FORESTRY LEAVES

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ARBOR WEEK - FORESTRY DAY ISSUES
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THE TWO PATHS

A SOUTH AMERICAN TALE

Before Man was incarnated in flesh and blood, and before animals were created, Inti, the servant of the Invisible God, was surrounded by spirits waiting to come to earth.

Two pathways were disputing which one the spirits would take. The safe path that led through the plains said, "To me all the best spirits will come, for they trust in my safety."

The other path, the unsafe one, full of brambles and thickets, led between defiles in the mountains and lost itself in the heights beyond. To the safe path, it replied, "The best spirits desire to conquer dangers. I offer many dangers. The spirits will prefer me."

"If they take me," argued the safe and straight path that led through the plain, "they will live happily."

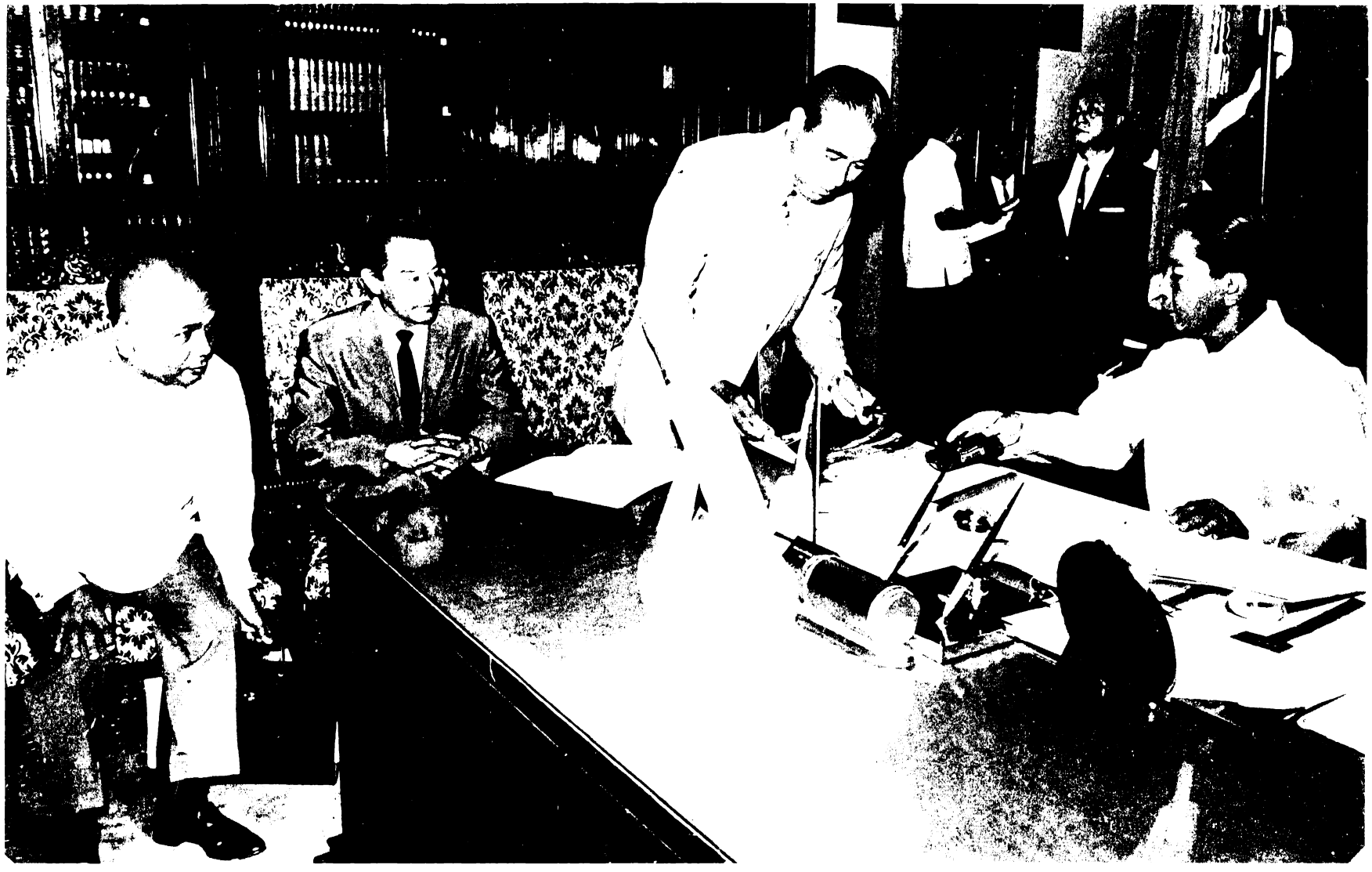
"No matter," said the dangerous path, "no matter what offers you make for easily gained happiness, the best spirits will choose me. The most courageous prefer the risks and the uncertainty of the unknown. They prefer that which they can conquer by the force of suffering and sorrow."

At that point Inti, servant of God, intervened.

"Hush, paths. The spirits that God has created are approaching. They shall choose."

The spirits advanced and Inti said. "Choose! This is the safe path-that, the unsafe. One goes by the plain here you will be safe and will have food in abundance. The other, no one knows where it leads, but it is sunk in the depths of the forest, and winds up steep and difficult mountains. Choose!"

The spirits began to advance. Some on the safe path; others by the dangerous path. Those who took the easy way became animals; those who had the courage to face danger became Men.



Cong. Caliwara presents to President Marcos report on the 6th World Forestry Congress held in Madrid last June. The Philippine delegation was chairmanned by Cong. Caliwara.
From left to right:—FPRI's Director Manuel R. Monsalud, Cong. Jack Soriano of Pangasinan, Cong. Caliwara, and President Marcos.

Let us Plant Forest Trees on Arbor Week

by
ANTONIO A. QUEJADO
Acting Director of Forestry

For the past many years up to July of 1954, the country had always celebrated Arbor Day. The following year, by virtue of Executive Proclamation No. 129 series of 1955 of the then President Ramon Magsaysay, the one day observance was extended to one week.

To me, Arbor Week has some infectious significance. Since I came to know of the annual celebration, I have always given the occasion some serious thoughts. As circumstances and opportunities permit, I have always participated actively in celebrating the occasion, and enlightened my children and friends on the ultimate purpose the celebration seeks to achieve.

Having spent the golden years of my life in the forest service of the country, I know and I need not state here the thousands and one uses of trees to man. I know, as all Filipinos know, that we need trees from the happy event of birth up to the tragic advent of death.

Like anybody else, I hope the celebration of Arbor Week this year is successful. In the past, due to the seemingly apathetic attitude of our people towards the protection and conservation of trees the occasion was devoid of any significance. If the Arbor Week celebration is successful this year, I am most certain it will to a great degree impress upon the minds of our people the importance of planting trees and the need of protecting them.

My service in the bureau of forestry has enabled me to go places, and I have seen with my own eyes the destruction our public forests have suffered from the hands of unscrupulous people. The kaiñgineros, together with the squatters and illegal loggers, have changed the picture of our countrysides and our forests into cogon and open lands now badly marked by erosion. The kaiñgineros, eking out a living in the hinterlands, the squatters seeking lands, and the illegal loggers hacking away the forests for profit, have reduced our forest land into a critical state.

The condition of our forests has disturbed me very much. Even before I became the Director of Forestry, I had already expressed my wish to stop the pillage of our forests. And I had also manifested in various occasions my conformity with work plans for the speeding up of reforestation work in the country to restore lost forests.

I am aware of the many aesthetic benefits we get from forests. To my mind, it was sheer nonesense as well as criminally negligent to remain complacent towards forest destruction. To me, it is an unpardonable act to burn the forests just to plant root crops when over in the lowlands we have vast untilled lands.

The temporary benefits the farmers get from clearing the forest for kaiñgin purposes can not offset the disaster the whole nation will suffer as a result of the destruction of the forest. The squatters have contributed to the denudation of our forests. And the get-quick loggers, the unscrupulous and money-hungry operators have irreparably done more harm to the national economy by destroying the timber stand.

The Bureau of Forestry has never tolerated this. We will never tolerate the ravage of our forests. Although somehow this unscrupulous persons can not be pinned down due to the bureau lack of fund and personnel, we are taking extra efforts to stop once and for all the despoilation of our forests.

Forest protection is one thing. Reforestation is another. But these two are gigantic forestry programs which should receive the cooperation of the people.

And so during this year's Arbor Week, with crossed fingers, I am hoping the people will start appreciating the importance of trees. Once our citizenry becomes aware of the necessity of planting trees to make their plazas, parks and boulevards, look cleaner and greener, there is no reason why they can not learn to plant forest trees, not only for their beauty's sake, but for the progress of our national economy.

In order to get much of this year's Arbor Week celebration the field personnel of the Bureau of Forestry have been instructed to participate actively in the planting of trees. As of this writing, I have already received copies of correspondence from our field personnel addressed either to the nearest Reforestation Office or to our experiment Stations, requesting hundreds of forest tree seedlings for planting during the Arbor Week.

We want the celebration to be successful. For quite sometime now, our Information Office, together with the extension department of the U.P. College of Forestry, in coordination with other members of the Joint Committee on Information and Education in Forestry, has been disseminating various information materials closely related with the Arbor Week celebration.

We have printed 10,000 copies of the Arbor Week posters and distributed them to all parts of the country. We have also given away printed information materials on forest conservation.

However, Arbor Week celebration this year should not only be limited to the planting of trees in parks, plazas and boulevards. There is a more urgent need of replanting denuded forests. We wish Arbor Week celebration would reach the hinterlands, where vast deforested areas awaiting afforestation lie.

We can say our efforts in planting trees today have been successful only when the seedlings we plant grow up to become big trees.

The Programs

Director Antonio A. Quejado has bared his major forestry programs which he has started implementing in earnest:

1. Decentralization

2. Improved assessment system and intensified collection of forest charges and other fees collectible from the forest-users.

3. Full implementation of the directives of the President and the Vice President and DANR Secretary on forest conservation.

4. Strict enforcement of forest laws and regulations.

5. Sustained nation-wide forestry information and education campaign.

6. Speeding up inventory of forest resources throughout the Philippines.

7. Thorough screening of existing forest licenses and permits with a view to weeding out those who violate the terms and conditions of their awards.

8. Effective protection of public forests.

9. Full-scale implementation of selective logging and watershed management measures.

10. Observance of the merit system and elimination of graft and corruption.

Forest Resources of the Philippines*

by
JUAN L. UTLEG
Assistant Director of Forestry

Because of modern weapon and intelligence developed for warfare, perhaps the use of forests as places of concealment and means of protection will become less and less important. But the maintenance of productive forests in healthy watershed so as to support a viable economy and, therefore, a strong, stable society will more substantially contribute to the promotion of national security. It is believed that a better knowledge and appreciation of our forests by this elite group of the National Defense College is very timely and worthwhile.

Much has been written and said about Philippine forests and forestry recently. With the prestigious position now occupied by the lumber industry which ranks the second top dollar-earner among the country's industries, it is not surprising that our people have become more conscious of the forests. In the wake of each destructive flood or drought, we hear indignant cries about the wanton neglect and abuse of our forest resources. Unreliable figures have been cited to support alarming statements that our forests are fast disappearing.

Many are interested in knowing just how much timber the Philippines still has. Lumbermen, log exporters, wood processors, all are anxious to know. Economists and national planners are as eager as the others for the answer to this vital question. As custodian of the nation's forest wealth, the Bureau of Forestry has the responsibility to ascertain the extent of our remaining forests and assess their value in terms of available timber volume for today's and tomorrow's needs.

* Lecture given by Juan L. Utleg, Assistant Director of Forestry, at the National Defense College of the Philippines, Fort Bonifacio, on June 22, 1966.

FOREST MANAGEMENT

All of the Bureau's present policies are geared toward conservation of the remaining forests. To accomplish this end, the Bureau is striving against odds to hold this remaining forest areas and place them under scientific forest management and keep them in the state of sustained maximum productivity by pursuing as closely as possible the following important programs:

(a) Intensify the delineation and establishment of permanent forest areas. The quicker this is done, the sooner will we obtain real control over our forests;

(b) A Nationwide forest inventory to gather vital statistics on our forest resources;

(c) Implement and enforce selective logging for the sustained yield management of our public forests;

(d) Grant, regulate and control timber licenses for the continued productivity of the forests; and

(e) Formulate policies and regulations relative to the scientific management, including research work, of the forests. Field studies and experiments are conducted to help improve the conditions, quality and growth of residual trees in logged-over areas.

FOREST INVENTORY

Basic to the administration and management of the public forests is a comprehensive forestry inventory. During the early

stages of development, the Bureau's activities along this line were limited to small-scale and sporadic ground forest surveys which gathered rough estimates of forest extent and timber volume. When the demand for logs and lumber increased tremendously after World War II, the uncoordinated surveys and estimates could no longer be relied upon. Thus, more reliable figures were needed.

To answer this need, a modern forest inventory program was implemented in 1962 with the assistance of the U. S. Agency for International Development and the National Economic Council. Aerial photographs flown and processed by the Philippine Air Force are used in the current forest inventory. The present nationwide inventory has completed the survey of Mindanao, where the bulk of our forests is found. Pending the completion of data computation and analysis for the rest of the islands already inventoried, the 1957 forestry statistics for Luzon and Visayas compiled by the Bureau of Forestry and the National Economic Council will still be used officially.

The following charts and tables show the present state of our forest resources:

(a) *Land Use Chart for Mindanao (1963):*

	Hectares	Per Cent
Forest —	6,638,719	67.0
Cultivated Croplands —	1,538,017	16.0
Plantation Croplands —	682,783	7.0
Open lands —	874,222	9.0
Marsh & small water areas —	78,304	0.6
Urban and others —	57,215	0.4
Total - - - -	9,869,260	100

The latest statistics based on the recently concluded forest inventory of Mindanao using aerial photograph show that 67 percent of the total land area (or 6.64 million hectares) is still under forest. The forest lands contain stands of all sizes ranging from seedlings, saplings, young poles, residual trees from cut over lands as well as mature virgin timber.

