in force since the organization of this bureau in June, 1900, and have been apparently satisfactory, but practical work in the field, where the work of

timber cutters has been observed, has made clear the fact that fuller protection of the commercially valuable tree species must be provided. Operations for logging on a large scale by several companies are under way, and regulations must be prepared so that the government's interests will be protected, and at the same time enable the licensee to see his way clear to profitable enterprise.

A vast amount of mature timber should be cut as soon as practicable, and inducements should be offered private parties to remove such, and also all other timber which the forester deems it advisable to cut.

The regulations should provide for licenses under special contract for periods sufficiently extended so that companies will feel justified in installing plants large enough to do the work desired by this bureau.

The Filipino method of logging is very destructive and wasteful. The native logger is unable to handle large logs. As a rule he fells the tree before its maturity and at its best seed-bearing stage. The large trees have rarely been removed and will necessitate the use of the cable system of logging, railways, etc., all of which take large capital. A period of at least ten years should be granted in the contract license. These licenses should be granted to the highest bidder.

LICENSES.

Pursuant to the dispatch dated October 22, 1901, from the Secretary of War, licenses were issued and limited to thirty in number per province, and the amount of timber allowed to be cut was limited to 10,000 cubic feet for individuals and 100,000 cubic feet for companies. Licenses are issued without charge, but the forest product under the license is charged for as it is taken from the forest. Applications for licenses are made on blank forms furnished by the bureau.

The largest amount of timber cut on public land by any one company during the past year was less than 100,000 cubic feet, and not more than five licensees cut more than 50,000 cubic feet. The average cutting under a timber license which is granted for one year is less than 6,000 cubic feet. This small amount is due to the primitive methods of logging, lack of transportation, good roads, and labor.

Persons may take firewood from public land for their own domestic use without license. Licenses are required in order to take out firewood for the market or for use in any commercial enterprise.

Each forestry official in the province is furnished with blank forms of applications and is required to see that these forms are properly made out, and forward same with his approval or disapproval, stating reasons therefor in the latter case.

A modification of the present regulations will be recommended, as mentioned above, which will permit the granting of contract licenses, in which licenses an agreement will be entered into by which a company will agree to cut and remove within a reasonable time all timber selected for felling. A working plan of the forest where such rights are granted will show the varieties and amount of timber to be selected, length of haul, and average market prices of the better known varieties, cost of transportation, etc.; in fact, just such information as a logging company would require. To justify the installation of a modern plant for handling large and heavy timber, a company should be given in the license a term of at least ten years, and also the exclusive privilege in a specified district of cutting timber for the market; the local residents in said district to have every facility offered them to secure such timber as they may require for their own use at reasonable rates.

Under the suggested contract license the amount of timber marked for felling would probably be much in excess of the present limit of 100,000 cubic feet. It will take several well-equipped companies many years to cut a small part of the overmature timber which this bureau would be willing to mark for immediate removal.

The following are the forms of application for licenses at present in use:

APPLICATION FOR A TIMBER LICENSE.

——— ———,
———, 1902.

FORESTRY BUREAU, *Manila, P. I.:*

I hereby make application for a license to cut timber on the public lands in the province of ——— ———.

Location in province of timber ——— ———.

I am a resident of ——— ———.

I shall employ about ——— men for cutting and hauling timber.

My equipment for logging consists of ——— ———.

I will not cut or haul any timber under a gratuitous license.

I shall be prepared to cut and haul to shipping points during the year about ——— cubic feet of timber.

I fully understand the forestry regulations in force in these islands; will strictly comply with same, and will be responsible for the compliance with same of all parties operating under the timber license granted the undersigned.

——— ———,
——— ———.

Date: ——— ———.
Place: ——— ———.
Remarks: ——— ———.

——— ———, *Ranger.*

———

APPLICATION FOR A FIREWOOD LICENSE.

I hereby make application for a license to cut firewood on the public lands of the province of ——— ———, town of ——— ———.

I understand the forestry regulations governing the cutting of firewood and will comply strictly with the same.

I am a resident of ——— ———.

——— ———, *Applicant.*

Date: ——— ———.
Place: ——— ———.
Observations: ——— ———.

——— ———, *Ranger.*

———

APPLICATION FOR A GRATUITOUS LICENSE.

I hereby make application for a gratuitous license to cut timber on the public lands in the province of ——— ———, town of ——— ———.

I am a resident of the town of ——— ———, province of ——— ———.

The amount and kinds of timber required are as follows:

Classes of timber.	Dimensions.	Cubication.

I shall use this timber solely for the following purpose: ——— ———.

I understand the forestry regulations governing the cutting of timber under a gratuitous license and will comply strictly with the same, and will be responsible for the compliance with same by all parties operating under the gratuitous license granted the undersigned.

Neither the undersigned nor any of the parties cutting for him are holders of an ordinary license.

——— ———,
Applicant.

I hereby certify that this applicant, ——— ———, is a needy resident.

——— ———,
Municipal Presidente.

Date: ——— ———.
Place: ——— ———.
Observations: ——— ———.

——— ———,
Ranger.

APPLICATION FOR A DYEWOOD LICENSE.

I hereby make application for a license to cut and gather dyewoods on public lands in the province of ——— ———, town of ——— ———.

I am a resident of ——— ———.

I will not cut or haul any timber under a gratuitous license.

I understand the forestry regulations in force in these islands and will comply strictly with the same, and will be responsible for the compliance with same by all parties operating under the license requested.

——— ———,
Applicant.

Date: ——— ———.
Place: ——— ———.
Observations: ——— ———.

——— ———,
Ranger.

APPLICATION FOR A CHARCOAL LICENSE.

I hereby make application for a license to cut timber and other firewood on public lands in the province of ——— ———, town of ——— ———, for the purpose of making charcoal.

I am a resident of ——— ———.

I will not cut or haul any timber under a gratuitous license.

I understand the forestry regulations in force in these islands and will comply strictly with the same, and will be responsible for the compliance with same by all parties operating under the license requested.

——— ———,
Applicant.

Date: ——— ———.
Place: ——— ———.
Observations: ——— ———.

——— ———,
Ranger.

APPLICATION FOR A LICENSE TO EXTRACT GUMS AND RESINS ON PUBLIC LANDS.

I hereby make application for a license to extract gums and resins on the public lands in the province of ——— ———, town of ——— ———.

I am a resident of ——— ———.

I understand the forestry regulations in force in these islands and will comply strictly with the same, and be responsible for the compliance with same by all parties operating under the license requested.

——— ———,
Applicant.

Date: ——— ———.
Place: ——— ———.
Observations: ——— ———.

——— ———,
Ranger.

Statement of licenses granted during the fiscal year ending June 30, 1902, and for months of July and August, 1902.

JULY 1, 1901, TO JUNE 30, 1902.

[The black figures in column of timber licenses indicate the number of companies granted license to cut 100,000 cubic feet. All other timber licenses are for 10,000 cubic feet.]

Province.	Timber.	Firewood.	Gums and resins.	Dyewoods.	Charcoal.	Gratuitous.					Total licenses.
						For private needs.	Quantity.	For public works.	Quantity.	Total gratuitous.	
							Cu. ft.		*Cu. ft.*		
Albay	2 18	3						2	13,119	2	23
Antique	9	1				2	550	2	9,694	4	14
Abra	25	2				5	1,900	2	46,400	7	34
Bataan	28	22				7	2,398	9	48,496	16	66
Bulacan	16				2						18
Batangas	1										1
Benguet	5							1	5,200	1	6
Capez	17	11				21	8,732	2	14,000	23	51
Camarines Ambos	1 13	3	3								19
Cagayan	30	4						3	65,000	3	37
Cattabato	6	2	3					2	10,000	2	13
Cavite	5	11									16
Cebu	3										3
Davao	1 7	3	12	2							24
Ilocos Norte	15	1	1			3	567	12	60,250	15	32
Ilocos Sur	27	6	1					13	54,027	13	47
Iloilo	16	21		9	2			3	4,724	3	51
Isabela	10							5	40,000	5	15
Laguna	4	1						1	13,000	1	6
Leyte	1 19	6						5	38,056	5	30
Lepanto-Bontoc								1	6,500	1	1
Marinduque	1 16	9	1			1	1,000	3	72,800	4	30
Masbate	31	15	6	3		52	14,975	5	79,125	57	112
Misamis	14	1	1								16
Nueva Ecija	17	6				2	1,050	5	10,935	7	30
Negros Occidental	1 30	29	6					1	4,533	1	66
Negros Oriental	24	7				13	2,085	2	37,619	15	46
Pampanga	21	10				1	178			1	32
Pangasinan	25	10						6	41,020	6	41
Paragua	20	13	3								36
Rizal	20	9						1	4,000	1	30
Romblon	10	3	2			16	5,108			16	31
Sorsogon	15	4						2	10,250	2	21
Surigao	6	7				1	127			1	14
Tayabas	1 30	29	6	1	1	2	1,549			2	69
Tarlac	30	12				14	3,936	5	9,307	19	61
Union	18					3	616	4	40,166	7	25
Zambales	30	21	4	3	8	3	463	10	116,184	13	79
Zamboanga	2 31	6	13	1		3	1,474	4	40,000	7	58
Total	10 662	288	62	19	13	149	46,708	111	894,405	260	1,804

Statement of licenses granted during the fiscal year ending June 30, 1902, and for months of July and August, 1902—Continued.

JULY 1 TO AUGUST 31, 1902.

[The black figures in column of timber licenses indicate the number of companies granted license to cut 100,000 cubic feet. All other timber licenses are for 10,000 cubic feet.]

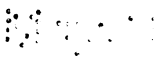
Province.	Timber.	Firewood.	Gumsand resins.	Dyewoods.	Charcoal.	Gratuitous.					Total licenses.
						For private needs.	Quantity.	For public works.	Quantity.	Total gratuitous.	
							Cu. ft.		*Cu. ft.*		
Albay	3	2									5
Antique								1	5,000	1	1
Abra	8	2	1		4			1	2,500	1	16
Batnan	10	6				2	853	2	15,122	4	20
Bulacan	11	3			1						15
Benguet	2										2
Capez	7	2						9	5,031	9	18
Camarines Ambos	1 7	3		1	1			2	14,000	2	14
Cagayan	10	1									11
Cattabato	3	3	12	2							20
Cebu	1	1									2
Davao	6	2	11	2							21
Ilocos Norte	1 3										3
Ilocos Sur	11	2			1						14
Iloilo	16	9	1	3	1						30
Isabela								2	12,000	2	2
Laguna	2										2
Leyte	1 6	1									7
Marinduque	1 10	6	1	1							18
Masbate	9	6	1								16
Misamis	2							1	10,000	1	3
Nueva Ecija	10	2									12
Negros Occidental	2 8	6	1								15
Negros Oriental	5	4						1	1,620	1	10
Pampanga	8	5						1	25,000	1	14
Pangasinan	11	10						1	1,000	1	22
Paragua	5	2	1								8
Rizal	5	5									10
Romblon	3					5	2,790	1	3,000	6	9
Sorsogon	9	2						1	25,000	1	12
Surigao	9					1	600			1	10
Samar	1							1	35,000	1	2
Tayabas	1 18	13	2	1		1	700			1	35
Tarlac	19	10				6	1,380	2	2,100	8	37
Union	8										8
Zambales	2	1	1					1	3,000	1	5
Zamboanga	1 9	3	9	1		1	857			1	23
Total	8 257	112	41	11	8	16	7,180	27	159,373	43	472

Cost of Logging in the Philippines.

A company or individual who has secured a timber license from the forestry bureau pays the following government stumpage per cubic foot, according to the grade of the timber:

	Cents.
Superior group	14
First group	10
Second group	8
Third group	3
Fourth group	2
Fifth group	1

MOLAVE, SHOWING TYPICAL SHORT BOLE AND LARGE SPREADING LIMBS.



CAMP, MINDORO LUMBER COMPANY, BALER, TAYABAS.

TYPICAL DENSE UNDERGROWTH OF BEJUCO, WHICH PREVENTS ALL REPRODUCTION.

A CLEAN PATH CUT FOR OVER A HUNDRED FEET THROUGH THE FOREST BY THE FALL OF A BIG TREE.

TANGUILE CUT FOR BANCA, SHOWING WORKMEN HEWING.

Large opening made in the forest by fall of this one tree.

WASTE IN LUMBERING—FINE PANAO TOP LOG 40 FEET LONG AND 3 FEET IN DIAMETER, WHICH WAS LEFT IN THE WOODS TO ROT.

NOTE.—All moneys, other than salaries of forestry officials, mentioned in this report are in local or Mexican currency. The linear measure used by the native loggers, local concerns, and forestry bureau is the Spanish system. The Spanish cubic foot is equal to 0.76 of an English cubic foot.

On large operations, where the cutting includes trees of the superior, first, second, and third groups, the average government valuation has been found to amount to 10 cents per cubic foot. The total cutting by all parties shows that the average valuation is about 5 cents per cubic foot.

The price paid for labor in the woods varies according to the local demand; but the following average prices are believed to be approximately correct:

Choppers and hewers, 70 cents per day, exclusive of board; trail builders, skidders, and drivers, 50 cents per day, exclusive of board; hire of carabao, $1 to $1.50 per day.

Rinderpest has carried off thousands of carabaos, so that in some provinces the lack of these animals is a very serious problem, especially in agricultural work. Consequently the price or hire of carabaos varies considerably, according to local conditions. The cost of hauling with carabaos naturally varies, but on an average haul of from 1 to 3 miles it is customary to figure on about 20 cents per cubic foot.

However, nearly all the cutting, hewing, and hauling is done by contract, the timber companies paying the natives a certain price per vara and punto for squared timber delivered on the beach.

One of the successful companies operating in the Philippines pays according to the following scale:

Tariff for timber delivered on the beach.

IPIL, MOLAVE, ACLE, TINDALO, NARRA, YACAL.

Dimensions.			Prices.			Excess for each extra punto.	
Varas.	Puntos.	Puntos.	Pesos.	Reales.	Cuartos.	Reales.	Cuartos.
3	10	10	.....	4	10	.....	7
4	10	10	.....	6	.....	.....	15
5	10	10	.....	7	10	1	2
6	10	10	1	1	.....	1	10
7	10	10	1	4	.....	2	5
8	10	10	2	4	.....	3	.....
9	10	10	3	.....	.....	4	10
10	10	10	3	6	.....	6	.....
11	10	10	4	4	.....	7	.....
12	10	10	5	2	.....	9	.....
13	10	10	6	6	.....	10	10
14	10	10	6	6	.....	12	.....
15	10	10	7	4	.....	13	10
16	10	10	8	2	.....	15	.....

BANSALAGUIN, BANABA, BATITINAN, GUIJO, ARANGA, MALACADIOS.

5	10	10	.....	6	.....	.....	7
6	10	10	.....	7	10	.....	15
7	10	10	1	1	.....	.....	15
8	10	10	1	4	.....	.....	15
9	10	10	1	5	10	.....	15
10	10	10	1	7	.....	1	10
11	10	10	2	.....	10	1	10
12	10	10	2	2	.....	1	10
13	10	10	2	3	10	1	10
14	10	10	2	5	.....	1	10
15	10	10	3	.....	.....	3	10
16	10	10	3	.....	.....	3	.....
17	10	10	3	6	.....	3	.....
18	10	10	4	4	.....	4	10
19	10	10	4	7	.....	4	10
20	10	10	5	2	.....	6	.....
21	10	10	6	.....	.....	6	.....
22	10	10	6	3	.....	7	10
23	10	10	6	6	.....	7	10
24	10	10	7	4	.....	9	.....
25	10	10	7	7	.....	9	.....

Tariff for timber delivered on the beach—Continued.

BETIS AND DUNGON.

Dimensions.			Prices.			Excess for each extra punto.	
Varas.	Puntos.	Puntos.	Pesos.	Reales.	Cuartos.	Reales.	Cuartos.
8	10	10	1	7	.....	.....	13
9	10	10	2	2	.....	1	10
10	10	10	2	5	.....	1	10
11	10	10	3	.....	.....	2	5
12	10	10	3	3	.....	2	5
13	10	10	3	6	.....	3	.....
14	10	10	4	1	.....	3	.....
15	10	10	4	4	.....	4	10
16	10	10	4	7	.....	4	10
17	10	10	5	2	.....	6	.....
18	10	10	5	5	.....	6	.....
19	10	10	6	.....	.....	7	10
20	10	10	6	6	.....	7	10
21	10	10	8	2	.....	9	.....
23	10	10	9	.....	.....	10	10
24	10	10	9	5	.....	10	10

MANCACHAPUY, SUPA, BANUYO, CALAMANSAY.

8	10	10	1	5	10	.....	15
9	10	10	1	7	.....	1	10
10	10	10	2	2	.....	1	10
11	10	10	2	3	.....	1	10
12	10	10	3	.....	.....	2	5
13	10	10	3	3	.....	2	5
14	10	10	3	6	.....	3	.....
15	10	10	4	1	.....	3	.....
16	10	10	4	4	.....	3	15
17	10	10	4	7	.....	3	15
18	10	10	5	2	.....	4	10
19	10	10	5	5	.....	4	10
20	10	10	6	.....	.....	6	.....
21	10	10	6	4	10	6	.....
22	10	10	7	1	.....	7	10
23	10	10	7	5	10	7	10

Nearly all the timber is cut in as long lengths as it is possible for the carabao to haul, and then in order to materially reduce the weight and save hauling slab and cull, the log is hewed on four sides in the woods.

The forestry bureau adds 25 per cent to the scale of the hewed timber to cover the loss of this material.

All the large mills are located in Manila and very little lumber is manufactured in the provinces. When the timber is cut in the provinces close to Manila, the squared timbers are often made up into rafts, with a large amount of bamboo, which is necessary in order to float the heavy Philippine timber. But when the sea trip is a long one, especially in the typhoon season, the timbers are shipped to Manila, usually on sailing vessels. The average freight to Manila may be figured at about 30 cents per cubic foot. This cost is much lower where the lumber company uses its own vessels.

The amount of timber which was received in Manila from the provinces from July 1, 1901, to June 30, 1902, is approximately:

	Cubic feet.
Public lands	1,787,225
Private lands	182,626
Total	1,969,851

MARKET PRICE FOR SQUARED TIMBER IN MANILA.

Within the last two years there has been an ever-increasing amount of building in Manila and also in many of the provinces. In consequence of this, especially as the demand far exceeds the amount which the natives are able to get out with the present lack of carabaos, the price of native and imported timber is steadily rising.

This is shown by the following prices paid for squared timber by the mills in Manila on May 4 and August 12, 1902:

Market price per cubic foot (Manila) for squared timber August 12, 1902.

Ipil	$2.00 to $2.50
Molave	1.80 to 2.50
Tindalo	2.00 to 2.50
Yacal	.80
Betis	1.00
Banuyo	.80
Amuguis	.60 to .65
Apitong	.60
Lauan	.45
Narra	1.00 to 1.20
Balacat	.45
Calantas	1.20
Acle	1.10

Market price per cubic foot (Manila) for squared timber May 4, 1902.

Ipil	$0.95 to $1.30
Molave	1.10 to 1.25
Tindalo	.95 to 1.30
Yacal	.80
Betis	1.00
Banuyo	.60
Amuguis	.55
Apitong	.35 to .45
Lauan	.40
Narra	.90 to 1.10
Calantas	1.10 to 1.15
Acle	1.10
Dungon	.80 to .90
Tanguile	.60
Guijo	.55 to .60
Batitinan	.50
Manienie	.36
Mangasinoro	.40
Palo-Maria (Del Monte)	.30

This rapid increase may be partly accounted for by the small amount of timber shipped to Manila during the months of June and July, at which time, in many of the provinces, nearly all work was stopped on account of the cholera.

Philippine Sawmills.

There are but fourteen sawmills in the Philippine Islands using steam or water power. Eight of these are in Manila and six in the provinces, one at each of the following places: Caloocan, Paete, Tarlac, Tacloban, Island of Sibuyan, Santa Maria, Zamboanga, and Dulapoan. The description of the Manila mills will serve for all.

The following data were gathered with care, and unless the American lumberman has had experience in sawing very hard wood and understands logging methods in the Philippines he will be surprised at the figures given below.

The ordinary slowest feed on some of the saws which were set up recently in Manila was found to be too fast, for many logs seemed as hard as stone, and ripped out sawteeth and stopped operations in some of the mills only too frequently. The mill owners realize the value of a very slow feed and the value of first-class sawyers. In time as these woods are better known there will be fewer breaks in milling and the daily output for each mill will increase.

The following is a list of the eight Manila sawmills mentioned above, and also a list of the mills where the sawing is done by hand:

Sawmills in Manila using steam or water power.

Name of mill.	Machinery used.	Daily output in cubic feet.	Remarks.
Compania General de Tabacos de Filipinas.	1 band saw, 3 resaws, 4 planers, 1 gang of five saws.	40	At present this company is only cutting calantas for cigar boxes for its own use.
Spanish sawmill, No. 120 Calle Globo de Oro.	1 gang of three, 2 gang resaws, 1 circular ripsaw.	120	
Manila sawmill, 106 Reina Regente.	1 gang rip, 2 gang resaws	300	No stated output.
Rafael Perez, 42 Calle Soler..	1 gang saw, 5 gang resaws, 2 band saws, 3 ripsaws.	500	
Clark's mill	Not running		
San Nicolas Iron Works	1 gang three saws, 1 circular ripsaw, not running.		Do.
Cadwallader & Co	1 band mill, planers, molders, and joiners.	1,000	
Bourns's mill	1 band saw, complete, with steam feed.	1,700	
Total output		3,660	

Spanish, Filipino, and Chinese mills sawing by hand.

Mill owner.	Number of men employed.	Number of saws used.	Daily output in cubic feet.
Maricano de Compe	9	3	36
Gregorio Here	15	6	72
Domingi Queen	7	2	24
Shee Chanco	6	2	24
Becinto Garcia	5	1	12
Co-Quinco	14	5	60
Maricano Arselano	9	3	36
Pablo Co-Quinco	26	11	121
Pablo Escolar	13	5	60
M. B. Sarata	18	3	36
Pablo Co-Quinco	11	4	48
Pio Barretto	39	17	204
Li-Ginco	12	4	48
Yu Sunquian	5	1	12
De Ching Co	9	3	36
Yeng Jungco Cuay & Co	10	3	36
Go-Tom Co	9	3	36
Di Yaco	9	3	36
Mariano Velasco	20	8	96
Yong Saco	13	5	60
To Tangco	6	2	24
Tableria de Tansamco	9	3	36
Tableria Antigua	8	3	36
Horacio J. Higgins	9	3	36
Chans Nan Co	17	7	84
Tang Yong	13	5	60
Yu Chico	15	6	72
Tan Tan Co	18	7	84
Tableria de Abreu	10	4	48
Rafael Go Tan Co	9	3	36
Ciriaco Cieya	11	4	48
Tan Tan Co	35	15	180
Do	13	5	60
Total	432	159	1,897

The above output is not equal to the demand, and in consequence prices continue high, and the hand mill alongside the steam sawmill is running at a good profit. As a rule it costs not less than 30 cents per cubic foot to saw by hand. Those sawing by hand are paid by the piece, as follows:

Class of timber.	Thickness of boards in inches.	Cost per cubic foot.
Ipil and tindalo	9/16	$0.39
Molave	9/16	.40
Yacal, banuyo, lauan, balacat	1/2	.39
Betis	1/2	.60
Dungon	1	.80
Apitong, narra, acle, guijo	1/2	.35
Tanguile, manicnic, batitinan	1	.28

One steam sawmill in Manila will saw into boards 1 inch in thickness and over for 17 cents per cubic foot. This price, however, applies only to a mixed shipment of logs. A higher charge is usually made for sawing molave, betis, dungon, and other especially hard woods. The other mills charge a higher price for sawing, ranging from 30 to 50 cents per cubic foot for ordinary timber; higher prices rule for sawing the very hard woods.

The market price for sawed stuff is so high that the loss of wood due to sawing with the circular saw was the reason one company discontinued using its circular saw and employed handsaws in preference, stating later that the change above noted was profitable to the company.

The reasons for the existence of the above conditions are as follows: A strong market, scarcity of logs, an uncertainty of the supply, and a lack of skill in handling steam sawmill machinery.

Market Price for Manufactured Lumber.

The following table shows the average prices of boards nine-sixteenths, seven-sixteenths, five-eighths, three-eighths, one-half, and 1 inch in thickness per cubic foot:

Lauan	$1.00 to $1.12	Guijo	$2.25
Tanguile	1.40	Acle	2.50 to $3.00
Manicnic	1.30	Calantas	3.00
Molave	4.00 to 4.50	Batitinan	3.00
Dungon	3.00	Yacal	1.80 to 1.90
Panao	2.00	Betis	2.00
Apitong	1.40	Banuyo	1.50
Narra	4.00 to 5.00	Amuguis	.83
Tindalo	4.00	Balacat	1.12
Ipil	4.00		

Imported Lumber.

Several departments of the United States Government in these islands find it necessary to import several million feet of manufactured lumber from the United States and Borneo, owing to the high prices and scarcity of native lumber.

The average prices paid for the above lumber is as follows, in gold, per thousand:

Oregon pine, laid down at Portland, Oreg	$9.00
Oregon pine, laid down at Manila, from	21.65 to $26.50
Redwood, laid down at Manila	31.50
Borneo lumber, laid down at Manila	65.00

Cord Wood.

Cord wood in the provinces costs from $4 to $7 per 1,000 rajas. Freight to Manila from $12 to $15 per 1,000 rajas.

Transportation by hand from dock to yards in Manila costs about $4 per 1,000 rajas. Licenses to sell cord wood in Manila cost $60 per year.

Market Price of Cord Wood in Manila.

Rajas, superior class, sticks 4 to 5 inches in diameter and 3 feet long, $40 to $50 per 1,000 rajas. (At the present time, August, 1902, the price is $56.50, but this is unusually high.)

Rajas, first class, sticks 3 inches in diameter and 3 feet long, $20 to $30 per 1,000 rajas.

Rajas, intermediate class, containing sticks of both superior and first class, $28 to $35 per 1,000 rajas.

Split sticks, about 2 feet long and 1 inch in diameter, three to four sticks for 1 cent, according to grade.

Charcoal.

Charcoal sells for $1 to $1.20 per sack, containing 27 "gantas." Most of it, however, is sold to the natives by the ganta, the price ranging from 10 to 12 cents.

The Forests of the Philippine Islands.

The various charts show from 948 to 1,725 islands, with a total area of about 119,542 square miles. Of this great number of islands the two largest are Luzon (47,238 square miles) and Mindanao (36,237 square miles). The next largest is Samar (5,040 square miles). There are eight others of more than 1,000 square miles and but six additional islands of more than 100 square miles, some fifty or more smaller islands of minor importance, thus leaving about 1,600 islands not worth mentioning, many of them nothing more than great masses of rock and sand, with little plant life visible.

The area of the Philippine Islands as given by various Spanish engineers runs between a little less than 70,000,000 to a little more than 73,000,000 acres. The forest area was estimated by Fernando Castro in 1890 at about 48,112,920 acres. This estimate includes all woodland, public and private. The area of private woodlands held under a good title is far below 1,000,000 acres.

All owners of private woodlands must register their titles to such lands in the forestry bureau at Manila before cutting for the market any timber or firewood on such property. If these titles are not registered in the forestry bureau, the wood cut is charged for as if cut on public lands. At present the total area of private woodland registered in this bureau is about 250,000 acres.

As far as we can learn from the former forestry officials in these islands no scientific examination was ever made of the stand of timber. This work is now being carried on by field parties from the forestry bureau. Field parties have examined the forests in the provinces of Bataan and South Camarines, and are now in the forests of Mindoro and Baler. These parties inaugurate their work by a preliminary reconnoissance of the region. They then make a detailed investigation of the amount and varieties of standing timber, measuring and noting carefully every tree included in the sample acres selected. A botanical collection is made at this time. A log at least 6 feet in length is taken from the tree from which the leaf, fruit, and flower are taken.

There are between 600 and 700 native tree species, of which there is some information, but there is great confusion in both scientific and popular names of tree species which it will take much time to correct. Upward of 50 species are found on an acre and several hundred species in a comparatively limited region. From Bataan Province alone we have valuation surveys on about 600 average acres, and before the work is closed some 500 more will be added. From these surveys much interesting information will be gathered concerning the stand and varieties of timber, their peculiarities of growth, character of the soil, and rock formation. (See chapter on Bataan.) In addition there will be notes on methods and cost of logging, labor, means of transportation, character of roads and streams, as well as a topographical map, on which will be shown the location of the valuation surveys, thus enabling any one to see at a glance the amount and value of timber available and the possibilities of bringing it to market.

This investigation will extend all over the islands, as trained men, capable of managing such work, are secured from the United States.

A preliminary examination of the forests of the Philippines shows that they have been almost entirely destroyed in many places. This line of destruction seems to follow the line of civilization. In Cebu—the first island settled by the Spaniards—almost every stick of merchantable timber has been cut away, and no good reproduction has ever taken place. In Panay and Negros, as well as in many provinces of Luzon, very little merchantable timber of a high grade is to be found.

A trip on the railway from Manila to Dagupan will not reveal much good timber within several miles of the road. In many of the islands the good timber has been cut away for about 3 miles back from the coast. But as we leave the centers of civilization, we soon run into virgin forests, where the stand of timber over 20 inches in diameter averages in places close to 7,000 cubic feet per acre; some sample acres show more than 10,000 cubic feet. In the total of forty odd million acres of woodland, we find at the very least 20,000,000 acres of virgin forest. We find virgin forests in the provinces of Cagayan, Isabela, Nueva Viscaya, and in that part of Tayabas formerly known as Principe and Infanta; in fact, the entire east coast of Luzon, south to Atimonan, is a virgin forest. The above-mentioned forests in Luzon will aggregate an area of at least 3,000,000 acres.

The above is a conservative estimate, and any change made later will undoubtedly be to increase the estimate instead of reducing it.

There is much merchantable timber left in the provinces of Tayabas, Camarines, parts of Bulacan, and Bataan.

The islands of Mindoro and Paragua, each containing an area of more than 2,000,000 acres, are covered with a dense stand of virgin timber

Mindanao, with an area of 23,000,000 acres, contains more than 10,000,000 acres of virgin forest. Samar and Leyte—both large islands—are heavily timbered.

All of these latter islands are well supplied with water courses sufficiently large for driving logs. Many of these streams need a little clearing before driving could begin. One fine tract of timber near Manila has been protected up to the present time by a small obstruction in a stream that an American logging company would have removed in a very few days and at slight expense.

A glance at the topography of the islands will show the logger that the average length of haul to tide water is a short one. A combination of a short line of railway with the wire-cable system of logging would be ideal for a country with a topography such as these islands present. The methods of logging are very crude, as the carabao is relied upon as the principal means of transportation. The methods of felling trees are slow and antiquated. Wasteful methods of cutting are evident everywhere, and it is extremely doubtful if an average of 35 per cent of the merchantable timber cut is taken from the forest to the market.

Several hundred varieties of native woods are received in the Manila market during the year. Spanish engineers tested and described only some 70 varieties, so that we have many species in the market to-day that are not popular, owing to the lack of reliable information concerning their strength, durability, and suitability for construction purposes. Where strength and durability are especially desired there are no finer construction woods in the world to-day than molave, ipil, and yacal.

There are many other native woods which, when tested, will find a place with those just mentioned.

We have a number of woods which will attract the fine-furniture makers, of which may be mentioned narra, tindalo, camagon, ebano, calamansanay, tucan-calao, and alintatao. These varieties are found all over the islands. We find also 11 different oaks, cedar in abundance, teak, and many other species awaiting investigation to bring out their value.

At this time no more than a mere mention will be made of the fact that there are large areas in the southern islands of this group where gutta-percha and a good quality of rubber are found. (See appended report of Dr. Sherman and statistics of forest products used during the year.) The islands are rich in other gums, in a great variety of valuable dyewoods, and other forest products that time and enterprise will develop.

At present very little cutting is going on in the virgin forests of the islands. Nearly all of the cutting is found in those provinces and islands which have been cut over for many years. Two or three licensees have established themselves at good points in virgin tracts, and there is no reason why satisfactory returns should not be realized from cuttings in such places.