Sixteen percent (or 1.54 million hectares) is under cultivation to low garden or field crops like rice, corn, etc. Also included under these category are managed pasturelands.

More than 682,000 hectares are planted to permanent plantation crops such as coconut, rubbers, citrus and other field crops. Most of these lands are found in Zamboanga, Bukidnon and Davao.

Around 9 percent of the land area is made up of open lands principally grasslands and abandoned croplands. Urban areas, towns, roads and marshlands make up 1 percent or about 136,000 hectares of the total land area.

(b) *Land Use Chart for Luzon and Visayas (1957):*

	Hectares	Per Cent
Forest —	7,964,720	40.7
Brushland —	1,076,600	5.5
Cultivated and other lands —	7,944,020	40.6
Open lands —	2,192,590	11.2
Marsh or swamps —	412,460	2.0
Total - - - -	19,590,390	100.0

We have about 41 percent of the total land area in Luzon and in the Visayas still under forest. This represents about 8 million hectares. Cultivated lands, urban settlements and others amount to almost the same total or 8 million hectares representing about 41 percent. Brushlands are over a million hectares or 11.2 percent. Marshes and swamps make up 2 percent, or 412,000 hectares.

(c) *Timber Volume for Mindanao (1963):*

	Million Cubic Meters	Per Cent
Western Mindanao	148.4	12.9
Central Mindanao	353.5	30.7
Eastern Mindanao	649.2	56.4
Total - - -	1,151.1	100.0

The latest forest inventory shows there is a total of 1.15 billion cubic meters of timber in Mindanao, composed of trees 15 centimeters or larger in diameter. More than half of this volume is found in Eastern Mindanao where the bulk of the rich Philippine hardwood forests is located. The forests of Central Mindanao have a standing volume of 353.5 million cubic meters while Western Mindanao forests have 148.4 million cubic meters.

(d) *The Timber Volume for Luzon and Visayas (1957):*

	Million Cubic Meters	Per Cent
Western Luzon —	95.1	18.5
Eastern Luzon —	155.2	30.3
Southern Luzon —	74.4	14.5
Western Visayas & Palawan —	119.4	23.3
Eastern Visayas —	68.7	13.4
Total - - -	512.8	100.0

The 1957 volume figures of Luzon and the Visayas Inventory show a combined total of 512.8 million cubic meters available in trees 30 centimeters in diameter.

You will note from the table that the bulk of the timber volume is found in Eastern Luzon and Western Visayas and Palawan, where much of the remaining forest areas are located. Southern Luzon and Eastern Visayas have the least timber volume available. However, these figures might be altered, as was the case when the results of the Mindanao inventory were released.

(e) *Annual Volume Growth, Mindanao; (1963):*

	Cubic Meters
Western Mindanao —	1,523,261
Central Mindanao —	6,156,449
Eastern Mindanao —	10,852,369
Total - - - - - - - -	18,532,079

To be comprehensive and useful, the forest inventory collected data on growth. Results of the Mindanao inventory show that an average of 18.5 million cubic meters is accumulated annually, as a result of growth. Eastern Mindanao has the highest growth volume per year because it has the highest growth rate among the three regions.

(f) *Average Annual Drain from Authorized Logging, Mindanao:*

	Cubic Meters
Western Mindanao —	1,147,488
Central Mindanao —	964,146
Eastern Mindanao —	2,700,485
Total - - - - - - - -	4,812,119

The table shows that an average of 4.8 million cubic meters of timber is drained annually from Mindanao forests. *The sustained yield management program of the Bureau strives to maintain a balance between wood drain and wood growth.* In other words, the volume cut from the forest per year ideally should not exceed the volume growth per year.

Now, a comparison between the growth table and the authorized logging drain table shows that the cut is way below the growth. This is a clear indication that much of the blame alluded to the legitimate loggers for forest denudation is misplaced.

(g) *Average Annual Drain from Clearing, Illegal Kaiñgin, Illegal Logging and Other Causes (Mindanao):*

	Cubic Meters
Western Mindanao —	5,369,960
Central Mindanao —	5,254,221
Eastern Mindanao —	4,658,483
Total - - - - - - - -	15,282,664

While there is a very favorable growth-drain balance with regards to authorized logging operations, the same cannot be said of the growth-drain balance involving land clearing, illegal kaiñgin, illegal logging and other causes totalling to over 15.2 million cubic meters. The over-all growth-drain balance tips over unfavorably when both drain due to logging and drain due to clearings

and other causes are lumped together. Total annual growth is 18.5 million cubic meters; drain from all causes is 20.1 million cubic meters.

Thus, there seems to be a yearly deficit of 1.6 million cubic meters. What matters most, however, is the growth and drain in the permanent forests, not in the alienable and disposable areas which are intended for agricultural production that are subsequently cleared. Proportionately, the growth and drain in permanent forests would be less. Eventually, by more intensive protection and forestry practices, the unfavorable balance will become less and less. The figures just show the real existence of a conservation problem which we must solve with earnest and speed.

FOREST RESOURCE OUTLOOK

The result of this forest inventory shows that the forest resources are still large, of tremendous economic value and of importance to the future prosperity of the Philippines. It is expected that after the result of the inventory of Luzon and the Visayas, we shall have a complete updated and reliable set of statistics.

Meanwhile, based on the forest resource in Mindanao, and using the present rate of cut (drain by authorized logging operations), the old growth or virgin forests of Mindanao should be able to meet the demands of local and export timber markets for at least 70 years even assuming that there is no wood growth at all. This length of time is almost two times the estimated 40 years it takes for trees in adequately stock logged-over areas to attain harvestable (exploitable) size and volume ready for another cutting operations.

This is so because trees grow and reproduce, and as we pegged the allowable annual cut to equal the net growth, then it is only logical to conclude that we can have a continuing source of forest goods and services, so long as we follow sound forest management practices with adequate protection from destruction.

FORESTS AND THE NATIONAL ECONOMY

The lumber industries rank second among the major dollar-earning industries of the country today. Figures compiled by the National Economic Council show that the Philippines supplied about 29 percent of the wood requirements in the international market.

Starting from scratch at the end of World War II, timber production has been steadily increasing from the early fifties, reaching a peak in 1963 when 7.7 million cubic meters of timber were produced. Table "h" shows the timber production and represented by the graph; Table "i" shows the export, and value of export. However, in 1964, the Central Bank issued Circular No. 182, which contained provisions considered to be too stringent by log buyers, specially those from Japan.

The Central Bank Circular 182 almost brought a paralyzation of log exportation with the cancellation of log-buying contracts by Japan. Many producers were forced to reduced or stop operations. A new set of grading rules (Forestry FAO No. 19-a) was adopted in lieu of C.B. Circular 182, which was acceptable to the log buyers. Log exportation subsequently resumed. Timber production, nevertheless, still was feeling the adverse effect of the circular up to 1965. Timber production deacreased as a result of the Administration's policy of issuing temporary 3-month cutting permits to licensees. Many licensees had to suspend their operation as a result of this policy.

The present Administration's ban on the issuance of new timber licenses; the nonrenewal of licenses expiring this year; the suspension of granting of additional or adjustment of allowable cut and the cancellation of log dealer's permit for those exporting logs who are not concessionaires and actual

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*The Role of Science in Forestry Development**

by
JOSE VIADO
Administrator
Reforestation Administration

In more advanced countries such as the United States, Germany, Japan and Finland, forestry is a dynamic process in the strict sense of the word. Forestry development is closely synchronized with the countries' socio-economic, industrial, agricultural and technological developments. The obvious reason for this is that their forest practices and policies are consistently guided by scientific findings and studies with the minimum interference, if there is at all, of the kind of politics that we have in the Philippines.

And so we are left to envy the colossal strides in forestry development in those countries which are highly developed. Paradoxically, we seem to be very slow at learning by, and benefiting from, their examples.

For instance, we know about Germany's highly articulate but steadfastly followed sustained yield forest management but what fraction of it have we emulated? In Finland, forests have been foremost in national consideration and planning because they constitute a great resource for Finland. So much so that Finland's forest resources provide 95 per cent of all Finnish exports. We have almost a similar case with Finland in that our forest resources provide the second largest export of our country. But have we given the commensurate national consideration and planning for these precious resources?

Much has been said about the United States forestry development which has not been allowed to lag behind her ambitious nuclear development. It is a fact that almost every aspect of American forestry is highly mechanized. Thus we have heard about helicopter logging and seeding, forest mensuration with the aid of aerial photogrammetry and photo-interpretation, the use of radioactive isotopes in forestry research, etc. Japan is known also for her scientifically managed forest and the almost unbelievable level with which she has reduced forest products wastes through efficient utilization. So much so that it has been said that the only thing not utilized of a tree there in Japan is the sound of its fall.

Science, indeed, plays a very important and indispensable role in forestry development. After all, was it not said that forestry in itself is a science, besides being an art?

And so we have evolved what we now know as "forest management" which, according to the Society of American Foresters, is "the application of business methods and technical forestry principles to the operation of a forest property." Since the task of forest management is "to build, put in order, and keep in order a forest business," I suppose forest management is in itself forestry development.

From the definition of forest management, we can very well see what a vast role science has in forestry development. For science throws its weight on such technological aspects of forest management as (1) silvics and silviculture, (2) mensuration, (3) logging and milling, (4) wood technology, (5) pathology, (6) entomology, 7) fire control and use, (8) wildlife, (9) recreation, (10) grazing, (11) water and (12) civil engineering.

* Speech delivered at the Third Plenary Session of the 6th Annual Convention of Log Producers and Wood Processors sponsored by the Philippine Chamber of Wood Industries held at the NSDB Pavilion, April 13-16, 1966.

Science also permeates the business and social aspects of forest management. It is thus unimaginable how there should be any substantial forestry development without science playing a key role. Science has now become a byword identified with progress in any human undertaking.

Science has severely revised forestry concepts, improved methods and techniques as well as research and developmental work. A pertinent write-up on the latest developments in forestry was recently made by Dr. Francisco M. Tamolang, Assistant Director of the Forest Products Research Institute. (See Forestry Leaves, XIV: 1 & 2.)

Now, what are the scientific developments in Philippine forestry? It may be said that the beginning of any scientific knowledge being applied in forestry here dates as far back as the establishment of the *Inspeccion General de Montes* during the Spanish regime. The first ten years of the Bureau of Forestry were devoted to forest administration and forest research.

As of today, the history of forest research in our country may be grouped roughly into three periods. The first period embraces the Spanish regime; the second, from the creation of the Bureau of Forestry in 1900 to the establishment of the Forest Research Division of the same bureau in 1954; and the third, from that time to the present. Outstanding accomplishments of the first period were botanical studies of indigenous species. The second period had germination studies, plant introduction and testing and the third, determination of tree and timber stand growth and forest products utilization.

But while much has been learned in the past years about Philippine forestry thru scientific studies, it is said that the potential field of forest research has as yet hardly been scratched. For instance, there is a dearth of information regarding our forest soils, the seeding habits of our commercial tree species. We have not had compiled comprehensive data on which to evolve sustained-yield management practices. Practically nil has been done towards determining various local forest influences and forest cover on soil erosion, waterflow. There has been a sadly inadequate attention given to studies on the protection of the forest against insects and fungi. Forestry genetics is still strange to us and so in logging, all the high quality trees are cut instead of leaving a sufficient number of them to regenerate future stands.

What actually have we done during the past years? One of our colleagues here, Forester Nicolas Lansigan, virtually summed up the situation when he wrote that "there has entirely been too much pre-occupation on the exploitation and revenue-raising activities of forestry to the utter neglect of the basic phases on which the very practice of forestry must rest."

Of course, we reason out that science in local forestry development has been set back by several factors foremost of which are: (1) the perennial problem of lack of funds, (2) destruction of previous or early research data by the war, (3) dearth in research personnel and equipment and (4) the diversity of our forest species and climatic types. The situation not under control, we bungled in our forestry practices and policies.

For instance, in the absence of reliable growth data, the so-called "diameter limit" system was adopted as a basis for management plans. This stipulates in timber licenses, among others, that trees of the first group woods below 60 cm. in diameter (40 cm. for second group and 50 cm. for all dipterocarps, except yakal) shall not be cut. Those below this diameter size left uncut are expected to grow and take over. However, after more than 50 years of forest exploitation under this management plan, there is no substantial forest area where the expected subsequent cut had been made, attesting either to the failure or impracticability of the diameter limit system.

Some ten years ago, we launched the present selective logging system with the pur-

pose of leaving enough thrifty residuals for a subsequent cut after a certain period. The attendant difficulty of implementation and the inadequacy of protection of logged-over areas from squatters and kaingineros, however have rendered the system practically meaningless except in very limited areas. And so we have vast kaingins or abandoned kaingins out of logged-over areas instead of second growth for a subsequent cut. As I said, the implementation was not systematic enough and the protection very inadequate.

Then there was the unscientific assumption that our timber stock grows at the rate of 1.5 per cent a year. But we know that most of our forests under exploitation are virgin forests so that any wood growth could only compensate decay and mortality in such forests. But because of the lack of comprehensive growth studies on which to base annual cuts, we used the 1.5 per cent growth assumption as our basis. And what happened? We set the volume of annual cut at a certain level so there was a steady drain. But could there have been an equally steady replenishment? The National Economic Council observation that we are losing our forests at the stupendous and alarming rate of 172,000 hectares every year should beget serious thoughts.

Our forestry development has sorely lagged behind because of the paucity of scientific knowledge about our forests. The government forestry agencies have, with their limited resources, strived hard in putting forestry development in the forefront. But despite all these efforts, our forestry development has been remarkably slow.

We are warned, not infrequently, that we are fast liquidating our forest capital on which hinges so much of our potential for industrialization and socio-economic program. Conservative estimates have it that deforestation is outpacing reforestation at the rate of 5 to 1. And to note that we are currently under retribution for our splendid record of deforestation! Although perhaps some of us are not fully aware of it; others even insist to be unaware of it. For the root cause of the prevailing water crisis which has been considered the worst in years is WANTON DEFORESTATION. Not only that. Comparatively speaking, for the last decade, we have had more floods than we had before that, percentagewise. The scientific explanation for this is that forests do have a considerable influence on the water flow of streams or rivers although deforestation alone does not directly cause floods; it only enhances the occurrence of floods. On this we do not want to be misunderstood.

According to Kittredge, one time director of the U.S. Weather Bureau and a ranking member of the American Society of Civil Engineers, deforestation and denudation increase surface runoff and the increased runoff further increases the height of flood crests.

Such an oversight, if not a grave mistake, in the exploitation of our forests stems from the fact that, in the management of our forest resources, we have not been consistently guided by scientific methods and findings, simply because of the fact that we have not established our own scientific bases or, if we have, they are insufficient and hardly reliable. Indeed, so much in our forestry development remains to be desired.

Recently, there are overtures by the Philippine Chamber of Wood Industries to push through some legislations to help the wood industries. Significant among the proposals for legislation are: (1) the establishment, by the government, of the Wood Industries Development Bank with ₱150-million initial fund; (2) the setting aside by the government of ₱25-million for forestry development and reforestation work; (3) the setting aside of of ₱25-million for the promotion of wood products export trade; (4) the setting aside of ₱25-million for manpower training for forestry and wood processing; (6) the allocation of another ₱25-million for forestry research and education.

Working on the assumption that, with the systematic programming in the next five years, the wood industries will have an earning of ₱970-million in export proceeds, your chamber president proposed that the funds needed for these proposed legislations can be taken from the 7 per cent tax slapped on these proceeds. Tax collections on these proceeds, according to your chamber president, would amount to some ₱275-million.

However, with the tight financial situation under the present dispensation as it always was under previous administrations, I am not certain if you can have all those legislative proposals pass Congress. The government earnings from forest products export may yet be funneled into projects considered more urgent by the present administration. I can only hope with you that this may not happen. But in the event that it does happen, what can you do?

This brings to mind what President John F. Kennedy once told his fellow countrymen: "Ask not what your country can do for you; ask what you can do for your country." Yes, why not? With your earnings, you can very well put up part of the funds, if not all of it, to promote the wood industries and forestry development in this country.

Knowing fully well the role of science in forestry development and knowing further that the existing government forestry research agencies cannot cope with the demand for scientific studies and findings comprehensive and adequate enough to serve as the bases on which to evolve sound forest policies and practices, I, therefore, now recommend that, with your resources pooled together, you put up a private science foundation or institute to carry on forestry research. In foreign countries, the private sector seems very aggressive in initiating the establishment of similar science foundations. I believe that you, their counterpart in the Philippines, are not less capable in order to match their aggressiveness in promoting the advancement of science in forestry development.

If you would now challenge us to make a commitment on the proposed science foundation devoted to forestry research, we believe that with the available resources at our disposal, we can meet the challenge. Let it be put on record that on this day and before this august body offer the free services of the technical staff of the Reforestation Administration for the organization of a science foundation or institute for forestry research. You can pitch in the needed financial resource to establish and maintain this proposed science foundation and the Reforestation Administration shall give you the necessary technical assistance in laying out its goals and policies as well as its organizational structure.

At this juncture, I wish to inform you that preliminary arrangement had been made with the Federal Republic of Germany for the establishment of the Forestry Institute of the Philippines as a counterpart of the Forest Products Research Institute. The proposal, however, has not yet been approved on the part of the Philippines but in Germany it is already being counted as approved. If finally approved, then your added support (material and moral) would induce the continuity of the project and will certainly be a boost to the wood industries of our country.

To expedite things, I suggest that the Resolutions Committee of this convention take note of this matter so that they may frame up a pertinent resolution to be taken up during the period of presentation of resolutions.

In the area of forestry education which is of course the frontier in the advancement of forestry science, so much awaits the attention of those of you in the wood industries. Either individually or collectively, you can sponsor study and research grants in forestry here and abroad. Part of the earnings of your bank deposits can support a professorial chair or more in our established forestry schools and still you are helping in the ad-

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The Philippine Forest Resources: Their Fuller Utilization and Relation to World Trends[1]

by

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ABSTRACT

The forest area of the Philippines totals 12.3 million hectares which is 41.5% of the land area. Of this 8.3 million hectares are commercial forests with a volume of 1.3 trillion board feet of standing timber. The remaining stand which is classified as non-commercial contains 105.2 billion board feet.

Of the 3,500 species only about 100 species are commonly utilized. The greater percentage of these belong to the Dipterocarp family, commercially known as Philippine mahogany. Among the important species are the dark Philippine mahogany: lauan (*Shorea negrosensis* Foxw.), tangile (*S. polysperma* (Blco.) Merr.) and the light-red Philippine mahogany: almon (*Shorea almon* Foxw.), mayapis (*S. squamata* (Turcz.) Dyer), bagtikan (*Parashorea plicata* Brandis) and white lauan (*Pentacme contorta* (Vidal) Merr. & Rolfe).

Majority of the species are not now utilized due to the lack of knowledge of the properties of wood.

Forestry and forest products are important factors in the national economy of the Philippines. At present, about $125,000,000 are invested in wood based industry including the pulp and paper sector. There are now 226 sawmills, 21 plywood mills, 10 veneer mills, a hardboard mill, a particle board plant and a pulp and paper mill. Other pulp and paper mills are being installed or planned.

The predominating forest products are timber with annual production of 2½ billion bd. ft.; lumber, 530 million bd. ft. and plywood, 600 million sq. ft.

The Philippines is the world's heaviest exporter of hardwood logs. In the year 1964-1965, 58 percent of the total production (1,522,094,345 bd. ft.) were exported. Ninety-five percent of this was absorbed by Asian countries: Japan (83 per cent); Taiwan (6.9 per cent) and Korea (4.9 per cent). A very small fraction went to the United States, Europe and Africa. Other exports included lumber (35 million bd. ft.), plywood (320 million sq. ft.) and veneer (500 million sq. ft.).

The Forest Products Research Institute conducts research projects to find ways and means for fuller utilization of forest products and to reduce waste; improve production and processing techniques; and to produce new commodities. It has been found that many of the species not now utilized are suitable for many uses, and fast growing "weed' species show promise as pulp wood.

The recommendation for the protection and fuller utilization of the Philippine forest resources includes (a) forest products development and research to promote production and consumption of forest products; (b) market development to increase exports; (d) development of forestry education particularly in the graduate level; (f) and intensified public education in forestry to curb forest destruction and promote conservation work.

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I.—THE PHILIPPINE FOREST RESOURCES

To fully appreciate the forest resources of the Philippines and their potentialities, it is well to keep in mind a few essential facts regarding the geographical location and natural conditions of the country.

The Philippines is a small country compared to the United States and the Union of Soviet Socialist Republics. It is an archipelago named after Philip II of Spain, with approximately 7,093 islands, located about 500 miles off the southeast coast of the Asian mainland. To the West and North is the China Sea, to the East, the Pacific Ocean and to the South, the Sea of Celebes and the coastal waters of Borneo. The islands extend north and south about 1,152 miles and east and west about 688 miles, their shape, if bordered by straight lines, being about that of an isosceles triangle, and their area, 115,600 sq. mi., or about 6,000 sq. mi. less than that of Great Britain.

Though the Philippines is small in area, it has attached to itself great world significance for its tremendous wealth in natural resources, particularly forest resources.

a. Forest areas and timber stocks.—The forests of the Philippines are among the most replenishable assets of the Republic. This natural wealth is inexhaustible or exhaustible, depending on whether it is fully conserved or abused. Latest statistics of the Bureau of Forestry (as of July 1, 1964 to June 30, 1965) reveals that out of the total land area of the Philippines of 29.7 million hectares, 41.5 per cent (or 12.3 million hectares) are commercial and non-commercial forests. It is estimated that 6.3 million hectares of commercial forests have standing timber of 1.3 trillion bd. ft., and non-commercial forests covering 4.0 million hectares have an approximate timber stock of 105.2 billion bd. ft.

b. Forest types.—The Philippine forests are well-known for their beautiful and durable woods of high quality, which are comparable to many foreign woods. The wood flora is so rich that there are more than 3,500 arberescent species in the country. These species, although found growing in different elevations, are of distinct vegetation, thus comprising different forest types in the country. The different types of forests are: dipterocarp, molave, pine, mangrove, beach, mid-mountain and mossy forests.

1. Dipterocarp forest. The forest of this kind is typically tropical, with the members of the dipterocarp (lauan) family constituting the heavy timber stands which form the basis for lumber and allied industries. About 75 to 80 percent of the timber stock come from the dipterocarp forest and the timbers harvested, in turn, form the mainstay of both the wood-using industries and wood export trade of the Philippines. The dipterocarp forest is of the mature to overmature type, averaging in timber volume about 100 to 200 cubic meters to a hectare, and this is considered sufficiently valuable to warrant the use of modern mechanical means for extraction.

The best known species producing the best woods for trade under the dipterocarp forest are: apitong (*Dipterocarpus grandiflorus* Blanco), guijo (*Shorea guiso* (Blanco) and yakal (*Shorea astylesa* Forw.); and the "Philippine mahogany" species, namely: almon (*Shorea almon* (Foxw.), bagtikan (*Parashorea plicata* Brandis), mayapis (*Shorea squamata* (Turcz.) Dyer), red lauan (*Shorea negrosensis* Foxw.), tangile (*Shorea polysperma* (Blanco) Merr.), tiaong (*S. agsaboensis* Stern) and white lauan (*Pentacme contorta* (Vid.) Merr. & Rolfe). Other principal species thriving in this forest type are dao (*Dracontomelon dao*), malaikmo (*Celtis philippinensis*), taluto (*Pterocymbium tinctorium*), katmon (*Dillenia philippinensis*), malugai (*Pometia pinnata* Forst. forma *glabra* (Bl.) Jacobs), ilang-ilang (*Cananga odorata*), alupag (*Euphoria didyma*), and *Canarium* spp.

Molave forest. — This type of forest is more open in character and its average volume

of timber per unit area is only 30 cubic meters per hectare. The woods produced from this forest, however, are highly valued for their natural beauty and durability. The most important species are: molave (*Vitex parviflora* Juss.), narra (*Pterocarpus indicus* Willd.), tindalo (*Pahudia rhomboidea* (Blanco) Prain), ipil (*Intsia bijuga* (Colebr.) O. Ktze.) and dangula or sasalit (*Teijsmanniodendron ahernianum* (Merr.) (Bakh.).

3. Pine forest.—The pine forest type is generally composed of coniferous species like Benguet pine (*Pinus insularis* Endl.) and Mindoro pine (*Pinus merkusii* Jungh. & de Vr.). These species occupy most of the mountain and mining regions of high altitudes in Northern Luzon and Mindoro.

4. Mangrove forest.—The mangrove forest is a contrast of the pine forest type wherein forest stands of the former usually grow in low altitudes, particularly in tidal flatlands at the mouths of streams and on the shores of protected bays. The species that thrive well in these places are mainly used as firewood, charcoal, tan bark, cutch and dye-bark. However, the woods produced may also serve for construction purposes, that is, if the materials are treated to make them durable. Majority of the species belong to the Rhizoporaceae, namely: bakauan (*Rhizophera apiculata*), bakauan-babae (*R. mucronata*), busaing (*Brugiera gymnorrhiza*), pototan-lalaki (*B. cylindrica*), pototan (*B. sexangula*), langarai (*B. parviflora*), and tangal (*Ceriops tagal*). There are also other species of other families, such as tabigi (*Xylocarpus granatum*), piagau (*X. moluccensis*), dungon-late (*Heritiera littoralis*), pagatpat (*Sonneratia alba*), api-api (*Avicennia officinalis*), and tabau (*Lumnitzera littorea*).

5. Beach forest.—This forest type has a forest stand composed mostly of species that grow well on sand or sandy soil. Species like talisai (*Terminalia catappa*), dungonlate (*H. littoralis*), dapdap (*Erythrina orientalis*), botong (*Barringtonia asiatica*), bitaog (*Calophyllum inophyllum*), bani (*Pongamia pinnata*) and agoho (*Casuarina equisetifolia*) commonly grow in this kind of forest.

6. Mid-mountain and mossy forests.—The mid-mountain and mossy types of forests are composed of short-boled trees whose branches are generally covered with mosses, liverworts, ferns, and orchids. Usually found in high and very rough mountainous regions, these forests are essentially protection forests. Among the principal species are: *Dacrydium* spp., *Tristania decorticata, Myrica* spp., *Symplocos* spp. and *Syzygium* spp.

Practically all (97%) of the forests in the Philippines are owned and managed by the government. As indicated by the forest resource inventory in Mindanao, the timber drain due to land clearing is more than three times that of logging and other causes (based on 11-year period, 1952-1963). This land clearing ("kaingin making") is a consequence of increasing population which inevitably required expansion of agriculture and communities. Release of lands from the public domain was necessary for this expansion, but with an objective of retaining at least 42% of the total land area of the country for forest purposes. While 59% of the total land area still remains under government control, the momentum of land clearing should be slowed down in order to keep the remaining forest (now only 41.5% of the total land area) for essential forest uses.