It would be difficult at this time to even approximate the present value of the timber on public lands in the Philippines. Statistics of this office show that several hundred varieties of native woods are brought to market in the islands and are disposed of at a fair price. The government charges for the past year on this great variety of woods averaged a little over 6 cents Mexican per cubic foot Spanish. This charge has continued to remain between 5 and 10 per cent of the market price of timber in Manila.

It will be safe to assume an average stand of about 3,500 cubic feet English or 4,600 cubic feet Spanish, although the valuation surveys give double this estimate of merchantable timber (over 20 inches in diameter) on each acre of the 20,000,000 acres of virgin forests in these islands.

At the above valuation of 6 cents per cubic foot, it is evident that the value to the Philippine government of the above timber is more than $100 gold per acre. By

removing this timber under the supervision of forestry officials, each forest tract will gradually improve in value, and while realizing the large sum mentioned, the value per acre of public timber land will eventually approach its true and permanent value, which will be much nearer $200 gold per acre than $100; i. e., after the great mass of mature and overmature timber is removed, the revenue from the sale of the annual increase of growth of public timber will, under careful supervision, bring to the state a fair interest on the valuation per acre as given above.

The remaining public woodland, about 28,000,000 acres, will average in value not less than one-half the value as given for the virgin forest. A small part of this remaining woodland will be taken up as mineral land and for agricultural purposes. After three centuries of civilization in the islands, we find but 6,000,000 acres improved out of a total area of 63,000,000 acres. It will be safe to assume that the forestry bureau will have at least 20,000,000 of the 28,000,000 acres to protect and improve for many years to come. This area, added to the 20,000,000 acres of virgin forest, will give to the state an area of 40,000,000 acres of valuable woodland.

By diverting the efforts of the timber cutters to the virgin forests, and by a rigid protection of the remaining woodland, the value of the total area will, in about thirty years, reach a value undreamed of to-day by those not familiar with what rational forestry is capable of accomplishing.

The United States market is not considered in this proposition. The Philippine market will be strong for many years. The Chinese market is always strong, and always will be, as all of lowland China is without timber. The Philippine construction timber is considered by many engineers in China the best timber to be had in the Orient. Strong as has been the Chinese market for timber in the past, the future promises even better, as there are indications that foreign enterprise and capital are securing concessions which will awaken that vast Empire.

PRIVATE WOODLANDS.

Article 75 of the forestry regulations provides as follows:

"Persons owning lands containing trees suitable for lumber, firewood, or other forest products, shall immediately present certified copies of their title deeds at this office for registration. Forest products taken from private lands whose owners have not complied with these requirements shall be considered unlawfully taken."

Up to the present date 103 titles to private woodlands have been registered in this bureau, as prescribed in the above-mentioned article. These lands are owned by 13 companies and 90 individuals.

The aggregate area of the woodland registered by the 13 companies is 55,757 hectares, an average of 4,289 hectares.

The aggregate area of woodland registered by the 90 individuals is 44,575 hectares, an average of 495 hectares.

The following is a list of provinces, giving the number and area of private woodlands registered from each.

Woodlands registered.

Name.	Individuals.						Companies.			Total.		
	Individuals.	Companies.	Total.	Hectares.	Areas.	C.	Hectares.	Areas.	C.	Hectares.	Areas.	C.
Romblon	2	.....	2	649	92	50	.....	.....	.....	649	92	50
Tarlac	22	3	25	17,216	80	95	10,637	12	40	27,853	93	35
Pampanga	48	2	50	2,508	66	83	4,241	48	00	6,750	14	83
Davao	2	.....	2	1,150	00	00	.....	.....	.....	1,150	00	00
Mindoro	1	1	2	916	00	98	23,266	00	00	24,182	00	98
Isabela	1	5	6	607	50	00	12,543	1	14	13,150	51	14
Bataan	1	.....	1	2	79	50	.....	.....	.....	2	79	50
Pangasinan	2	.....	2	6,583	90	15	.....	.....	.....	6,583	90	15
Nueva Ecija	4	1	5	12,668	79	40	418	7	13	13,086	86	53
Laguna	1	.....	1	195	71	62	.....	.....	.....	195	71	62
Zamboanga	1	.....	1	159	00	00	.....	.....	.....	159	00	00
Rizal	.....	1	1	.....	.....	.....	4,651	20	12	4,651	20	12
Bulacan	2	.....	2	644	96	73	.....	.....	.....	644	96	73
Negros Occ.	1	.....	1	293	62	80	.....	.....	.....	293	62	80
Camarines	1	.....	1	923	60	72	.....	.....	.....	923	60	72
Manila	1	.....	1	54	56	00	.....	.....	.....	54	56	00
Total	90	13	103	44,575	88	18	55,756	88	79	100,332	76	97

1 hectare = 2.4711 acres.
C = centiareas.

A few of the largest holdings registered are as follows:

	Hectares.
Order of Recolletos, Mindoro	23,266
Compañia General de Tabacos, Luzon	21,494
Francisco Gonzales, Luzon	20,881
Marcelino Santos, Luzon	13,202
Justo Porcuna, Mindoro	916
Rafael Calvo, Luzon	923
Santiago Molino, Mindanao	850
Ayala y Ca, Luzon	3,675
Compañia General de Filipinas, Luzon	4,651

The amount of timber, firewood, and charcoal taken from the above lands during the fiscal year ending June 30, 1902, is:

Timber	196,987 cubic feet.
Firewood	43,854 cubic meters.
Charcoal	9,562 cubic meters.

As soon as practicable the division of forestry management will take charge of investigating the amount of timber and other wood on private woodlands registered or to be registered in this bureau.

The report of each investigation will be attached to the record of forest products taken from said land, and will act as a check on those parties who occasionally forget boundaries and by mistake or otherwise take timber from adjacent public land.

Forest Management.

Up to the present time the lumbering operations in the Philippine Islands have been very primitive, without any system or thought of forest management. The actual cutting in the forest is carried on almost exclusively by the natives, who either cut and haul on contract or else sell the hewn timber to lumber companies or Chinese buyers.

The forestry bureau issues licenses to cut timber on public lands, specifying a special district in a province and the amount of timber which shall be removed.

In most cases the licensee makes a verbal contract with the loggers, paying them a fixed price per cubic foot for certain species of hewn timber, either delivered in the woods or at some given point, usually on the beach.

The licensee naturally instructs his workmen to cut the most valuable species which will necessitate the shortest possible haul. So the loggers pick out the best tree they can find, chop and burn it down, taking as long a log as they think their carabao can haul, and leaving the remainder (often as much as 40 to 60 per cent) to decay in the woods.

In consequence of this system of logging, the forests on many of the islands have been culled for a distance of from 2 to 3 miles back from the coast line and in the vicinity of all the large towns in the interior.

The tremendous weight of the Philippine woods, together with the slowness and expense of hauling with carabaos, has left the more distant forests absolutely untouched. The young growth on the lands which have been cut over is very largely composed of the inferior species, which is the natural consequence of the native custom of cutting only the most valuable species.

Unless the lumber companies change their methods and cut out the less important species together with the more valuable trees, artificial reforestation of the latter will in time become necessary. In this connection the following quotation from Forestry in British India, by B. Ribbentrop, inspector-general of forests to the government of India, is pertinent:

"The treatment of forests of this kind, in view of the natural regeneration of the most valuable species whilst exploiting these, the only marketable trees the forests frequently contain, is perhaps one of the most difficult problems in forestry. The consequence is that though often it is a matter of no great difficulty to insure reproduction in this class of forest by protective measures only, it is by no means an easy problem in Indian forestry to promote the production of the more valuable kinds and to prevent the deterioration in the character of the peuplement of the forests, which, without special attention to this point, must, it is very evident, result from the removal of parent trees of the more useful kinds only."

Under forest management, in order to improve the condition of the forest, it will be necessary to mark for cutting all the over-mature timber which will pay the least margin of profit over the cost of removal.

This will mean the felling of a considerable number of trees per acre, and the large tops, if left in the woods, will cover so large a part of the openings as to seriously retard reproduction. Under the present system of lumbering, the cutting is on such

a small scale and so widely distributed that the scattered tops do very little harm, and the amount of merchantable wood left in the tops in any one locality is comparatively insignificant.

The great objection to this method, however, is that these blanks are restocked with very inferior timber, as most of the valuable trees within seeding distance have been cut and will be eliminated from the stand for many years.

It will be necessary in the Philippines to depend upon natural reproduction for restocking our forests.

Very fortunately we have an enormous area of almost virgin forest, and with careful forest management all land more suitable for forests than for agriculture should be kept under timber.

The most difficult point will be to increase or even maintain the present percentage of valuable merchantable species in the total stand.

In certain sections where the valuable species are greatly outnumbered, and on bare slopes which it is important should be restocked, artificial seeding or planting may become necessary.

Up to the present time the hard-wood forests of the islands have been immune from fire for the reason that there has never been sufficient dry inflammable material to create a fire of sufficient force and heat to sweep through the forest.

But when the forest is full of large down tops, held above the soil by their branches, and so allowed to dry out thoroughly, and also remain sound and hard for many years, the danger from fire will be far greater, and it is not at all improbable that large bodies of timber will be destroyed.

In all the logging operations in the islands a large percentage of clear lumber below the crown is left in the woods, eventually to rot, but for many years before that occurs it will suppress most of the young growth in the openings formed by the fall of the trees, and furnish well-seasoned wood in the event of a forest fire.

In order to localize the cutting so that the ranger can exercise an intelligent supervision over the work, all timber should be marked by a competent official of the forestry bureau.

One forester can mark enough timber in a few days to keep the largest lumber company in the islands busy for some time.

Each tree selected should be stamped with a Government marking hatchet both on the stump and on the flare of the roots, so that after the removal of the tree, even though a very low stump has been cut, it could be readily determined whether the tree had been marked for cutting or not.

In case a tree is cut which has not been marked, a heavy fine should be imposed.

In all large operations the individual or company holding a license should be obliged to enter into a contract with the forestry bureau and also give a bond to carry out the work according to the forestry regulations.

After the timber has been marked and the cutting commences, the rangers should be instructed to inspect the cutting frequently, and see to it that long tops containing clear lumber are not left in the woods. Also, after repeated violations of the forestry regulations and terms of contract, all lumber and logs of the licensee, in the forest or vicinity, should be seized and held until the clear logs in the tops are cut and removed.

Licensees should have the free use of all lumber and wood in the tops (after logs 6 feet long and 12 inches at the small end have been cut and removed) to work up into box boards, staves, shingles, firewood, charcoal, etc. If this is done, the tops will be cut up to such an extent that they can be readily burned, and this the licensee should be obliged to do toward the end of the dry season when the wood is thoroughly seasoned.

In case the licensee does not make use of the small wood in the tops he should be obliged to pile the branches around the main crown, and at the end of the dry season burn the whole thing. Such a rule, and the careful selection and marking of the timber which should be cut, will enable the forester to make the main improvements over the present methods of logging. Concentrated lumbering and the removal of a far greater number of trees per acre will make it extremely important that good clean work be done, and to do this contracts are absolutely necessary.

This will be especially true when large companies install a wire-cable system of logging.

However, the introduction of American methods of lumbering, especially the adoption of the "bull donkey" and wire cable system, will make possible the practical, conservative exploitation of many species which with the present antiquated methods is impossible.

With a crosscut saw the natives can not only cut lower stumps, but they will also do the work in about one-half the time which it takes at present.

Under present conditions, however, the main reason for cutting high stumps is

that it would be very difficult, if not impossible, for carabaos to haul the heavy butt log.

Consequently the native logger cuts his stumps anywhere from 10 to 14 feet high, takes one long log, and wastes as much good clear timber as he utilizes.

On account of the same difficulties and limitations when hauling with carabaos the large overmature timber, which should be cut and removed first of all, is very seldom taken.

The native realizes perfectly the work that is ahead of him and his carabao if he fells one of these big trees, and consequently he selects one of a medium diameter, which does not present such difficulties.

It is self-evident that such a system is not only bad for the forest but also extremely wasteful, for these large trees which are left to decay and fall, contain the very finest grade of timber,

With an engine and wire cable, which can easily haul from 800 to 1,000 cubic feet of logs at one load, it would be natural to remove this large timber on the first cut.

As previously stated, the forestry bureau should mark for cutting all mature trees which will pay any margin of profit over the cost of removal, for unless this is done the forest will ultimately consist of only the less valuable species.

At the present time there is a large number of trees which are not being cut or utilized, and in order to determine the merchantable value of these species a timber-testing laboratory has been established, as noted in another chapter. In this way it is hoped to make a market for a number of forest trees which have heretofore never been cut, for the simple reason that the natives have always taken the very finest woods.

In order to establish an intelligent forest policy it is absolutely imperative to determine the extent of the Philippine forests and the species of which they are composed. This work and the arrangement of detailed working plans for large and valuable tracts of timber is assigned to the division of forest management. The field work was started in December, 1901, and up to the present time detailed examinations have been made of three important forest areas, viz: Bataan Province, the southwest coast of the Camarines, and the northwest coast of Mindoro.

In order to determine very accurately the amount and composition of both the mature and young growth in the forest, acre valuation surveys are taken.

These acre surveys are run in strips through the timber; in the valleys, along the coast, on flats, lower and upper mountain slopes, and in fact all aspects and situations, so as to secure a record of the average stand of timber in all localities.

The strips are measured with a surveyor's chain, and are 66 feet wide and 660 feet long. All trees on this strip, usually down to a diameter of 8 inches, are measured with calipers and recorded on a valuation sheet, under their respective species and diameter.

A topographical map is made with special reference to important bodies of timber, together with the important rivers, valleys, and harbors, all of which are extremely important in connection with the transportation of the material. At the end of each acre, careful notes are taken to cover the following points, viz: Situation, course, altitude, slope and aspect, rock, soil, humus, ground cover, underbrush, reproduction, density, quality of locality, sylvicultural condition, merchantable condition, damage, remarks.

With the hypsometer, a German instrument, the merchantable length and total height are recorded for a large number of important species, and these data, when applied to the results of the valuation surveys, give a very close estimate of the merchantable stand.

The merchantable amount of each species is known, and also, which is quite as important, the amount and character of the young growth which will form the future forest.

As will readily be seen, from what has been said, the future condition and welfare of the forest rests very largely with the forester and is determined by the trees which he marks for cutting. Naturally in a forest where the percentage of the valuable species is far below what it could be made by means of careful forest management, it would be the worst possible policy to allow the lumber companies to cut out only the most valuable species and so secure a forest of inferior species for the future.

Report of the Forest Conditions on the Southwest Coast of the Camarines, and the Operations of the Philippine Lumber and Development Company.

The tract of forest land which is being operated by the Philippine Lumber and Development Company extends along the southwest coast of the Camarines from Bangon to Hamuroan and back from the coast to the main watershed, the highest point of which is Mount Hantic, at an elevation of about 2,145 feet. Approximately

this area comprises 169.88 square miles (108,680 acres), about 74,100 acres of which contain good timber.

With the exception of the valleys, the land from Binahian to Cotmo rises abruptly from the coast, but in the Caranan, Tinalmud, and Caima valleys there is some fine bottom land which extends back from the shore for a considerable distance.

There are six main valleys in this region with streams of a fair size, viz: Ragay, Caima, Tinalmud, Caranan, Pasacao, and Cabasanan. None of these so-called rivers are drivable, but the valleys are all broad enough to make the construction of main logging roads comparatively easy.

The valleys contain a considerable amount of rich clay and loamy soil, apparently capable of growing almost any field crops. At present there are some good-sized hemp and banana plantations, especially in the Caranan, Tinalmud, and Caima valleys, most of which, however, have been abandoned and allowed to grow up to weeds since the outbreak of the insurrection.

Higher up in the mountains are many small settlements of from one to four houses, with clearings of from five to thirty acres.

The following table gives a rough estimate of the private land in the inspected area, including ownership, amount of cultivated land, and the present crops:

Private land—Area table, in acres.

Compartments.	Abaca.	Rice and corn.	Gardens, including sugar.	Cocoa.	Grass.	Brush.	Forest.		Total.
							Swamp.	Hilly.	
1. Bangon	123.5	123.5	98.8	24.7	123.5	494	49.4	197.6	1,235
2. Binahian	49.4	24.7	49.4	.....	123.5	123.5	49.4	74.1	494
3. Caima	.....	.....	.....	.....	1,482	123.5	247	123.5	1,976
4. Baao	24.7	49.4	24.7	.....	1,111.5	123.5	74.1	74.1	1,482
5. Cambalidio	74.1	49.4	74.1	.....	247	617.5	49.4	123.5	1,235
6. Tinalmud	815.1	123.5	98.8	24.7	247	741	49.4	123.5	2,223
7. Dalupaon	74.1	74.1	49.4	.....	49.4	247	.....	.....	494
8. Caranan	494	123.5	98.8	24.7	74.1	741	49.4	123.5	1,729
9. Pasacao	3,705	247	247	49.4	74.1	3,458	123.5	741	8,645
10. Catmo	24.7	24.7	24.7	.....	.....	123.5	.....	49.4	247
11. Bagolatao	.....	24.7	24.7	.....	49.4	123.5	.....	24.7	247
12. Hamuroan	49.4	123.5	74.1	.....	123.5	494	49.4	74.1	988
Total	5,434	988	864.5	123.5	3,705	7,410	741	1,729	20,995

The following table for the public lands is also approximate:

Public lands (acres).

Compartments.	Grass.	Brush.	Forest.		Unproductive district.	Total.	Total State and public lands.
			Swamp.	Hilly.			
1. Bangon	247.0	494.0	494.0	4,940	.....	6,175.0	7,410
2. Binahian	494.0	247.0	494.0	3,705	.....	4,940.0	5,434
3. Caima	1,605.5	321.1	1,160.9	4,940	123.5	8,151.0	10,127
4. Baao	123.5	247.0	247.0	4,446	617.5	5,681.0	7,163
5. Cambalidio	247.0	494.0	247.0	8,398	494.0	9,880.0	11,115
6. Tinalmud	172.9	494.0	247.0	8,398	1,556.1	10,868.0	13,091
7. Dalupaon	24.7	247.0	24.7	5,187	444.6	5,928.0	6,422
8. Caranan	24.7	494.0	123.5	6,669	345.8	7,657.0	9,386
9. Pasacao	123.5	1,729.0	370.5	8,892	247.0	11,362.0	20,007
10. Catmo	.....	172.9	74.1	6,916	494.0	7,657.0	7,904
11. Bagolatao	24.7	123.5	98.8	3,705	247.0	4,199.0	4,446
12. Hamuroan	123.5	370.5	123.5	4,199	370.5	5,187.0	6,175
Total	3,211.0	5,434.0	3,705.0	70,395	4,940.0	8,768.5	108,680

Of this total area of 108,680 acres, the Government owns about 87,685 acres, of which 74,100 acres are almost virgin forest, 8,645 acres grass and brush land, and about 4,940 acres of more or less unproductive area, in the form of streams and very steep, rocky slopes and ridges. The rest of the tract, about 20,995 acres, is believed to be private land, partly scattered along the coast and over the plateau in the center of the forest, more concentrated along the lower and middle courses of the streams.

The private land is covered principally with brush (7,410 acres) and abaca, wrongly called hemp (5,434 acres). Only a small portion is real timber land (1,729 acres), swamp forest (741 acres), rice and cornfields (988 acres), plantations of sugar cane, vegetables, cacao, etc. (1,011.5 acres), cocoa palms (123.5 acres).

Much of this grass and brush land, and even a large area of the forest, is claimed by private parties, but so many of these claims have faulty titles that it is safe to consider as Government land at least as much as is shown in the above table.

Two men of Nueva Caceres, Camarines, seem to be the largest private owners; one controls almost half of the Congonal of Caima and the other has large abaca fields, brush, and timber forests south of Batang in the Pasacao Valley. The rest of the private land is mostly divided into small holdings. Abaca is the principal product and is exported on a large scale. Corn, rice, cocoanuts, bananas, various vegetables, cacao and other tree fruits are cultivated for domestic use and grow well there. Abaca fields lie mainly in the valleys of Pasacao, Cabasanan, Tinalmud, Canbalidio, and Caranan.

CLIMATE.

Along this coast heavy rainfalls and strong winds are of frequent occurrence—from the northeast in the winter and spring, and from the southeast in summer and autumn. The northeast monsoon might be expected to arrive in a fairly dry condition, but, on the contrary, a great amount of moisture is recorded, due to the short distance between the two coasts of this province and the lack of high mountains near the Pacific coast northeast from the tract.

Several months are very wet; from November to March scarcely a week passes without showers, and sometimes the rain falls without cessation for entire weeks at a time. Considerable rain also falls during the other months of the year. April, August, and October seem to be the dryest months, but even during that period a two weeks' stretch of dry weather is an exception. For this reason the vegetation is very rich, both in variety and quantity. The temperature is fairly even, varying from 60° F. in January to 90° F. in April and May, the general average being between 80° and 86° F.

TOPOGRAPHY.

Along the coast between Punta Carvenig and Hamuroan the shipping of timber is almost entirely restricted to the season of the northeasterly winds (from November to May), while the months of the southwest monsoon (from June to November) makes shipping usually impossible because (with the exception of the bays of Binahian and Ragay, where loading is possible at all times) there is no protected bay or harbor in the entire licensed strip. Several capes jut out into the sea, but only Punta Carvenig and Octoc far enough to stop the high waves of the open sea. The bays are too shallow to allow vessels to load directly from the shore. It is necessary for them to anchor about half a mile outside of the bays of Binahian and Ragay, about one-quarter of a mile outside Tinalmud, Caranan, Pasacao, Hamuroan, and Gotosan, and a short distance outside of Dalupoan, Cotmo, and Bagolatao. Along the coast there are some steep cliffs and ridges, thrown up by heavy volcanic action. As a general rule these are well timbered, but with the present system of carabao logging the problem of transportation is a very difficult one.

Back from the cliffs the land slopes more or less gradually for 6 or 8 miles to the top of the main watershed.

DESCRIPTION OF THE FOREST.

With the exception of the six valleys mentioned above, and also a few unimportant valleys which have small clearings near the mouth, the forest extends to the seacoast. The conditions of the entire forest are very similar.

Mr. John Orr, who is the manager of the Philippine Lumber and Development Company, and who has charge of their logging operations, cuts the following species, which at present includes all those timber trees of the province which are considered merchantable.

Superior group.—Calantas, camagon, dungon, ebano, molave, tindalo, ipil, and narra.

First group.—Acle, batititnan, betis, calamansanay.

Second group.—Amuguis, aranga, bangcal, banuyo, bolong-eta, malacadios, Malacatmon, mangachapuy, mangasinoro, palo-maria, supa, tanguile, tucan-calao.

Third group.—Apitong, bitoc, palo-maria (del monte) calumpit, lauan.

Fourth group.—None.

Fifth group.—Bacauan, tangal.

The Philippine Lumber and Development Company have found that 3 miles in a straight line, or 5 miles, following the winding of the valleys, is the extreme limit of profitable lumbering with the carabao, so that the bulk of the timber on main mountain slopes is still untouched. Most of the timber is very scattering, with no pure stands of any one species, so that in order to lumber profitably, it will be necessary to cut all the merchantable species.

In running the valuation surveys, where all timber, down to 8 inches in diameter, is measured on acre strips, it was found that the following species predominated in the forest near Dalupoan: Apitong, macaasin, dungon, lauan, molave, palo-maria (del monte) guijo, catmon, camagon, mangachapuy, tucan-calao, balete, bolong-eta, pili, betis, calamansanay, banuyo, and calantas; also some scattering acle, malacadios, amuguis, calumpit, and tindalo.

Apitong, lauan, and alahan are almost equally distributed, forming the greater part of the forest.

Between Ragay and Binahian is a good stand of molave and dungon. On the slopes back of Binahian is a fair stand of calantas, which also occurs in considerable quantity along the head of the Caranan Valley, and between Cabasanan and Cotmo. On the seacoast north of Binahian is a fair stand of ebano, but this is the only place in which it was found. Palo-maria occurs along the seacoast over the whole country. Where the banks of the rivers are very low, as in the case of Ragay and Ciama, a heavy growth of inferior trees, such as tangat, padagpad, and some species which are good for firewood, has taken possession.

The best stand of timber occurs north of Tinalmud and on the slopes of the Titis and Hantic mountains. It will readily be seen from the above that the forests in this section of the Camarines contain an unusually large number of superior, first and second group trees, all of which are very valuable; but on the other hand many of these species as they occur in the Camarines are short-boled (apitong being a notable exception), with large overdeveloped crowns, which take up a very large amount of space in the forest, suppressing young growth.

Mr. Orr estimates that about 30 per cent of the apparently sound timber must be discounted for unseen defects and cull. It would unquestionably be perfectly safe to allow the company to cut four or five times as much timber as they are removing annually, for there is an enormous amount of overmature timber in the forest whose removal will greatly facilitate the growth of the young timber and the reproduction of the more important species.

The following list gives the generic and local name of the species collected in the Camarines, and the group under which each is listed:

Generic name.	Local name.	Group.
Terminalia edulis, Blanco	Calumpit (in Bicol: Calumayon)	III.
Artocarpus incisia, Linn	Antipolo or tipolo	Rubber tree.
Eriodendron anfractuosum, D. C	Bubuy or boboy-cayo	IV.
Maba buxifolia, Pers	Ebano	Superior.
Diplodiscus paniculatus, Turcz	Balobo	III.
Taxotrophis ilicifolia, Vidal	Cuyos-cuyos (in Bicol: Curos-curos)	IV.
Octomeles sumatrana, Miq	Binonang	IV.
Hernandia peltata, Meissn	Colon-cogon or colongcogong	
Calophyllum inophyllum, Linn	Palo maria de la playa or dancalan (in Bicol)	II.
Xilopia blancoi, Vidal	Banitan or lanutan	II.
Eugenia claviflora, Lam	Dilang butigui	IV.
Cordia blancoi, Vidal	Anonang	III.
Vitex littoralis, Dene	Molave	Superior.
Mallotus moluccanus, Muell	Taquit-asin in Tagalog; Alim in Bicol	IV.
Cinnamomum mercadoi, Vidal	Calingay or calingac	II.
Calophyllum spectabile, Willd	Bitoc or bitanhol, or Palo-maria (Del Monte)	III.
Ternstrœmia toquian, Vill	Toquian	IV.
Dolichandrone rheedii, Seeman	Tua, or tuy, or tooc	IV.
Heritiera littoralis, Dryam	Dungon, late	II.
Sonneratia acida, Linn	Pagatpat or palapat	III.
Bruguiera rumphiv, Blume	Buzain	V.
Alstonia macrophylla, Wall	Batino	II.
Terminalia cattappa, Linn	Talisay	III.
Carappa moluccensis, Lam	Tabigui pulá or tabigui	III.
Cordia subcordata, Linn	Banalo second or sigan dagat	II.
Heritiera sylvatica, Vidal	Dungon	Superior.
Columbia serratifolia, D. C	Anilao	IV.
Morinda bracteata, Roxb	Bancudo or nono	IV.
Thespesia populinea, Corr	Banalo first or boboi-gubat (in Bicol: Malibago)	III
Duabanga moluccana, Blume	Lubtub	IV
Macaranga lanarius, Muell	Binunga	IV
Avicennia officinalis, Linn	Bungalon (Tagalog) or pipisig (Bicol)	V
Aegiceras majus, Gaertn	Tingan baguis (Tagalog) or tapal	V
Sterculia campanulata, Wall	Taloto	IV
Xylopia blancoi, Vidal	Banitan (Tagalog) or tanguisan bayanac	II
Evodia latifolia, D. C	Taligarac	
Azaola betis, Blanco	Betis	I

Altogether 131 species were collected, or 94 in addition to the 37 listed above.

The following table shows the average stand per acre for those species which occur most frequently:

Acre measurement of trees 8 inches and over (102 acres) on the southwest coast of the Camarines.

Species.	Average number of trees per acre.	Average diameter.	Maximum diameter.	Average height of tree.	Average merchantable length.	Amount per acre.
		Inches.	*Inches.*	*Feet.*	*Feet.*	*Cubic feet.*
Alahan	23.16	10	20	48	23	197
Anang	1.58	12	28	66	43	51
Apitong	1.07	20	40	100	70	145
Aranga	.65	15	35	80	43	36
Balobo	15.45	12	28	52	20	240
Bitoc	1.09	11	28	58	22	15
Bolong-eta	.35	16	32	80	49	24
Camagon	.68	13	35	57	31	17
Dungon	1.98	17	40	75	33	103
Ebano	.01	8	20	33	10	.10
Guijo	.87	19	48	73	45	70
Lauan	4.70	27	65	104	63	892
Mucaasin	5.39	14	52	69	31	169
Molave	.75	27	63	68	42	88
Total	57.73					
Mean average		15.8	38.1	68.8	37.5	146.2

ROCK.

On the entire tract the prevailing rock is limestone, especially along the seacoast and on the lower slopes of the main watershed. It is also found outcropping on the steep ridges and in the upper portions of the different valleys. Along the ridges and in a few sections where the newer volcanic formations occur crystallanic schists are found, but in no case do they occur over a sufficient area to form an important factor.

On the south slope of Mount Hantic there is a considerable amount of granite, which forms large bowlders on the top of the mountains. Along the coast and on gentle slopes the limestone is found in layers, and on the ridges and in the valleys there are large drifts of limestone rock, which in many instances make it extremely difficult to get at the timber, as the carabao is an extremely tenderfooted animal.

SOIL.

The soil formed from the disintegration of the limestone varies from a sandy clay near the seacoast to a very stiff clay a short distance back from the coast, on the upper slopes, and in fact over the greater extent of the tract. In places where the heavy forest extends down nearly to the coast a small amount of sandy loam or loamy sand has been formed, but on the whole almost all the soil is heavy clay, which is not especially favorable to tree growth, as it is rather difficult for the roots to penetrate deeply into such a soil. For the best development of hard woods it is necessary that the tap roots should descend to a considerable depth. That the soil is favorable to the best root development is shown from the fact that many of the roots extend along the surface of the ground, are thus very easily injured in logging, and the health and soundness of the trees affected. Such heavy clay soils harden and crack very readily when exposed to the full force of the sun, so that extreme care should be taken in lumbering not to form large openings throughout the forest.

One of the worst features of such a stiff, heavy clay is that the total height and clear length of the trees is seriously reduced on account of the inability of the tap root to reach the looser and moister subsoil. Along the lower slopes, however, the soil composition is a more favorable one, containing a greater proportion of sand, and so forms a mixture which should be able to produce the very best kind of timber.

HUMUS.

The leaves decompose very rapidly during the rainy season, but throughout the dry season the ground is covered with a fairly heavy matting of dry leaves, with only a thin layer of humus underneath. This humus is sufficient to allow the seed to germinate, but the young seedlings find it difficult to gain a foothold in the heavy clay soil.

The reason that a certain amount of humus remains undecomposed through the dry season is on account of the large degree of moisture in the soil.

GROUND COVER.

This is usually nothing more than dry leaves, and in places both leaves and humus are lacking, the soil being exposed to the serious drying-out effect of the sun. Within one year the fallen leaves decompose entirely, while in the colder climates they often remain almost entire for three years or more.

No moss covers the ground, but in its place, in openings in the forest, we find grass, herbs, ferns, dwarf varieties of vines, etc., which often mat on the soil and prevent all chances of reproduction.

UNDERBRUSH.

In all places where the stand is not sufficiently dense a great many climbing palms bamboo, and other shrubs come up, frequently forming an impenetrable thicket which seriously retards all reproduction. In low ridges, where the soil and undergrowth are favorable, we often find a considerable amount of young growth, while in the depressions and more open forests the climbing palms of the genus calamus (Spanish, bejuco) prevail in such numbers as to absolutely prevent reproduction.

Although the bejuco is a very important material in the Tropics, it presents to-day, and probably will in the future, the main obstacle to the existence of a desirable young growth.

It does not appear to thrive under dense shade or in the open, but grows most thickly where the forest has been partly thinned out. This fact, together with the growth of grass in the openings, is another strong reason for using extreme care in logging not to form large clearings.

REPRODUCTION.

In some sections where the bejuco has not gained a strong foothold the stand of saplings is quite dense, but the most valuable species rarely predominate. The reason for this is that only the best merchantable species have so far been cut, and consequently they have very little chance of holding their own in the forest, and are being gradually eliminated from the stand.

On the whole, the reproduction of the more valuable species, with the exception of camagon, is very poor. Hundreds of seedlings of this species, and occasionally a fair amount of saplings and pole wood, occur around one seed tree.

Next in the power of reproduction come palo-maria, dungon, and molave. Molave seems to be the only species that requires much light for its development. All other species stand more or less shade, and some, especially camagon, alahan, and balobo, seem to thrive best under dense shade.

In the small openings caused by the removal of single trees the dense growth of bejuco is unfavorable to good reproduction, and the large openings and abandoned "cainius" (small rice fields) are covered with grass.

There is, of course, a great difference in the quantity of good seed produced from one tree or from a certain number of flowers, depending on the species, size, age, and position of the tree, and also on the weather and destructive animals. Several inferior species, especially balobo and lauan, have abundant blossoms and probably produce seed every year, while of many other species, such as dungon, dungonlate, molave, camagon, and tucancalao, we only find seed-bearing specimens at certain intervals in the age of the tree. No fruit, flower, or young growth of calantas, ebano, or tindalo could be found, neither seeds nor seedlings of acle.

The heavy seeds and fruits of camagon, tucancalao, dungonlate, apitong, bangcal, dungon, acle, tindalo, betis, dulitan, calantas, ebano, and others have a great disadvantage, both in number and facility of distribution, in comparison with the species of balobo, lauan, guijo, bayug, macaasin, anilan, ligaa, etc.

Beyond a doubt the seed of many species either do not find enough soil to protect them from drying out, or the ground is too heavy or hard for their germination. Even when sprouted many seedlings die under the dense bejuco cover or are strangled by this plant, bamboo, and other weeds.

On steep slopes many seeds are washed away by heavy rains. Several varieties of balete have an abundant fruit production, but unfortunately most of them, as climbing species, are much more destructive than useful, as they strangle many of the best trees, particularly molave. On account of the uniformity of the weather throughout the year many tree species have a much more variable season in which to ripen fruits than the trees in colder climates, and in every month of the year we see ripe, fresh fruit of some species.

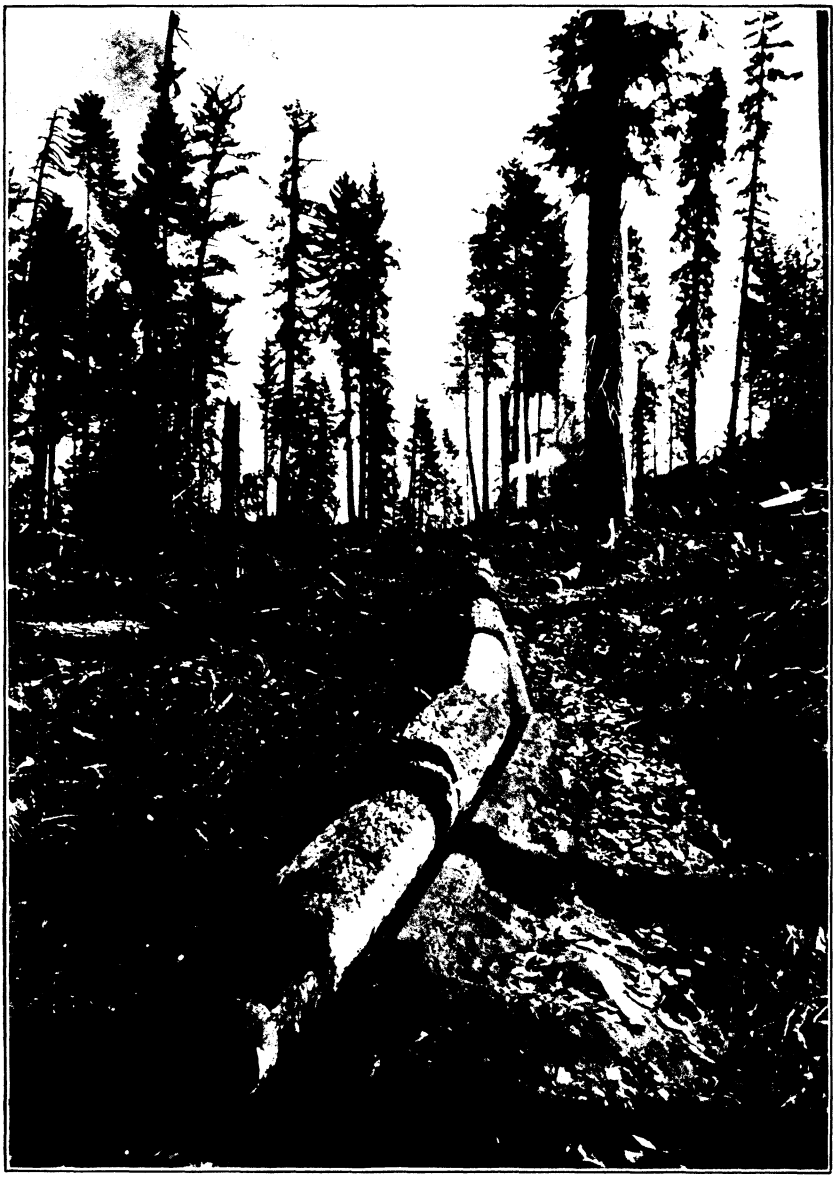
The majority of the species blossom in March, April, and May, dropping the ripe seeds in July, August, and September. Often a tree will have both flowers and ripe

SPRING WHICH SUPPLIES THE TOWN OF CULION WITH WATER—GENERAL VIEW.

SPRING WHICH SUPPLIES THE TOWN OF CULION WITH WATER—NEAR VIEW.

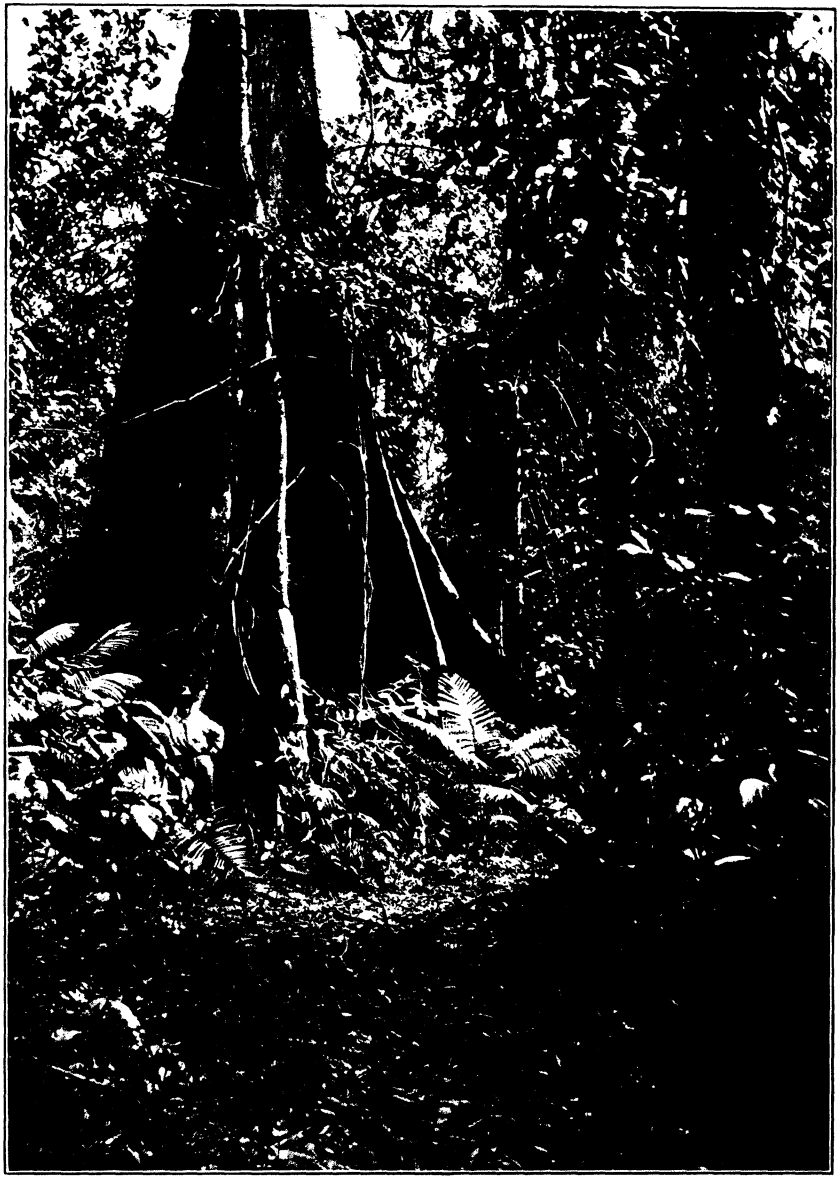
CANEBRAKE, CULION ISLAND.

These canebrakes produce bamboo in great abundance for building purposes.



SIERRA FOREST RESERVE, CAL., LOOKING UP A LOG SLIDE TRIBUTARY TO MAIN SLIDE TO MILL.

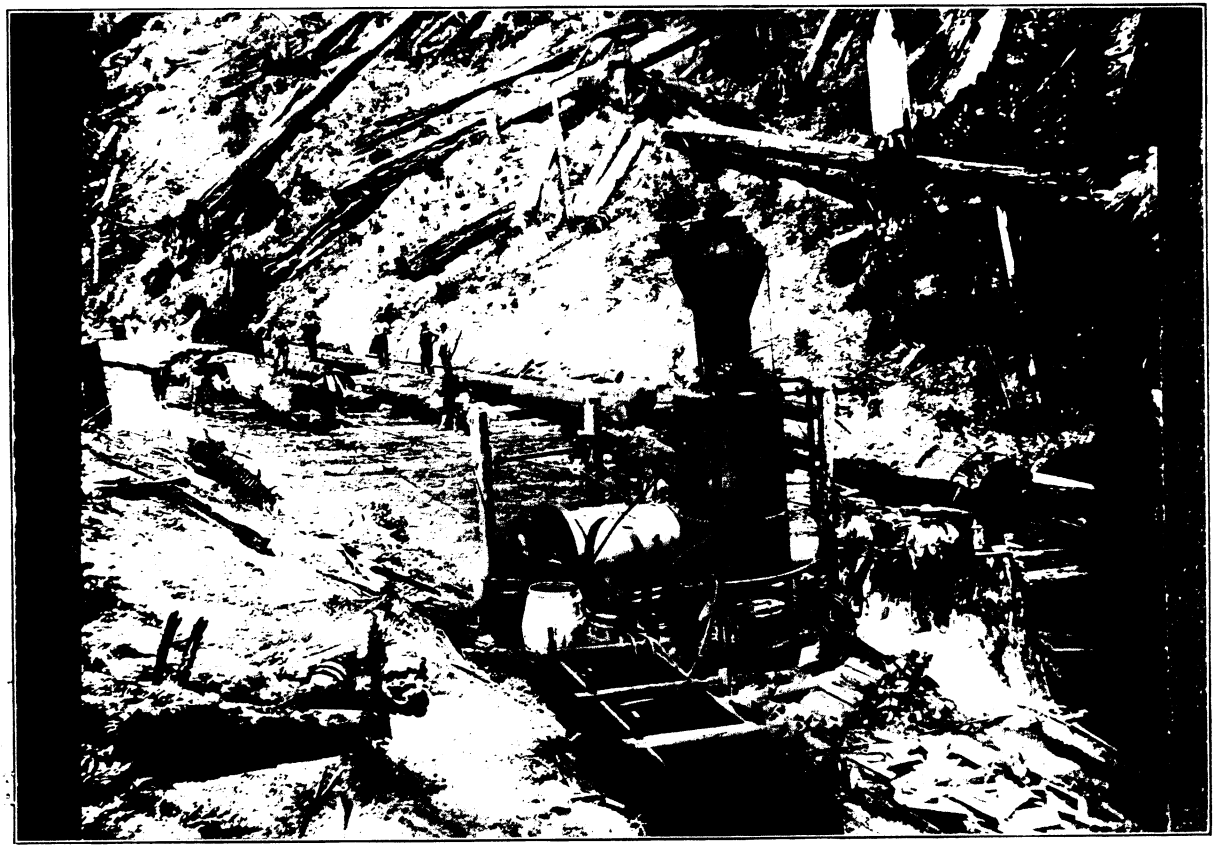
MILLWOOD. FRESNO COUNTY, CAL. ROLLING LARGE REDWOOD LOG WITH "DONKEY" ENGINE.



DOA, SHOWING SPREADING CHARACTER OF ROOTS, ALSO CHARACTER OF FOREST UNDERBRUSH

Attention is invited to picture of American at base of tree, from which an idea of size of tree and its buttresses may be obtained.

BULL TEAM AND TURN OF LOGS, 12,000 FEET, BOARD MEASURE, USAL, CAL.



"BULL DONKEY" AT FORT BRAGG, MENDOCINO COUNTY, CAL.

Vrau

fruit at the same time, and this occurs in the case of botang and colon-cogon about January, dap-dap about March, and dancalan about April.

As far as is known January seems to be the principal month in which dungonlate, botong, and ligaa ripen; February for balobo; March for dancalan; April for tucancalao and certain species of balete, betis, and toloto; June for calumpit, bubuy, bitbit, pili, dulitan, catmon, catapan, muling-muling, and macaasin; July for alahan, malacatmon, lauan, guijo, and camagon.

DENSITY.

In some sections, particularly near Binahian, on the ridges extending down toward the coast from the main watershed, the stand of timber is comparatively dense. In the valleys and on the top of the highest ridges the timber is rather open, but over by far the greater proportion of the tract the stand is broken.

MERCHANTABLE CONDITION.

This forest area contains a large number of very valuable species, but the merchantable condition of all the timber is rather poor, both on account of the short clear length of the trees and the percentage both of the timber and lumber which is found to be unsound.

The clear or merchantable length of the following species is about one-half the total height of the tree, viz: Calantas, dungon, ebano, batitanan, betis, amuguis, banuyo, guijo. The merchantable length of aranga, bangcal, apitong, lauan, tanguile, and anang is fully two-thirds of the total height, while in tindalo, acle, balobo, malasaquin, alahan, catmon, macaasin, tucancalao, and ligaa the merchantable length is only about two-fifths of the tree, and the proportion in the case of molave, dancalan, balete, botong, and some others is one-third or less. For apparently sound timber about 30 per cent should be discounted on account of unseen defects.

Insects and the white ant attack timber within a short time after it is felled, but they very rarely attack living trees, and do them almost no damage. The worst enemy of the forest is the balete, of which five different species were found on the tract.

The balete starts on a tree as a vine, then sends its long air roots down to the soil, and finally forms an entire envelope around the whole tree. In a comparatively short time the tree rots within its shell and the balete grows into one solid mass.

The natives very often girdle apitong and pili in order to collect the resin, which is burnt in cups and torches to furnish light, but it appears that this practice with the possible exception of checking the rate of growth, does very little damage to the tree, as the wounds heal over very rapidly and the tree is apparently sound.

LUMBERING.

Some hundred years ago a very small amount of cutting was carried on in these forests for local use at Pasacao, as this town was apparently of far greater importance in former years than at the present time. The export of timber from this portion of the Camarines coast to Manila, began about twenty years ago when molave, calantas, dungon, ebano, tindalo, betis, aranga, and mangachapuy composed the main portion of the cargo.

In those days the native lumbermen hauled timber from a much greater distance from the coast than at the present time, when both the amount cut and the length of the haul have been restricted on account of carabao, and also, within the last two years, the danger of ladrones.

The average Government valuation which is paid by the Philippine Lumber and Development Company on all classes of timber amounts to 10 cents per cubic foot.

At present this company have only thirty carabaos hauling timber, while in early years they always employed one hundred or more. The company cuts timber from three main points, viz.: Cotmo, Dalupoan, and Binahian, and as they practically control these three towns, nearly all the natives work for them, receiving the following scale of wages: Choppers and hewers, 70 cents per day, exclusive of board; trail-builders, skidders and drivers, 50 cents per day, exclusive of board; hire of carabao, $1 to $1.50 per day. The price for a fairly good sized carabao ranges from $150 to $200. This high price is on account of the scarcity of the animals, as it is estimated that the rinderpest carried off between 75 and 90 per cent of the carabaos in the province.

The manager of the company hires a number of carabaos, paying $1 per day, and figures the average cost of hauling, from 1 to 3 miles, at 16 cents per cubic foot. However, nearly all the cutting and hauling is done by contract, the natives cutting

those trees which offer the least difficulty in hauling, and hence along the seacoast the forest has been stripped of the most important species. The only restriction so far is that the company will not export any logs which are not at least 12 inches square.

Such native logging is naturally very scattering and close supervision has been impossible. When the operations are concentrated into a small area, supervision by the forest officials will become less difficult, and the lumberman will be able to use a wire cable system for hauling out the logs. Skidding with the cable could be very easily adopted in the Caima, Tinalmud, and Caranan valleys. The company has under consideration the establishment of such a system in the Caima Valley, and this would include the timber from the mountains northeast of Binabian, from the west slope of Titus, and from the southwest slope of Hantic.

Under such a system carabaos would skid the logs from the tree to the main valley, which, in nearly all cases, would be a short haul.

In order to lumber successfully, companies operating in the Philippine Islands must be, to a certain extent, independent of carabaos, as these animals are very scarce, delicate in health, and must be taken to water several times a day, and this latter point especially makes their use on high mountain slopes, where some of the best timber is located, practically impossible.

Nearly all the timber which is shipped to Manila is squared in the forest and usually ranges from 12 to 24 inches wide at the top end, and as long as the carabao can conveniently haul.

This system leads to a large percentage of the clear length being left in the woods to rot. However, special efforts are made to get out long lengths of timbers which are used on docks and shipbuilding, such as dungon, tetis, and guijo, which will measure from 49 to 59 feet clear length. Batitinan, mangachapuy, palo-maria (del monte), 19 to 32 feet logs.

Lauan, the principal tree for bancas, is often cut the entire clear length, forming bancas and cascos from 32 to 65 feet long and 24 to 48 inches wide. Lauan, and more especially apitong, furnish planks and boards with a top diameter of 12 inches and from 82 to 98 feet long.

Molave timbers are very seldom over 16 to 32 feet long and 16 to 32 inches square.

Fortunately the crooked, tough, and durable branches of molave and dancalan, down to a diameter of 8 inches, are very valuable in ship construction.

Calantas is used mainly for cigar boxes, and also to a small extent for interior finishing.

Tindalo, acle, and camagon are also used in interior finishing and for furniture, so that short logs of these three species are readily sold in the Manila market.

The best tindalo furnishes clear logs up to 32 feet, acle 19 to 26 feet, calantas 65 feet, and in exceptional cases 98 feet. Tucancalao and calumpit 26 to 39 feet. Lanete is a beautiful yellow straight-grained wood, which is very fine for furniture.

The black-heart wood of ebano, dressed round and ready for the market, is brought in to Dalupoan by the natives in lengths ranging from 6 to 36 feet with a maximum diameter of 10 inches at the bottom and a minimum diameter of 2 inches at the top.

Bitoc and alahan are used for telegraph poles and house posts. Molave is used for beams, flooring, all sorts of construction timbers, railroad ties, doors, windows, etc.

Most of the cordwood (rajas) is cut from swamp trees, principally tangal and bacauan, and to some extent pipisig and pagatpat.

The Philippine Lumber and Development Company make a small amount of charcoal for their own use from guyong-guyong, which is said to be the very best for blacksmithing.

The following timbers are those which are generally used in the construction of native houses: Alahan, anang, bitoc, lauan, apitong, anaho, banga, bonga, and bamboo, while in the better class of houses a considerable amount of guijo and molave is employed.

The few tables, chairs, and benches which are found in the native houses are usually made from guijo, while guyaba brush furnishes the wood for cooking. The resin of apitong and lauan is often used in cups and torches as a fuel, and the soft white resin of biti is used extensively in the manufacture of fine varnishes. The company ships from 500 to 1,000 kegs of resin to Manila each year.

Several other species have an abundant flow of a sticky white juice, which is now being investigated by chemists and will probably be found to contain valuable properties.

Dungon, tooc, and tua are recognized as more or less valuable dyewoods, and the bark of bacanan is said to be good for tanning.

Under the present system of logging, only a small portion of the tree is used, and the natives not only leave the entire top in the woods, but a large part of the merchantable length as well.

The following table gives the approximate amount which is utilized:

	Per cent.
Camagon	15
Ebano	10 to 20
Guijo, aranga	30
Lauan, molave, dancalan	40
Apitong, calantas	50
Dungon and, in general, most other species	25

Of course, in every case all the merchantable length should be utilized, and the wood in most of the tops, which are left in the woods to rot, is suitable for charcoal, box boards, staves, paving blocks, etc.

The natives have never used a crosscut saw in the forests, and with an ax it is a long and hard piece of work to fell the large, very tough Philippine timber.

The Filipino uses a heavy, narrow, single-bitted ax, with a very long handle, both for felling the tree, cutting the logs, and hewing the timber. Finding it slow work, the native who is not overburdened with energy attempts to hasten matters by setting fire to the stump, and when the tree falls he sets fire to the log in order to save himself a certain amount of hewing.

Such a method is of course very primitive and a considerable amount of fine timber is lost through such carelessness. The natives will leave a log burning for such a length of time that it is either badly injured or almost totally destroyed.

The Philippine Lumber and Development Company pays the following prices for sawing the hewed timber into boards by hand at Dalupoan:

	Cuartos.
Dungon and betis, per square foot	4
Molave, dancalan, acle	3
Guijo, mangachapuy	2
Apitong and lauan	1

1 cuarto=1¼ cents Mexican.

The company contract for bancas according to dimensions and the quality of the timber used. A good lauan banca 48 feet long and 3 feet wide, when trimmed out ready for use, but without outriggers is worth about $60.

It will take six carabaos and four men two days to haul a banca of this size 1½ miles from the forest to the shore, at a cost of about $20. At present the Philippine Lumber and Development Company is cutting annually about 100,000 cubic feet, most of which is shipped to Manila.

FOREST MANAGEMENT.

The present scattered lumbering leaves the present forest wealth entirely in the hands of the ignorant cutter, and consequently the most valuable species are seriously handicapped in holding their own.

Careful supervision in the forest by the company and particularly by the government is impossible under the present system.

While the inferior species and weeds have an increased chance for reproduction, the more valuable species are gradually disappearing, especially the light-needing varieties, such as molave, tindalo, and calantas.

When the large timber is slashed down without any regard to the young growth, the first seeding is apt to fail on account of the excessive amount of light in the openings. After the young growth has commenced to come up again, shading the soil to a certain extent, the conditions for reproduction are more favorable. However, later on the more valuable, slow-growing species are in danger of being suppressed and killed by the bejuco vines, bamboo, and the less valuable species.

The entire tops are left in the woods, and cover so much ground that they either check all reproduction or delay it for years to come, until the tops have rotted down.

All trees which are to be cut should be selected and marked with a view to the sylvicultural requirements of the forest, and the cutting should be carried out under the supervision and direction of the government rangers.

The use of fire in felling and hewing should be absolutely forbidden.

PRELIMINARY REPORT ON WORKING PLAN OF BATAAN PROVINCE.

By RALPH C. BRYANT, Forester.

Bataan Province, situated directly across Manila Bay from Manila, is a long peninsula forming the western coast line of Manila Bay and separating it from the China Sea. Its greatest length is about 35 miles, and it varies in width from 15 to 20 miles,

with an approximate area of 303,200 acres. The general trend of the province is northerly and southerly.

The configuration in general is mountainous, with two main centers, the one in the southern end of Bataan Province being about 5,000 feet high, and undoubtedly is the crater of an extinct volcano. This system with its foothills covers an area south of a line drawn from Bagac on the west coast to Orion on the east coast, and comprises somewhat more than one-third of the area of the province.

South of Bagac on the west coast the country is divided up into long leading ridges running from the central peak to the coast, with more or less narrow valleys down which flow small rapid streams. On the south and east coasts, the lowlands run back for a distance of 2 miles before they reach an elevation of 300 feet.

The ridges on the south and east coasts are fewer in number than on the west slope and generally do not extend to the coast. On the south eastern side there is a large amount of flat land, mainly covered with brushy growth, which has but little merchantable value. The streams on this side are generally larger than those on the west coast, draining a greater area, but none are suitable for lumbering purposes.

The other mountain system lies in the region north of Bagac, and including its foothills occupies a greater part of the remaining portion of the province, with the exception of a long strip of flat land along the east coast extending from Orion to Dinalupihan, which constitutes the greater portion of the agricultural lands of the province.

There is no accessible timber of any value on the east coast from Balanga to Dinalupihan, except in the gorges where it is very hard to get out. The timber on the ridges and other accessible places has been severely culled for years past, all the towns along the coast being fishing towns, and consequently there is always a large demand for bancas. The main species to be found here are banao, which has not been cut in the past; cupang, inferior; amuguis and guijo of small dimensions. All lauan which will make even the smallest-sized bancas has been taken out.

On the west coast northeast of Bagac is found some of the finest timber in the province, mainly on the long leading ridges extending down from the mountains almost at right angles to the coast. Here there is a fine stand of panao, tanguile, lauan, and cupang, tanguile in general predominating.

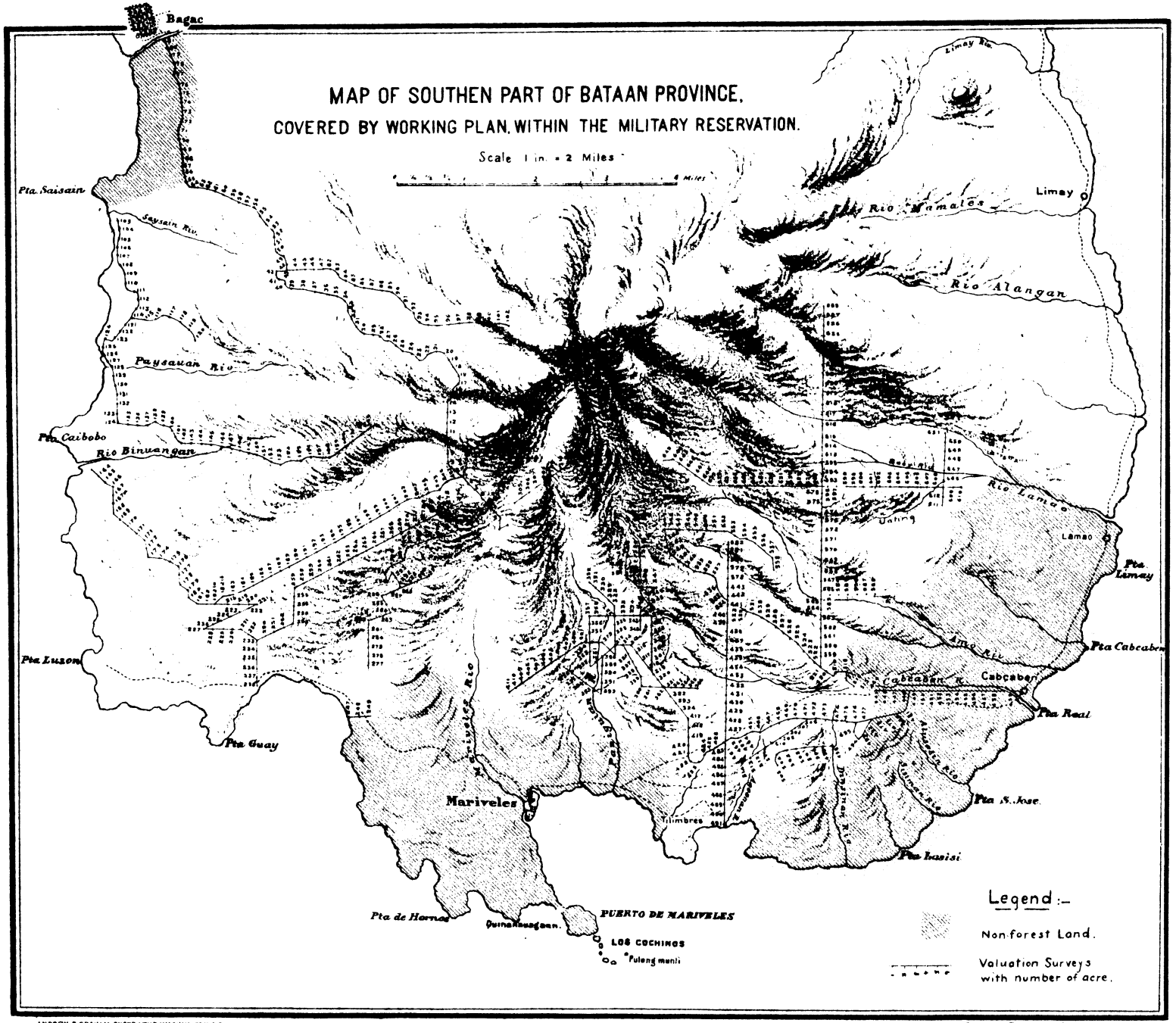
Between Bagac and Moron brush land and rice fields extend back from the coast for 2 or 3 miles, but higher up there is a fairly dense forest of tanguile, panao, lauan, cupang, bolong-eta, mareg, and many less valuable species. In the vicinity of Moron the brush lands extend back from the coast for about 3 miles, but from here on to the northern boundary of the province the lower slopes are covered with a fine stand of lauan, which is unusually tall and clean boled. There are also scattered specimens of tanguile, panao, and palo-maria.

The timber tributary to the Colo River back of Dinalupihan has also been severely culled in the past for banca timber.

Principally lauan and tanguile have been cut here, and much of the timber remaining is inferior both as to species and quality. In the region south of a line drawn from Bagac on the west coast to Lamao on the east coast, an area of approximately 65,900 acres, within what has been set aside as a military reservation, a detailed examination was made of the forest. In this part of the province the family of Dipterocarpeae reach a fine development and constitute the bulk of the merchantable timber. The following are the most important members of the family found here: Tanguile (shorea), lauan (anisoptera), panao (dipterocarpus), palosapis (shorea), guijo (shorea), dalindigan (shorea).

Of these the first four are found in greatest abundance. The soil here is a laterite and seems especially adapted to the development of this family. The greater part of it is a sandy loam—rich, fresh, and deep—formed by the disintegration of the sandstone and the decomposition of the leaves and litter composing the ground cover. Along the lower slopes of the mountains the soil is a deep, loamy sand, easily dried out when exposed to the sun, yet supporting a good tree growth under favorable circumstances. In much of the flat land on the east side the soil tends more to a loamy clay, which when dried out often forms large cracks in the soil and though not of the best for forest growth seems to be adapted to agricultural crops when irrigated.

The work was begun west of Mariveles, a municipality on the south coast of the province. The land near the town is covered mainly with rice fields, and as the low-lying foothills west of these are entered a brush growth commences composed mainly of third and fourth group trees, with an occasional first and second group tree, such as molave, anubing, malaruhat, and palo-maria. All these trees here are short, limby, and of very poor form. This area of brush lands was at one time cov-



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ered with a growth of large timber, but repeated encroachments have been made for timber and firewood, causing the boundary of the forest to be gradually pushed back toward the mountains and less accessible places.

The soil has not been able to reclothe itself with large forest growth, due partly to the continuous demands on it for small-sized timber and firewood.

Proceeding northwest from the brush land, the stand of timber increases, the trees becoming larger and better formed, cupang, bolong eta, paho, lanutan, alupag, mabantut, and mabanut comprising the main stand, the diameter being generally 14 inches or under. In this region amuguis, banaba, manienie, guijo, camayuan, panao, lamio, dalindigan, mayapis, ligaa, malaruhat, malatum baga, and puso-puso are found growing to merchantable dimensions.

Occasional specimens of dungon, tindado, acle, and anubing are also found. The last three, however, are usually of poor form and of little merchantable value. The greater part of timber in this region adjacent to the Bayaan River is more suitable for poles, posts, piles, and sills than for saw timber. The merchantable-timber line is reached in almost all cases at an elevation of 2,000 to 2,200 feet, the timber above this being short-boled and very often defective.

In many cases tanguile in almost pure stands is found at an elevation of 1,500 to 2,200 feet, mainly on the long leading ridges running down to the coast. It is generally the last tree of commercial importance before the merchantable timber line is reached.

Panao in pure stands was found at elevations varying from 1,200 to 1,800 feet, but mainly on the main ridges. Lauan was found, but seldom in pure stands.

In general there were found from 30 to 50 different species per acre above 8 inches in diameter, the greater number of these having a small average diameter of 10 to 15 inches, and boles generally short.