II.—THE IMPORTANCE OF FOREST PRODUCTS TO THE PHILIPPINES

No country whose forests are economically important can afford to neglect the utilization of forest products.

Forestry and forest products, in recent years, have grown tremendously in importance to the national economy of the Philippines. In 1963, forestry has accounted for 6.7 percent of the national income. Likewise, at present, forest products are among the top products earning foreign exchange for the country.

There are now 226 sawmills, 21 plywood mills, 10 veneer mills, a hardboard mill, a

particle board plant, a pulp and paper mill using wood. Another pulp and paper mill is being installed and others are in the planning stage.

The demand for forest products both for local consumption and for export has steadily increased in the past decades, and the forest industries as a whole are now an important sector in Philippine industrialization. Production trends and expansion programs in many of the wood-using industries, now capitalized at about half a billion pesos ($125,000,000), aside from the hundreds of millions of pesos ready to be poured into industries of this nature, particularly the pulp and paper sector, will bring about further growth in dollar earnings from forest products in the years to come.

The capital investments in the wood-using industry excluding pulp and paper are as follows: logging, $18,100,000; sawmilling, $18,150,000; veneer and plywood, $9,094,000; and minor forest products, $500,000.

Considering the amount of capital investment in these industries and in the timber and lumber trade (as shown in Tables 1 and 2), the half-million people employed—and the millions more dependent on them for subsistence—and the host of business establishments and supply houses catering to the industry, it will not be hard to imagine the important role of the forests in the economic structure of the country.

III.—THE UTILIZATION OF PHILIPPINE FOREST RESOURCES

a. Species commonly utilized. — In the Philippines, about 3,500 indigenous and 300 exotic wood species thrive. Of the 80 families represented, 20 and 60 comprise the timber and non-timber producing families, respectively. However, in spite of the great number of species available in the country, only about 100 commercial wood species are being utilized by loggers and lumbermen.

Majority of the species which are suitable for a variety of uses, such as cabinet and furniture making, panelling, patterns, cigar and jewel boxes, veneer and plywood, general house construction, and many others, belong to the well-known "Philippine Mahogany" groups otherwise known as the Dipterocarp (lauan) family. Examples of the species are the red lauan (*Shorea negrosensis* Foxw.), tangile (*S. polysperma* (Blco.) Merr.)

TABLE 1. Destination, volume and value of logs exported to foreign countries from June 1964 to July 1965.

Countries	Volume (Bd. ft.)	Value (US)
Japan	1,239,799,822	$68,432,452.64
Taiwan	102,114,107	5,989,946.09
Korea	73,097,588	4,582,516.59
Italy	19,367,783	1,156,965.37
Okinawa	15,590,108	815,552.47
U.S.A.	12,846,937	615,286.48
Hongkong	10,467,906	542,878.87
Denmark	4,324,612	284,271.78
France	3,404,412	222,394.97
England	2,564,859	135,110.46
Australia	1,939,852	132,105.98
Africa	1,654,470	58,414.08
Germany	145,740	31,050.00
Switzerland	19,877	6,273.82
	1,487,338,073	$83,005,219.00

TABLE 2. Destination, lumber export of the Philippines from June 1964 to July 1965.

Countries	Volume (Bd. ft.)	Value (US)
U.S.A.	21,670,186	$ 2,719,278.03
Australia	4,758,030	582,282.12
Africa	3,313,981	458,941.88
Okinawa	1,424,993	100,394.17
Denmark	889,892	155,261.22
Canada	844,401	108,385.05
Hongkong	724,903	74,159.02
Guam	194,770	43,471.27
Germany	172,770	31,316.84
Hawaii	137,106	19,018.43
Korea	109,128	12,729.93
Sumatra	95,700	15,204.21
Norway	88,227	20,645.11
Bire	74,681	2,932.38
England	67,825	13,129.68
Belgium	51,376	10,604.00
Japan	42,385	4,187.45
New Zealand	39,900	5,306.70
Sweden	17,745	3,774.78
Holland	12,349	2,118.96
Caroline Is.	10,000	1,524.20
Copenhagen	6,337	1,328.37
North Europe	4,996	789.37
France	4,427	798.11
T o t a l ----------	34,756,272	$ 4,387,581.28

and tiaong (*S. agsaboensis* (Stern), which are grouped under the Philippine red or dark-red mahogany; while species like almon (*S. almon* Foxw.), mayapis (*S. squamata* (Turcz.) Dyer), bagtikan (*Parashorea plicata* Brandis) and white lauan (*Pentacme contorta* (Vidal) Merr. & Rolfe) are classified under the light-red Philippine mahogany.

Because of the beautiful colors, intricate figures and grains exhibited by the "Philippine mahogany" woods, the United States and various foreign countries in Europe have learned to make use of them in place of other foreign wood species. However, the "Philippine Mahogany" is highly desirable and can be favorably compared to the tropical American mahogany (*Swietenia macrophylla* King), the West Indian mahogany (*S. mahagoni* Jacq.) and the African mahogany (*Khava ivorensis* A. Chev.) in quality, beauty, workability and versatility. Recently, too, the Philippine Forest Products Research Institute has found these species promising for pulp and papermaking.

Other Philippine species of great importance belong to the Anacardiaceae, Ebenaceae, Guttiferae, Leguminosae, Meliaceae, Sapotaceae and Verbenaceae. They commonly possess a wide range in color, grain and texture, weight and strength properties, ease of working and hardness, assuming many possibilities for every species to be used in any manner and be converted into a variety of forest products. The most common species

include such well-known woods as narra (*Pterocarpus* spp.), dao (*Dracontomelon dao*), acacia or raintree (*Samanea saman*), ipil (*Intsia bijuga*), tindalo (*Pahudia rhomboidea*), molave (*Vitex parviflora*), kamagong (*Diospyros philippinensis*), guijo (*Shorea guiso*), palosapis (*Anisoptera thurifera*), akleng-parang (*Albizia procera*), and many others.

b. Groups of species not now usually utilized.—On the other hand, the great majority of the 3,500 wood species in practically untouched or ignored due mainly to lack of knowledge on their physical, mechanical and chemical properties. No sane businessman, logically enough, would risk investing hundreds of thousands of pesos in introducing in the lumber trade an unknown wood species for fear that he might not be able to sell his products later on.

At present, certain groups of species not now utilized by small and big industries belong mostly to the Alangiaceae, Fagaceae, Flacourtiaceae, Melastomataceae, Podocarpaceae, etc.

c. Predominating products.—The production and consumption of timber in the Philippines rank first, followed by lumber, plywood and other products in the descending order. Timber or logs consumed are either used in their natural form, as piles for instance, or manufactured into lumber, plywood or veneer.

The major production and consumption of various products in the Philippines for 1964 are:

Products	Production	Consumption
1. Timber	2,618,048,055 bd. ft.	1,130,922,007 bd. ft.
2. Lumber	531,413,104 bd. ft.	274,051,079 bd. ft.
3. Plywood	397,426,538 sq. ft.	212,302,648 sq. ft.

Majority of the species commonly utilized in the form of timber, lumber and plywood belong to the Dipterocarpaceae or the Philippine Mahogany group, while a few come from the Leguminosae and Anacardiaceae.

It is expected that in the near future many more species, heretofore not used, will fill the need of the pulp and paper industry.

d. Fuller utilization of forest products.—Due to lack of information on the anatomical structure, strength and chemical properties of local woods in building construction and other phases of work, it is likely that wood members, particularly in local building designs, are oversized, and this especially applies to those assigned to carry heavy loads. Needless to say, a specific structure so designed is builder than it should be.

Not infrequently, excessive safety factors are applied for insufficiency or lack of data. The work of the Forest Products Research Institute in the Philippines has helped solve the problems along this line and will eventually open the way for the use of lesser known structural timbers as good, if not better, substitutes of many of the commercial woods popularly known today, which are fast becoming scarce in our forests.

Concomitantly, the finding of ways and means by which wood wastes can be converted into profitable commercial products, such as hardboard, particleboard, briquetted charcoal, tannin glue formulation from bark and other products, help greatly in lessening the abnormal drain from our forests.

The Institute, at any rate, has achieved modest accomplishments along the utilization of weed-tree species for specific uses. Take the case of the wood which is good for tool handles. The premier wood known the world over for striking tool handles is

American hickory (*Carva* spp.), which is not found in the Philippines. Until recently, the Philippines used to import hickory for tool handles. Within a few years of study, the Forest Products Research Institute found suitable Philippine woods for the same articles like agoho (*Casuarina equisetifolia* L.), katilma (*Diospyros nitida* Merr.). and ata-ata (*Diospyros mindanaensis* Merr.). Binggas (*Terminalia citrina* (Gaertn.) Roxb.) is also considered to be a good substitute for hickory, and this can be obtained easily from local supplies.

Toog (*Combretodendron quadrialatum*), another weed species, has been found to be good in the manufacture of pulp and paper as well as veneer. Toog grows in fairly good stands in the forests of Agusan and Surigao. Results of experimental studies conducted at the Institute established the required treatment of toog bolts as well as proper veneer table settings before good quality veneer can be produced from it. With its long fibers already tested, toog also shows promise for pulp and papermaking.

Some wood species found by this Institute to be suitable for the production of certain wood products are: magabuyo (*Celtis luzonica* Warb.) for bowling pins, shoe lasts and baseball bats; balobo (*Diplodiscus paniculatus*) and karaksan (*Linociera ramiflora*) for bobbins and bowling pins; malakape (*Canthium dicoccum*) and mambog (*Mitragyna rotundifolia*) for bobbins; mamalis (*Pittosporum pentandrum*) for toothpicks, fan ribs and tennis racket frames; lanutan-bagyo (*Gonystylus macrophyllus*) and anongo (*Turpinia ovalifolia*) for venetian blind slats; ulaian (*Lithocarpus llanosii*) and bolongeta (*Diospyros pilosanthera*) for picker sticks and tool handles; balakat (*Ziziphus talanai*) for discus discs and softball bats; white nato (*Pouteria macrantha*) for rulers; malakamias (*Ailanthus triphysa*) for electric wood moldings; almaciga (*Agathis philippinensis*) for artificial limbs; veneer and plywood, and pulp and papermaking.

As the basic objective of the Institute is to have a fuller utilization of forest products as well as to give assistance to wood-using industries in working out solutions to their individual problems regarding raw materials and processing, and the control of quality products as well as the avoidance of waste or unnecessary cost, the same research agency will likewise continue to do research on species that are of no economic value today but which in the future will likely prove to be of great value to the economic progress of the country.

e. Trends in timber production and processing of wood.—Timber production figures in the Philippines for 1960-1965 have been oscillating in the neighborhood of 3 billion board feet and the processing of wood was generally low.

The amounts of timber produced as well as the amounts locally consumed for the last six years are as follow:

Fiscal year	Timber production in bd. ft.	Local consumption including inventories bd. ft.	Percent of Local consumption
1959-1960	2,677,448,475	1,130,860,149	47.8
1960-1961	2,796,897,297	1,513,016,808	54.0
1961-1962	2,838,794,900	1,207,065,827	42.5
1962-1963	3,251,265,131	1,285,152,680	38.8
1963-1964	2,530,582,711	604,560,522	23.8
1964-1965	2,618,260,081	1,061,197,438	42.2

f. Research and technology development in relation to forest products utilization.—The Forest Products Research Institute conducts research projects (1) to find ways

and means for wiser and fuller utilization of products from our forest, particularly wood; (2) to reduce wood waste stemming from different processings involved in converting the live tree into various wood products that will ultimately reach the end consumer; (3) to improve present-day techniques of wood processing so as to effect high wood recovery; and (4) to produce new commodities from the products of our forests.

The Institute has made numerous researches on some forest products and has studied intensively the characteristics and properties of all potentially important species.

Fiber characteristics studies conducted by the Institute, in conjunction with pulp and paper experiments, have shown certain weed species, such as toog (*Combretodendron quadrialatum*), Kaatoan bangkal (*Anthocephalus cadamba*), tuai (*Bischofia javanica*), Moluccan sau (*Albizzia falcata*), paper mulberry (*Broussonetia papyrifera*), African tulip (*Spathodea campanulata*), hinlaumo (*mallotus ricinoides*), bigau (*Miscanthus floridulus*) and many others to be promising raw materials for pulp and paper manufacture.

Also, veneer and plywood studies at the Institute show that some non-commercial wood species are good materials for either the manufacture of face or core veneers or the manufacture of plywood, namely, Kaatoan bangkal, toog, moluccan sau and others.

The growing concern for full utilization of raw materials as well as waste forest products will ultimately contribute to the development of the country's full potential for a progressive national economy.

IV.—THE CONTRIBUTION OF PHILIPPINE HARDWOOD TRADE IN THE FOREIGN MARKET

a. The rank of the Philippines in the production of wood products. — The Asia-Pacific region is among the heaviest producers of tropical hardwood logs, contributing 39,484,000 cubic meters to the world production. Within the region the leading countries, in the order of production, are:

1. China
2. Philippines
3. Australia
4. Japan
5. Indonesia
6. British North Borneo
7. India
8. Federation of Malaysia
9. Burma
10. Thailand

The production of the Philippines comprise about 17% of the logs cut in the region, or .4% of the total world production of tropical hardwood timber.

The Philippines also produced 2,618,260,-081 bd. ft. of timber in 1964-1965, of which 1,522,094,345 bd. ft. or 58%, valued at $83,-005,219, were exported. This makes the Philippines the world's heaviest exporter of hardwood logs.

In 1962 the export for same was about 53% of the total exportation of Asia, or about 30% of the world total. On the basis of the forest area of the Philippines which is only 0.4% of the total tropical forests of Latin America, Africa and the Asia-Pacific regions, this export product is disproportionately big. However, growth studies by the Bureau of Forestry have shown that with proper conservation and forest management, the Philippine forest resources can maintain the present rate of cutting without undue detriment to the present growing stock.