The timber on the west coast is found in greater abundance and of the best form on the long leading ridges running in an easterly and westerly direction from the mountains to the coast; also on the higher slopes of these ridges.

In the valleys near the streams the timber is of an inferior quality both as to form and soundness, tanguile often showing punk knots, and lauan a rot near the butt.

On the dividing ridge between Bayaan and Aglolma rivers a fine stand of tanguile is found at an elevation of 1,900 feet, it being the only merchantable species at this height in the vicinity.

In the upper watershed of the Binouangan River the preponderating species is panao of a fine form. This species is found in best development in this basin between the elevations of 900 and 1,500 feet. Here good tanguile was found above 1,500 feet elevation, and a considerable amount of lauan and guijo below 900 feet elevation, though they are found scattered over the whole area. There is a large amount of lauan here below 20 inches in diameter, which in time will form a good stand of large timber. One of the finest lauan trees seen in this province was found in this basin, having a diameter of 60 inches and a clear length of 120 feet.

One 60-foot banca had been cut out from the tree, two or three years previously, but the banca was not finished and still remains in the forest, though in a bad state of decay, due to the attacks of insects.

The area of this basin is approximately 6,120 acres, all being forest land except a narrow strip directly along the coast, where the timber is small and scattered. This comprises, however, but a small part of the area.

The Binouangan River and its tributaries drains one of the largest basins on the west coast, the topography being hilly in all places except a strip extending east from the coast along the stream for about half a mile. The character of the country is such that lumbering operations can be easily carried on here, the timber coming off the secondary ridges, toward the base of the mountains, and then down the valley of the stream for three-fourths of a mile to the coast. The distance from the coast to the most remote timber in this basin is about 6 miles, all of which, however, can find an easy outlet. The principal species here, as on the eastern coast, are panao, tanguile, lauan, guijo, palosapis, cupang, and some amuguis.

There is also a small amount of cahoy-buur at the higher elevations, but this is generally of very poor form and little value, though some of the trees will yield one log. The various species in this basin do not have the same distribution as to altitude, cupang and amuguis covering only the lower elevations up to 900 feet, an area of approximately 3,900 acres. Panao, lauan, guijo, and palosapis are distributed over the whole area; tanguile, however, is found only on the highest slopes, and covers an approximate area of 2,950 acres. The following table will serve to show the approximate area in acres covered by each of the seven important species, the amount

in cubic feet that it will yield within this area, and the total stand for each species within the basin:

Species.	Acres.	Amount per acre.	Total stand.
		Cubic feet.	*Cubic feet.*
Panao	6,120	1,880	11,505,600
Tanguile	2,950	1,760	4,792,000
Guijo	6,120	368	2,252,160
Cupang	3,160	592	1,870,720
Lauan	6,120	258	1,578,960
Palosapis	6,120	170	1,040,400
Amuguis	3,160	93	293,880
Total	33,750	5,121	23,333,720

The above figures represent the merchantable stand within this river basin 20 inches and over in diameter, after making the following deduction for unsound timber:

	Per cent.
Tanguile	30
Amuguis	40
Lauan	30
Guijo	20
Panao	15
Palosapis	15
Cupang	10
Average	22.8

Other species 20 inches and over in diameter suitable for lumber are very scattering, and will yield but a small amount of material suitable for telephone and telegraph poles or piles unless the better species are cut below 20 inches, which is not advisable at the present time.

The above figures show an average stand per acre for the whole basin of 5,121 cubic feet round timber for all species mentioned, though on the lower slopes the stand will be somewhat smaller, and in the higher elevations, larger than the average.

In the drainage basin of the Paysun River the principal species is panao, with an occasional stand of tanguile and lauan, a small amount of guijo, and the usual number of small inferior species.

At an elevation of 1,960 feet, on a gentle southerly slope, was found the heaviest stand of tanguile in the province. It was an almost pure stand, the few additional species represented here having crooked boles and large overdeveloped crowns.

The reproduction of tanguile here was very good between the diameters of 1 to 3 inches, but the reproduction of seedlings was rather poor. The trees have large spreading crowns with a clear length of 40 to 60 feet, and a comparatively small taper; the trees were generally quite sound.

In the basin of the Talin River, a small stream having its headwaters but a short distance back in the mountains, the stand is rather small and the trees have in general a short bole and are more inclined to be defective than those at higher elevations. The more important species found here are cupang, some panao, lauan, amuguis, apitong, and antipolo, together with numerous other species, of which but one or two are found on an acre. The timber in this basin is, on the whole, more suitable for poles, piles, posts, and small-sized timbers, though some of the larger trees will yield a fair amount of saw timber.

The timber along the coast back to an elevation of 400 to 500 feet is generally shorter boled and more defective than at the higher elevations. The trees also have a very large crown development. The density of the stand is "broken to open." A large amount of cupang is found here, with some scattered panao, and considerable inferior lauan, the latter often being defective at the butt. The remaining species of importance found here are batitinan, palosapis, guijo, amuguis, palo-maria, anubing, camayuan, and antipolo. A considerable amount of short saw timber and a large number of medium-length poles can be secured here. This timber being near the coast has some advantages, but a company operating here would probably prefer to go farther back in order to secure greater lengths and sounder timber.

From the Saysaen River to Bagac the density of the forest is open and the quality of the stand in form, figure, and species is poor. In many places no merchantable timber is found, and in general but little timber suitable for poles, posts, and piles. Near Bagac the large timber has been cut out for some distance and the forest

is kept in poor shape by the repeated cullings made by the natives for small timber and firewood.

Rice fields extend from the town for five-eighths of a mile south 20 degrees east, the majority of these being under cultivation at the present time. For the next five-eighths of a mile on the same course the timber has been heavily culled, and fields are scattered here and there throughout the brush land.

The following table shows the average stand per acre of the most important species on the west coast (average number of trees per acre, 8 inches and over in diameter, average diameter, maximum diameter, and average merchantable length of the eight important species).

Acre measurements on the west coast.

Species.	Average number of trees per acre.	Average diameter.	Maximum diameter.	Average merchantable length.
		Inches.	*Inches.*	*Feet.*
Panao	9.25	20.43	57	66
Tanguile	4.19	22.11	72	56
Lauan	5.96	16.62	65	65.2
Palosapis	.96	19.42	56	63.8
Guijo	2.44	18.70	64	65.1
Cupang	2.62	24.17	72	54.5
Amuguis	.58	21.68	60	47.7
Palo-maria	.95	12.06	32	38.6
Panganan	2.01	18.08	30	.....
Dalindigan	1.21	11.87	42	.....
Camayuan	1.57	10.45	40	.....
Malaruhat	2.10	14.35	44	.....
Putian	2.76	12.29	54	.....
Boc-boc	4.18	9.92	22	.....
Alupag	3.94	14.45	52	.....
Bolong-eta	4.11	10.37	27	.....
Dalinas	.44	9.76	17	.....
Cato	1.20	11.24	35	.....
Calivas	1.28	11.26	22	.....
Malacamanga	.88	10.09	25	.....
Total mean average	52.63	14.71	44.4	37.1

From this it will be seen that panao is the predominating species, and also has the greatest merchantable length. Lauan comes second in abundance, though the average diameter is considerably lower than panao, the average merchantable length being very nearly the same.

Tanguile is third in number, but shows the largest average diameter of any species. Boc-boc is fourth in number, bolong-eta fifth, and alupag sixth. The last three have, however, an average diameter of 9 to 14 inches. The same order is also found on the eastern coast, except that alupag is fifth and bolong-eta sixth instead of vice versa. For a distance of 2 miles, north of the town of Mariveles, toward the headwaters of the Lalinbin and Mariveles rivers there is no timber of value, the first mile being taken up mainly by fields and rice paddies, the next mile being mainly brush land. In the next three-fourths of a mile there is some small timber but the valuable accessible timber has been taken out.

The general configuration of the country around the headwaters of the Lalinbin and Mariveles rivers is very rough, being cut up into sharp ridges with very steep slopes generally extending to the stream uninterrupted, and often so steep as to be almost impassable.

Panao forms the bulk of the merchantable timber here, but the clear length, except in favored spots, is generally not over 40 to 50 feet, and the boles are inclined to be more defective than usual. There is a small amount of lauan, but it is largely of poor form and defective. Guijo and tanguile are short, but quite sound. The remaining species are generally of very poor form and of little value.

Owing to the very steep slopes no animals could be used here, and the quality and amount of timber is such that a lumber company would not care to put in a cable system so long as there is better and more accessible timber in other parts of the province.

Great care should be exercised in opening up the forest, reproduction being rather poor on the greater part of the area, and the danger from erosion great.

The soil is a shallow, fresh, sandy loam, and, containing many small and some larger bowlders, it washes very easily during the heavy rains. No lumbering should go on here except under strict supervision.

Toward the headwaters of the Mariveles River there are two waterfalls—the upper one about 80 feet high and the lower one 30 feet high. The banks of the river are

very steep, and the upper fall is almost inaccessible, the only passage being up the river bed and over the lower fall. The banks of the river rise almost vertically in places to a height of 200 to 400 feet, and there is not sufficient water passing over the falls in the dry season to be of any service as a power.

In the region drained by the Batirrol River and its tributaries northeast of Mariveles, panao is the predominating species, with also a large amount of tanguile and lauan. The panao and the tanguile are usually sound, but the lauan is often defective. On the lower levels there is also a small amount of cupang and guijo, with a large number of inferior species intermixed.

The timber in this region can find an easy outlet down the long leading ridge separating the Cabcaben and the Batirrol River basins. This ridge, joining with the lowlands in the vicinity of Cabcaben, affords an excellent opportunity for the construction of a tramroad from some point along the coast, or from Cabcaben, into the heart of the timber belt. This, in connection with a wire-cable system, would afford an easy and comparatively cheap method of getting out this timber.

The track for such a tramroad could be laid cheaply, as there would be but little grading to be done, and the large amount of timber tributary to such a road would certainly warrant the construction of such a system.

In the flat lands lying south of the trail between Mariveles and Cabcaben, about 3 miles west of Cabcaben, there is a very good stand of amuguis and guijo. The amuguis trees are inclined to be defective at the butt, and, as a general rule, the sound trees will only yield two logs. The reproduction of these two species is poor, especially that of amuguis. Reproduction of amuguis in the pole stage seems to be almost totally lacking here in the forest, though on the edge of the brush lands, where there is considerable light, the conditions are somewhat better. The timber here is quite accessible, and can be easily taken out on the tramroad mentioned previously.

CABCABEN RIVER BASIN.

In the Cabcaben drainage basin the important species are panao, tanguile, lauans guijo, palosapis, cupang, and amuguis. The form figure of all is much the same a, in the other drainage basins, though tanguile as a whole is more inclined to be defective, especially at the higher elevations, than on the western coast. In this region guijo and palosapis reach a fine form and development, and will furnish a large amount of excellent saw timber.

The development of all the above species is very good, with the exception of amuguis.

The brush lands in this region extend back from the coast for a distance of 2 miles or more, and within this area there are no trees of merchantable value. In spots there is a good seedling reproduction of panao, lauan, guijo, cupang, and palo-maria.

The best timber in this region is along the ridges and part way down the slopes, the timber in the valley being generally shorter and more inclined to be defective, This basin could be easily lumbered by means of a cable system, the timber around the headwaters going down the ridge between the Batirrol and the Cabcaben rivers, the timber on the lower slopes finding an outlet down the ridge just north of the Cabcaben River.

AMO RIVER BASIN.

The region drained by the Amo River and tributaries lying west of the barrio of Cabcaben consists approximately of 4,890 acres, of which 3,220 acres are forest land situated near the headwaters of the river and 1,570 acres of brush land lying adjacent to the coast. Within the forest area the river consists of two main branches, both having their source near the base of Bataan Mountain and divided by a low ridge.

From the mouth of the Amo River just north of the barrio of Cabcaben the brush lands extend along the stream in a westerly direction for 2½ miles, the elevation at the end of the brush lands being about 350 feet.

From the edge of the brush lands to the end of the merchantable timber line the distance is 3¼ miles, making the distance from the coast to the most remote timber 5¾ to 6 miles. There are but few large bowlders and but little rough ground in this basin, thus affording a good logging bottom.

There is a considerable amount of large timber which it will be impossible to take out by means of animals owing to its size and weight, and in order to secure this timber some wire-cable system should be used taking the timber down the ridges on either side of the stream.

Timber could be driven down the stream only with difficulty, and even were it feasible a considerable amount of the timber is too heavy to float and could not be taken out in this way.

Within this basin the 7 species found in greatest abundance and of the greatest commercial value are panao, tanguile, palosapis, lauan, cupang, guijo, and amaguis.

In addition to these there are a large number of species of small diameter, which at present have but little value in the market.

The approximate stand of timber in this basin is given below, and will serve to show the approximate stand to be found on the eastern coast in the river basins where the conditions are similar.

The eight species noted previously were used as a basis for determining the stand, the remaining species of large size being scattered and but few in number.

Only trees 20 inches and over in diameter were taken into consideration here, as in the great majority of cases it is not deemed advisable to cut below this diameter limit, mainly on account of silvicultural reasons. Many of the species which attain a large size do not bear fruit abundantly below a diameter of 18 to 20 inches, and in order to insure the presence of a sufficient number of seed trees it will be necessary to set a diameter limit which is not below this. Cutting down to 20 inches will yield an amount of timber sufficient to make the exploitation profitable, and still leave the forest in a condition in which it can recover rapidly.

In determining the stand of timber after computing the volume of the different species it was found necessary to make a reduction varying with the different species for unseen defects and poor timber. This was greatest in the case of tanguile and amuguis, and least in cupang.

The following percentages were deducted for defects from the species named below:

	Per cent.
Tanguile	40
Amuguis	40
Lauan	30
Guijo	20
Panao	15
Palosapis	15
Cupang	10
Average	24.5

The average stand per acre within the forest area for trees 20 inches and over in diameter is as follows:

Species.	Contents.	Per cent of stand.
	Cu. feet.	
Panao	1,448.4	34
Tanguile	937.2	22
Palosapis	724.2	17
Lauan	596.4	14
Cupang	255.6	6
Guijo	213.0	5
Amuguis	85.2	2
Total	4,260	100

The above represents the stand after the deduction of unsound timber, and shows an average of 4,260 cubic feet round timber per acre, with a total volume for the 3,320 acres of 14,143,200 cubic feet. In addition to this there will be an average of 100 cubic feet per acre of other merchantable species, composed of many kinds, and but a small amount of each kind, bringing the total up to 4,360 cubic feet per acre, making the total for the basin 14,475,200 cubic feet.

Panao forms one-third of the stand in this basin, and will furnish long lengths of straight, sound timber. At the present time no panao has been cut in the southern part of the province, the natives claiming that the timber is hard to cut, and, being heavy, is difficult to haul out.

In the upper part of the province and in Zambales Province panao is cut and shipped to Manila, finding a ready market, and undoubtedly the disfavor into which panao has fallen in the south end of the province is due largely to prejudice.

Tanguile forms about one-third of the stand, and though not generally furnishing quite as long lengths as panao, yet on an average yields timber of somewhat larger diameters.

Palosapis forms about one-sixth of the stand, and is of fine form and generally sound.

Lauan forms about one-seventh of the stand, and though there are many more stems per acre than of palosapis, the average diameter is not as large and the timber is more defective.

Cupang, guijo, and amuguis form but a small part of the stand, and are found only on the lower elevations. The amuguis is in general very defective.

This region will yield in telegraph poles an average of 1.4 poles per acre of bolong-eta between the diameters of 10 and 20 inches (mainly between 10 and 14 inches); an average of 0.6 poles per acre for amayuan between 10 inches and 18 inches diameter; an average of 1 pole per acre of boc-boc between 10 and 17 inches diameter; an average of 1.8 poles per acre of alupag between 10 and 20 inches diameter (mainly between 10 and 15 inches); an average of 2.2 poles of palo-maria per acre between 10 and 20 inches in diameter (mainly between 10 and 16 inches). These poles have an average length of 35 to 40 feet, and in most cases are straight and sound. The following table shows the average stand of poles per acre and also for the tract:

Species.	Number of trees.	Total number of trees.
	Per acre.	
Camayuan	0.6	1,680
Boc-boc	1.0	2,800
Bolong-eta	1.4	3,920
Alupag	1.8	5,040
Palo-maria	2.2	6,160
Total	7.0	19,600

At the present time it will not be advisable to remove a large number of palo-maria, if it is desired to continue this species in the forest. None should be taken out except under direction of some forest official.

LAMAO RIVER BASIN.

The chief species in this basin are panao, lauan, and tanguile, the two former predominating. There is also a considerable amount of camayuan, palo-maria, and bolong-eta, with a fair stand of guijo, cupang, and amuguis.

The silvicultural conditions here vary but little from the other river basins, with the exception of tanguile, which here reaches a greater average height and clear length than is found on the west coast.

This region can be easily lumbered by means of a wire cable system, the ascent toward the mountains being easier and the country less broken by ridges than on the west coast. The main outlet for the timber in this basin is down the valley of the Lamao River, which enters the sea near Lamao.

The following table shows the average stand per acre of the most important species on the eastern coast, computed from 307 valuation surveys showing the average number of trees per acre, 8 inches and over in diameter, average diameter, maximum diameter, and average merchantable length:

[Acre measurement (307 acres) on east coast.]

Species.	Average number of trees per acre.	Average diameter.	Maximum diameter.	Average merchantable length.
		Inches.	*Inches.*	*Feet.*
Panao	10.20	20.04	59	66
Tanguile	5.45	22.70	64	56
Lauan	6.30	17.86	51	65.2
Palosapis	2.03	22.29	66	63.8
Guijo	2.81	19.02	71	65.1
Cupang	.63	33.30	60	54.5
Amuguis	.54	24.17	51	47.7
Palo-maria	2.83	11.57	38	38.6
Panganan	1.67	13.96	36	.....
Dalindigan	1.34	12.26	33	.....
Camayuan	2.15	10.89	34	.....
Malaruhat	2.15	13.81	47	.....
Putian	1.16	14.36	47	.....
Boc-boc	4.14	10.32	26	.....
Alupag	3.51	13.65	51	.....
Bolong-eta	3.32	10.49	33	.....
Dalinas	.77	9.87	23	.....
Cato	1.04	11.55	31	.....
Calivas	2.04	10.67	40	.....
Malacamanga	1.70	9.88	33	.....
Total	55.78	.....	.....	.....
Mean average	.....	15.63	44.65	57.1

GROUND COVER.

The ground cover over the whole region consists principally of leaves, varying in depth from one-half to three inches, with occasional ferns and some grass. In all places there is a marked absence of any form of herbaceous growth, due, to a considerable extent, to the absence of humus.

UNDERBRUSH.

The most common form found in this region are the several kinds of bejuco, which thrive best under a moderate shade, thinning out to a great extent as the forest becomes dense. It is almost entirely absent in the brush lands and in other places where the stand is open. It has, however, a wide range of distribution, and has been found at an elevation of 3,000 feet, though of a dwarf, scrubby form.

Timac comes next in importance, and in open places forms an almost impenetrable thicket. It is found in greatest abundance on the low-lying lands, and evidently needs a large amount of light, being absent in all cases where the forest cover is dense. It is a greater hindrance to reproduction than bejuco, owing to the dense thickets which it forms in open spots where the forest has been opened up. However, in places where seedlings have obtained a start before the timac they apparently are able to live, though their growth is retarded to quite an extent.

REPRODUCTION.

The reproduction in general is as satisfactory as can be expected in a mixed virgin forest, where there are many large trees with broad-spreading and more or less dense crowns, which shade the ground to quite an extent, tending to retard the growth of small seedlings by shutting out a large amount of light. But little difference is found in the reproduction on the east and west coasts.

The reproduction of the three most abundant species—panao, tanguile, and lauan—is good, though it can be considerably improved by a judicious opening up of the forest, and the removal of the large-crowned, mature, and overmature timber. The larger part of the species found in this province are heavy-seeded trees, and are not able to seed much territory except close to the parent tree.

Of the three most important species lauan has the lightest seeds, but they generally do not cover a territory more than 200 feet from the parent tree. It bears fruit only on alternate years.

Panao has a very heavy two-winged seed, which falls directly to the ground. It bears a large number of seeds and germinates readily, the small seedlings being able to endure a considerable amount of shade.

Tanguile fruit was not seen during the work, but the tree bears an abundance of flowers, and reproduction in the region of the parent tree is generally good.

Guijo is also a heavy-seeded tree, and produces a large number of flowers and fruit. The reproduction of this species on the lower slopes, where the density of the forest is "broken to open," is generally good.

Palosapis is a demander of more light than many species, and germinates readily only in more or less open places. The best reproduction of this species was found in the brush lands along the eastern coast, especially in the valleys of the Cabcaben and Amo rivers. The seed is quite light and capable of being borne some distance by the wind. The principal enemy of the fruit is the wild hog. It bears seed every year.

Amuguis is found in considerable abundance on the lower elevations of the eastern coast. It has a heavy, fleshy fruit, and bears abundantly every year. It evidently demands a large amount of light for development, and reproduces well only on the edge of the brush lands. Reproduction within the forest is almost entirely lacking.

A considerable amount of fruit is destroyed every year by hogs, monkeys, deer, birds, and the natives—all being very fond of the fruit.

Cupang is also a demander of considerable light. It bears fruit abundantly every year, the fruit being a pod about one foot long and containing large, heavy, dark-colored beans. It apparently germinates easily during the rainy season along the trails in a fairly dense forest, but dies after germination, probably for want of suitable light conditions, as very few seedlings or saplings of any size can be found in such places. Cupang and amuguis are generally found associated together, both seeming to demand the same condition as to soil, light, and elevation. They seldom go above 900 feet elevation, and the only good reproduction noted was on the edge of open places or in open places themselves.

Palo-maria reproduction is generally good, the seed being able to germinate and the seedlings to develop under fairly dense light conditions. The fruit is rather small and heavy and can not be distributed far from the parent tree. It bears fruit every year at a diameter of 10 to 12 inches.

Boc-boc reproduces very well under a medium shade. It bears an abundance of seed every year at a diameter of 6 inches and over.

Bolong-eta reproduces well in the forest and under almost all conditions as to elevation and aspect within the merchantable timber line. The fruit is heavy, abundant, and is borne every year. The tree bears at a diameter of 6 inches and over.

Alupag reproduces fairly well under medium shade. A large amount of fruit is borne every year at a diameter of 5 inches and over.

Camayuan reproduces fairly well, and bears only on alternate years. The first is heavy and borne at a diameter of 6 inches and over. The greater part of the important species bear seed only at comparatively large diameters—from 16 to 20 inches—and are thus handicapped by the great number of less important species, which seldom reach a diameter of 15 to 18 inches and bear seed at a diameter of 6 inches and over.

In order to encourage the more important species it will be advisable to remove as many of the larger trees of the inferior species during the lumbering operations as is possible, without opening up the stand too much. This would remove a large number of seed trees of undesirable species which at the present time offer strong competition to the leading species.

The inferior species are generally more prolific seed bearers than the others, and this, taken with the low diameter at which they bear seed, gives them a decided advantage over the better species.

In opening up the forest during lumbering operations great care must be exercised that no large blanks are made where the sun can reach the soil directly. There being but little ground cover, the soil in exposed places, especially during the dry season, dries out very rapidly, and large cracks are formed in the soil, the conditions being such that young seedlings will be unable to survive.

DENSITY.

Taking the number of stems per acre as a basis, the stand in the province may be considered as "broken," though in many places the soil is heavily shaded by the very large spreading crowns of the trees, which by interlacing form a dense canopy. Where there are heavy stands of panao and tanguile the density is frequently dense, and in some places, especially in panao "groves," the soil is entirely devoid of any brushy growth. This occurs most frequently at an elevation of 1,200 to 1,500 feet.

QUALITY OF LOCATION.

The quality of the whole region for tree growth may be considered No. 1, except along the seacoast, on the very steep slopes, where the soil is thin, and near the end of the merchantable timber line.

In the main forest regions the soil is very favorable for forest growth and, with some assistance, heavier stands can be produced in many places than are found at the present time.

SILVICULTURAL CONDITIONS.

The silvicultural conditions of the species, which grow to a merchantable size, is very good, showing in general a long, clear length and straight boles.

PANAO (DIPTEROCARPUS).

Panao has the best form of any species found in this region of the province. The clear bole ranges from 60 to 90 feet, and clear boles up to 120 feet have been found, though these are the exception. The boles are uniformly straight and clean and the trees in most cases apparently sound.

The large trees are to a great extent dominant, which permits the development of a large crown. The crowns, however, are usually quite symmetrical, and, being above the other trees, allow considerable light to reach the trees in the lower story. When, however, there is a heavy stand of panao poles the ground is generally densely shaded and but little undergrowth is found. The average diameter, caliper-ing all trees down to 8 inches, is 20 inches.

TANGUILE (SHOREA).

Tanguile generally has a shorter bole than panao, running from 40 to 60 feet, fairly cylindrical, and with a small taper. It reaches its best development in height growth in the basins of the Amo and Lamao rivers, on the eastern slope. The aver-

age clear length bole here is from 50 to 70 feet, and clear boles to the length of 115 feet, with a total height of 180 feet, were recorded.

The crown of the tanguile is heavy limbed and very irregular, with a small leaf which does not offer as much shade as the larger leaved panao. The average diameter, calipering all trees down to 8 inches, is 22 inches.

LAUAN (ANISOPTERA).

Lauan has not as great a length of clear bole nor as great a height growth as panao. The crown is quite symmetrical and extends a considerable distance down the trunk. The foliage is rather dense on many crowns, but does not generally offer as much shade as panao. The average clear length bole on the west coast is from 50 to 65 feet, but on the east coast, in the region around the Cabcaben, Amo, and Lamao rivers, the clear length will average from 50 to 95 feet. The average diameter, calipering all trees down to 8 inches, is 17 inches.

GUIJO (SHOREA).

The heaviest stand of guijo is found on the lower elevations on the eastern coast, where it forms an important part of the forest.

Guijo resembles tanguile in the character of the bole and general appearance, though the crown is not as heavy limbed and is more regular. The length of clear bole ranges between 50 and 80 feet, with an average diameter of 19 inches, calipering all trees down to 8 inches.

PALOSAPIS (SHOREA).

This is found in greatest abundance and best development on the eastern coast. It has a long, straight, clear bole with a small taper. The crown is usually large, spreading, and the foliage somewhat dense. The clear length ranges between 50 and 80 feet, and has an average diameter, calipering all trees down to the diameter of 8 inches, of 20.8 inches.

AMUGUIS (SHOREA).

Amuguis is found in considerable abundance on the lower elevations of the eastern coast, rarely above 900 feet elevation. The clear bole ranges from 45 to 60 feet in length, with a small taper, generally spreading roots, extending 3 or 4 feet above the ground. The crowns usually spread widely at the end of the clear length, and are large limbed, with a rather thin foliage. It is found in greatest abundance, associated with cupang, on gentle to moderate slopes at an elevation of from 400 to 500 feet. The average diameter, calipering all trees above 8 inches, is 23 inches.

CUPANG (PARKIA).

Cupang has a rather large diameter, with a smooth, straight, cylindrical bole, which is often quite short. The clear length of the bole ranges from 40 to 55 feet, and at the end of this the crown spreads out in many cases very broadly, and is large limbed. The foliage is thin and offers but little shade to the surrounding growth. The cupang has very broad buttressed roots, which in some cases extend as high as 8 to 10 feet above the ground, but generally not over 3 to 5 feet.

On the edge of clearings and in open spaces the cupang produces a very short bole and a crown 80 to 90 feet in diameter, forming a low tree of little value as timber. The average diameter, calipering all trees down to 8 inches, is 24 inches on the west coast and 33 inches on the east coast.

DUNGON (HERITIERA).

Dungon is very scattered and the reproduction is poor, due partly to the light conditions and the comparatively small amount of seed which it bears. It has a straight, clean bole, with a clear length of 50 to 70 feet. The crown is large, spreading, and fairly dense. Its range extends over all aspects and elevations within the merchantable timber belt.

BOLONG-ETA (DIOSPYROS).

This tree is found widely distributed over the whole territory and at all elevations up to 2,000 feet. The boles are fairly straight, but rather rough, and the sapwood is frequently more or less defective. It averages in clear length from 30 to 50 feet.

The crowns are large, regular, and generally fairly dense. The average diameter, calipering all trees down to 8 inches, is 10 inches. It is suitable for posts and small poles, and in Bataan is frequently used as fuel in burning out bancas and to a limited extent as house posts.

ALUPAG (NEPHELIUM).

Generally distributed over the whole area up to 1,900 feet elevation. The boles are usually rather crooked, with a large and irregular crown, and a total height under 100 feet. The length of the clear bole is usually from 30 to 50 feet; the average diameter, calipering all trees down to 8 inches, is 14 inches. Used principally for house posts in Bataan.

BOC-BOC (STREBLUS).

Widely distributed over the whole region. Boles are fairly straight, with a clear length of 30 to 50 feet. The crown is usually large, and very thin. The average diameter, calipering down to 8 inches, is 10 inches. Not used in Bataan at the present time, but should make good posts and poles if treated with creosote or some other preservative.

RATE OF GROWTH.

Here, as in all tropical forests, the greatest difficulty has been found in determining the annual rate of growth of the various species. Owing to there being no abrupt cessation of tree growth, as is found in temperate climates, there is no marked distinction of annual growth rings. Rings are present in numerous cases, but it is undoubtedly true that more than one ring is formed in a year, depending upon the habits of the individual species and also upon the local moisture conditions.

Until much more data are at hand than we have at the present time it will be impossible to deal with the question of the rate of growth.

MERCHANTABLE CONDITION.

The merchantable condition varies considerably with the changes in situation and elevation, but as far as the important species are concerned it is very good.

Panao furnishes long log lengths, which are straight and sound. Tanguile is affected to some extent by fungous diseases, especially in the region of the Cabcaben River, yet almost all trees will yield some saw timber.

Lauan is often affected by a butt rot, but will generally furnish some good logs. The boles are long, straight, and smooth.

Guijo is affected to some extent by fungi, but not to as great an extent as tanguile. Guijo will furnish some very fine saw timber of long lengths.

Palosapis is apparently very sound, and gives long, clear, straight log lengths of large diameters.

Amuguis, found in greatest abundance in low lands, is often defective, but will usually furnish at least one log.

Cupang is generally very sound, and will furnish a large amount of material suitable for boxes, etc., where a light timber is desired. The trees will not generally furnish over two logs, owing to the short bole and the buttressed roots.

Many of the other larger species will furnish good saw material, though the number of trees of each species is so small that only a limited amount of timber can be secured of any one species without covering a large territory. The smaller species, such as bolong-eta, alupag, boc-boc, and camayuan are in general of a size suited for poles, posts, and small sills, but of such materials of small dimensions a large amount can be secured.

DAMAGE.

The principal damage to forest growth is from fungi which attack tanguile, lauan, and some others quite readily. Insects apparently injure the living trees to no appreciable extent, though attacking dead timber in a very short time. The damage to living trees from vines is small, except in the case of balete, which in time reaches the form of a tree growth. This starts as an epiphyte on a great variety of trees, but is generally more common on tanguile than any other one species. It commences in the crown of the tree, generally in a crotch, sending out aerial roots, which by means of small tendrils cling to the body of the host tree, and gradually creep downward and upon striking the soil take root. In time these roots almost completely envelop the tree and kill it. The wood is of no value, but the bark yields a whitish juice,

which can be made into a form of gum. This juice and also the leaves of the tree are supposed to have medicinal qualities.

This species occurs at all elevations within the merchantable timber line. There is another species of balete, rarely found here, which is of good form and suitable for the construction of bancas.

In the following list will be found the various species of trees 8 inches and over in diameter, found in the southern part of the province, in the region covered by the investigation. This list gives the common name by which the trees are known in the province, and as far as possible the generic name, and the group under which it is classified in the "Forest Regulations."

The species of southern Bataan.

Common name.	Genus.	Group.	Common name.	Genus.	Group.
Acle	Pithecolobium	1	Binouang	Octomeles	4
Aclen-Parang	Albizzia	3	Binunga	Macaranga	4
Agay			Bitog	Calophyllum	3
Alalangat	Adenanthera	2	Biton		
Alalunga			Boc-Boc	Streblus	4
Alangang			Bolong-eta	Diospyros	2
Alasan			Botong	Baringtonia	4
Alisiis			Bungalon		
Almaciga			Bubuy	Eriodendron	4
Alupag	Nephelium	2	Bulac		
Amuguis	Odina	2	Bulacdamo		
Amuyon	Xylopia	4	Buta-Buta	Excoecaria	
Anadlang			Cabot		
Anabo			Cabuyao	Citrus	4
Anabung			Cacayasen		
Anagap	Pithecolobium	3	Caetana		
Anagatli	Canarium		Cahoy-blic		
Anarong			Cahoy-buur		
Andolan			Cahoy-dalaga	Zollingeria	4
Angninin			Calasan		
Aniatan	Ochna	3	Calrocan	Bellschmedia	
Anapo			Calabuyo		
Antipolo	Artocarpus	P.	Calamansay	Terminalia	1
Apios			Calayocoi		
Anunung	Cordia	3	Calios	Streblus	3
Anubing	Artocarpus	1	Callvas		
Apis-Apis			Calong-caging		
Apitong	Dipterocarpus	3	Calumpit	Terminalia	3
Apulong	Osmoxylon		Camagon	Diospyros	3
Auili			Camanchiles	Pithecolobium	3
Baacon			Camansalay		
Babayan			Camayuan	Gymnosporia	1
Bagna			Caming		
Bago	Gnetum		Caminge		
Balacat	Zizyphus	3	Camoong		
Balacbac	Eugenia		Camuning	Murraya	1
Balete	Ficus	P.	Cana fistula	Cassia	2
Balinaonao	Capura	4	Canumay		
Balingbing			Caping-tilo		
Balinhasay	Buchania	3	Cara		
Balucanat	Aleurites	3	Caraya		
Banaba	Lagerstræmia	2	Casoy		
Banacalan			Catmon	Dillenia	2
Banao			Cato		
Banal			Caton bacalao		
Banati			Cilisilihan		
Banato	Mallotus	4	Citing-citing		
Banabanyan	Stereospermum (?)	3	Colo		
Banay			Corig		
Banga	Calyptrocalix	5	Culis	Memecylon	4
Bangcal	Sarcocephalus	2	Cupang	Parkia	3
Banquid			Dalinas	Polycthia (?)	
Banquir			Dalindigan	Shorea	3
Baniguisa			Dampol	Bishopia	
Bani			Danglin	Grewia	3
Bani-Bani	Stereospermum (?)	3	Dao	Dracontomelun	3
Banyar			Dap-dap	Erythrina	4
Barangoi			Darangin		
Basac			Daray		
Baticulan			Dia	Zizyphus (?)	
Baticuling	Litsea	1	Dilac		
Batitinan	Lagerstræmia	1	Dila-dila	Excoecaria	4
Bayabas	Psidium	3	Dirita	Alstonia	
Bayan			Ditae	Alostonia	3
Bayog	Pterospermum	3	Diton		
Bignay	Antidesma	3	Dolit		
Bilucao	Garcinia	4	Dungon	Heritiera	3

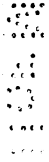
The species of southern Bataan—Continued.

Common name.	Genus.	Group.	Common name.	Genus.	Group.
Duplac	Zizyphus	3	Ngisingisi		
Galis			Ngisingisi-ulo		
Gati			Ninabatay		
Guijo	Shorea	2	Nivatay		
Guilac			Opac		
Guisihan	Ratonia	2	Opplay		
Guyon-guyon	Cratoxylon	3	Pagsainguin	Canarium	3
Hipus-hipus			Pahotan	Mangifera	2
Ipil	Afzelia	S.	Paho		3
Lab-lab			Palac-palac	Palaquium	P
Labac			Palicpican		
Labunyo			Palo-Maria	Calophyllum	3
Labuyo			Paluchina		
Lago			Pamaytolon		
Laguina			Panao	Dipterocarpus	3
Lagundi			Pandacaqui	Tabernæmontana	4
Lamio	Dracontomelum	4	Pandan	Pandanus	
Lamug			Panaloion		
Lanete	Wrightia	1	Panganan	Quercus	
Lano			Pangayranin		
Lanutan	Thespesia	2	Pangi		
Lapinac			Pappling		
Latanan			Paquiling		
Lauan	Anisoptera	3	Parœp		
Laylayan			Pasac	Parinarium	2
Leoseu			Patangis		
Letoc			Paysapis (Palo-sapis.)	Shorea	3
Libas			Pincapincahan	Oroxylum	3
Ligaa			Puas		
Ligag			Puavi		
Ligas	Semecarpus	1	Puso-puso		
Lunas	Lunasia	1	Putat	Barringtoniana	1
Mabanot			Putian	Eugenia	
Mabantut			Puyaui		
Mabayan			Sagayatcatot		
Maguilic	Litsea	4	Salap		
Malabaquis			Samiling		
Malabitog			Sampaloc	Tamarindus	3
Malabonga	Ileadaphne	4	Sandana	Anisoptera	3
Malabulac	Bombax	4	Santol		
Malacacao	Talauma	4	Sao-sao-lalaqui		
Malacadios	Myristica	3	Sasaa		
Malacamanga			Sulipa	Gardenia	4
Malacaminge			Susum biic		
Malanarayum			Taclanganac		
Malacatabi			Tagatoy		
Malacatmon	Dillenia	2	Tagom		
Malacauyan	Stemegypora	4	Tagpo		
Maladanglin			Taliantan		
Malagos			Talibagot		
Malaicmo	Celtis	4	Talimurong		
Malalunga			Talisay	Terminalia	3
Malaoban			Talobasin		
Malapapaya	Polyscia	4	Talongatingan		
Malaputpat			Tambao		
Malaringin			Tanag	Kleinhovia	4
Malaruhat	Eugenia	2	Tanaquitic		
Malasampaloc			Tanguisan bayouac.		
Malasantol	Sandoricum	4	Tanglin		
Malasoca			Tanguile	Shorea	2
Malatadiang	Canthium	3	Tapinac		
Malatalang			Tauto		
Malatumbaga	Crudia	2	Tibig	Ficus	P
Malosa			Tindalo	Afzelia	S
Mamanic			Tuco		
Mareg			Tucodlangit		
Marantic			Tuoy		
Matang-olang	Salacia	4	Ualing		
Mayapis			Ui-ui		
Molave	Vitex	S	Ylang-ylang	Cananga	P
Molanin-aso	Premna	2			

FOREST MANAGEMENT.

The greater part of the merchantable timber in Bataan Province is composed of a few species generally of a small diameter, which at the present time have but little value in the market. Many of these it will be desirable to remove in order to improve the conditions of the better species, and also to remove the seed trees of the undesira-

NIPA PALM, FROM WHICH ROOFS AND SIDES OF HOUSES ARE MADE, CULION ISLAND.



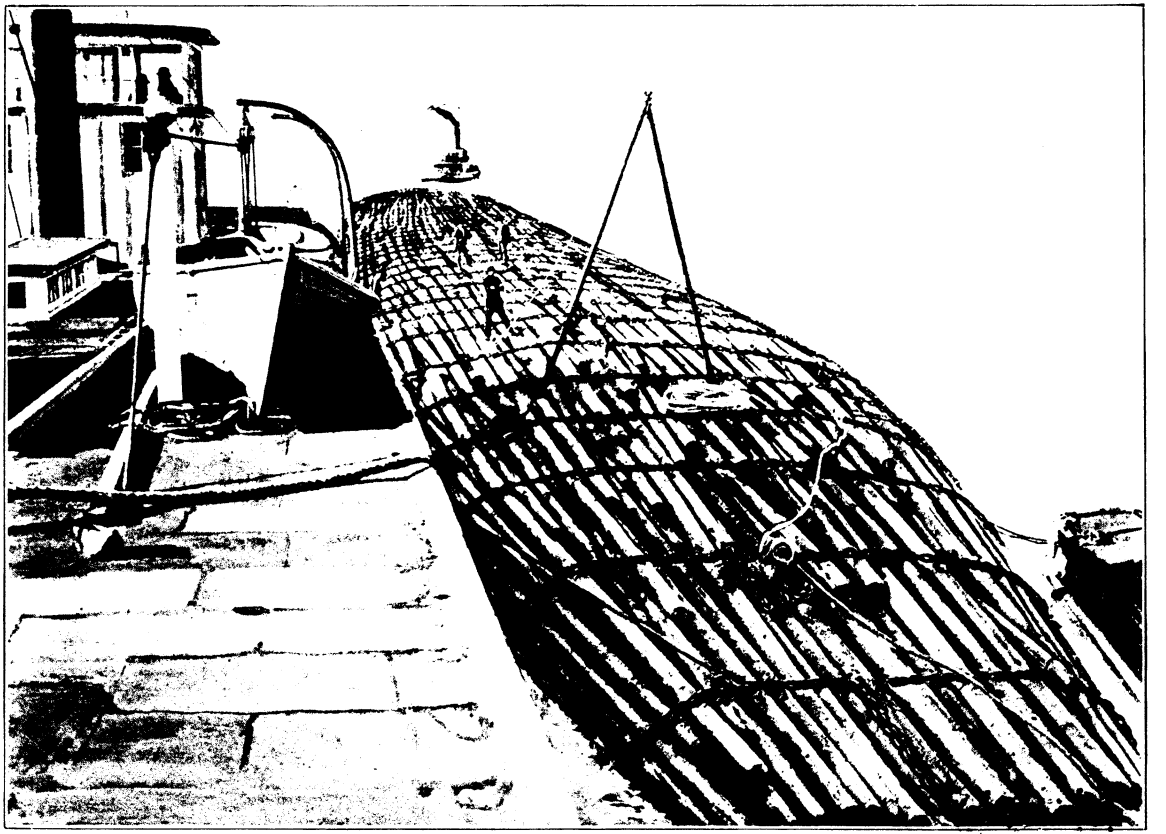
POINT WHERE ROAD FROM LEPER COLONY WILL REACH TIDE WATER ON HALSEY BAY.

Ground on left high, that on right low and covered with nipa palm.

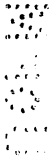
RIVER SCENE. SHOWING DENSE FOREST GROWTH.

SMALL RAFTS OF HEWN TIMBER AND ROUGHLY HEWN BANCAS, DALUPOAN, CAMARINES SUR

Approximate volume of each raft 250 cubic feet. The largest rafts towed into Manila never exceed 6,000 cubic feet.

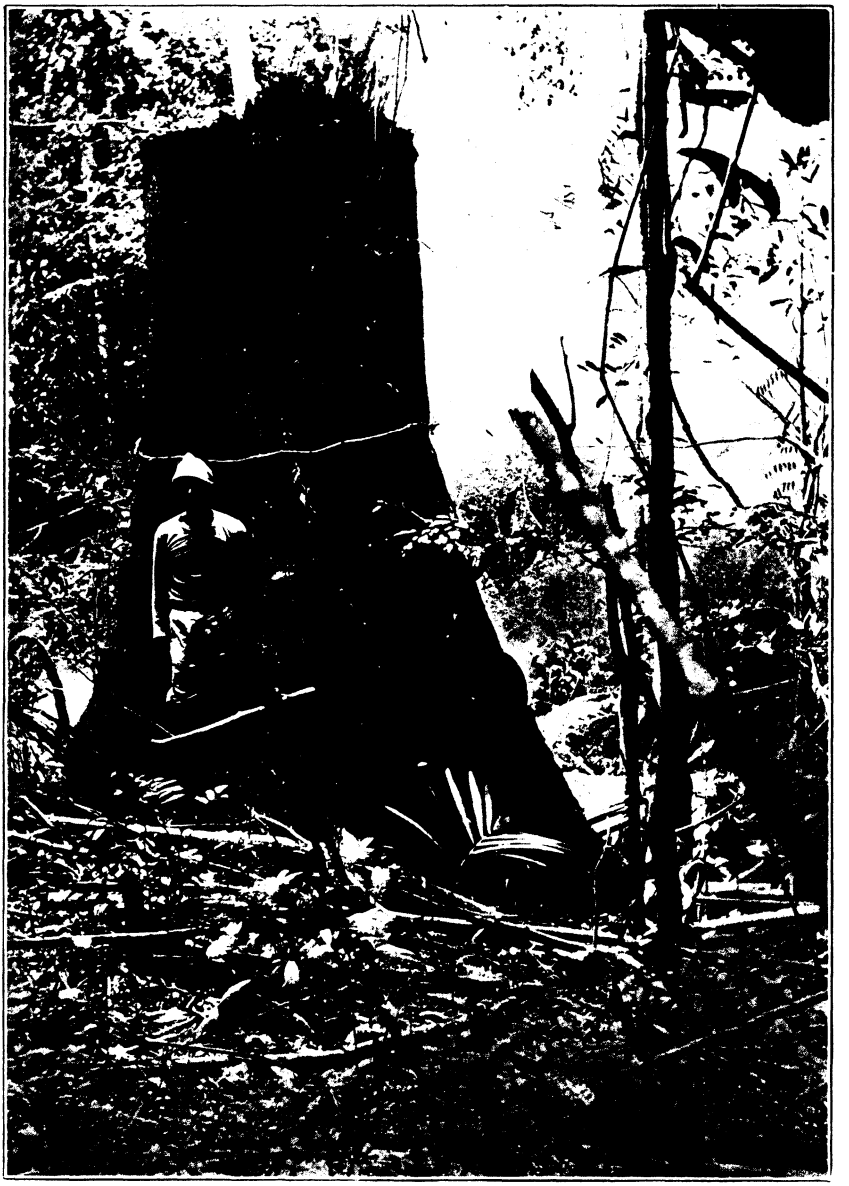


ON THE COLUMBIA RIVER, OREGON. LOGS CONTAINING 6,000,000 FEET OF LUMBER, ABOUT 600,000 CUBIC FEET.



LARGE MOLAVE TOP, WITH LIMBS 20 INCHES IN DIAMETER, WHICH WAS LEFT IN THE WOODS.

For many years this will keep down all young growth and should have been used.



LAUAN STUMP 13 FEET HIGH.

Large banca was cut from this tree.

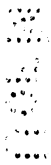
TANGUILE WHICH HAS BEEN CUT FOR BANCA, AND THE VERY LARGE OPENING WHICH IS MADE IN THE FOREST BY THE FALL OF ONE TREE.

LARGE BALETE, ABOUT 30 FEET IN DIAMETER AT THE BASE.

GETTING READY TO SAW A SAMPLE OUT OF A LARGE IPIL TREE JUST FELLED.

JOLOANO-SAMAL MOROS SAWING OUT WOOD SAMPLE.

One-half of the piece sawed out was enough for 8 men to carry through the jungle.



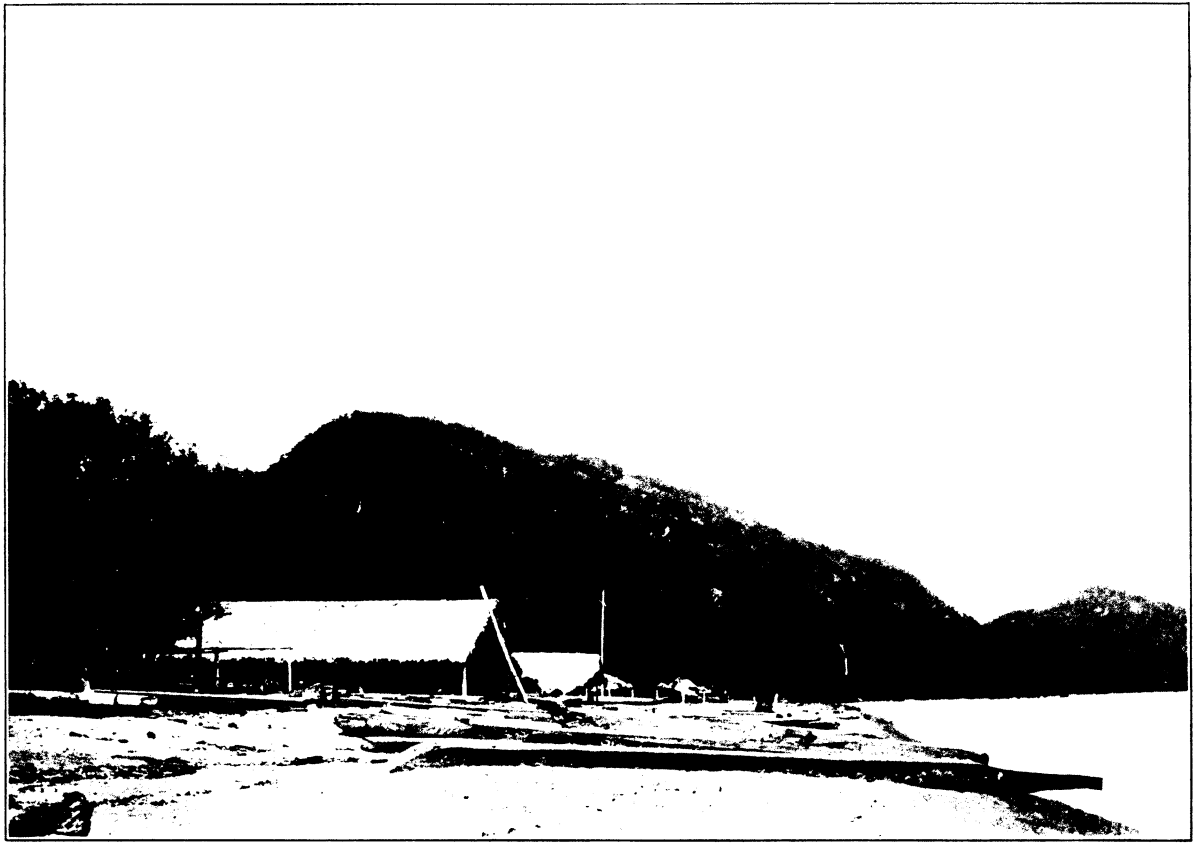
JOLOANO MOROS SAWING TEAK SAMPLE, ISLAND OF JOLO.

MOROS CARRYING A WOOD SAMPLE—TWO MOROS GOING AHEAD TO CUT A PATH THROUGH THE JUNGLE.

Two small vines of green rattan will hold the heaviest sample.

A TEAK STOOL GROWING IN THE FOREST NEAR THE CITY OF JOLO.

ROOTS OF THE BACAGUA TREE IN A PARTIAL SWAMP, BONGAO ISLAND.



GENERAL VIEW OF THE PHILIPPINE LUMBER AND DEVELOPMENT COMPANY'S MILL YARD AT DALUFOAN, CAMARINES SUR.

ble species as far as possible without opening up the stand to too great an extent. Owing to the nearness of the Manila market, a considerable portion of the smaller material can probably be worked up into cordwood, which at the present time can be laid down in Manila at a cost of from 20 to 26 pesos per 1,000 rajas.

The market price at the present time for rajas, superior class sticks 4 to 5 inches in diameter and 36 inches long is $40 to $50 per 1,000 rajas.

Rajas, first class, with sticks 3 inches in diameter and 36 inches long, sell for $20 to $30 per 1,000 rajas.

Rajas, intermediate class, containing sticks of both superior and first class, sell for $28 to $35 per 1,000 rajas.

Split sticks about 24 inches long and 1 inch in diameter are retailed at the wood yards 3 to 4 sticks for 1 cent, according to grade.

The larger-sized trees with good form can be made into telegraph and telephone poles, for which there is a large demand at the present time.

Considerable difficulty may be experienced at first in making the lumberman cut anything but the larger and better class of timber, for it is from these that the largest profits will be secured. However, if only the better species are cut, the forest will soon only consist of inferior species. In order to prevent this it will be necessary to mark all timber which is to be cut and restrict the cutting to marked trees only, a sufficient force of rangers being provided to see that the regulations are complied with.

All the timber cutting in this province has been done by many parties, holding small licenses, most of the timber being cut for bancas. The man holding the license rarely goes into the woods himself, but hires men by the day or by contract to go into the forest, select the trees and cut the timber, and hew the bancas for him. The native workmen practice a severe selection system, picking out the most sound and best-formed trees, usually of the middle diameters, as they are unable to handle the largest-sized timbers, owing to the poor transportation facilities. The trees cut are usually scattered over a large area, and as the various licenses at present cover a large territory supervision is very difficult. The result is that in the past a great waste has taken place, often only one short banca being taken out of one tree and from 20 to 40 feet good lumber left in the top. In cases where the tree in falling has lodged in a place where it is somewhat difficult to remove, the entire tree is left. In either of the above cases the licensee should be held responsible for the full amount of timber cut, and the ranger should inspect the same and see that the regulations are complied with. Sections 1 and 2, article 62, "Regulations governing the utilizations of forest products," have been repeatedly violated in the past.

These sections are as follows:

"SECTION 1. The trees to be cut shall be selected and cut down close to the ground, care being taken that no damage be done in falling to the adjacent trees. The concessioner shall compactedly pile the branches where the least damage shall be done to the younger growth.

"SEC. 2. Forest products shall be transported as far as possible by routes where there are few trees, avoiding as far as practicable the destruction of the younger growth."

At the present time the stumps are cut entirely too high, often 10 to 12 feet above the ground, thus wasting a large amount of valuable timber. In some cases it is necessary to cut several feet above the ground on account of root swellings, but generally the stumps are cut much higher than is necessary.

In felling, no attention is paid to avoid injuring adjacent trees, and sometimes considerable damage is done to saplings and young growth, especially by the large heavy-limbed tops. The branches of the crowns are never lopped or piled up, but left as they fall.

The disposition of the larger material in the tops will be a serious problem in a large lumbering operation. In parts of the islands, wher emolave and certain other superior group woods are abundant, it is found to be profitable to bring all large limbs into the market, almost the entire tree having a merchantable value; but in Bataan Province, where the majority of the merchantable trees are second and third group timbers, the tops have but little value at the present time in the market.

This material should not be left in the woods, but worked up into box material, charcoal, or some other form, which would at least cover the cost involved and rid the forest of a large amount of material which, if left, would be a menace to the forest in the dry season on account of fires.

At the present time in the Manila market charcoal sells for $1 to $1.20 Mexican per sack of 27 "gantas." In some places in the islands charcoal can be laid down on the beach for 20 cents Mexican per sack, the freight charges to Manila generally being one-half the selling price of the same in the Manila market, leaving a profit of

30 to 40 cents per sack. In the past the cutting has been so scattered that there has been but little damage resulting from fires, but when lumbering operations on a comparatively large scale take place, and there is a large amount of brush on a limited area, the danger from fire will be greatly increased, and the regulation in regard to lopping and piling tops must be strictly enforced. Timber at the present time, is taken out by the shortest and easiest route, without regard to the presence of the young growth, and valuable species are frequently cut to build scaffolds for cutting timber, and also to serve as rollers in the skidding trails.

Holders of firewood licenses, especially in securing firewood for use in the small towns, frequently cut in small amounts the better classes of timber, prohibited for firewood, paying little attention to the species, but taking that which is most convenient to get out.

A lumber company working under the direction of the bureau of forestry will experience, no doubt, some trouble with their workmen at the start, as the natives for years past have been in the habit of following loose methods and cutting where and what they wished. The class of natives who do the forest work are generally uneducated, and do not comprehend the meaning of a rational exploitation of the forests, and hence they will have to be gradually educated.

However, the operations of a lumber company whose work is localized in some one region can be supervised far more closely than is possible at the present time, and many of the existing evils can be corrected. In order to give some idea as to the cost of cutting timber in this region and getting the same to Manila, the following statement is given, taken from data collected by Mr. E. M. Griffith, in charge of division of forest management:

The following shipment was not actually made to Manila, but the data were secured from an actual shipment made to this city a short time ago from Olongapo, Zambales Province, near the northern boundary of Bataan Province. The entire work was done by contract, and the following will show the actual cost of the timber and the profit realized from the same:

Cost of cutting and bringing to Manila market 20,000 cubic feet of Panao, Lauan, and Apitong.

[All prices in Mexican currency.]

Government valuation, at 3 cents per cubic foot, plus 25 per cent additional, government valuation for squared timber	$750.00
Cutting and hewing, at 4 cents per cubic foot	800.00
Hauling to beach, ¼ mile, at 2 cents per cubic foot	400.00
Rafting timber and bejuco, at 3 cents per cubic foot	600.00
Towing timber, Olongapo to Manila, 2 days, at $200 per day	400.00
Total cost	2,950.00
Value of timber in Manila market, 40 cents per cubic foot	8,000.00
Cost of same delivered in Manila	2,950.00
Profit	5,050.00

Thus yielding a profit of 25 cents on each cubic foot, or 171 per cent on the investment.

At the present time the species named are selling considerably higher in the market, and the figures are certainly within a safe limit.

In the southern part of Luzon Island, on large operations where superior, first, second, and third group trees are cut, the average valuation charged by the government amounts to 10 cents Mexican per cubic foot.

In Bataan Province, however, owing to the small amount of superior and first group timbers, the average government valuation will be considerably less. The greater part of the merchantable timber here is in the second and third groups, which have a valuation of 8 and 3 cents, respectively, per cubic foot.

At the present time much of the cutting, hewing, and hauling is done by contract, the timber companies paying the natives a certain price per varas (33 inches) and puntos (1.09 inches) for squared timber, delivered on the beach.

The following scale of prices is paid by one of the larger companies operating in southern Luzon, and though the species are not the same as many which are found most abundantly in Bataan, yet it will serve to show the approximate cost of getting out timber of other species than those mentioned previously.

Tariff for timber delivered on the beach, Banaba, Batitinan, Guijo, Malacadios.

Dimensions.			Value.			Excess for each additional puntos.	
Feet.	Inches.	Inches.	Pesos.	Reales.	Cuartos.	Reales.	Cuartos.
13.6	10.9	10.9	.....	6	.....	.....	7
16.3	10.9	10.9	.....	7	10	.....	15
18.2	10.9	10.9	1	1	.....	.....	15
21.8	10.9	10.9	1	4	.....	.....	15
24.6	10.9	10.9	1	5	10	.....	15
27.2	10.9	10.9	1	7	.....	1	10
30.0	10.9	10.9	2	.....	10	1	10
32.7	10.9	10.9	2	2	.....	1	10
35.5	10.9	10.9	2	3	10	1	10
38.1	10.9	10.9	2	5	.....	1	10
40.9	10.9	10.9	3	.....	.....	3	.....
43.6	10.9	10.9	3	.....	.....	3	.....
46.4	10.9	10.9	3	6	.....	3	.....
49.0	10.9	10.9	4	4	.....	1	10
51.8	10.9	10.9	4	7	.....	4	10
54.5	10.9	10.9	5	2	.....	6	.....
57.3	10.9	10.9	6	.....	.....	6	.....
59.9	10.9	10.9	6	3	.....	7	10
62.7	10.9	10.9	6	6	.....	7	10
65.5	10.9	10.9	7	4	.....	9	.....
68.2	10.9	10.9	7	7	.....	9	.....

Peso=42.5 cents gold.
Real=5.3 cents gold.
Cuarto=0.5 cents gold.

The market price per cubic foot which prevails at the present time in Manila for squared timber is as follows:

	Cents.		Cents.
Amuguis	60–65	Guijo	55
Apitong	60	Batitinan	50
Panao	60	Manienie	36
Lauan	45	Palo-Maria	30
Tanguile	60		

The species furnishing the greater part of the merchantable timber here do not reproduce abundantly below a diameter of 18 to 20 inches, and in order to secure good reproduction after lumbering the better species should not be cut below a diameter of 20 inches except in places where an overabundance of seed trees would be left. In other places it may be necessary to leave some seed trees above this diameter. Any variations from the rules must be left to the marker, who should be a man of good, sound judgment. The best means of lumbering this region, owing to the poor transportation and the size of the timber, is by means of a wire-cable system. At the present time there are not sufficient carabaos in the province to work the fields, and much difficulty is experienced in securing carabaos in sufficient numbers to carry on the small amount of lumbering in progress at the present time.

The scarcity of the animals, the high valuation of the same ($100 to $200 Mexican), the comparatively small amount of work renderable, and their inability to handle the largest sized timbers practically eliminates them as a factor in lumbering operations of any size.

It is questionable if American or Australian horses would stand the work in the forest here. It is certain that they could not perform the same amount of labor as American horses do in the forests of the United States.

With the introduction of modern machinery it will be necessary to have American foremen in the forest to take charge of the several branches of the work and instruct the natives in the methods of American lumbering.

The labor conditions in this province are not as satisfactory as could be desired. The natives as a whole are inclined to be indolent, and do not care to work in the forest for any length of time. The only works of any size going on in the province at the present time are at the stone quarry and the shipyard near Mariveles. At the quarry the company found that they were unable to work the natives of this

province, and were forced to import men from Pampanga and one of the southern provinces in order to carry on the work successfully. The superintendent of the shipyard has also had considerable difficulty in keeping men at work for any length of time. The men employed by him were classed as skilled carpenters, and what is true of the skilled labor is true in a greater degree of the unskilled labor. The average wages of laborers in the forest varies from 40 to 80 cents Mexican per day, with subsistence. The more experienced men receive from 60 to 80 cents, and the inferior laborers from 40 to 60 cents.

Laborers furnishing their own subsistence usually receive $1 Mexican per day. Carabao labor varies somewhat in price, but is usually from $1 to $1.50 Mexican per day, with driver.

RECOMMENDATIONS.

At the present time there is a large amount of mature and overmature timber in the province which should be taken out as soon as possible, preferably by some company rather than by a large number of licensees as at the present time.

The main advantage of a single company or a few companies will be the greater ease of supervision and placing of responsibility, which, under the present system, is difficult. They will also be able to take out the largest-sized trees, which under the present methods are not removed on account of the difficulty of handling the same. These trees have in most cases reached maturity, and each year are becoming less valuable, so that it is desirable that they come out as soon as possible.

There should be a more rigid enforcement of article 62 of the forest regulations in regard to the felling of timber, the piling of the tops, and the preservation of young growth.

Also the paragraph in article 63 in regard to felled timber left in the forest after operations have ceased. All timber which is to be cut should be marked, and all marked timber cut, unless a satisfactory reason can be given for not doing so.

Owing to the scarcity of superior and first group timbers in this province, and the poor reproduction of the same, none should be cut except under the direction of some forest official.

The companies operating in this province should not be permitted to cut only the best class of timber, but should also be required to take marked timber which will pay the least profit, in order that the condition of the forest may be improved and the inferior species weeded out.

MARCH 18, 1902.

The SECRETARY OF THE INTERIOR,
Manila, P. I.

SIR: I have the honor to inclose herewith a special report of P. L. Sherman, inspector, forestry bureau, on forest conditions in the Sulu Archipelago and southern Mindanao, Philippine Islands.

From this report we gain many additional data concerning the rich forest resources of the southern islands. But a very small percentage of the timber cut in the Philippine Islands comes from this region, due to various causes, namely, lack of labor, transportation facilities, and distance from Manila market, and very little timber will be cut by the small contractor for some years to come. The only parties able to get much timber in this southern country, in fact, anywhere in the Philippine Islands, will be the large companies well equipped with modern appliances for logging and milling.

The policy of this bureau will be to make a thorough investigation of these regions where large companies contemplate operating. The work by the field parties will begin with the reconnoissance of every part of the tract to be operated over, including a rough sketch map of the same, and followed by valuation surveys of about 1 sample acre in each 25, at the same time making, as far as practicable, a botanical collection as the work progresses.

There is but one spot in the southern islands where any large operations are contemplated at present, namely, at Santa Maria, Zamboanga district, where a field party from the forestry bureau will be sent in the near future to inaugurate the work outlined above.

Very respectfully,

GEORGE P. AHERN,
Captain, Ninth U. S. Infantry, Chief of Forestry Bureau.

MANILA, P. I., *March 3, 1902.*

Capt. GEORGE P. AHERN,
Chief Forestry Bureau, Manila, P. I.

SIR: In accordance with instructions issued from your department, I have the honor to make the following report on forestry conditions in the Sulu Archipelago and southern Mindanao:

POSITION AND EXTENT OF FORESTS.

A study of the forests of all of the southern islands shows that they occupy practically all of the land which attains to an altitude of even a few hundred feet above sea level. A trip along the southern coast of Mindanao, for example, will illustrate very clearly the forest formations. First comes the shore land, often open and heavily grassed, and in other places wooded, even on tide lands, with densely growing mangrove and other trees that, as the land rises to the foothills, give place to high growing trees and tropical jungle, and so on to the mountains beyond, range behind range, so far as the glass can reach, all is forest.