Items	Quantity	Value
Logs	1,487,338,073 bd. ft.	₱319,570,095.46
Lumber	34,756,272 bd. ft.	16,892,187.00
Plywood	323,375,459 sq. ft.	63,941,326.83
Veneer	530,624,001 sq. ft.	31,270,580.95

b. Exports of forest products.—The major timber and wood products exported during the same period by the Philippines to foreign countries are:

From June 1964 to July 1965, the Philippines sent to Japan 1,239,799,822 board feet of round timber, or 83% of the total timber export; 102,114,107 board feet or 6.9% to Taiwan and 73,097,588 board feet or 4.9% to Korea. The rest were exported to other Asia-Pacific countries, the United States, Europe and Africa.

c. The future of forest products industries of the Philippines.—The Philippines has been sustaining a more or less steady production of 2½ to 3 billion board feet in the last six years. Without proper safeguards, it is doubtful if any further increase in cutting is possible without hurting the growing stock. Because of the increasing investment on processing equipment, which is now worth about half a billion pesos (pulp and paper sector included), the local log requirement will correspondingly rise as long as market conditions remain favorable. This means that future log exports must necessarily decrease. The probability is that there will be a gradual shift in export from raw timber to finished products.

The industrialization of the Philippines will also have a pronounced effect on Philippine forestry. The utilization, for one, of the mixed hardwoods for pulp and paper for home use will become more and more important and man-made forests will ultimately become a significant factor in the national economy.

V.—RECOMMENDATIONS

a. *Products development and research.*—The limited forest resources of the Philippines cannot hope to fill the increasing need of other Asia-Pacific countries for industrial logs. The Philippines then must process its own timber production. To do this the need for forest products research and development is evident in the Philippines. New products and the improvement of existing products should receive prime consideration, and fuller utilization of Philippine hardwoods is necessary to increase the number of useful products. This is of primary concern if the Philippine producers are to compete successfully with industrialized countries who have the experience and the technological capacity for fuller utilization of raw materials.

Maximum and efficient conversion techniques of non-exportable hardwood logs must be studied too. As the supply of large diameter timber of high quality dwindles, processing and conversion becomes more demanding. For this reason, manufacturers in the Philippines are beginning to favor the use of high quality logs over the cheaper grade logs.

b. *Market development.* — The foreign market for round logs cannot possibly be expanded because of the limitation of forest resources. However, new market for Philippine wood products must have to be developed. So far, the Filipino producer has been leaning heavily on the North American market, but his participation in the European hardwood market has remained small compared to that of Africa which is the dominating supplier of logs in that area.

The South American forest products production has been steadily rising in the past years. As this development continues its upward trend, the Philippine manufacturers could expect heavy competition in the future. At present, Japan and other Asian countries are supplying the European market with finished wood products. In contrast, the Philippines has a very limited forest products trade with Europe. The Filipino producers thus should study the possibility of entering the European market if its forest products industries are to expand.

c. *Development of world standards for forest products.*—A serious deterrent to the development of new markets for forest products is the varying market requirement which the producers are trying to meet. The development then of a universal wood products

specifications and grading rules must have to be developed. This will provide for flexibility and proper channeling of products from one region of the world to another compatible with market requirements.

d. *Training of forestry workers.*—The expansion of the wood-using industry in the Philippines cannot be achieved without the much needed technical men. At present the training of forestry workers is limited to ranger training in the University of the Philippines College of Forestry which is oriented for work in the government service. Workers in the woods and in the mills, at present, are trained on the job, but the supply of these type of labor is small, resulting in the competition among producers.

The development of a vocational type of training should be studied. The cooperative project of training forest guards by the forest industries, which was instituted in 1965, is a good example of how such type of training may be approached. Likewise, the lumber training course which was sponsored by the Bureau of Forestry in the same year should be expanded to include more men from the industry.

e. *Development of forestry education.*— The development of forestry education in the Philippines needs impetus if forestry practices and forest products technology are to improve. At present the University of the Philippines College of Forestry offers 4-year curriculum leading towards a Bachelor's degree with major courses of study in Forest Resources Management. Present trends show a need for 5-year curricula with strong background in the basic sciences to better prepare students for key positions in the government forestry agencies and the industry. Particularly short is the supply of men with background in forest economics, conservation, production management and forest products technology in general.

Graduate education in forestry must be developed. The absence of a graduate education in forestry has slowed down research efforts due to the low supply of foresters with advanced training. Training is available in foreign countries but very few schools emphasize the field of tropical forestry. The cost of foreign training has limited the opportunity for graduate education.

f. *Public education in forestry.* — The widespread destruction of the Philippine forest resources must be attacked from the root. A stepped up campaign in forestry extension work must have to be done to promote public understanding of the values of forests with the aim of improving forest protection and forest conservation work. The present nation-wide forestry extension work of the University of the Philippines College of Forestry must be strengthened and given adequate support.

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A Study of Wood Utilization and Manufacturing Efficiency in Plywood

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INTRODUCTION

Philippine mahogany veneer and plywood continues to dominate the hardwood plywood import of the United States. The Philippines, however, is now a poor third behind Japan and Taiwan (5)[2] Lansigan (5) reported that the present shares in the American markets of Japan, Taiwan and the Philippines were 40, 23, and 20 percent, respectively.

Japan has been absorbing about 80 to 90 percent of our log export which is manufactured into plywood (3). This shows that lauan log cost in Japan is higher than those logs processed in the Philippines. The purpose of this study is to find out the plywood recovery, efficiency of workers, defects and distribution of cost of production of eight mills in Mindanao including one mill in Visayas.

RAW MATERIALS AND MANUFACTURING METHODS

a. *Raw Materials and Costs.*

Philippine mahogany species, namely red lauan, tanguile, tiaong, mayapis, white lauan, almon, and bagtikan constitute the majority of logs processed into veneer and plywood. In addition, veneers from lumbayau, nato, and pahutan are used for faces in plywood for export. Lanipao, talisay, palosapis, kalunti, and manggasinoro are used mainly for cores and backs.

Logs of high quality are mostly exported to Japan, Taiwan and Korea; the remainder is converted into veneer and plywood. However, mill B uses its high grade logs in veneer manufacture.

Log cost of mixed grades at the mill ranges from ₱17.00 to ₱96.00 per cubic meter; the cost is generally on the upper range. At least four factors affect the cost of logs, namely 1) proximity to the concession, 2) with or without concession, 3) means of log transportation, and 4) wages of the workers.

Mill located adjacent to or within the concession has lower log cost, e.g. mill C, than those located in the business centers e.g. mill B. Those mills without concession are forced to buy logs at export prices. Whenever exportable logs are not available, mixed grades or export rejects are bought for processing into plywood, e.g. mill A.

b. *Veneer Bolt Preparation and Rotary-Cutting.*

Logs for faces and backs are bucked bolts of 104" except in mill A which is bucked into 108 inches. Bolts for cores are bucked into 54" long. The veneers are manufactured by rotary cutting without preheating in water or steam vat. The species used

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[2] Number in parenthesis refers to literature cited.

belong to the low and the medium density species as shown in Table 1. The specific gravity based on the ovendry weight and volume is from 0.32 to 0.40, and 0.41 to 0.55 for low and medium densities, respectively (4). The quality obtaining as confirmed by inspection, however, shows the need to further improve veneer smoothness. Preheating of logs to optimum rotary-cutting temperature may apply to Philippine species; it has improved the quality of Douglas-fir plywood from low quality logs (7).

TABLE 1. Mean Specific Gravity of Species in the Manufacture of Rotary-Cut Veneer and Plywood*

COMMON AND SCIENTIFIC NAME	SPECIFIC GRAVITY[1]	
	Green	12% M.C.
1. Almon (*Shorea almon Foxw.*)	0.41	0.42
2. Bagtikan (*Parashorea plicata Brandis*)	0.52	0.55
3. Lauan, Red (*Shorea negrosensis Foxw.*)	0.46	0.49
4. Lauan, White (*Pentacme contorta (Vid.)* Merr and Rolfe)	0.42	0.44
5. Mayapis (*Shorea squamata* (Turcz) Dyer	0.35	0.39
6. Tanguile (*Shorea polysperma* Blanco Merr.)	0.44	0.48
7. Tiaong (*Shorea polysperma* formerly Tiaong)[2]	0.44	0.46
8. Dagang (*Anisoptera aurea* Foxw.)[3]	0.48	0.53
9. Afu (*Anisoptera brunea* Foxw.)[3]	0.54	0.57
10. Lanipao (*Terminalia copelandii* Elm.)	0.44	0.48
11. Manggasinoro (*Shorea philippinensis Brandis*)	0.37	0.40
12. Pahutan (*Mangifera altissima* Blanco)	0.55	0.57[4]
13. Nato (Palagium luzonense (F. Vill.) Vid)	—	0.56[4]
14. Talisay (*Terminalia catappa* L.)	—	0.56[4]
15. Lumbayau (*Tarrieta javanica* Blume)	—	0.56[4]

[1] Laurico, F. M. and S. B. Bellosillo. n.d. Strength studies on Philippine woods. FPRI. College, Laguna.
[2] Mechanical properties of Philippine woods, Forest Products Research Institute, College, Laguna. October 30, 1963.
[3] Included in Palosapis group.
[4] Reyes, Luis. 1938. Philippine Woods. Tech. Bull. No. 7 Dept. of Agric. & Commerce. Bureau of Printing, Manila.
* Villaflor, A. A. 1963. Analytical study of Manufacturing Operations of Plywood and Veneer Mills in Mindanao. Mimeographed copy. U.P. College of Forestry, College, Laguna.

The use of new equipment has increased the production of veneer and plywood. The lathes are equipped with automatic or manual nosebar compression indicator and other features which enhance ease in adjustment and operation. The peripheral speed is from 240 to 900 fpm for faces and backs.

The use of mechanical debarker as in mill I increases the service life of veneer knives. This reduces nicks in knife from contacts with grits of stones and sands adhering on the surface of logs. However, the debarker removes sapwood which may be converted into usable veneers if bark alone is removed.

Instead, a spud may be used in debarking. In this respect, the management has to make a choice based on the standpoint of economy. Those mills which peeled their bolts with bark on showed lower machine utilization.

Green taping in thin veneers minimizes and splits, before and during veneer drying, and its subsequent handling prior to gluing. The tape is applied mechanically on the tight side of green veneer as rotary-cutting and reeling progress. This technique is favorable in peeling for thin face from exportable logs e.g. 1/20". This is not practical in tipple-deck system.

Lathe setting is usually done by feel, it is based on the operator's experience. This is not advisable since personal judgment is subject to error. It is advantageous in the long run to train operator and develop understudy in the proper use of knife setting devices.

c. *Veneer Clipping and Veneer Drying.*

The minimum green width of face or back used in 4 x 8 feet plywood is 54". This dimension is reduced to about 51.30" as the veneer dries to 8% MC. The oversize of 1.30" is equal to 2.6% waste. Majority of the mills has waste of 4.5% and over in a dry veneer of 50" x 100". The figure when converted into pieces of veneers would represent a large amount. For instance, a mill turning out 12,000 pieces of 50" x 100" loses 312 pieces if the green veneers are clipped to 54", 543 pieces if the green veneers are clipped to 55", and 720 pieces if the green veneers are clipped to 56".

The distance between the two spur knives during the rotary-cutting ranges from 99.5" to 104"; this represents the initial length of face and back of 4 x8 feet plywood. Shrinkage along the grain is negligible so that the length remains after drying. Mill A sets the distance to 104 inches which raises its waste from 4.5 to 8.5% as shown in Table 2. The additional allowance of 4" is claimed to reduce the degrees of end splits in the main body of plywood. The percent waste in green cores clipped to 107 and 110" are 1.65 and 4.5%, respectively, as shown in Table 3.

A number of mills dry their veneers to about 8% MC; the range is from 4 to 12%. The dry moisture contents of cores are dried from 3 to 8% MC. The veneers are dried in hot air recirculating veneer dryer which are the roller and mesh type dryers. The dryer temperature is from 260° to 320°F. The drying time varies according to temperature, air velocity, species, veneer thickness, initial and final moisture contents, and sapwood or heartwood.

The presence of wet spots in veneer is one of the major causes of blister and delamination. These are minimized by checking the moisture distributions within and among the veneers through the use of moisture detector.

d. *Jointing and Splicing.*

Random sizes arising from the presence of natural defects, and open, severe, and long splits resulting from careless handling and improper drying may be utilized by jointing and splicing. Veneers are jointed by traveling or stationary cutterheads and the glues are applied mechanically or manually while the batch of veneers is still held firmly in the jointer. In other cases, the glue is applied automatically in the splicer. To insure the formation of solid bond, the glue mixture should be protected from foreign matter.

The temperature of the splicer should be set within the allowable range which is from 400° to 550°F. Splicing is parallel or perpendicular depending on grain orientation. Parallel splicer is commonly used in faces and backs.

TABLE 2. Dimensions of Face and Back Veneers During Wet and Dry Clipping and the Corresponding Waste Incurred in Percent*

MILLS	NOMINAL THICKNESS (inch)	WET CLIPPING		EXPECTED DRY DIMENSION		DRY CLIPPING		WASTES (Percent)
		Width (inch)	Length (inch)	Width[1] (inch)	Length (inch)	Width[2] (inch)	Length (inch)	
A	1/16, 1/20	55	104	52.25	104	50	100	4.5[3]
B	1/16	55	100	52.25	100	50	100	4.5
C	1/16, 1/20	54	100	51.30	100	50	100	2.6
D	1/20	54	100	51.30	100	50	100	2.6
E	1/18	55	99.5	52.25	99.5	No Clipping		4.5
F	1/18	55	100	52.25	100	—do—		4.5
G	1/17	54	100	51.30	100	—do—		2.6
H	1/19	56	100	53.20	100	50	100	6.4

[1] Average tangential shrinkage of 5 percent at about 8 percent moisture content based on FPRI Tech. Note. No. 17 governing Philippine mhaogany group. Longitudinal shrinkage is negligible.

[2] Most factories don't practice clipping to size 50 x 100 inches for full size veneers after drying. Dry dimension of 50 inches wide is used in computing percent of wastes.

[3] Waste including oversize length is 8.5 percent.

*Villaflor, A. A. 1963. Analytical Study of Manufacturing Operations of Plywood and Veneer Mills in Mindanao. Mimeographed copy. U.P. College of Forestry, College, Laguna.

TABLE 3. Dimensions of Core Veneers on Wet and Dry Clipping and Percent of Wastes*

MILLS	NOMINAL THICKNESS (inch)	WET CLIPPING		EXPECTED DRY DIMENSION		DRY CLIPPING		WASTES (Percent)
		Length[1] (inch)	Width (inch)	Width[2] (inch)	Length (inch)	Length (inch)	Width (inch)	
A	1/18	110	50	104.5	50	100	50	4.5
B	1/10, 1/6	108	50	102.6	50	100	50	2.6
C	1/7, 1/6	108	50	102.6	50	100	50	2.6
D	1/6	108[3]	50	102.6	50	100	50	2.6
E	1/7	108	50.5	102.6	50.5	99	50.5	3.64
F	1/7	108	50.5	102.6	50.5	99.5	50.5	3.12
G	1/7	108	50.5	102.6	50.5	99	50.5	3.64
H	1/6	107	50	101.65	50	100	50	1.65
I	1/7. 1/6	108	50.5	—	—	—	—	—

[1] Distance along the grain.

[2] Average tangential shrinkage of 5 percent at about 8 percent moisture content based on FPRI Tech. Note No. 17 governing Philippine mahogany group. Longitudinal shrinkage is negligible.

[3] Sometimes clipped wet to 166 inches and then clipped dry to 100 inches and 50 inches pieces.

*Villaflor, A. A. 1963. Analytical Study of Manufacturing Operations of Plywood and Veneer Mills in Mindanao. Mimeographed copy. U.P. College of Forestry, College, Laguna.

e. *Gluing*

The thickness tolerance of sanded 3-ply, 1/4" x 4' x 8' plywood is plus zero inch, -1/32-inch (1, 2). The unsanded thickness of plywood reaches 0.281 inch. Table 4 shows allowance for scraping and sanding; it is from 0.031 to 0.053 inch in face and back. Plywood with unsanded thickness of 0.250", e.g. mill A, has only 1/64-inch allowance for finishing in either face or back. This requires skilled operator, although, its face of 1/16" is the thickest among the mills. Those mills using 1/20" face should have efficient and skilled operators or scraper and sander, since plywood may be damaged by sand-through. The use of thin faces in plywood is desirable because of the great recovery of high quality veneers and plywood.

TABLE 4. Nominal Thickness of Faces, Backs, and Cores Use in the Assembly of #-Ply, 1/4" x 4' x 8' Plywood*

MILLS	NOMINAL THICKNESS DRY CONDITION (inch)[1]			PLYWOOD THICKNESS UNSANDED (inch)	WASTES[2] (Percent)
	Faces	Cores	Backs		
A	1/16[3]	1/8	1/16	0.250	0
C	1/20[4]	1/6	1/20	0.266	6.4
D	1/20	1/6	1/20	0.266	6.4
E	1/18	1/7	1/18	0.254	1.6
F	1/18	1/7	1/18	0.254	1.6
G	1/17	1/7	1/17	0.260	4.6
H	1/19	1/6	1/19	0.272	8.8

[1] Philippine mahogany species including lumbayau, nato, talisay, manggasinoro, kalunti, lanipao, and pahutan.

[2] Waste (percent) $= \frac{\text{Plywood thickness unsanded} - 0.250}{.250} \times 100$

[3] The recovery of face veneers from a given volume in term of surface measure is lowest, considering all other factors equal.

[4] The recovery of face veneers from a given volume in term of surface measure is highest, considering all other factors equal.

*Villaflor, A. A. 1963. Analytical Study of Manufacturing Operations of Plywood and Veneer Mills in Mindanao. Mimeographed copy. U.P. College of Forestry, College, Laguna.

The cores are passed through the glue spreader with its grain running approximately perpendicular to the doctor rolls. This orientation prevents splits and curling of veneers particularly for full size cores whether spliced or unspliced.

The use of unspliced cores in plywood is governed by the size of glue spreader and the economy of splicing. The costs in terms of glues, power, and labor as well as, the lack of 8 feet glue spreader, have to be considered.

As shown in Table 5, the average actual costs of imported and local glues are ₱0.73 and ₱0.55 per 3-ply, 1/4" x 4' x 8' plywood, respectively. The use of imported glues raised the glueliness cost per panel by about 30 percent. Gluing defects are minimized by following the recommendations of glue suppliers with respect to spread, extension, catalyst, press temperature, assembly time, moisture content of veneers, and the amount of solvent. It is preferrable to use flour with low water absorbing capacity as extender.

TABLE 5. Average Gluelines Cost Per 3-Ply, 1/4" x 4' x 8' Plywood*

MILLS	GLUES (IMPORTED OR LOCAL)	Cost Per Panel (Pesos)	
		Expected[1]	Actual
A	Local	0.54	0.50
C	Imported	0.73	0.77[2]
D	Local	0.49	0.54
	Imported	0.73	0.71
E	Imported	0.54	0.72
F	Imported	0.68	0.72
	Local	0.55	0.56
	Local	0.55	0.56
Average	Imported		0.73
	Local		0.55

[1] Cost per MDGL plus percent oversize of core veneer.
[2] Maximum cost ₱0.878 per 3-ply, 1/4" x 4' x 8' plywood.
*Villaflor, A. A. 1963. Analytical Study of Manufacturing Operations of Plywood and Veneer Mills in Mindanao. Mimeographed copy. U.P. College of Forestry, College, Laguna.

f. *Hot Pressing.*

Hot press equipped with automatic loaders and unloader shortens the press cycle. This is a step towards increased output and also minimizes precure. However, the use of automatic loader without pre-pressing the assembly increases the frequency of defective panels in the forms of folds, short faces, cores, and backs and core gaps.

In manual loading, the practice of closing first the daylight which is loaded last may cause pressure in the gluelines. As a rule of thumb, the daylight which has been loaded first should be closed first. If the hot press is designed such closing starts at the bottom, then loading should start at the bottom. The loader should be installed with its top load aligned with the bottom daylight.

Double pressing which is the loading and pressing of two panels per opening is used in mills A and F. There is the belief that it increases the output on the basis of short press time. However, if equal degrees of cure is to be attained on the farthest gluelines of both panels as in the gluelines nearest the platens, this would require over twice the single press time, because the heat takes longer time to travel through the thicker cores. This may result in undercured glueline which is easily determined by the earlier delamination of the farthest glueline of the test specimen when evaluating for Type II[2] bond. Another defect in plywood resulting from double pressing is cupping which was reported by Villaflor (8).

g. *Trimming, Scraping and Sanding.*

The U.S. Commercial Standard CS 35-61 and the Exports Standard for Philippine Hardwood Plywood set the dimensional tolerance of 3-ply, 1/4" x 4' x 8' plywood (1, 2). The tolerance can be easily set on the trimmer for both length and width. The setting requires regular inspection to prevent loss by degrades.

[2] Type II bond—Water resistant bond. The bond shall practically retain all of its strength when occasionally subjected to a thorough wetting and drying. The bond shall be of such quality that specimens shall withstand an average of 10 cycles when subjected to the 15-cycle coldsoak test (USCS 35-61).

Scraping removes tapes and wood on the face and back of plywood. Scraping is not used in the United States, because it requires thicker face, 1/20-inch and greater, hence it increases the volume of wood wastes and veneer cost. Furthermore, it is not adapted to sliced face veneers. Its principal advantage, however, is lengthening the service life of sandpaper.

Sanding begins with the use of drum sander which is usually the three drum type. Smoothness is reflected by the sizes of grit papers. The grit papers from the first, second, and third drums are 80, 100, and 120, respectively. Auto-sander or narrow belt sander consists of two belts which are provided with 100 and 120 grit paper sizes. It is the last phase of sanding in most plywood mills. However, in mill F, the wide belt sander becomes its last machine for finishing. The grit size used is either 320 or 400 which makes the face of plywood very smooth.

h. *Production, Grading of Veneer and Plywood.*

Veneer production in mill B consists of 5, 10, 35 and 50% of grades A, B, C, and D, respectively. Mill C exports its high grade veneers to the United States and assembles to plywood those of lower quality for local consumption in order to increase wood utilization. The Export Standard for Philippine Hardwood Plywood, the U.S. Commercial Standard 35-61, and the agreement between importer and exporter are followed. Table 6 shows that the bulks of plywood are C and Print grades; mill D turns out B grade over 20% of its output. This result is to be expected because the quality of the raw materials serves as a reliable index of the grades of finished products.

Defects in plywood manufacture averages 3.37 percent of the total production. The minimum is 1.4 percent, while the maximum is 7.6 percent. Manufacturing and natural defects in the order of their frequencies are shown in Table 7.

Splits result from either drying or improper veneer handling. Veneers may be immediately dried after green clipping to minimize end splits. In cases where the dryer is working below its capacity, veneers may be bulk piled and their ends wet at regular

TABLE 6. Distribution of Veneer and Plywood by Grades in Percent*

MILLS	EXPORT GRADES									LOCAL	GRAND TOTAL
	A	B	C	D	Print	Utility	Kraft	SG	Total		
A	—	10	40	20	—	—	—	—	70	30	100
B[1]	5	10	35	50	—	—	—	—	100	—	100
C[2]	—	3	12	15	—	—	—	—	30	70	100
D	—	24	—	3	49	—	—	—	76	24	100
E	—	—	40[3]	—	50	—	—	—	90	10	100
F	—	—	21	—	15	35	5	6	82	18	100
G	—	2	41	—	46	—	—	—	89	11	100
H	—	—	21	—	—	24	15	—	60	40	100
Average[4]	0	6.00	27.17	3.83	26.67	9.83	3.33	1.00	77.83	22.17	100

[1] Veneer factory grades indicated are for veneers, USCS 35-61.
[2] This factory is exporting its good quality veneers.
[3] This figure includes a few B grade.
[4] Excluding B and C mills.
*Villaflor, A. A. 1963. Analytical Study of Manufacturing Operations of Plywood and Veneer Mills in Mindanao. Mimeographed copy. U.P. College of Forestry, College, Laguna.

intervals. It may be further minimized by synchronizing the lathe's output with the present capacity of the dryer. Proper drying schedule should be used to minimize drying defects. Too dry veneer becomes susceptible to splits in handling and also cause starved joint. Wet veneers are conducive to blisters and delaminations.

TABLE 7. Frequency of Occurence in Per Cent of Manufacturing and Natural Defects Found in Plywood Grading[1]

DEFECTS	Percent	DEFECTS	Percent
Splits	19.55	Knotholes	3.06
Overlaps	10.98	Hot Press	2.77
Short Core	14.83	Rough Cut	2.58
Tape Marks	7.52	Oil Stain	1.36
Worm Track & Scars	6.81	Nip	0.71
Core Cap	6.02	Patch	0.47
Delaminations	4.94	Scraper	0.28
Short Face	4.00	Crossbreaks	0.33
Blisters	3.22	Handling Defects	0.23
Sand Through	3.80	Doze	0.19
Missanding	3.06	Trimmer	0.18
Worm Holes	3.06	Low Spot	0.05
		TOTAL	100.00

[1] Villaflor, A. A. 1963. Analytical Study of Manufacturing Operations of Plywood and Veneer Mills in Mindanao. Mimeographed copy. U.P. College of Forestry, College, Laguna.

Overlaps, short cores, core gaps, and short faces are traceable to improper assembly in the gluing process or automatic charger without pre-pressing the assembly. Short cores and short faces may not actually be short of dimension prior to their assembly; this may be due to improper orientations which are aggravated by automatic loading system, particularly, if the assembly has not been pre-pressed. Overlaps and core gaps may be minimized by splicing cores and by proper orientation of random width cores in gluing, and by proper handling of assembly during loading.

The required glue spread should be closely approached. This must be checked at regular intervals at least once in every batch of glue mixture in order to minimize overspreading and underspreading. Lack of spread causes starved joint which promotes delamination. Overspreading produces thick gluelines which weaken the bond; this also results in higher gluelines cost.

Splits and core gaps in plywood are repaired by putting glued inserts and veneer inserts, respectively. Short faces and short backs are corrected by veneer inserts, respectively. Short faces and short backs are corrected by veneers shimming. Other defects, such as pinholes, worm track, live vine streaks, are easily repaired by glue putty.

i. *Efficiency and Production.*

The success of an enterprise particularly in veneer and plywood is governed at least by three principal factors, namely, output, quality of the product, and production cost.

These factors are affected by the skill of the workers and the availability of good equipment or labor saving devices. The study shows that the production per man per 8 man-hour is from 8.0 to 20.0, 3-ply, 1/4" x 4' x 8' plywood based on direct workers. The figures in Table 8 indicate a big difference in the capacity of workers from mill to mill. It is interesting to note that, although, mill D uses manual loading in the hot press, it has, nevertheless the highest per capita production in comparison to mill F which uses automatic loader.