In contradistinction to the forest lands which follow the hill and mountain formations, we find the open lands in the river valleys and low-lying lake regions. The best example of this is in the valley of the great Rio Grande, which, beginning at Cottabato, extends for miles on miles in a T-shaped formation to Sarangani Bay on the south, and to the north no one knows how far, with miles of width as well, yet contains scarcely a tree, certainly no forest.

In Basilan and the rest of the Sulu Archipelago the general formation is the same, the high islands of a volcanic origin being densely wooded from the seashore up, while the low lying coral islands are generally wooded, but contain no high timber. Tawi-Tawi is the best timbered island in the archipelago; in fact, with the exception of one or two small districts, it is wooded and even timberd from end to end. Bilatan, to the south of Tawi-Tawi, comes next in amount of timber. Sulu Island itself has at present almost no forest, being mostly low and rolling. Its timber was confined to a few miles on the north and southeast coast, and even this, with the exception of a belt on the southeast coast, has been cut out.

VARIETIES AND NUMBER OF TREES.

Nothing is more discouraging to the wood collector in the southern islands than the confusion that arises from the varieties and names of the trees composing these tropical forests. Scarcely any two trees look alike, and when the trunks are enough similar to warrant the supposition that they are of the same variety, an inspection of the leaves, either through felling the tree or through much hard and dangerous climbing, discloses the fact that they are in no way related. It may be truthfully said that, with perhaps the one exception of the former teak forest in Jolo, there are no forests of any one or two kinds of trees anywhere in the southern islands, but rather aggregations of species and varieties mounting into the hundreds. A great deal of difference also apparently exists in the general conditions of growth of the forest. This is especially noticeable in the amount of undergrowth, some forests being almost a jungle of small trees, rattans, and other vines, through which one can only pass after a path is cut out with a bolo, while others are almost free from undergrowth, except for the scattered young trees which shoot up slim and straight to the light above. Some forests, especially on the coral islands, are of recent growth, having no large trees, but promise well for the future, while others, such as Bongao, have had their best varieties cut and the new growth is apparently of inferior kinds. It was my endeavor while visiting the various forest points to get answers to the following questions:

1. What is the number of trees having a circumference of over 3 feet, per acre?
2. What is the average height of these trees?
3. What species is the most abundant?
4. What species do the natives consider the finest?

JOLO.

The open, rolling nature of the island has already been referred to. The one forest worthy of the name which has not yet been destroyed is said to be on the south coast, east of the center. The natives were not peaceful enough to permit of my going there; in fact, the military were preparing for drastic measures in that direction. The forest feature most worthy of attention is, however, just outside the city of Jolo, and has been referred to as the exception to the general growth of southern Philip-

pine forests. This forest, or rather former forest, of teak trees extends from Jolo south and west for nearly 10 miles, and in places is from 3 to 5 miles in width. There are no evidences that it was planted, but it certainly grew to the exclusion of all other trees. According to the information in Jolo, this forest was entirely cut down by the Spanish Government some twenty years ago. A very thorough job was certainly performed, for scarcely a tree is now standing which has any considerable size or age. From stumps of all old trees a multitude of stools grew up, and to-day they are of all sizes, from a foot to 40 or 50 feet high. A few are of a respectable size. The tree I selected for a sample was 58 feet high (see Wood Exhibit No. 1) and had a girth of 6 feet 8 inches at a height of 5 feet from the ground. It was 12 feet to the first limb, and fairly represented the shape of the average trees. Should, from the sample, this teak prove to be of superior variety, with some judicious cutting out of crooked and overcrowded stools and the prevention of the Chinese and natives from cutting the trees as soon as they reach a good size, a fine teak forest might yet be produced.

TAWI-TAWI, BONGAO, AND SANGA SANGA.

These islands, being of the same formation and only separated by narrow channels, may be considered together. They are still well wooded, and in former times must have contained magnificent forests. The Spanish, Chinese, and natives have cut trees in the last two islands for many years, and of course have taken some of the best timber; still, on account of the proximity of the forests to the town of Bongao and the number of natives (Filipinos and Moros), who have had much forest work and were more than ordinarily fitted to aid me in my collecting, I found it the best place in the Sulu Archipelago for securing samples of the most important woods of these islands.

The best-known species is probably the molave, which was formerly very abundant, and even now can be found in considerable numbers here. The tree selected for sample (see Wood Exhibit No. 4) had a height of 72 feet and a circumference of 5 feet 2 inches. To the first limb it measured 14 feet, where it was 4 feet in circumference.

This shortness of trunk I found characteristic of these trees in this locality. The ipil trees were of unusually striking appearance, being large, high, and with broad, spreading limbs, the ends of which bore very large seed pods. The sample tree (see Wood Exhibit No. 12) was 118 feet high, with a circumference of 9 feet 6 inches 8 feet above the ground. To the first limb it was 4 feet 7 inches, where the circumference was 8 feet 9 inches. On account of the small amount of white sapwood and the deep reddish brown of the heartwood, the natives considered the tree very old.

The narra trees had mostly been cut out; still the size and growth of those left show what must have been here at one time. The sample tree taken (see Wood Exhibit No. 9) was 100 feet high and 5 feet 5 inches in circumference above the buttresses. The height to first limb was 21 feet 5 inches, where the circumference was 5 feet. Not far from this we found another narra tree from which the natives had cut large pieces of wood from the buttresses. These pieces we found the following week for sale, for making barong scabbards, in the Bongao market. (See Wood Exhibit No. 9A.)

It took a long hunt to find any large-sized camagon trees, for these especially had been sought for by Spanish and Chinese and large numbers cut down. The one selected for sample (see Wood Exhibit No. 16) measured 21 feet to the first limb, the total height being 85 feet. The girth was 5 feet 5 inches, tapering to 4 feet 2 inches at the first limb. Upon sawing the tree we found the grayish-black heartwood to be very small in proportion to the white sapwood. This the natives accounted for by saying that in soft, wet soil the heartwood was always small; in rocky ground, on the contrary, always large. This camagon tree was growing within 100 feet of the sea in soft, wet ground. Within a short distance of it, along the shore, were several fine dungon trees, one of which was felled for a sample. This had a height of 76 feet, the first limb being 21 feet above the ground. In circumference it was 5 feet 7 inches above the buttresses, which reached 9 feet, while at the first limb it measured 4 feet 8 inches. When felled, we found a large heartwood of deep red color, the sapwood being white. On account of the variance of the leaves with those commonly called dungon, I would not be surprised if this tree proved to be a different species or variety from the northern dungon, but it certainly is highly prized by the natives of Tawi-Tawi, who use it for the handles of their krises and barongs, considering it only second to camuning in this respect. Another tree which resembles this, and is considered a very good timber, is the guijo, belonging to the second group. The tree selected as a sample (see Wood Exhibit No. 3) gave a straight log 42 feet long, 4 feet 10 inches in circumference at the base, and 3 feet 5 inches at the small end. Height of tree, 94 feet.

In order to find the new species of trees which seemed of special value, as well as to get an idea of the number of trees per acre where as yet the forest had been untouched, I spent ten days encircling the islands of Tawi-Tawi, Bongao, and Sanga-Sanga, stopping at all the villages to question the natives, and touching at various points on these and adjacent islands where the forests seemed worthy of special study. As I was always close to the coast and had with me several natives who had lived in the vicinity all their lives, and worked for every Spaniard and Chinaman who had cut wood during that time, I was able to acquire a very good idea of the general forest conditions. The finest spot on the south coast is undoubtedly in the vicinity of the small village of Buan. Here the forest starts practically down at high-water mark and extends unbroken over the mountains to the northern coast. An acre proved to have 48 trees, each one having a circumference of over 3 feet. As there was no way of taking out any wood samples, I disliked cutting down any trees, but their average height we agreed upon as 125 feet. Many of the trees had a circumference of 20 to 25 feet, with a height of 60 to 70 feet to the first limb. The largest trees were undoubtedly of the cedar or spruce class, and gave a pitch called by the natives "poot." The trees which the natives picked out with great pride and said were equal to molave and ipil, they called giam, the synonym of which I can not find in any forestry book, nor does it seem to be related to the species bearing the easily confused names of guijo and guisoc. The giam trees were of large size, high, and very plentiful. Associated with them were large trees called palambuyon and pisang-pisang, samples of which I secured in Bongao.

Passing around the eastern end of Tawi-Tawi we entered the forests in these places on the northern coast; here the trees also grew near the shore and were in fine condition. An average acre selected near the northern central part of the island gave 43 trees to the acre, each one being over 3 feet in circumference. The average height we estimated at 100 feet, some growing as high as 125 feet, undoubtedly, while others were only 50 to 90 feet. My followers recognized in this acre trees belonging to the ipil, narra, legayan, and bugoc species. The largest tree on the acre was 35 feet in circumference above the buttresses; it probably belongs to the softer wood species.

To the westward of this place we visited a section of fine forest in which a Chinaman, some twelve years ago, had cut a great many logs.

After the logs were cut some trouble occurred with the Spanish Government, and he was not allowed to remove any of them. A few of them he had gotten near to the seashore, and we saw them lying in a creek in the water, mud, and hot sun. Some were partially decayed, but many others were in fine condition, which certainly speaks well for the staying qualities of those species, for surely no severer test could be applied. Among them was a piece of giam which my foreman remembered cutting twelve years ago when working for this Chinaman.

The piece, in spite of its twelve years of wet and dry, was as good as the day cut.

On Bongao Island we secured samples of giam, together with the unknown species of palambuyon, pisang-pisang, calung-calung, and surogtamban, all of which grow luxuriantly there, and are counted by the natives among their best trees. The samples taken are as follows:

Giam.—Height of tree, 55 feet 5 inches; circumference, 4 feet at base. The wood is undoubtedly hard (see Wood Exhibit No. 15), and resists the action of moist earth so well that the natives use it instead of molave. The pier at Bongao, now some 14 years old, is apparently as well preserved as the day it was put in. The piling is of giam cut in the neighborhood.

Palambuyon.—This tree grew in a partial swamp, with high buttresses, having a circumference of 6 feet 10 inches at the base. The height was 115 feet, with 33 feet to the first limb, where the circumference was 6 feet. In sawing, it showed that it was not so hard as molave or giam, but is greatly prized by the natives because, they claim, when put into the water or wet ground it hardens with age and never rots.

Pisang-pisang.—This magnificent tree species was quite plentiful, and is recognized by its thick, knotty bark and the straight, high-growing character of the trunk, which, in the tree taken as a sample (see Wood Exhibit No. 11), measured 90 feet to the first limb and 122 feet to the top. The girth at 6 feet above the ground was 6 feet, while at the first limb it was 1 foot 8 inches. The wood was fine grained, and cut like hard wood of the best class. The sapwood was white, the heartwood a beautiful deep yellow.

Calung-calung.—This tree undoubtedly belongs to the class of soft woods, though used much by the natives for boards and joists in house building. The only thing against it is the slight resistance it has against wood beetles. The sample secured (see Wood Exhibit No. 5) was from a tree 109 feet high, with a height to the first limb of 50 feet. The circumference at the base was 4 feet 3 inches; at the first limb, 3 feet 6 inches. The bark is smooth and light colored, with small black spots on it.

The limbs are not heavily leaved, and have large pink blotches on them, which aid in the identification of this tree.

Surogtanban.—A species peculiar on account of secreting, instead of a resin, a thick, odorous oil. It happened that we found the tree cut for a sample just before dark, and I arranged for the men to meet me there the following morning at sunrise in order to saw it down. They asked to be allowed to keep the saw over night, as one of them lived in the neighborhood, and it would save the trouble of carrying it to my house. I allowed them to take it, and the next morning, reaching the place at the appointed time, to my wonder I found the tree already sawed down, which must have been a work of some time, as the tree was large. The men were all there and gathered about the stump, into the center of which one of them was plunging a piece of bamboo and drawing it out covered with a thick, colorless, odorous oil. This was eagerly scraped off the stick and smeared over the naked bodies of the Moros—hair, face, and all—each one eager to put on all he could get. They said it made them well and strong and valiant in battle. The tree (see Wood Exhibit No. 7) had a height of 74 feet. To the first limb it was only 12 feet, where the circumference was 6 feet 4 inches. At the base it measured 7 feet 6 inches. The trunk when cut showed rings of oil. The bark was tough, smooth, and gray colored, mottled with white.

SIMONOR.

This island is of coral formation, and, though well wooded, none of the trees are large. On account of the frightfully sharp coral rocks everywhere it is impossible for the barefooted natives to get about. Near the shore we found, however, plenty of camagon trees, and cut a sample (see Wood Exhibit No. 10). The small amount of heartwood showed it to be very young.

BILATAN.

A rather large island, completely wooded, so far as we could judge. It also is of coral formation, and flat. The natives say the trees are large in the interior and many of them camagon.

SECABUN AND TANDABAS.

Two flat coral islands separated by a narrow channel and sparsely wooded, consequently they are capable of supporting 1,000 to 1,500 inhabitants each, who grow large numbers of tapioca trees, which supply the bread food of the Tawi-Tawi Moros.

To summarize the conditions of the Sulu Archipelago, we have:

1. The island of Tawi-Tawi represents three-fourths of the entire forests of the Sulu Archipelago. It is entirely covered, except the northwest and southeast corners.
2. The average height of timber trees is 100 feet.
3. The average number of trees over 3 feet in circumference is 45 to 46 per acre.
4. The best-known trees of the archipelago are teak, giam, ipil, narra, camagon, molave, bunloc, legayan, malabayabe, bugoc, calung-calung, dungon, surogtamban, pisang-pisang, palambuyon, guijo, legayan-bato, mangachapuy, camuning, legot, sandana, gutta-percha, balete, gatmon, ubal, cambantuli, saquil, coletapo.

SOUTHERN MINDANAO.

A study of the southern coast forests of Mindanao during my trips between the various towns, coupled with a lack of transportation and suitable white and native help, convinced me that even a superficial inspection of the forests of this region would take months, and was beyond, in point of time and equipment, the scope of my investigations; consequently I confined myself to a personal study of the forests in the regions southeast of Cottabato and along the trocha extending north from Tukuran while hunting for gutta-percha trees.

As already remarked, the forest-covered hills and mountains extend in unbroken parallel lines from a few miles south of Cottabato to Sarangani Bay. As I entered this belt from the north, or Rio Grande Valley side, south of the sultanate of Talayan, scattered clumps of trees were passed on the river banks even before we were obliged to leave the boats, but we had to push through miles of rank river grass, swamp bushes, and bamboo groves before the ground finally rose and the forest began. I was greatly disappointed to find that none of my Magindanao Moros knew anything about trees, and the Tiruray or Mountain Moros professed ignorance, probably through fear, of all but a few trees, and to these they gave names which, of course, had no connection with any other Moro name for the same trees.

It can be stated, however, that narra, ipil, molave, and camagon were easily recognized, and at least two species of calantas. The forest was mostly open, well watered, and in fine condition. The number of trees on an acre of this mountain side averaged between 45 and 50; their average height was rather great, certainly over 100 feet.

The forests spreading out to the west, north, and east from Tukuran have been cut into by the Spanish only in the near vicinity of the trocha. As active military operations were on during my stay there, I could not go far inland, but was able to go far enough to find apparently untouched forests where the trees were of fine growth, many measuring 16 to 25 feet in circumference. Here I counted 45 trees to the acre. By way of corroboration of the above figures I met an American carpenter at Cottabato, who told me that he had been a lumberman in America all of his life. I asked him if he had seen the forest about Tukuran, and he said that he had been from Tukuran to the northern coast and examined the forest carefully, as he was very much interested in the trees of southern Mindanao, intending to go into the lumber business later on. When asked if he could average the big trees per acre along the 50 miles of his travel, he answered, without hesitation, "Yes, between 40 and 45." The largest trees I saw were of soft wood, probably cedar species. There were also many large hard-wood varieties.

CONCLUSION.

The forests of southern Mindanao and the Sulu Archipelago cover a large extent of this country and are practically unexplored from a forester's standpoint. They have been cut into only at the most accessible points, and then only the very best trees taken.

The forests are not made up of any one kind of trees, but of an aggregation of several hundred species. There are comparatively few big trees to the acre, but many of those are very large, so that the number of board feet will probably average high. To determine the extent of the forests, the different species, and the number of each species, as well as their practical value, is undoubtedly a work of large proportions, but promises returns of great scientific and commercial value. My investigation simply showed many of the difficulties of the task and some of the methods of overcoming them. To get the best insight into these forests, with the least expenditure of time and money, I should suggest the purchase of a native sailboat capable of stowing away several tons of short log samples in her hold, and rigged Moro fashion, so that native crews can always be used to man her; the organizing of a collecting party to consist of two or more American foresters, assisted by the best Spanish and native forestry talent obtainable; the addition to this permanent staff in the different sections of the country visited of all the local help obtainable, and a valuable and scientifically prepared collection could be made in a short time with a minimum amount of risk and discomfort.

Nowhere did I find a forestry official with any wood samples in his office, nor the thought of making a collection of them. The most of them have good reason for not collecting in the forests, still samples of all the woods passing through their offices for exportation or local consumption, marked with the different names current in that section of the country, would help greatly in a short time to do away with the ignorance and confusion which prevail everywhere in the southern islands resulting from a multiplicity of Moro names for the same tree species.

For a summary of the timber business done in southern Mindanao and the Sulu Archipelago up to August, 1901, the reader is referred to the special report of Capt. George P. Ahern, chief of the forestry bureau.

From July, 1901, to February of this year, the books of the bureau show that 13 new timber-cutting licenses have been issued for Zamboanga, 6 for Cottabato, and 3 for Basilan, making a total of 22. As 4 licenses were issued previous to this time, and are still in force, the total number of licenses is therefore 26. During this period the timber cut has amounted to 13,881 cubic feet for Zamboanga, 11,547 cubic feet for Cottabato, 6,282 cubic feet for Basilan, and 612 cubic feet for Jolo. This gives a total of 32,212 cubic feet, with an average of 1,238 cubic feet for each license.

Among this timber is included the product of the one steam sawmill in this entire district. It is located at Zamboanga and supplies part of the lumber needed by the military post there. Needless to say, the output is not limited by the size of the mill, but rather by the number of logs which can be cut in the hills, dragged to the nearest waterway by carabaos and by hand, and floated to the mill.

Since the period above mentioned, the first American steam sawmill belonging to the Philippine Lumber and Development Company, of West Virginia, has sent out its first shipment of 5,000 cubic feet. Until it gets into full running order it can not be stated whether the mill can run under full capacity or must be subject to the

limitations imposed by the Moro and Filipino workmen, carabaos, and the necessity of covering a large extent of ground in order to find the trees of the varieties now in demand.

Very respectfully,

PENOYER L. SHERMAN,
Inspector Forestry Bureau.

MARCH 7, 1902.

SECRETARY OF THE INTERIOR, *Manila, P. I.*

SIR: I have the honor to submit herewith a very interesting and valuable report of Dr. P. L. Sherman, inspector forestry bureau. Dr. Sherman has recently returned from an expedition through the island of Mindanao and the Jolo Archipelago, investigating the rubber and gutta-percha resources in those islands and the trade in said products. The report contains a description of the methods of extraction and preparation of the raw material, photographs illustrating the same, and, with his conclusions, forms a complete and instructive document which will aid materially in arriving at some plan for conserving these valuable products and regulating the trade in them.

From the above-mentioned report it is evident that it is but a matter of a few years when all the available gutta-percha trees in these islands will have been destroyed. This is inevitable unless decisive action is taken in the near future.

There are various phases of this problem which at first sight seem complex and difficult of solution, but on careful consideration one or more practicable solutions present themselves.

First. Measures necessary to protect the existing sources of rubber and gutta-percha, including the suppression of detrimental methods of extraction and preparation.

Second. The future development and expansion of the industry, including a gradual increase in area in new plantations.

Third. Methods of obtaining a revenue from the industry.

The following propositions present themselves, and with those submitted by Dr. Sherman, may lead upon full consideration to a practical solution of the problem.

PROPOSITIONS.

First. Forests, including rubber and gutta-percha trees, to be reserved as state property, to be directly administered, and the rubber and gutta-percha to be collected by the officials of the forestry bureau.

Second. Forests to be retained as state property, but private enterprise to be permitted over specified areas through terminable leases and strict conditions.

Third. Tracts of forests to be transferred to private ownership and development left to individual action under some degree of legislative regulation.

Fourth. Forests to be given to the first comer subject to more or less strict regulations as to methods of extraction and trading in rubber and gutta-percha.

Without entering into the merits of all these propositions, I respectfully invite attention to the advantages from almost every standpoint to be derived from following some plan based on the second proposition, namely:

The state to retain ownership and direct supervision. A lease of twenty or twenty-five years, with a prospect of renewal, would be an incentive to private enterprise to improve the area operated on; would give the parties some time to derive the benefit from new plantations. The timber cut out to make place for the new plantations would at least pay for the clearing. The revenue to the government could be made to bear a relation to the value of the products utilized and would increase in amount as the area was improved. At the same time the government land operated over would increase in value, these valuable products conserved, each plantation forming the center of prosperous and progressive communities, so that in time enough rubber and gutta-percha could be produced from these islands to satisfy a large part of the demand in the United States for these products.

At this time I would respectfully suggest that the trade in rubber and gutta-percha in Mindanao, Paragua, and the Jolo islands be stopped by forbidding the shipment of these products from these islands after, say, May 1. All rubber and gutta-percha brought in for a limited period after that date to be bought by the government and stored. That agents (white men) of the forestry bureau be stationed at three or more points in Mindanao, one at Tawi-tawi, and one at the present gutta-purcha shipping point in Paragua, Calasian.

These men could be authorized to purchase rubber and gutta-percha from such Moros or other natives as would collect these products under their instructions and supervision.

A botanical substation and laboratory could be established at some central point such as San Ramon farm, near Zamboanga, where rubber and gutta-percha plantations should be established at each station of the above-mentioned forestry agents.

There are no men at present in the forestry service in these islands with the necessary training and experience for the management of these stations. An application was received from Mr. A. M. Sawyer, at present assistant manager of a rubber plantation in the East Indies under the British Government, to enter our service as forester. He was fully informed by this bureau of the nature of our service, salaries, etc., and on March 4 cabled to this bureau that he would accept the proposition made by this bureau.

Mr. Sawyer is a graduate of Dehra Dun Forestry School of India, receiving several prizes on graduation for special excellence. I would respectfully recommend that this man be immediately employed.

During the present year a few men could be given the necessary preliminary instruction to inaugurate the work above outlined, and next year the bureau is confident of securing three or four men from Yale and Cornell forestry schools who have given at least one year to the study of rubber and gutta-percha, including the necessary laboratory work.

Very respectfully,

GEORGE P. AHERN,
Captain, Ninth U. S. Infantry,
Chief of Forestry Bureau.

MANILA, P. I., *February 20, 1902.*

Capt. GEORGE P. AHERN,
Chief of the Forestry Bureau, Manila, P. I.

SIR: In accordance with instructions received from the forestry bureau I hereby respectfully submit the following report:

INVESTIGATIONS OF GUTTA-PERCHA AND RUBBER IN THE SOUTHERN PHILIPPINES.

Writers and dealers have long since declared that the entire territory which produces true gutta-percha includes only the lower part of the Malay Peninsula, part of Sumatra and Borneo, and the small adjacent islands of the Rhio Archipelago, etc. Java and Celebes, though very close on the west and south, have failed to produce even one gutta-percha tree of native growth, though the soil and climate are admirably suited to the same, as is shown by the wonderful growth and vigor of the gutta-percha trees planted under Dutch supervision in Java. The query naturally presented itself as to the eastern boundary of the gutta-percha zone, whether the spread of these peculiar trees stopped somewhere in eastern Borneo or whether it extended into the islands of the Sulu Archipelago and still further eastward into Basilan and southern Mindanao. The imports of Singapore[a] have shown for years that varying quantities of low-grade gutta-percha have found their way from southern Philippine ports into that city, and the statement was often made that still larger quantities were received at Sandakan, Borneo, for transshipment. But such is the secrecy employed by the Chinese of Singapore and Borneo, and so skillful are they in adulterating and coloring gutta-percha, as well as in changing names, that neither the quantity nor the quality of this Philippine gutta-percha is known to foreign buyers at Singapore, and certainly no gutta-percha is sold under any Philippine name.

To determine if the southern Philippines contained any true gutta-percha bearing trees, and if so, their species, location, and abundance, as well as to inquire into the methods employed in securing the gutta-percha and rubber now being exported from the southern Philippines, I left Manila November 11, 1901, and spent the ensuing three months visiting the islands and towns of the Sulu Archipelago and southern Mindanao, devoting most of the time to traveling and working alone among the natives, endeavoring in every way to establish friendly relations with them and allay the suspicion and even alarm with which they regard white persons who come among them and make inquiries into their pursuits, customs, and natural surroundings. I believe I was successful in many cases in gaining their confidence, and that the information they furnished me is as accurate as they themselves were capable of giving.

As a result of my investigations, I would divide the southern Philippines into two gutta-percha producing districts—first, the Sulu Archipelago; second, southern Mindanao—on account of their difference in species of trees, methods of collecting the gutta-percha, and ownership of the land.

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[a] See Sherman's report to the forestry bureau on rubber and gutta-percha in 1901.

FIRST, THE SULU ARCHIPELAGO.

(*a*) *Methods of collecting gutta-percha and rubber.*—With the view of going to the most western island of this group first, that is, going as near as possible to Borneo in order to begin my investigations, I went to our farthest military post, Bongao on Bongao Island, by steamer and from there tried by native boats to reach Sibutu Island, still farther to the westward. Every effort was unsuccessful, however, for the natives refused to take me in a sailboat at any price, alleging with good reason that during this season of light winds and strong currents no sailboat could hope to reach that island. The best information I could get was to the effect that no gutta-percha nor rubber was found there. If it is, it finds its way directly into Borneo ports and is unknown to the Moros of Tawi Tawi. At Bongao the natives from surrounding islands brought in small amounts of gutta-percha and rubber to sell to Chinese merchants, but upon being questioned they all declared most emphatically that they secured these products on Tawi-tawi and nowhere else. I secured three different grades of gutta-percha from these natives and one sample of rubber. To verify the statement that only Tawi-tawi contained gutta-percha and rubber, I made a trip of ten days' duration in a native boat, visiting the larger islands of Sanga Sanga, Seminor, Sekabum, and Tandabas, as well as many smaller ones, and in spite of continual questioning on the part of myself and my interpreter, we never found anyone to declare that any island but Tawi-tawi contained these products. After seeing these islands I felt convinced that they contained no suitable habitat for gutta-percha trees, as they were of coral formation, low-lying and small, while gutta-percha trees, judging from the varieties found in the Malay Peninsula, Sumatra, and Borneo, only do well at a somewhat remote distance from the sea and at an altitude of at least several hundred feet.

My investigations on the island of Tawi-tawi were as follows:

Starting at the southwest corner I first visited the very small village of Dajapatan. Here we found a small amount of gutta-percha in the dato's house, but the price he asked for it was so ridiculously high that I concluded he thought I was a curio hunter and ought to pay accordingly. The natives of the village said they did not collect much gutta-percha or rubber, as they had to go two days into the mountains in order to find it, as all the trees near them had been cut down. Leaving Dajapatan we sailed to the next village, called Balambing, some 10 miles along the south coast. Since the destruction of Tataan, on the northern coast, by the Spanish in 1898, Balambing has been the only town left on Tawi Tawi, and here I found that a considerable number of the people gained a living by gathering rubber, though they would not admit they gathered gutta-percha as well. When asked to show samples of their rubber they would remove a piece of the flooring of the room, draw up a concealed string, and display several large balls of rubber which had been floating in the sea-water below. When asked why they kept the rubber in the sea-water they replied that it made the rubber harder and better, but my guide, who also knew the fine points of rubber collecting, added that it was also because it kept the rubber full of water and hence prevented loss of weight. This rubber seemed of an excellent quality and identical in every way with the best Borneo rubber. The natives said they secured it from large vines that grew in the forests on the other side of the mountains. The sample I bought through my Chinese guide weighed about 115 pounds and cost 50 pesos. As I was offered this amount as a first price by a Chinese buyer on my arrival at Jolo, I concluded it was probably worth to him some 75 or 85 pesos a pico of 133 pounds and he would sell it for 100 to 125 pesos in Singapore. Closer than this I could not approximate for reasons that will be seen later.

As the people of this town were not very friendly, and I had good reason to believe they were intent on deceiving me as to the location of the best rubber district and their method of getting into it, I decided not to try to penetrate into the interior of the island from here, but to go farther eastward. Accordingly I went to Buan, situated in the middle of the island on the south coast. This village contains but a half dozen houses, but the old dato at its head was very friendly, and, besides giving me much information about gutta-percha and rubber, he let me have a boat, and ordered some of his followers to show me some gutta-percha trees and rubber vines, and to cut them down and secure the rubber and gutta-percha for me. We accordingly set out at daylight the next day, the small boat enabling us both to enter the shallow water along the shore and to paddle a long way into the mangrove swamp. From here the land rose abruptly and a forest of magnificent trees began. After a steady climb of several hours the Moros began the hunt for gutta-percha trees, for although most of them had been cut down in this locality, they said, "Still anyone who had enough luck could always find one or two." The first tree we found was 63 feet high and rather slender, but as it was in flower and fruitage, I told the Moros I wanted the

gutta-percha from it. To secure this they produced a small chisel-axe and proceeded to cut down the tree. When felled they at once ran to the top of the tree and with a chisel proceeded quickly to cut a ring in the bark entirely around the trunk. Just here a big altercation arose, for in my haste to see the Moros work I started to climb over the fallen tree instead of going around. They protested vigorously against my climbing over, alleging that the milk would not flow if anyone climbed over the tree. When the ring was made in the bark, as above described, a cocoanut shell was placed underneath the tree and at once the gutta-percha milk began to run down and drop into it. In a like manner they ringed the trunk at a distance of every 2 or 3 feet from one end to the other, under each ring placing a cocoanut shell. While waiting for the flow of milk to cease we secured samples of the flowers, fruit, and foliage of the tree. In shape the leaves resemble Dichopsis gutta (the best gutta-percha species), but the characteristic bronze color of the under part of the leaf was lacking and the fruit was dissimilar both in color and shape. The milk as it ran from the tree was much slower in coagulating than the milk from Dichopsis gutta, and when coagulated the product was more elastic. I saw nothing like this species of tree in Singapore or Java, and it will probably be found to be a new species of the genus Dichopsis. After half an hour the flow of the milk almost ceased, so the Moros scraped the milk that had partially coagulated on the trunk into the shells, poured the milk from a dozen and a half shells into one, inverted another half shell over it to serve as a cover, cemented the edges with mud in order that no milk should spill out during the journey, put shells and ax into the basket, and announced that they were ready to hunt another tree. This we found with a half hour's tramp, and it proved to be over a hundred feet high and of the same species. As I needed more milk for a sample, I ordered this one felled, and exactly the same process was repeated, the Moros alleging, however, that I need not expect much milk, as it was noon, at which time the milk returned to the roots of the trees. To get the most milk they said the tree should be cut at daylight or sunrise. When asked whether the rainy or dry season was the better for cutting down the trees, they answered that you should choose the season in which you were luckiest, for without luck you could not find any trees, and even if you did they would have no milk in them. Inquiries as to the best place for finding gutta-percha trees elicited the reply that the farther you went back into the mountains the more trees there were; in fact, there were gutta-percha trees everywhere in the interior. All efforts to get them to find any other kind of gutta-percha tree failed, as they maintained that although there had been another kind it was never seen nowadays and was of inferior quality. During our tramp in search of rubber vines we came upon the partially decayed trunk of a large tree which had been felled and ringed, and this the Moros claimed was of an inferior kind which gave much milk and was good to mix with the best kind so as to increase the weight and fool the Chinese who bought it.

The rubber vine which we found was twisted around on the ground for a considerable length and then ascended a high tree. The bark was black and very rough, and on being tapped with a bolo gave a quick flow of milk, which ceased almost as soon as it began and coagulated on a minute's standing, or quicker through stirring. In fact, though the leaves were larger than those of Willughbeia firma, and the bark somewhat rougher, the rubber resembled the product of this species very strongly and should compare favorably with the best grade of Borneo rubber. To secure the milk from the vine, my Moros jerked most of the vine down from the tree and tapped it with a bolo in many places, arranging their cocoanut shells so that what milk did not coagulate on the bark would run into them. When the milk had ceased to flow the coagulated strings of rubber were pulled from the bark, thrown into the milk in the shells, and all worked into a solid mass of rubber very elastic and quite tough and hard. Near by the Moros showed me a rubber vine which they had tapped the year before. It was lying along the ground and, though not cut through in any place, was dead. I surmised that death had resulted both from mutilation and inability to climb back to its former position in the sun and light. This method is therefore even worse than that used in Borneo, where the natives cut the vines into short pieces and let the milk drip from them into a pan. In that way all the milk is secured, while in Tawi Tawi the vine is killed and the greater part of the rubber is lost as well. The Moros knew of no other kind of rubber vine.

Returning to Buan, the natives took the gutta-percha milk from the shells and proceeded to heat it in a saucepan over a fire until it coagulated, forming a soft, plastic mass. This they put on a board and kneaded with cold water until cold, when they put it aside to harden.

I continued my journey around the entire island of Tawi Tawi in search of other towns, or even scattered houses, where I could gain more information on the subjects under investigation, but neither on the eastern nor northern coasts could we find a

single Moro habitation. In Tataan, on the northern coast, where there was a thriving Moro village during Spanish times, not one house is now standing. Near the site of this town, however, we found some half dozen Moro boats anchored in a little cove, and the women and children in them told us they were from Balumbing, and that the men had gone into the forest to gather rubber. This confirmed my suspicion that the people of that town intended to deceive me when they said they always went into the mountains by land and walked three days before reaching the rubber region.

(*b*) *Ownership of gutta-percha forests.*—All during my stay in Tawi Tawi, and also in Jolo before I went there, I was told repeatedly that the sultan of Jolo claimed to be not only the owner of the land and its forest products, but had some years previously positively forbidden the taking of either gutta-percha or rubber from the Tawi Tawi district. His friends said it was because the sultan wished to prevent the destruction of the trees, but the Moros of Tawi Tawi affirmed that it was due to his desire to secure all the profits of gutta-percha collecting for himself. The practical result of this restriction seems to be (1) that few Moros engage in gutta-percha collecting compared with those who undoubtedly would have gone into this work had it not been forbidden by the sultan; and (2) the trees are not saved from destruction, for it is the custom of the sultan, when needing money, to go to Tawi Tawi or an adjacent island, and order out all the people of a town to hunt gutta-percha and rubber. As a considerable force of men turn out, and orders are emphatic that they work hard, the result is that a large amount of gutta-percha is brought in. which the sultan sells to an accompanying Chinese merchant, giving a small portion of the proceeds to the Moro collectors, but keeping the lion's share for himself. The dato of Buan told me the last time the sultan was there the Chinaman gave the sultan 500 pesos for what they collected, and the sultan gave 100 pesos to them for the work, keeping 400 pesos for himself.

In connection with the ownership of the gutta-percha and rubber forests, mention should be made of the contract now in force between the sultan of Jolo and the Schuk Brothers of Jolo, by virtue of which the latter claim the exclusive privilege, among other things, of collecting gutta-percha and rubber in any of the islands of the Sulu Archipelago. So far I understand they have only cut wood under this contract, but should the present conditions not continue, the validity of this claim would probably have to be taken into consideration. So far as I could discover, all gutta-percha which the sultan or the Moros collected is purchased by the Chinese in Bongao, Siassi, and Jolo, and is shipped by them to Sandakan and Singapore. As they always work together in their trade dealings and barter cloth and other articles with the Moros, there is no such thing as a market price for gutta-percha or rubber in any of the towns of the Sulu Archipelago.

SECOND, SOUTHERN MINDANAO.

(*a*) *Geographical distribution of rubber vines.*—Contrary to expectation, I was unable to gather any definite knowledge in regard to rubber vines in Mindanao. Neither the Moros nor the Chinamen in the various towns had any rubber for sale, nor had they ever handled it. In one place in Cottabato only, a Chinaman told me that he had heard it was found in central Mindanao, and this confirms the statement made by Major-Surgeon Porter, of Malabang, who, while traveling in the interior, observed that the drumsticks of one forest tribe of Moros were tipped with rubber. Beyond these two statements I found nothing further to report on this subject.

(*b*) *Geographical distribution of gutta-percha trees.*—Treating all southern Mindanao as a whole, the central point of the gutta-percha trade is Cottabato. This being the regular port of call for several Sandakan and Singapore ships, as well as the geographical center of the south coast and Rio Grande Valley region, all the gutta-percha is collected here, and sorted and packed for exportation.

The towns and villages along the coast, west and east, from whence the gutta-percha is shipped to Cottabato, can be easily enumerated and are, mostly, accurately given by the maps; but to name and even approximately locate the forest lands of the interior (gutta-percha never being found directly on the coast) from which these various towns secure their gutta-percha, is difficult, as all of the maps are inaccurate, and most of them positively misleading. I append a table showing the principal towns which supply Cottabato with gutta-percha, and the names of the forest regions from which it is taken.

List of names of towns and forest regions from which gutta-percha is sent to Cottabato.

Central point for collection and exportation.	Point of collection.	Name of forest regions.
Cottabat	Turkuran and Dine	Dinas-Subano. Camalarang. Labangas.
	Malabang	Tukuran Laguna de Lanao. Baras.
	Glan, Serangani, and Binang	Liangan. Segayan. Tagabuli. Manobo.
	Reina Regente and Salaya	Bilan. Binang. Dama Balao. Matingauanan. Talayan.

I was greatly surprised to find the extent of country covered by these trees. In fact, the natives say, and no one has yet shown to the contrary, that all of the mountain region of southern Mindanao contains gutta-percha. Much, of course, has never been explored by Americans, and much also is never visited by gutta-percha collecting natives. Still, these trees have been found stretching out in all directions through the forest belts of the interior as far as anyone has gone, and only time and much exploration can determine their true extent and number. The very fact that gutta-percha is being collected from almost as far as Zamboanga on the west to Davao on the east gives proof of the extent and amount of these trees; and in none of the towns which I visited on the south coast did I find Chinese or Moros who were not engaged in the gutta-percha business.

(c) *Methods of collection of gutta-percha.*—A study of the Cottabato market showed that there are at least three kinds of gutta-percha coming in there; that arriving from the various coast towns coming in small quantities in native boats, while that arriving from the great region drained by the Rio Grande comes in large shipments and is all controlled by Dato Piang. In fact he has a Chinese agent in Cottabato who handles most of what he sends in. It seems that this gutta-percha monopoly, so to speak, needed investigating most of all, especially as the Chinese merchants assured me that Piang never allowed any trees to be cut down nowadays, but secured the gutta-percha by tapping according to forestry regulations. Accordingly, through the kindness of the military authorities and friends of the dato, I produced the amount of pressure necessary to secure me a cordial invitation from the dato to visit the forests south of his rancheria in order to see live gutta-percha trees for myself. Consequently I left Cottabato on January 21, going up the Rio Grande to Piang's rancheria at Kudarangan. Here Dato Piang met me and fitted me out with a boat and a large crew of Moros, sending another boat ahead to warn the people I was coming and to have some gutta-percha gatherers ready to take me into the forest when I had gone as far as possible by boat. Just as I was leaving Piang I asked him if we had an ax with us in case we wanted to cut down a gutta-percha tree to secure a sample, but he called back without a moment's hesitation that no ax was necessary, as the natives knew how to tap the tree with a small bolo. The journey upstream took two days, even with three polers and six paddlers working hard. Our general direction was southeast and then southwest. After we had arrived at the headwaters of the west branch of the Rio Grande we struck inland for half a day, where we were met by six natives of the Tiruray tribe, which inhabits the forests and mountains of the coast range southeast of Cottabato. They had come to meet me by order of Piang, and with them and my boat's crew we pushed into the forest for a day and a half before finding a gutta-percha tree. The first tree when found proved to be of the best variety, according to the Tiruray, and of good size. Telling them that I wanted a sample of the gutta-percha from the tree, they produced a chisel ax almost identical with the one I had seen used in Tawi-tawi, and proceeded to "tap" the tree in one place so effectively that in about an hour it toppled and fell. We found its length to be 135 feet, its circumference at base 5 feet 4 inches. The Tiruray then produced bolos and proceeded to cut rings in the bark—not so that the bark was cut off, but rather so that it was cut into small pieces. The gutta-percha milk at once flowed out, and the chipped-up bark absorbed it sponge fashion. In this way but little escaped and ran down to the ground. Owing, however, to the size of the tree and the force with which it fell, the under third of the bark was imbedded in the ground, and hence could not be tapped

at all. After waiting for about an hour the milk ceased to flow, and had so far coagulated that the chipped-up bark and adhering gutta-percha could be pulled off and worked molasses-candy fashion, so that all except the finest particles of bark fell out, leaving an elastic, tough mass of gutta-percha, which was molded into sausage-shaped pieces and left to harden. When asked whether the early morning or midday was best for tapping the trees they said midday, which was exactly the opposite of the observations made at Tawi Tawi by the Moros. The leaves of the tree were of a copper color below and green above, and while the general shape and appearance of the leaf showed it to be of the genus Dichopsis, still the intense color of the underside, as well as the too pronounced veining indicated that it was neither Dichopsis gutta, borneense, nor Oblongifolium, nor could I identify it with any of the Singapore, Sumatra, or Java species. The tree was growing on the mountain side, some 50 feet above the waters of a small mountain stream. The soil was rocky and the roots buttressed heavily and high above the ground.

I tried to get the natives to find some of the seedlings of this tree, but on account of a superstition or some unknown motive they at first refused to look, and when I insisted they obeyed mechanically, but brought back nothing. I finally had to make them all turn out again, and by offering a reward for each seedling we succeeded in finding fourteen during an hour's hunt. These I pulled up, and by careful packing brought them back to Cotabato and kept them in good condition for a week, when I had them planted in a private garden where they could be cared for and watched. During our hunt for these seedlings we found a seedling of another gutta-percha species, the leaves of which were large, veins pronounced, and copper color on under-part of leaf of greenish tinge. I asked the Tiruray whether they found trees of this species, and they said it was very rare, but sometimes found over on the second range of mountains from us toward the coast. They had not seen a tree for a long time until just before they had started to come to meet me, and this they had cut down and the gutta-percha they had secured was now in their house down in the valley. This gutta-percha I eventually secured on my return trip, finding it, however, to be of inferior quality. A third species of tree they said was often met with, so I ordered them to find one. By scattering in all directions they succeeded in doing this the next day, and we went to it, cut it down, and secured the milk as before. In this case, however, the milk coagulated slowly and was very sticky. The Tiruray were, however, equal to the emergency, and, after making a fire, proceeded to fashion a saucepan out of a piece of green bark. By warming the mass of sticky gutta-percha milk and adhering bark in it until thoroughly steamed the milk coagulated and the stickiness ceased, upon which the chipped-up bark was shaken out and the resulting gutta-percha packed away in a piece of fresh bark to harden. This kind of gutta-percha the Tiruray consider of third quality, and I infer that they use it to adulterate the better kinds. The leaves and general appearance of the tree were similar to the Tawi Tawi species, though the behavior of the gutta-percha was different.

On my return to Cotabato the commanding officer informed me that the day before I arrived he had received a pious letter from Dato Piang, filled with righteous indignation because he had found some Tiruray to the south of his rancheria—i. e., where I then was cutting down gutta-percha trees contrary to his orders; that he had confiscated the gutta-percha and was holding it subject to the command of the major. This of course was an effort to forestall the bad effects which he feared might result from my journey into the gutta-percha forests, as he well knew that my experience there would effectually disprove his long-standing assertion that none of his gutta-percha came from trees cut down.

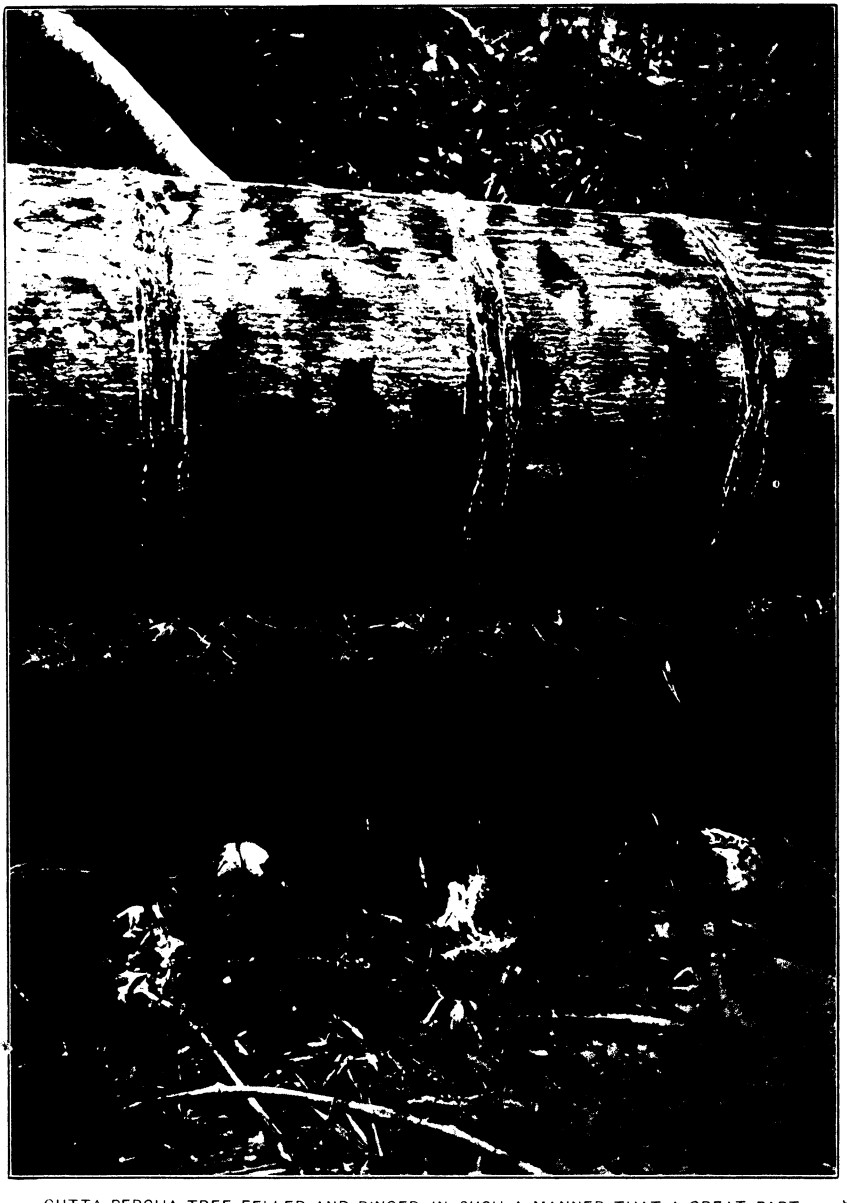
From Cotabato I went to Tukuran, and from this place made two trips in search of gutta-percha trees. The first was to the west along the coast, from which I expected to ascend a river and then strike into the mountains, but as the water in the river was too low for the boat and the mangrove swamps on both sides prevented walking, we gave up the attempt and returned to Tukuran to enter the forest from the trocha, which extends from there to Misamis on the northern coast. As an active military campaign was then on against some hundreds of renegade Filipinos and Moros, who were trying to cross the trocha through the best gutta-percha region (Subano), we had to limit our investigations to the vicinity of the trocha, but were lucky in discovering a very large gutta-percha tree some 5 miles inland. On my asking my Tiruray and Moro followers to get the gutta-percha for me, they cut the tree down and ringed it in a manner similar to that used by the Tiruray on the Rio Grande. The milk being much more abundant, however, and coagulating more slowly, much was lost by running to the ground. The part remaining absorbed by the chipped-up bark was scraped into balls, wrapped up in big leaves and carried back with us for cleaning. This tree measured 159 feet 5 inches in height and 8 feet

SCENE ALONG THE OLD SPANISH TROCHA NORTH OF TUKARAN, MINDANAO, WHERE GUTTA-PERCHA TREES STILL GROW. A GUTTA-PERCHA TREE FELLED AND RINGED BY THE MOROS OF BUAN, TAWI-TAWI. THE MILK RUNS INTO THE COCOANUT SHELLS ON THE GROUND.

GUTTA-PERCHA TREE FELLED AND RINGED IN SUCH A WAY THAT THE MILK WAS ALL ABSORBED BY THE CHOPPED-UP BARK AND NONE ESCAPED TO THE GROUND. THE TWO BOLOS WERE USED FOR MAKING THE RINGS.

LOGS HAULED BY "DONKEY" ENGINE AND CABLE, SHOWING METHOD OF "HOOKING ON," CRESCENT CITY, CAL.

FOUR CARABAOS SKIDDING LOG 30 FEET LONG AND 12 INCHES SQUARE.



GUTTA-PERCHA TREE FELLED AND RINGED IN SUCH A MANNER THAT A GREAT PART OF THE MILK WAS NOT ABSORBED BY THE CHOPPED-UP BARK. IT RAN DOWN TO THE GROUND AND WAS LOST.

3 inches in circumference at the base. It was some 88 feet to the first limb. The leaves were similar in appearance to the second tree which I found in the Cotabato region and the behavior of the gutta-percha seemed the same. On our return to Tukuran the natives built fires and warmed up the gutta-percha with water until completely coagulated and very soft, upon which they kneaded it with feet and hands until most of the bark was knocked out. It was then cooled and hardened in sea water. This process they claimed was that used by the natives of the Subano district lying northwest of Tukuran and from which the cleanest gutta-percha comes. After being dried the weight of the gutta-percha from this tree was 9½ pounds. Had the trunk fallen so that it could have been ringed entirely around, and had precautions been taken to catch all of the milk which was lost on the ground, we should certainly have secured 20 pounds. How much still remained in bark and leaves can only be guessed, but on the basis of the calculations given by V. Romburgh and others it probably totals 150 or 200 pounds.

At Tukuran I secured a fine sample of the best Subano gutta-percha, which the Filipino dealer said was worth $80 Mexican per picul in Cotabato. At Malabang and Parang, Barang, which I visited, there was no gutta-percha gathered within many miles. All that came in there for shipment to Cotabato was from the great Lake Lanao region, into which no American can go at present. The gutta-percha seen here was identical in every way with that already secured, and I did not deem it worthy of special study. The same will also apply to that coming into the little villages along the coast between Cottabato and Sarangani Bay, convincing me that at the present time the principal part, if not all, of the gutta-percha now being gathered comes from two or three varieties of trees, specimens of which I had seen and secured.

(*d*) *Market prices and values.*—From personal observations and information it appears certain that the real gutta-percha gatherers all belong to the mountain or pagan tribes of southern Mindanao, and they exchange the gutta-percha for cloth and weapons with the lake and river (Mohammedan) Moros, or visiting Chinese traders, who in turn sell it to the Chinese firms in Cotabato for exportation to Singapore. The system is well organized in spite of the fact that the gutta-percha business has only developed since the American occupation, probably because the instigators and promoters, buyers, and monopolizers of the whole thing are the Chinese. They get advices from Singapore as to prices, and then determine the price they will pay the middlemen—Moros—and that in turn, of course, fixes the price the gutta-percha gatherers themselves finally receive.

To find out the prices paid for the gutta-percha as it changes hands was very difficult. I know the Chinese in the various towns deceived me as to the prices they paid; and as most of the mountain tribes were paid in cloth and weapons, it was equally hard to fix their profits. During my journey up the Rio Grande region we came to the house of a dato, who acted as buying agent for Dato Piang in that part of the country. In his house I found quite an amount of gutta-percha which he said he had bought from the Tiruary for 3 pesos per basket. On this basis I figured the price of the picul to be ten or fifteen pesos. I offered him 8 pesos for two basketfuls, and he gave them to me for that price upon my promising not to tell Piang. Corroborative evidence that the Tiruray and Manobos receive about this price, both from Piang and the Chinese traders who visit the coast towns between Cotabato and Sarangani Bay, is offered by Lieutenant Van Horn, who during his trip through that part of the country had occasion to observe the amount of cloth paid for a picul of gutta-percha and figured it to be ten to twelve pesos in value.

It must also be explained that in using this word "picul" it stands for 133 pounds when gutta-percha is shipped to Singapore, or when weighed to sell to an American or foreigner, but 162½ pounds when the Chinese buy from the Moros. This practice may not be universal among the Chinese of all the towns, but it is certainly true for Cottabato, and the adjacent towns, which represent 80 per cent of the gutta-percha trade. Thus the Chinese gain 29 pounds by weight during the process of buying and selling. A native (Filipino) buyer in Tukuran told me he made his picul weigh only 150 pounds. I can see no possible excuse for this process of cheating ignorant natives. Of a market price for gutta-percha in Cottabato or in surrounding towns there is practically none. As everything is entirely in the hands of the Chinese they fix nominal prices for different grades of gutta-percha, in order that there shall be no excuse for the forestry bureau officials to collect a high export tax (forestry tax), but as soon as anyone tries to compete with them in buying from the natives up goes the price at once, and the outsider is still on the outside.

A forestry tax, therefore, that is made on the market price of gutta-percha in Cottabato, or in any southern port, has but a precarious foundation. The forestry tax collected in Cottabato was 7 pesos per picul for first class, 4 pesos for second, and 3

pesos for third class. The classification is, however, entirely in the hands of the Chinese themselves, as none of our forest officials in the southern ports know anything about gutta-percha, and in fact it is not made according to the intrinsic value of the gutta-percha itself, but rather on account of the amount of dirt and bark it contains, which, of course, is an entirely wrong basis of calculation. Such large amounts of gutta-percha were being shipped as second and third class, when they certainly should have been first and second class, that after a consultation between the forestry official of Cottabato, the collector of customs, and myself, we decided on February 1 to tax first-class gutta-percha 7 pesos per picul and second-class 5 pesos, doing away with third-class entirely. While this arrangement is still open to objections, it will save the government thousands of dollars, which it is now losing, until a new scheme can be devised. To be effective it must be general for all Philippine ports, as already the Chinese of Mindanao have hit on the scheme of shipping gutta-percha to Jolo, looking for a forestry official who will fix a lower price, and hence collect a lower export tax.

CONCLUSION.

From all testimony which I could gather—Chinese, Moro, and among the resident Spanish—it appears that gutta-percha was discovered at least ten or fifteen years ago in various places. The Chinese were the ones who sent it to Singapore, and probably a big export business would have resulted had not two things happened to ruin the enterprise. One was that several of the largest Chinese dealers lost heavily in gutta-percha for one reason or another, and thus scared all the rest. This and the vexatious forestry regulations made by the Spanish at that time completely killed the gutta-percha trade, and it did not revive until the American occupation of the southern islands. It is due to this cessation in the gutta-percha business that we have trees left at present. How many are still standing can not be estimated, though the information I received leads me to the conclusion that there are a large number.

The true gutta-percha gatherers of the Tawi Tawi district belong mostly to the tribe called Samales, while those of Mindanao embrace all of the forest tribes from Zamboanga to Davao. Their only method of collecting the gutta-percha is by felling the tree. I do not see how they can be instructed in any other method, or that they are amenable to forestry regulations. Their whole method of living and low grade of civilization are against almost any kind of instruction.

The chief gainers by the whole gutta-percha business are the Chinese merchants of Siassi, Jolo, and the ports of southern Mindanao, especially Cottabato. They are practically hiring whole tribes of natives to cut trees for them and bring in the product accruing from the destruction of the same, yet they do not take out forestry licenses, but rather violate the present forestry laws with impunity. They are undoubtedly dealing unfairly with the natives in the matter of weights, and unfairly with the government in the classification of the gutta-percha, and consequently in the payment of the forestry tax. Should the present forestry arrangements be continued, however, a white forestry official, who has a knowledge of gutta-percha and rubber, would do much to counteract the present evils existing at Cottabato and Jolo.

The intrinsic value of the gutta-percha now growing in the southern islands can only be settled by careful chemical analysis and the proper physical and electrical tests. The samples collected represent both the pure products from the different species of gutta-percha trees and the different commercial products now being shipped to Singapore in large quantities. The necessary analyses and tests can be made in Manila or in Singapore.[a] Should the tests show that the gutta-percha is of the standard required for submarine cables, and hence of international importance, and worthy of being controlled by the government, then apparently three courses are open:

(*a*) To continue the present plan of allowing the forest tribes to gather the gutta-percha by felling the trees, but prohibit the sale of the product to anyone but the government, a fair price being paid for the same and directly to the gutta-percha gatherers themselves. In this way a large amount of gutta-percha might soon be collected, but the forests would, of course, be ruined for half a century or longer.

(*b*) To prohibit the cutting of trees or the sale or exportation of gutta-percha by individuals. Forestry officials can easily instruct native workmen in the methods of tapping the trees, and they can go into the forests in gangs and could undoubtedly secure a large amount of gutta-percha all the year round without

[a] Mr. E. E. Steele, the Singapore representative of the Silvertown Essex Cable Company, of England, is well qualified to act as analyst.

harming the trees. There being so much coast line and deep-river waterways in southern Mindanao that supplies could easily be sent in and the gutta-percha taken out. This plan could be carried out in connection with a botanical garden substation in southern Mindanao, in which the various species of gutta-percha trees can be grown and instructions given to native forestry officials and workmen in the best methods of securing gutta-percha.

(c) To prohibit the cutting of gutta-percha trees without taking an active part in the extraction of the gutta-percha. The government could prohibit, under penalty of confiscation and fine, its sale or exportation. The isolated position of the Philippines would render it comparatively easy to prevent the smuggling of gutta-percha to Borneo or Singapore, and without a market the gathering of the same would soon cease.

The number of species of gutta-percha trees, as well as the great extent of country containing them, shows conclusively the ideal conditions which Tawi Tawi and Mindanao present for the growth of these valuable and fast disappearing trees. Many of the places I visited certainly equalled or rivalled the sites chosen by the Dutch and English for large plantations of gutta-percha trees in Java and Singapore. The soil, climate, and natural conditions generally seem all that could be desired. A forest reserve into which several hundred thousand seedlings of the best Borneo species were transplanted, in case our own species proved unsuitable, would in a few years make the United States sure of all the gutta-percha necessary for her submarine cables and independent of all threatened Dutch monopoly in the future.

An effort to collect the statistics of the gutta-percha and rubber trade in the Philippines since the American occupation has met with only slight success. The number of licenses granted by the forestry bureau, allowing these products to be collected, as well as the amount of forestry charges collected on the same, is to be found in the special report of Capt. George P. Ahern, chief of the forestry bureau. An inspection of the custom-house reports shows that up to the time of the establishment of the forestry offices in the southern Philippines, nothing under the name of gutta-percha or rubber was exported, but nearly 350,000 pounds of "copal" and "other gums." How much was gutta-percha or rubber it is hard to say. Since July, 1901, when forestry officials took charge in the southern islands, up to February, 1902, there have been issued but six licenses for collecting gutta-percha and rubber, showing that only a few white persons are engaging in the business, the bulk being done by the Moros, who need no license.

The amount of gutta-percha and rubberwhich has been exported to Borneo and Singapore during this time from all southern Philippine ports amounts to 297,000 pounds, upon which the forestry bureau has collected charges of 3 cents Mexican per pound. This, of course, relates only to that carried on large vessels which regularly clear at the various custom-houses. How much was shipped to Borneo in small boats can not be estimated.

Respectfully submitted.

PENOYER L. SHERMAN,
Inspector Forestry Bureau.

For the results of chemical examination of the samples of gutta-percha collected by Dr. Sherman, see the annual report of the Superintendent of Government Laboratories for the year ending August 31, 1902.

Administrative finances.—Revenues and expenses of Philippine forestry bureau for five years.

[Money is expressed in Mexican currency.]

	1901-2.	Spanish administration in Philippines.			
		1896-97.	1895-96.	1894-95.	1893-94.
Salaries	$111,965.31	$136,110.00	$123,385.00	$123,385.00	$118,135.00
Transportation	17,454.84				
Material, etc	25,849.63	16,380.00	15,380.00	15,380.00	15,380.00
Total expenses	155,269.78	152,490.00	138,765.00	138,765.00	133,515.00
Revenues, forest products	348,073.08	170,000.00	150,000.00	122,000.00	122,000.00
Sales public lands		45,000.00	55,000.00	45,000.00	48,000.00
Expense per cent of revenues, forest products	44.6	89.7	92.5	Deficit.	Deficit.

Comparative table of revenues and expenses.

	Philippines, 1901–2.	British Burma, average five years, 1895–1900. [a]	Java, 1900. [a]	Cape Colony, 1899. [a]	Madras. [a]	Cochin China. [a]
Revenue	$348,073.08	$5,412,486.73	$1,849,200.00	$207,452.00	.....	.....
Expenses	155,269.78	1,690,377.24	979,800.00	560,576.70	.....	.....
Surplus	192,803.30	3,722,109.51	869,400.00	Deficit.	.....	.....
Per cent expense of revenue	44.6	31.2	53.5	.....	77	57
Cost per square mile government forests	$2.07	$18.90	.....	.....	.....	.....

[a] Indian Forester, May, 1902.

Area public forests:

	Square miles.
Philippines	75,176
British Burma	89,417

Production of timber, by groups, in cubic feet for the twelve months ending June 30, 1902.

Groups.	July.	August.	September.	October.	November.	December.
	Cubic feet.	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*
Superior group	54,553	76,727	34,237	44,180	46,025	37,264
First group	15,192	12,847	9,464	8,321	15,147	8,008
Second group	48,890	68,928	47,191	52,591	69,245	63,775
Third group	191,812	158,888	148,172	217,328	227,353	181,083
Fourth group	40,177	35,276	24,456	42,234	39,440	28,842
Fifth group	12,288	19,557	14,523	22,903	29,909	6,078
Total	362,912	372,223	278,043	387,557	427,119	325,050

Groups.	January.	February.	March.	April.	May.	June.	Total.
	Cubic ft.	*Cubic ft.*	*Cubic ft.*	*Cubic ft.*	*Cubic ft.*	*Cubic ft.*	*Cubic feet.*
Superior group	61,615	51,868	42,078	71,693	83,050	70,477	673,767
First group	7,258	19,161	8,685	14,399	16,990	12,095	147,567
Second group	56,586	46,021	61,569	61,936	40,444	48,724	665,900
Third group	125,987	79,680	177,458	145,554	80,797	164,193	1,898,305
Fourth group	16,064	8,531	26,912	10,950	12,636	19,495	305,013
Fifth group	14,312	926	8,839	12,656	13,935	20,102	176,028
Total	281,822	206 187	325,541	317,188	247,852	335,086	3,866,580
Gratuitous (granted)	.....	.....	.....	.....	.....	.....	894,405
Private lands	.....	.....	.....	.....	.....	.....	196,987
Grand total	.....	.....	.....	.....	.....	.....	4,957,972

Quantities of forest products taken from the public lands of the Philippines during the fiscal year ending June 30, 1902.

Product.	Quantity.	English equivalent.
Timber (maderas)	4,760,985 cubic feet	3,637,392 cubic feet.
Firewood (leñas)	107,900 cubic meters	3,808,870 cubic feet.
Charcoal (carbon)	7,024 cubic meters	247,947 cubic feet.
Rattan (bejuco)	150 piculs	20,685 pounds.
Dyewoods (sibucao and tintorea)	16,363 piculs	2,256,458 pounds.
Tan bark (cascalote)	2,264 piculs	312,154 pounds.
Gum mastic (almaciga)	7,848 piculs	1,082,235 pounds.
Rubber (goma elastica)	2,050.7 piculs	282,996 pounds.
Gutta-percha (guta-percha)	2,705.3 piculs	373,331 pounds.
Vegetable oils (balao)	35,181 liters	9,181 gallons.
Pitch (breas)	826 piculs	113,905 pounds.
Cinnamon (canela)	150 piculs	20,685 pounds.

Revenue on forest products taken from the public lands of the Philippines in pesos for the fourteen months ending August 30, 1902.

Months.	Revenue.
1901.	
July	$29,308.21
August	32,004.38
September	22,808.18
October	17,769.59
November	37,524.33
December	30,592.94
1902.	
January	28,093.29
February	27,727.31
March	22,482.75
April	34,860.26
May	32,500.76
June	32,401.08
Total for fiscal year	348,073.08
July	40,644.26
August (approximate)	24,085.89
Total for fourteen months	412,803.23

Quantity of timber taken from public lands of the Philippines during the fiscal year July 1, 1901, to June 30, 1902.