TABLE 8. Production Per Man Per 8-Hour in Veneer and Plywood Mills in Terms of Number of Panels of Plywood or Square Feet of Veneer*

MILLS	PRODUCTION[1] ACTUAL	EMPLOYEES			PRODUCTION PER MAN PER 8-HOUR	
		Direct	Indirect	Total	Direct	Total
A	2,500	180	90	270	11.7	9.3
B	440,000[2]	96	18	114	4,580.0	3,860.0
C	2,000	175	12	187	14.3	10.7
D	5,500	273	27	300	20.0	18.3
E	4,000	230	101	231	17.4	12.1
F	4,000	277	41	318	14.4	12.6
G	2,000	250	50	300	8.0	6.7
H	2,200	199	24	223	11.1	9.9
I	100,000[2]	25	2	27	4,000.0	3,700.0

[1] 3-Ply, 1/4" x 4' x 8' plywood.
[2] Veneer in square feet.
*Villaflor, A. A. 1963. Analytical Study of Manufacturing Operations of Plywood and Veneer Mills in Mindanao. Mimeographed copy. U.P. College of Forestry, College, Laguna.

Table 9 shows that log cost ranks first among the elements of production cost of 1/16" veneer per MSF is 54.5% which is higher by 3.2% to that of plywood. The cost of production in percent for plywood is also shown in Table 9.

TABLE 9. Average Distribution of Cost of Production in Percent of 1/16 x 50 x 100 Inches per MSF and per 3-Ply, 1/4" x 4' x 8' Plywood

SOURCES OF COST	Veneer		Plywood	
Log	54.535		51.325	
Gluelines	—		15.2575	
Labor:	15.800		11.3775	
Direct		14.365		8.0750
Indirect		1.435		2.3025
Other Expenses	29.665		22.4550	
Total	100.00		100.00	

The recovery of 3-ply, 1/4" x 4' x 8' plywood is 40.1% of the log volume as shown in Table 10. These represent the average recovery from sawlogs, export rejects, and a small volume of veneer grades. In this connection, the result of Lee (6) on Philippine mahogany logs which were exported to Korea was 50.09 percent of log volume; the bucking waste was 12.40 percent.

TABLE 10. Recovery and Distributions of Wastes in Percent Incurred in the Production of 3-Ply, 1/4" x 4' x 8' Plywood per Thousand Board Feet of Loss

SOURCES OF LOSSES	MILLS	
	Recovery	Waste
1. Bucking	93.75	6.25
2. Rounding	89.75	4.00
3. Spurring	85.75	4.00
4. Core bolt	72.75	13.00
5. Wet clipping	67.25	5.50
6. Tang. Shrinkage	62.25	5.00
7. Dry Clipping (oversize)	58.70	3.55
8. Dry Clipping (random sizes, open splits, etc.)	54.95	3.75
9. Gluing, Hot pressing and grading	51.70	3.25
10. Trimming Allowance	43.70	8.00
11. Scraping & Sanding Allowance over 0.250 Plywood unsanded thickness	40.10	3.60
12. Grating	40.1	0
AVERAGE IN THE MILLS	40.1	59.9

j. *Availability of Technical Men and Product Research.*

Plywood and veneer mills have grown rapidly, although there has been an absolute dearth of technical men who are equipped with the basic knowledge of the behaviour of wood as a raw material. Right now, a number of the production and supervisory responsibilities are in the hands of men who have no technical background in wood. The adoption of technical measures that may help in the reduction of production cost through higher machine and wood utilization and the improvement of quality of veneer and plywood by minimizing defects resulting from glues, wood and gluing techniques is of paramount importance.

CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

1. Philippine mahogany species including lumbayau and nato are used for rotary-cut faces in plywood.
2. The average production per 8-man hour for the direct and the total employees are 13.8 and 9.6 of 3-ply, 1/4" x 4' x 8' plywood, respectively.
3. Log and labor costs per MSF of 1/16 x 100 inches are 54.5 and 15.8%, respectively, of the cost of production.
4. Log and gluelines cost per 3-ply, 1/4" x 4' x 8' plywood are 51.3 and 15.2%, respectively of the cost of production.

5. The average recovery of 3-ply, 1/4" x 4' x 8' plywood from mixed grades is 40.1% of the log volume without deduction from natural defects.

6. The average export and local grades produced in percent are 77.83 and 22.17%, respectively, using mixed grades of logs. C and Print grades are 27.17 and 26.6%, respectively.

7. There is an acute dearth of technical men who have adequate background in the use of wood as a basic material.

B. Recommendations

Taking into consideration the problems in the mills the objectives of increased wood utilization both in quantity and quality of veneer and plywood recommendations pertinent to the problems and objectives may be worthy of considerations, such as 1) rotary-cutting of thinner faces and backs, e.g. 1/20-inch and less, to obtain greater surface measure from high quality and expensive logs, 2) heating of certain logs to optimum rotary-cutting temperature suitable for faces to obtain smooth surface veneers, 3) debarking and cleaning of veneer volts to reduce machine downtime, 4) study of shrinkage property to obtain the proper clipping allowance, 5) rotary-cutting and drying of species with similar drying and shrinkage property to facilitate clipping to obtain uniform moisture content, 6) control and segregation of veneers with high moisture or waterpockets to minimize blisters and delaminations, 7) use of spliced cores to minimize core laps and core gaps, 8) using pre-pressing in hot press equipped with automatic charged to minimize folds, short faces, cores and back, 9) stop double pressing to minimize warping, 10) closing first the press opening first loaded with panel or panels to minimize precure in hot pressing, 11) checking the glue spread at regular interval to avoid overspreading or underspreading, 12) using extender with low water absorbing capacity to minimize weak bond, 13) evaluation of plywood glue bond for corrective measures, 14) training of workers and attendance in seminars dealing with veneer and plywood, 15) processing of good quality logs, and 16) integration of wood-using industries to utilize wood wastes.

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THE ROLE OF SCIENCE . . .

(*Continued from page* 10)

vancement of forestry science. With this kind of tie-up of those of you engaged in the wood industries and its government forestry agencies, especially with the government forestry educational institution, we expect to have a smoother coordination and a maximum of cooperation between you and us. If this tie-up can be obtained in other countries such as in the United States, why can't it be obtained here?

I know that there are a lot more you can do in the interest of science in forestry development. As a matter of fact, the field of science is unlimited. However, we will not now ask too much of you. It shall be my consolation and it shall be the consolation of many other Filipinos if you, nation builders, will act favorably on the few proposals I have just made if only to put science in its proper place in our forestry development.

Thank you.

FOREST RESOURCES . . .

(*Continued from page* 6)

producers, may continue the downward trend of timber production which started two years ago.

Wood producers are being encouraged to engage more in local manufacture and processing. At the same time, log exportation is being discouraged. The establishment of more bandmills, plywood and veneer mills, pulp and paper mills is expected to maintain the brisk business of the wood-using industries, continue to provide employment to thousands and continue to earn dollars for the country's economy.

CONCLUSION

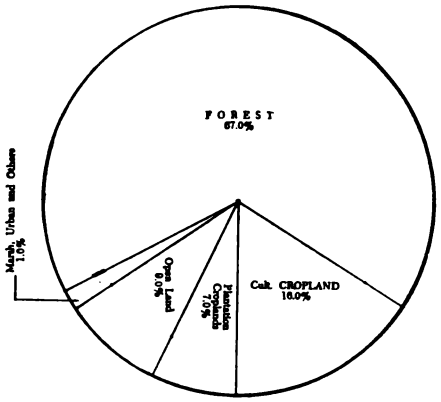
The expected population increase in the coming years is going to exert pressure on all the physical and natural resources of the Philippines and not the least to feel this pressure are the forests. There are already many provinces in the country deficient in forest area today. The threat to the remaining areas still verdant with forests is mounting withe the growing demands for more land and space which a developing country like ours requires.

It is our difficult task to see it that the public forests shall be conserved and wisely utilized. There is still a widespread and prevailing notion that once a virgin forest is logged or cut, it is a wasted forest unless it is replanted with trees. In reality, such a forest, even if carelessly logged, remains as forest and is self-replenishing without planting because of the abundance of reproduction consisting of seedlings, saplings, poles and young trees that may be saved from the operation.

Our problems are many but with the proper support from the executive, legislative and judicial authorities, especially with the continued support and cooperation of the Army authorities in the apprehension of those who destroy or attempt to destroy our forests, the Bureau's program of forest conservation can be a success. The future prosperity, economic well being, and security of our Nation depend on how well we take care of the important replaceable resource - our FORESTS.

(*Continued on page* 33)

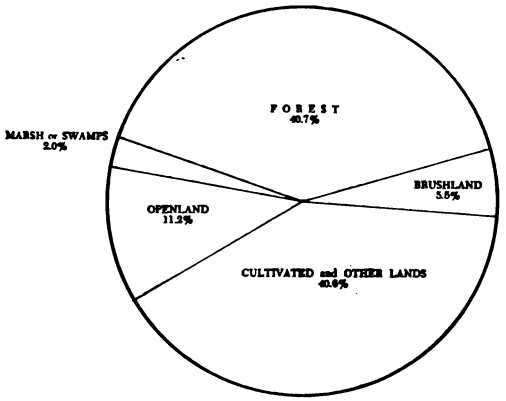
a. LAND USE CHART
MINDANAO, 1963



TOTAL AREA — 9,869,260

Forest	6,638,719	67.0
Cultivated Croplands	1,538,017	16.0
Plantation Croplands	682,783	7.0
Open Lands	874,222	9.0
Marsh & Small Water areas	78,304	0.6
Urban and Others	57,215	0.4
Total	9,869,260	100

b. LAND USE CHART
LUZON & VISAYAS, 1957



TOTAL AREA — 19,590,390 HA.

Forest	7,964,720	40.7
Brushland	1,076,600	5.5
Cultivated & Other Lands	7,944,020	40.6
Open Lands	2,192,590	11.2
Marsh or Swamps	412,460	2.0
Total	19,590,390	100.0

TIMBER PRODUCTION AND VALUE

Year	Cubic Meters	Equivalent in Board Feet	Value
1956-1957	4,631,208.91	1,963,632,577	₱157,090,000.00
1957-1958	4,825,743.15	2,047,115,099	163,769,200.00
1958-1959	5,451,636.41	2,311,493,838	184,919,440.00
1959-1960	6,314,760.56	2,677,448,477	240,961,363.00
1960-1961	6,596,934.66	2,796,898,297	251,810,820.00
1961-1962	6,771,780,63	2,871,234,991	258,411,124.00
1961-1963	7,668,078.14	3,251,265,131	292,613,850.00
1963-1964	6,517,426.13	2,763,388,679	358,101,327.00
1964-1965	6,175,141.70	2,618,260,081	471,286,814.00

LOG PRODUCTION, EXPORT AND VALUE EXPORT PRICES

Fiscal Year	Production (Bd. Ft.)	Export Volume (Bd. Ft.)	Export Value (Pesos)	Per Cent of Production
1955-1956	1,823,766,515	633,058,119	66,811,398	34.7
1956-1957	1,963,632,577	823,261,021	79,809,265	41.9
1957-1958	2,047,115,099	890,676,065	80,891,145	43.5
1958-1959	2,311,493,838	1,283,349,547	107,465,588	55.5
1959-1960	2,677,448,477	1,443,287,201	150,331,476	53.9
1960-1961	2,796,898,297	1,283,880,480	141,820,172	45.9
1961-1962	2,871,234,991	1,589,612,875	215,797,794	55.3
1962-1963	3,251,265,131	1,947,637,609	429,628,321	59.9
1963-1964	2,763,388,679	1,926,022,189	429,384,481	69.6
1964-1965	2,618,260,081	1,478,338,075	319,570,095	56.4

PHILIPPINE FOREST RESOURCES . . .

(*Continued from page* 20)

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An Administrative Study of Public Outdoor Recreational Management in the United States Selected for Possible Application to Philippine Conditions*

by
EDILBERTO Z. CAJUCOM

INTRODUCTION

The main objective of this study is to provide the author, who is on educational leave from his forestry position in the Philippines, with an understanding of pertinent recreational trends and administrative necessities in certain American public parks and forests.

The study concerns the major managerial responsibilities of certain selected public recreational areas as administered by the Forest Service and by the National Park Service of the United States, and by a State recreational agency. The variety of specific recreational areas was selected to provide the author with deeper understanding of outdoor recreational management under conditions possibly applicable in his native Philippines. The author had opportunity for on-the-ground study and analysis of problems, administrative procedures, and management methods or innovations that may be fully or partially adapted to meet the needs of the Philippine National Park System. Consideration of the feasibility of such adaptation gives recognition to the similarities or differences in cultural, social, economic, and political forces within the two countries. This study describes the managerial situation to provide technical background and other facts for the author, from which certain conclusions are reached and tentative recommendations are made.

The development of forest recreation in the Philippines is only just beginning. The nation maintains 39 national parks, 38 of which are under the administration of a Parks and Wildlife Office in the Department of Agriculture and Natural Resources. The remaining park[1] is under the general administration of the Board of Regents of the University of the Philippines, through the College of Forestry. The recreational potential of these areas has been developed to only a very limited extent to date, due largely to the unavailability of funds and a dearth of personnel with specialized knowledge in the field of forest recreation and park administration.

It is anticipated that this study will serve somewhat as a guide and orientation for beginning personnel in the Philippines in the field of forest recreation and park administration or management, while also assisting in creating a broader awareness of administrative necessities by those who make the decisions. Some major functions of the American agencies are discussed to relate reasons for their differences or similarities in recrea-

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[1] This park was known to the writer as Makiling National Park during the preparation of this thesis. Subsequently, it was disestablished as a national park by legislation and is still referred elsewhere in this paper as Makiling National Park.

tional objectives. Recreational areas included in the study are the Great Smoky Mountains National Park, Blue Ridge Parkway, Yorktown and Jamestown colonial historical sites, and Cape Hatteras National Seashore Recreational Area of the U.S. National Park Service; the Pisgah National Forest of the U.S. Forest Service; and the Green Lakes State Park of Central New York State Park Commission.