DISTRIBUTION.

Provinces.	Total for year.	Provinces.	Total for year.
	Cubic feet.		*Cubic feet.*
Abra	3,113	Marinduque	5,247
Albay	48,855	Masbate	151,773
Antique	16,736	Misamis	32,898
Bataan	382,178	Negros Occidental	207,996
Batangas	3,933	Negros Oriental	30,769
Benguet		Nueva Ecija	95,422
Bohol	4,021	Nueva Vizcaya	
Bulacan	280,907	Pampanga	229,986
Cagayan	208,153	Pangasinan	116,916
Camarines (Amos)	146,880	Paragua	10,511
Capiz	65,393	Rizal	35,584
Cavite	3,591	Romblon	41,993
Cebu	35,144	Samar	
Cottabato	26,065	Sorsogon	65,424
Davao	20,729	Surigao	23,855
Ilocos Norte	72,923	Tarlac	260,035
Ilocos Sur	53,994	Tayabas	435,379
Iloilo	105,717	Union	67,675
Isabela	12,123	Zambales	286,352
Jolo	1,671	Zamboanga	82,873
Laguna	18,585		
Leyte	195,179	Total	3,866,580

Month.	Cut with license.	Cut without license.	Total.
1901.	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*
July	284,830	78,082	362,912
August	269,595	102,628	372,223
September	232,853	45,190	278,043
October	334,428	53,129	387,557
November	364,404	62,715	427,119
December	256,963	68,087	325,050
1902.			
January	249,092	32,790	281,822
February	177,672	28,515	206,187
March	274,763	50,778	325,541
April	264,258	52,930	317,188
May			247,852
June			335,086
Total for year			3,866,580

Groups and varieties, arranged in order of quantities, cut during the fiscal year ending June 30, 1902, from public lands only.

Group.	Number of varieties.	Cubic feet.	Value (Mexican).
III. Third	571	1,855,617	$55,668.51
II. Second	48	708,588	56,687.04
S. Superior	12	673,767	94,327.38
IV. Fourth	85	305,013	6,100.26
V. Fifth	12	176,028	1,760.28
I. First	18	147,567	14,756.70
Total	746	3,866,580	229,300.17

Average value per cubic foot, 6 cents (Mexican).

Group.	Varieties.	Cubic feet.
III	Lauan	656,054
III	Apitong	309,823
S	Molave	228,863
II	Guijo	209,298
S	Narra	124,513
S	Yacal	105,937
	6 varieties	1,634,488
S	Dungon	76,154
V	Bonga	76,038
V	Bacao	62,183
III	Sacat	61,451
S	Ipil	55,279
	5 varieties	331,605
IV	Balacat	45,919
IV	Malasantol	45,214
II	Catmon	42,688
S	Calantas	41,614
III	Malaanonang	41,197
II	Mangachapuy	36,568
III	Palosapis	37,879
IV	Malabonga	37,720
S	Tindalo	37,200
I	Betis	36,441
II	Nato	36,417
III	Balinhasay	36,213
I	Acle	35,632
II	Macaasin	33,874
IV	Malabalac	31,742
III	Dalinsi	30,660
	16 varieties	608,978

Group.	Varieties.	Cubic feet.
IV	Anam	29,587
I	Batitinan	27,649
II	Palo-maria	26,698
III	Cupang	25,379
III	Pagatpat	24,098
III	Malacmalac	24,083
IV	Ma apapaya	23,545
II	Aranga	23,032
II	Amuguis	22,832
III	Bulao	22,082
III	Apuit	21,919
III	Mayapis	21,216
II	Banaba	19,624
III	Calumpit	18,992
II	Mangasinoro	18,071
I	Bansalaguin	18,052
III	Batete	17,890
III	Panao	16,497
III	Pagsainguin	16,026
II	Banuyo	15,046
III	Bayoc	14,469
V	Anahao	13,122
II	Dungon-late	15,532
III	Manicnic	12,301
	24 varieties	484,692
	16 varieties	608,978
	5 varieties	331,605
	45 varieties	1,425,275
	6 varieties	1,634,488
	51 varieties	3,059,763
	696 varieties	806,817
	747 varieties	3,866,580

The third group supplied 48 per cent of the total.
Six varieties contributed 42.3 per cent and 51 varieties 79.1 per cent of the total.
Lauan, of the third group, furnished 17 per cent.

Native woods brought to market in the Philippine Islands from July 1, 1901, to June 30, 1902.

SUPERIOR GROUP.	*Amount cut. (Cu. ft.)*
Calantas	41,614
Camagon	----------
Dungon	76,154
Ebano	----------
Ipil	55,279
Mancono	----------
Molave	228,863
Narra	124,513
Teca	----------
Tindalo	37,200
Yacal	105,937
Urung	----------
Total superior	673,767

FIRST GROUP.	*Amount cut. (Cu. ft.)*
Acle	35,632
Alahan	----------
Alintatao	----------
Anubing	----------
Bansalaguin	18,052
Baticulin(g)	----------
Batitinan	27,649
Bayuco	----------
Betis	36,441
Calamansanay	----------
Camayuan	----------
Camphor	----------
Camuning	----------
Cubi	----------
Jara	----------

FIRST GROUP—ctd.	*Amount cut. (Cu. ft.)*
Laneta	----------
Malatapay	----------
Tamuayon	----------
Total first	147,567
SECOND GROUP.	
Agoho	----------
Alalanget	----------
Alpay	----------
Alupac-amo	----------
Amuguis 1st	22,832
Aranga	23,030
Banaba	19,632

Native woods brought to market in the Philippine Islands from July 1, 1901, to June 30, 1902—Continued.

SECOND GROUP—ctd.	*Amount cut. (Cu. ft.)*
Banitan	
Batino	
Bayaco	
Banuyo	15,046
Bilolo	
Bolong-eta	
Calimantao	
Calingag	
Caña fistula	
Catmon	42,688
Dolitan	
Dungon-late	12,532
Guijo	209,298
Guisihan	
Lanutan	
Macaasin	33,874
Madre cacao	
Malacadios	
Malacapon	
Malacatmon	
Malaruhat	
Mangachapuy	38,568
Mangasinoro	18,071
Mangasirique	
Marang	
Mulauinaso	
Nangca	
Nato	36,417
Oayan	
Paitan	
Palayen	
Palo Maria	26,698
Pasac	
Pusopuso	
Romero	
Sirique	
Supa	
Tanguile	
Tansuyod	
Toob or Tua	
Tucan-calao	
Total second	708,588
THIRD GROUP.	
Abagon	
Abalorio	
Abar	
Abilo	
Abobo	
Aclen(g)parang	
Adaan	
Adumuy	
Afu	
Ahmon	
Alacac	
Alacon	
Alagao	
Alalangat	
Alamon	
Alasa	
Alem	
Alibamibang	
Aligamin	
Alioan	
Almolan	
Alpay	
Aludia	
Alupacamo	
Amatog	
Ambiong	
Amian	
Ammapla	
Amoan	
Anagap Casay	
Anago	
Anahanon (Apitong)	309,823
Analig	
Anam	
Anarep	
Anatan	

THIRD GROUP—ctd.	*Amount cut. (Cu. ft.)*
Adulamon (Andulanan)	
Anigado	
Aninapla	
Aningat	
Anis	
Anitap	
Anobiang (Bayoc) (Annobrang)	
Anobling	
Anonang	
Antcug	
Anteng	
Antipolo	
Apalang	
Apostula	
Apuit	21,919
Arandon	
Arangien	
Aritontong	
Ayo	
Baacan	
Babayan	
Bacayo	
Baclang	
Bacoog	
Baga	
Bagalitotas	
Bagarilao	
Bagobinlod	
Bagocu	
Bagotambis	
Bagotoob	
Baguilio	
Baguilumboy	
Bahay	
Balacbacan	
Balacbalac	
Balaitlog	
Balanga	
Balao	
Baligan	
Balnesoc	
Balingagta	
Balinhasay	36,213
Balintarhan	
Balit	
Balitagtag	
Balopo	
Baloy	
Balungcanit	
Balutay	
Banacao	
Banaypanay	
Bancal	
Bancahoylan	
Bancalan	
Bancalari	
Bancanilan	
Bancolanog	
Banga	
Bangles	
Banguid	
Banilic	
Banitan	
Banite	
Bansilang	
Barangao	
Baransiagao	
Baratayan	
Bariuan	
Barosingsin	
Barosmising	
Baroy	
Barung	
Basa	
Basangal	
Basilayan	
Basug	
Batete	17,830
Batobalarao	
Batobato	

THIRD GROUP—ctd.	*Amount cut. (Cu. ft.)*
Batocanag	
Bating	
Batunganag	
Bayit	
Bayoc (Anobiang)	14,409
Bayoguidoc	
Bayucan	
Bia	
Bilolo	
Biluan	
Binalia (Binalinan)	
Binalucan	
Binalungay	
Bingas (Binglas)	
Binong (Bitnong)	
Binuang	
Binulo	
Bolilising	
Boloan	
Bolobolo	
Bolongcadios	
Bonoang	
Borros	
Bulala	
Bulao	22,082
Bulo	
Bulog	
Bungal	
Busaeng	
Busili	
Butigan	
Buyo	
Cabagtin	
Cabal	
Cacaate	
Cadiz	
Cahabating	
Calambalin	
Calantil	
Calaolot	
Calapini	
Calasay	
Calibayoan	
Calinan	
Calinas	
Callag	
Calliot	
Calocatmon	
Calomagon	
Calubcub	
Calumgatingan	
Calumpit	18,992
Calungalingan	
Camanchiles	
Camangiman	
Camantayo	
Camantivis	
Camarag	
Candol	
Caniguet net	
Cans lod	
Cansuyot	
Cantingen	
Canulgtingan	
Capasanglay	
Caputihan	
Cararen	
Caratacal	
Caratacat	
Carimbucal	
Carisguis	
Carontingan	
Caropcoc	
Casabang	
Casay, Anagap	
Casiray	
Cayetana	
Cuasicuasi	
Cubatigan	
Culatingen	
Culibabac	
Culicat	

Native woods brought to market in the Philippine Islands from July 1, 1901, to June 30, 1902—Continued.

THIRD GROUP—ctd.	*Amount cut. (Cu. ft.)*
Cumalisquis	
Cunacon	
Cunalong	
Cupang	25,379
Cutipie	
Cuyaguia	
Cuyaogao	
Daeng	
Daguil	
Daha	
Dalinsi	30,660
Dalindigan	
Dalipaen	
Dalunit	
Dampul	
Danaan	
Dancalan	
Dangula	
Danlig	
Danyay	
Dao	
Daracan	
Dasadasa	
Datino	
Diladila	
Dina	
Dinglas	
Dinuguan	
Diraan	
Ditaa	
Duclap	
Duguan	
Duldolbuquid	
Dulilulbugin	
Duran	
Duyong	
Galagala	
Galis	
Gasatan	
Gatasgatas	
Ginlagasi	
Guisoc	
Gueddeng	
Guilac	
Guinay-guinay	
Guinlayasi	
Guitot	
Guyongguyong	
Hagachac	
Hagadhad	
Hanagdong	
Hilagasi	
Himbabaod	
Hindan	
Hinlalon	
Indang	
Janagdong	
Jindan	
Junop	
Labang	
Lacolaco	
Lagasa	
Lagnig	
Lagting	
Laguimisin	
Lalasig	
Lambulauan	
Lamian	
Lamim	
Lanasahan	
Lanbang	
Langosi	
Lanipga	
Lapolapo	
Lasatan	
Lasila	
Lasilasan	
Lauan	656,054
Lauan-pula	
Laylayan	
Leggay	
Lemnan	

THIRD GROUP—ctd.	*Amount cut. (Cu. ft.)*
Lettacu	
Libato	
Libato puti	
Ligamen	
Limbayao	
Linal	
Linal	
Lingolingo	
Linog	
Liosin	
Liptog	
Litis	
Lomboy	
Lucban Gubat	
Lugnac	
Lumacao	
Lumagabos	
Lumbayao	
Mabolo	
Macugalum	
Magabinyo	
Magalayo	
Magarambulo	
Magarapale	
Magarilao	
Magarilas	
Magatalay	
Magacalanag	
Maglibuyo	
Magobinlod	
Magobuyo (Magobaye)	
Magsampinit	
Magsangal	
Magsinolo	
Magtalisay	
Maguinbuyo	
Mahaguis (Mahalay)	
Malaanonang	41,197
Malabacanan	
Malabagao	
Malabaguis	
Malabato	
Malabayabas	
Malabayabat	
Malabocboc	
Malabuga	
Malacayang	
Malacmac	
Malacmalac	24,083
Maladaguin	
Maladogan	
Maladoron	
Malagagaoao	
Malaganet	
Malaginsihan	
Malaguisoc	
Malamanga	
Malaigot	
Malausa	
Malapingan	
Malaranum	
Malasaguin	
Malasaguin puti	
Malasapsap	
Malasican	
Malasmoro	
Malatabaco	
Malatalang	
Malatalay	
Malatindalo	
Malatubig	
Malatumbaga	
Malaya	
Malayambo	
Malit	
Malungay	
Mamalis	
Mambog	
Manapias	
Manayao	
Mandalaonon	

THIRD GROUP—ctd.	*Amount cut. (Cu. ft.)*
Manga	
Manganit	
Mangbalut	
Manicnic	12,301
Manili	
Manungal	
Mapilig	
Marabical	
Maracapas	
Maracasile	
Maragared	
Marambolo	
Masampinit	
Mataaolan	
Matabao	
Matamata	
Matangolan	
Matata	
Mauro	
Mayapis	21,216
Miao	
Mitla	
Morning	
Mulato	
Nalagbo	
Nasug	
Niguet	
Niguit	
Nipot-nipot	
Oas	
Oayan	
Odling	
Ogao	
Ontol	
Oponopong	
Osiben	
Oyaoy	
Paduco	
Panglumbuyen	
Pagaliyagmin	
Pagatpat	24,098
Pagsainguin	16,026
Paguan	
Paho	
Pahopahoan	
Pahotan	
Pahubo	
Paihod	
Paina	
Palacpac	
Palataguin	
Palati	
Palmabrava	
Palochina	
Palogapit	
Palosapis	37,879
Pamaltaguen	
Pamalitien	
Pamangarem	
Pamanganomen	
Pamangarem	
Pamananglayamen	
Pamayabasen	
Pamiclaten	
Pamitaoguen	
Pamorideguen	
Pamulaten	
Pamusilaguen	
Panalayapen	
Panantuman	
Pananutlen	
Panao, Balao	16,497
Pangalinaoen	
Pangalingen	
Pangandongen	
Pangaolasen	
Pangatisen	
Pangi	
Panolsalan	
Panulatin	
Panulosiguin	
Panunsungan	

Native woods brought to market in the Philippine Islands from July 1, 1901, to June 30, 1902—Continued.

THIRD GROUP—ctd.	*Amount cut. (Cu. ft.)*
Paoan	
Paonlitien	
Papuyay	
Parna	
Paronatin	
Pasan	
Payen	
Piagao	
Pichola	
Pili	
Pipi	
Pisec	
Pisig	
Poguipoc	
Pongui	
Popoyot	
Puigao (Piagao)	
Pulangbalat	
Punhan	
Pusopuso	
Putian	
Quinay-quinay	
Quita-quita	
Sacat	61,451
Sagues	
Saguisi	
Sagummisumis	
Salasala	
Saleng	
Saliesic	
Salomague	
Salongan	
Salong-salong	
Salsaloyot	
Saluyen	
Samac	
Saman	
Sambulanan	
Sambulumin	
Sambutuhan	
Samogui	
Sampuit	
Sanait	
Sandalo	
Santol	
Saray	
Sarmayen	
Sasalit	
Saynbong	
Seggay	
Sigcuran	
Sipingan	
Soroya	
Suitang	
Sulipa	
Tabalangin	
Tabiguc	
Tabgas	
Tabong	
Tabontabon	
Taclanganac	
Tacuban	
Taculitaqui	
Tagabong	
Tagatoy	
Taggay	
Tagoalom	
Tagobinlod	
Tagogong	
Tagopinay	
Taguitagui	
Tagumtagum	
Taguraguir	
Talacnongen	
Talagtag	
Talagutingan	
Talahangin	
Talay	
Talingaan	
Talisay	
Taloconuguen	

THIRD GROUP—ctd.	*Amount cut. (Cu. ft.)*
Taloot	
Talulong	
Talumurung	
Tambalalud	
Tamib	
Tamlang	
Tamlao	
Tamogui (Tamug)	
Tanagosep	
Tangalai	
Tangisan	
Tanto	
Tapuhangin	
Tapuhay	
Tapulao	
Tapulas	
Tarabdab	
Taracatac	
Taran	
Taranglay	
Taras	
Taratara	
Tiaong	
Tiga	
Tigpod	
Tiguem	
Tinaanpantay	
Tingantingan	
Tipolo	
Tiranlay	
Tiwi	
Truel	
Tuale	
Tuel	
Tugaue	
Tumbongaso	
Tungog	
Ubien	
Ughayan	
Ulalud	
Ump (Unip)	
Untol	
Violon	
Yambang	
Yango	
Yayapag	
Yuel	
Total third	1,855,617
FOURTH GROUP.	
Agosos	
Alasas	
Amugan (an)	
Anam	29,587
Anilao	
Atá-ata	
Bagonito	
Bago-santol	
Bait	
Balacat	45,919
Balay-bayan	
Balibago	
Baloc	
Baloc-baloc	
Balubat	
Banato	
Bancalauan	
Barincongcorong	
Batican	
Bating	
Biga	
Bignay	
Bilucao	
Binayuyo	
Binting-dalaga	
Binunga	
Bocboc	
Bogo	
Botong	

FOURTH GROUP—ctd	*Amount cut. (Cu. ft.)*
Calay	
Caloc-catmo	
Calumpang	
Caraol	
Culis	
Danloy	
Danlay	
Duca	
Guyonguyon (Salingogan)	
Himbabao	
Hopong-Hopong	
Lagasa	
Libas	
Ligao	
Lunas	
Macaturay	
Maguilic	
Malaaduas	
Malabago	
Malabonga	37,720
Malabulac	31,742
Mala cacao	
Malacamote	
Malac(au)ayan	
Malaga-itiman	
Malaiba	
Malaicmo	
Malanbang	
Malapalitpit	
Malapapaya	23,545
Malasamat	
Malasantol	45,214
Malatagon	
Malatubig	
Matobato	
Oonog	
Paihot	
Payaquitan	
Pingol	
Pototan	
Puray	
Putad	
Rubian	
Sagum-sagum	
Salamungay	
Salingogan (Guyonguyon)	
Surug	
Tabao	
Taboc	
Tanag	
Tanglon	
Tical	
Tinaan	
Tinaan-pantay	
Tive-tive	
Uban	
Total fourth	305,013
FIFTH GROUP.	
Bacao	62,183
Bacauan	
Biuas	
Culasi	
Libato-pula	
Libatong-puti	
Tangal	
PALMS.	
Anahao	18,122
Anibong	
Barangoy	
Bonga	76,088
Luyos	
Total fifth	176,028

	Number varieties brought to market.
Superior group	12
First group	18
Second group	48
Third group	572
Fourth group	85
Fifth group	12
Total	747

All unknown woods when brought to market are classified and appraised as third-group woods.

Wood exports from the Philippines for the four fiscal years 1899–1902.

[Values are in gold.]

Country.	1899.	1900.	1901.	1902.	Total.
Hongkong	$1,062	$23,836	$5,318	$30,956	$61,172
French China				38,095	38,095
United Kingdom	4,400				4,400
All others				[a] 3,343	3,343
Total	5,462	23,836	5,318	72,394	107,010

[a] United States $983.

Wood imports into the Philippines for the fiscal year ending June 30, 1902.

Country.	Dutiable.		Free.	Total.
	Gold value.	Cubic feet.	Cubic feet.	Cubic feet.
United States	$183,308	666,214	367,537	1,033,751
All others	125,374	727,674		727,674
Total	308,682	1,393,888	367,537	1,761,425

Exports of Philippine forest products, by custom districts, for the fiscal year ending June 30, 1902.

Articles.	Manila.	Iloilo.	Cebu.	Zamboanga.	Jolo.	Total.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Gum mastic (almaciga)	880					880
Copal	568,706			29,704	396,670	995,080
Pitch (brea)	56,079			495	704	57,278
All other gums and resins	733,394		4,564	281,239	[a] 1,872	1,021,069
Glue	45,753	8,251	97,390			151,394
Cabinet ware and furniture	1,163					1,163
All other manufactured wood	32,133					32,133
All other unmanufactured wood	91,605		5,333,200			5,424,805
Sapan wood		7,383,483				7,383,483

[a] Includes 1,344 pounds from the port of Siassi.

Imports of forest products, by leading countries, for the fiscal year ending June 30, 1902.

Articles.	United States.	British East India.	Germany.	United Kingdom.	All others.	Total.	Value in gold.
Timber:	*Cu. feet.*	*Cu. feet.*	*Cu. feet.*	*Cu. feet.*	*Cu. feet.*	*Cu. feet.*	
Sawed	60,116	29,112	2,088	36	3,871	95,223	$23,998
Hewn	59,724	26,928	1,584	1,080	6,660	95,976	32,110
Logs	41,724	144	0	52	1,194	43,114	7,814
Boards, deals, and planks	504,473	68,976	12,384	6,408	111,769	704,010	237,914
Pine wood, unplaned					372,000	372,000	5,449
All other wood	177	1,295	68,808		13,285	83,565	1,557
Total quantity wood	666,214	126,455	84,864	7,576	508,779	1,393,888	308,582
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	
Naval supplies: Resin, tar, turpentine, and pitch	411,138	152	16,457	907,378	141,459	1,476,584	$23,024
Total value forest products (gold)	$187,910	$36,850	$21,415	$17,962	$67,469		$331,606

World statistics of rubber and gutta-percha.

WORLD'S ANNUAL PRODUCTION OF RUBBER.[a]

	Long tons.
Brazil, Peru, etc. (Para)[b]	22,500
Brazil, Ceara, etc	4,700
Brazil (Mangabeira)	3,250
Bolivia	1,500
Rest of South America	2,300
Total South America	34,250
Central America and Mexico	2,500
Total America	36,750
East and West Africa[c]	24,500
India and Burmah	400
Ceylon	7.5
Java, Borneo, etc	1,000
Total	62,657.5

WORLD'S ANNUAL CONSUMPTION OF RUBBER.[a]

	Long tons.
America (United States and Canada)	20,000
United Kingdom, etc., except Canada	22,500
Continent of Europe[d]	20,000
Total	62,500

[a] Adapted from "India Rubber, gutta-percha, and balata," by Wm. T. Braunt, 1900, p. 89.
[b] Para exports in 1901 aggregated 29,800 long tons. India Rubber World, February, 1902.
[c] Includes 500 tons for Madagascar and Maritius.
[d] Germany the leading country; third in the world, following the United States and Great Britain.
The principal import markets for india rubber are, in approximate order, New York, Liverpool, Hamburg, Antwerp, Havre, London, Lisbon, Rotterdam, and Bordeaux.

Rubber imports, exports, and manufactures of the United States.

IMPORTS.

Sources.	Short tons.	Value (gold).
Brazil	17,398	$16,919,707
United Kingdom (reexports)	3,732	4,241,959
Belgium (reexports)	2,576	3,311,776
Portugal (reexports)	1,049	1,159,234
Germany (reexports)	837	794,534
Central America	634	673,126
Ecuador	366	335,704
Rest of Europe (France and Holland)	301	335,639
British East Indies	281	247,993
Rest of South America	265	255,064
Rest of North America	199	180,539
Total, fiscal year 1901	27,638	28,455,383
Total, fiscal year 1900	24,700	31,376,867
Total, fiscal year 1891	16,860	17,856,280
Average, 10 fiscal years, 1891-1900	19,880	21,134,600

EXPORTS.[a]

Total, fiscal year 1901	1,653	$2,302,109
Total, fiscal year 1900	1,876	2,760,046
Average, 5 fiscal years, 1895-1899	1,326	1,433,000

[a] Chiefly to Canada.

MANUFACTURES.

Consumption of crude india rubber (net imports), tons	25,985
Value (gold)	$26,153,274
Average value per ton	$1,006
Manufactures, seven States, Twelfth Census[1]	$87,172,694
Manufactures, all States, estimated total	$100,000,000
Approximate value per ton	$4,000
Manufactures, Eleventh Census[1]	$42,853,757
Exports of manufactures, 1901[2]	$3,246,663
Imports of manufactures, 1901	$478,663
Net exports of manufactures	$2,767,970
Net consumption (estimated)	$97,232,030

The total value of rubber goods imported into the Philippines in 1901 (fiscal year) was $71,829, of which $21,480 worth was from the United States. $21,472 from Great Britain, and $13,971 from Germany. The previous maximum imports from the United States was $4,936, for the fiscal year 1900.

[1] Including relatively small amount of gutta-percha manufactures. The estimated total is from India Rubber World, July, 1902, p. 311.

[2] The value of boots and shoes makes up one-fourth of the exports, which average only one-fourth of the German exports and only one-half of the British exports of rubber goods.

Imports and exports of gutta-percha, gutta-inferior, and india rubber at Singapore, Straits Settlements, during the calendar year 1901.

Imports.	Gutta-percha.			Gutta-inferior.			India rubber.		
	Piculs.	Value (Mex.)	Average per picul.	Piculs.	Value(Mex.)	Average per picul.	Piculs.	Value(Mex.)	Average per picul.
Sumatra	28,778	$4,418,385	$153.53	868.5	$7,090	$8.02	210	$26,000	$123.80
Dutch Borneo	[a] 17,061.5	3,502,210	205.27	117,786	866,796	7.36	63.5	6,771	106.60
British Borneo [b]	6,281	1,137,640	181.12	26,603	200,557	7.54	473.8	53,924	113.70
Sulu Archipelago [c]	1,966.5	150,299	76.43						
Java	624.5	72,775	116.63	95	1,852	19.40	20	3,460	173.00
Philippines [c]	105	8,550	81.43						
Total, including all others	59,331	9,889,583	166.67	149,396.5	1,109,015	7.42	773.8	90,642	117.14
Dutch possessions [d]	46,866.5	7,957,975	169.82	119,119.5	878,938	7.39	294.5	36,391	123.50
British possessions	7,175	1,248,025	173.94	26,603	200,557	7.54	473.8	53,924	113.80
American possessions	2,071.5	158,849	76.69						
	Short tons.	*Gold value.*		*Short tons.*	*Gold value.*		*Short tons.*	*Gold value.*	
Calendar year 1901	3,955	$4,826,117	[e] $1,220.25	9,959.8	$541,199	[e] $54.00	51.6	$44,233	[e] 857.00
Calendar year 1900	4,938			7,842					

[a] Including 634 piculs, worth $90,370, from Chinese ports received at Penang, and excluding 4,317 piculs, worth $470,452, from Sumatra received at Penang.
[b] Including imports from Sarawac, British North Borneo, and Labuan Island.
[c] The average import value of the 2071.5 piculs received at Singapore *directly* from the Philippines and the Sulu Archipelago was only $76.68 (Mex.) per picul compared with $169.91 (Mex.) for all the rest. Large quantities of gutta-percha not credited above to the Philippines or the Sulu Archipelago arrive indirectly at Singapore via Borneo.
[d] Including Netherlands Archipelago.
[e] Average per ton.

Imports and exports of gutta-percha, gutta-inferior, and india rubber at Singapore, Straits Settlements, etc.—Continued.

Exports. [a]	Gutta-percha.			Gutta-inferior.			India rubber.		
	Piculs.	Value (Mex.)	Average per picul.	Piculs.	Value(Mex.)	Average per picul.	Piculs.	Value(Mex.)	Average per picul.
United Kingdom	55,777	$12,233,356	$219.30	9,487	$173,533	$18.30	939	$102,653	$109.32
France	7,793.7	1,374,199	176.30	9,651	108,488	11.24			
Germany	5,383	330,042	61.31	11,176	182,511	16.33	40.8	8,075	197.91
United States	2,797.5	226,605	81.00	121,303.8	929,570	7.66	11	1,500	136.36
Belgium	247.5	23,155	93.55	1,122	10,762	9.50			
Italy	180.9	20,080	111.00	125	875	7.00			
Japan	6	330	55.00	3	70	23.33	172.5	25,295	146.63
Netherlands	5	1,000	200.00						
Total, including all others	73,815.9	14,427,589	195.00	153,001.8	1,406,919	9.20	1,188.8	139,745	117.55
	Short tons.	*Gold value.*		*Short tons.*	*Gold value.*		*Short tons.*	*Gold value.*	
Calendar year 1901	4,921	$6,272,865	[b] $1,274.00	10,200	$611,704	[b] $59.97	79.3	$60,772	[b] $766.36
Calendar year 1900	6,493			6,395					
Average 12 years, 1885–96 [c]	2,890	1,966,596	[b] 680.48						

[a] "Singapore is the principal and almost exclusive market for the export of crude gutta-percha. The leading European markets are Liverpool, London, Marseilles, Rotterdam, and Hamburg."—Brannt.

[b] Average per ton.

[c] Adapted from "India Rubber, Gutta-Percha and Balata," W. T. Brannt, 1900, which also gives the following annual distribution of gutta-percha exports reduced to short tons and averaged for the same period of 12 years, 1885–96: United Kingdom, 2,197 (nearly one-fourth reexported, chiefly to Germany, France, and Holland); France, 253; Germany, 220; United States, 177; Holland, 20; all others 24; total, 2,890.

Prices of india rubber.

[New York quotations, June 28, 1902.[a]]

Varieties.	Per pound.	Varieties.	Per pound.
PARA.	*Cents.*	AFRICAN.	*Cents.*
Islands, fine, new	68 to 69	Tongues	42 to 43
Islands, fine, old	71 to 72	Sierra Leone, first quality	60 to 61
Upriver, fine, new	70 to 71	Benguella	42 to 43
Upriver, fine, old	74 to 75	Cameroon, ball	42 to 43
Islands, coarse, new	44 to 45	Flake and lumps	29 to 30
Upriver, coarse new	55 to 56	Accra, flake	17 to 18
Caucho (Pernvian), sheet	47 to 48	Accra, buttons	43 to 44
Caucho (Peruvian), ball	51 to 52	Accra, strips	47 to 48
CENTRALS.		Lagos, buttons	43 to 44
Esmeralda, sausage	50 to 51	Lagos, strips	47 to 48
Guayaquil, strip	47 to 48	EAST INDIAN.	
Nicaragua, scrap	49 to 50	Assam	52 to 53
Mangabeira, sheet	39 to 40	Borneo	30 to 40

[a] India Rubber World, July, 1902.

Fluctuations of New York prices per pound for islands spot fine Para rubber for three years (gold).[a]

Month.	1899.	1900.	1901.
Average:			
January	$0.94	$1.06	$0.85
February	1.00	1.04	.84
March	1.04	1.02	.835
April	1.02	.99	.89
May	1.01	.94	.87
June	.94	.92	.85
July	.93	.89	.835
August	.97	.95	.84
September	.98	.97	.86
October	.98	.97	.81
November	1.03	.93	.78
December	1.05	.86	.80
Year (average)[b]	.99	.96	.84
Average American import values for all kinds of rubber[b]	.621	.635	.533

[a] India Rubber World, February, 1902. [b] Idem, September, 1901.

The following arrivals (including Caucho) at Para, in long tons, for the crop years indicated, ending June 30, will give a clue to the fall in market price of Para rubber, as shown above:

1896–97	22,320
1897–98	22,250
1898–99	25,370
1899–1900	26,670
1900–1901	26,610
1901–1902[1]	30,000

Gutta-percha.

[Gold prices per pound.]

Market.	Date.	First quality.	Medium.	Lower.
Singapore	August, 1900[a]	$1.57 to $1.82	$0.91 to $1.57	$0.19 to $0.91
Do	August, 1901[b]	1.55 to 1.96	.98 to 1.46	.16 to .65
New York	May, 1901[c]	1.75	1.45	.65

[a] India Rubber World, October, 1900.
[b] Agricultural Bulletin of the Straits and Federated Malay States, October, 1901.
[c] India Rubber World, June, 1901.

Respectfully submitted.

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[1] India Rubber World, July, 1902.