DISCUSSION OF RESULTS AND CONCLUSIONS

Although most of the administrative recreational management policies of both the United States and the Philippines are similar, these two countries differ significantly in the social, economic, and political structures. The United States is a highly industrialized and socially developed nation, whereas the Philippines is pre-eminently agricultural with a newly developing economy. Outdoor recreation in the United States is regarded by many as a "necessity" which may be considered in the Philippines as a "luxury or comfort" which is not essential. Many factors are therefore involved in considering the possible application or adaptation of some recreational management procedures and practices in the United States which may suit Philippine conditions. The probable adaptation of some United States recreational management methods and practices to Philippine conditions will not be based on economic capability but rather on its geographical, climatic, and social adaptability. This study is concerned with what the country can adapt to and is able to pursue at present, but even more, it deals with aspirations for the years to come.

In the United States, for instance, administrative policies or park rules and regulations are fully enforced or carried out to the letter. Any forest or park violators are apprehended and tried. The necessary penalty is meted out in case of conviction according to the gravity of the offense. This in a way deters future commission of violations of park or forest laws. In the Philippines, on the other hand, park or forest laws concerning the proper management and protection for the forest or park may be flawless on paper but poor in implementation. One serious violation, specifically in the park or forest areas, is the "kaingin-making" or "squatting," as previously discussed. Unscrupulous people find it possible to enter any public forest reserves or national parks and start clearing portions of the forest for cultivation purposes, without apparent fear of reprimand or conviction. These people can hardly avoid knowing that clearing public forest is illegal practices. What then is the reason behind it? Political protection or intervention is the more common cause of lack of law enforcement. Not infrequently, politicians will fight valiantly for the acquittal of the accused park or forest violators, or in the case of conviction, for the meting out of lighter penalties, because the politically elected officials feel that their official existence depends upon the votes of the kaingineros and/or squatters. Actually, in terms of equitable standards, one might question the basic right of such irresponsible property-wasters to have any voice or vote in matters of national resource policy. In the United States, politicians do not materially interfere with the normal legal professional functions of the National Park Service, Forest Service, or other forestry agencies operating in accord with the law. Duly qualified authorities or personnel should be given more autonomy and power in the discharge of their duties and responsibilities, without partisan political restraint.

A somewhat related but secondary question is that of decentralized administration. Decentralization can either be administrative or geographical, or both. In this study, administrative decentralization would mean "the minimization of decision making at the highest, central point of authority and the maximization of the delegation of authority and responsibility in the making of decisions to lower levels of management." In accord

with the political tone of the nation, most of the government offices in the Philippines operated on a highly centralized basis. This includes, of course, the Philippine Parks and Wildlife Office. The reason why most government offices are highly centralized is well explained by Heady, who puts it this way:

> The Centralist tradition is just as strong in the relationships of central government department headquarters in Manila, and the department of offices in the field. The counterpart of the Centralist tendencies is the reluctance of the typical Filipino civil servant to accept responsibility which can be evaded. This means "passing the buck" upward and of course contributes to Centralism. The alternative is to try to fend off the need for any decision at all, and this often means a failure to meet the legitimate demands of citizens. Subordinates are more subservient to superiors in the Philippines and this leads to hesitation in taking action without expressed authorization if it might possibly bring a reprimand from the boss. A feeling of inadequacy to cope with complex and unruly problems must also influence many civil servants who lack technical competence (Heady, 1957).

Such a situation is ripe for political manipulation. Some of the reasons advanced by Heady are still existent, though to a lessening degree as technically trained men increase in government offices. Filipinos may well be willing to accept or assume responsibility provided they are given requisite authority. Centralization would seem to be a very disadvantageous and inefficient system of governmental management in a divergent and geographically dispersed nation such as the Philippines. Backlogs or bottlenecks are created in the Central Office and red tape is usually the adverse consequence. The decentralized form of both the administrative and geographical government practiced by the U.S. Forest Service and the U.S. National Park Service offers obvious advantages if properly adapted to Philippine conditions. A reasonable degree of local responsibility is essential to Philippine conditions if efficiency and intensity of recreational management is desired. In a decentralized park agency, only matters which involve policy change or major administrative modifications are referred to the Central Office. Other administrative and recreational work is executed or discharged by regional or local park offices who are prepared to face up to the consequences of their own decisions.

At present, the Philippine National Park Service is poorly staffed. Lack of funds and technically trained personnel are great deterrents to national park progress. For an office to function more efficiently, employment of the professional men for the right job should be encouraged. This is carefully observed in all forest and park agencies in the United States at both federal and state levels, where its technical employees have to be qualified civil service eligibles in their respective fields of specialization. In the Philippine National Park Service, only a few technical men such as engineers, architects, foresters and naturalists make up the professional staff. The great majority of employees are non-technical. If the modern concept or recreational management is to be attained, then modern procedures and practices as used by the park and forest recreational agencies in the United States, which is considered a pioneer in park management, should be considered seriously and adapted to the needs of Philippine park management. The professional landscape architect may well be a primary need in the Philippines. Landscape architecture training is geared to planning and designing of recreational facilities in varied types of outdoor recreational settings. The landscape architect's job therefore fits into national park work, perhaps more than any other professionally trained man in recreational management. A few Filipino architects are available but are lucratively engaged in private practice. The national park of the Philippines

might as well accept the responsibility, therefore, of hiring a landscape architect if modern design of recreational facilities is to be achieved. Landscape architects are commonly employed in considerable numbers by the forest and park agencies recreational management. The lack of training and interpretive materials and park publications for free distribution to park visitors and other interested groups is a hindrance to popular park recognition in the Philippines. The use of "dioramas" in Jamestown and earthwork reconstruction of the battleground in Yorktown, Virginia, are appreciable interpretive American ideas that will be useful in the Philippines. Bataan and Corregidor where the heavy fighting took place during the Second World War are examples of historic places in the Philippines where interpretive features could play a major role. Corregidor is already declared an international shrine. A huge international recreational center will be developed jointly by the United States and Philippine governments in honor of the unknown American and Filipino soldiers who gave their lives there in action against the Japanese forces. Interpretive programs have a long way to go in Philippine park improvement and nationwide recognition.

In the over-all appraisal of the outdoor recreational impressions acquired by the author in the study of specific recreational areas of the U.S. National Park Service, U.S. Forest Service, and state park agencies, some recreational methods and practices appear to be well suited to adaptation in the Philippines over a period of time as it becomes economically possible to do so. Others need long planning and consideration. For example, construction of a parkway similar to the Blue Ridge Parkway requires thorough study and justification. This involves a large outlay of money in road construction and exclusive use for leisurely travel. This would not be practicable in the Philippines at the present time. However, it might become feasible if so located that commercial vehicles could use it economically without defeating its recreational objectives. Development of historical areas like those done in Jamestown and Yorktown, Virginia, is being undertaken in the Philippines, though less elaborate in its interpretive presentation. Aside from a few seashore areas under the present administration of the Philippine National Park Service, many seacoast areas are publicly owned and offer much opportunity for development to serve recreational purposes such as the Cape Hatteras National Seashore Recreational Area. In the United States, one present problem is the conversion or designation of forest lands to wilderness or wild areas. Such areas are characterized by the absence of roads and man-made structures such as stores, lodges, or summer homes. They are accessible by trails and are removed as completely as possible from the influences of civilization. In contrast, the major problem in the Philippines is how to make park areas more accessible to the people. Most of the park areas are characterized by thick undergrowth and virgin timber stands. Since recreational financing is too meager to warrant large scale park improvement and development, limited timber exploitation should be allowed on forest areas under proper controls. The purpose is to help the park in the construction of roads done by the timber licensee. However, the survey and road construction should be carefully specified by park engineers. Timber exploitation should only be allowed on a highly selective basis under the strict supervision of park personnel. The selective cutting or special treatment done in reserved recreational areas of the North Carolina National Forest can be advantageously adapted to some isolated Philippine National Parks.

The operation of a park similar to the U.S. state park system does not seem practicable in the Philippines at present. Local revenue or income varies significantly from province to province. Population is unevenly distributed throughout the country. As was previously discussed, Luzon is the most populated and largest island. Provinces in Luzon

have very much higher income generally than those either in the Visayas or Mindanao. It is obvious then that the operation of a park on a state level basis would only be advantageous to high income provinces. Further, technically trained park personnel are lacking to run the system. A national park system, therefore, as a "starter" would serve the purpose of park appreciation and recognition on a nationwide scale. Perhaps later as people began to participate actively in outdoor life, and the need for more recreational areas become imperative, then a state park system could be considered. A state or provincial park system should serve the limited financial resources of the average family for recreation better than a national system. National parks are remote from populated centers in general. The geographical subdivisions of the country into several islands make land transportation impracticable for out-of-state visitors. The use of water transportation is expensive and tiresome. Since a greater percentage of the population falls in the lower income strata, then a less expensive means of recreational pursuit should be developed. A state park system similar to that of the United States would serve the purpose. However, the national parks should be primarily developed as a national assets for all, even though used mostly by high income local visitors as well as foreign tourists.

The rate of improvement, development, and expansion of the Philippine National Park system will depend heavily upon the rate of national appreciation and recognition of the tangible or direct benefits achieved in the form of the relief from the stresses and strains of modern life by periods of physical and mental relaxation are important.

> Outdoor recreation also has cultural values that are essential to the health of the nation. It is a part of the educational process that strengthens men's minds as well as their bodies, that broadens their understanding of the laws of nature; that fold beauties; and that fortifies man's most sharpens their appreciation of its maniprecious possession—the spirit which gives life its meaning (ORRRC Study, Final Report, 1962).

Tangible or indirect benefits in the development of business activities in the areas within and adjacent to recreational areas are solid human values too. Generation of economic goods and services in terms of recreational money expended in a locality is a vital factor in the economic development and stability of local areas in particular and that of the whole country in general. These are some of the vital points to be considered in reaching administrative and economic decisions in the justification of national recreational pursuits. If water is needed to quench thirst, food to appease hunger, then outdoor recreation is a necessity for mental uplift and psychological and physical relief.

Careful examination makes it apparent that many of the proven recreational management administrative methods and practices used in the United States, both at the federal and the state level, can be adapted to Philippine conditions with only minor modifications in its present organizational setup and recreational administrative policies. Employment of technical personnel whose training is specifically geared to park work should be strictly adhered to, to attain park objectives more scientifically and successfully. Some of the antiquated laws should either be repealed, modified, or updated to suit the present social, economic, and political situation of the country. These and other necessary remedial measures should be seriously undertaken immediately if national parks and related outdoor recreational areas in the Philippines are to be improved and modernized.

The Philippines is a young nation with still abundant public forest lands endowed with recreational potentials. Some of its virgin forests are fortunately still untapped. The logging industry ranks third in the nation's economy. However, with the present rate of

forest exploitation and destruction, the nation may soon be facing a critical situation of forest denudation. It has been observed repeatedly by foreign forestry experts that "the Philippines is destroying her forest faster than any country in the world." This is a problem that needs serious attention and urgent solution.

Although outdoor recreation at present has not yet played a major role in the Filipino way of life, now is the proper time to "reserve" and "preserve" whatever recreational resources the country still has in anticipation of imminent future recreational needs. For the most part, recreational resources are nonrenewable. Once misused and abused, they are gone forever. As the nation approaches the prime of economic development, people will become financially able to engage in outdoor recreation more intensively and fruitfully. Transportation systems will soon have been developed and increased mobility is assured. Recreational areas which have long been idle will be put to intensive use. More facilities will be needed. On the other hand, the forest will be exploited at a much faster rate for local processing and consumption as more wood-using industries come into existence. Log exportation will further dwindle its forest base and the present problem of deforestation will be aggravated.

At present, in the United States, acquisition of lands for recreational purposes (especially in the state and local level) is difficult and involves a sizeable outlay of money. Most of the lands are privately owned. In most cases recreational lands are purchased directly from private owners. Others have to be acquired through eminent domain, negotiated purchase, easements, leases or partial rights. As outdoor recreation has brought an impact throughout the whole nation, each state has doubled its efforts in acquiring more recreational lands. New York State, for instance, has recently approved a huge $75,000,000 bond issue (N.Y.S. Conservation Department, 1960) and later augmented this with $25,000,000 for the same purpose. Under this land acquisition program, $35,000,000 of the amount of $75,000,000 will be used for state purposes. ($20,000,000 for state parks alone) and the remaining $40,000,000 for cities, counties, and towns for local park and recreation areas. The amount will be matched on a 75 per cent state-25 percent local basis. The bond issue will be amortized from the annual revenues derived from state parks and other recreational facilities. Comparatively, this huge amount for recreational land acquisiton alone in the State of New York is more than the total allocation of "Operation Outdoors" (recreation development program of the U.S. Forest Service, 1958-1962) which incurred $85,000,000 (U.S. Department of Agriculture, 1958) within a five-year span for administration, maintenance, modernization, and capital investment in all recreational areas within the whole national forest system. This clearly shows the tremendous amount involved in recreational land acquisition alone in order to cope with the upsurge of recreational needs.

The Philippines is not yet faced with a recreational land acquisition problem. At present the greater percentage of forest lands is publicly-owned. But as the population grows and the people become more financially and economically self-sufficient, most of these public lands (especially forest lands) will shift into private hands under existing legislative provisions. This is the time when scarcity of recreational lands will be felt. It would be difficult for the Philippine government to buy lands just for recreational purposes, as the United States is doing, now or in the foreseeable future. Prices of lands are spiralling as the country achieves economic intensification. Therefore, preservation of forest lands with recreational potentials should be the main concern of the government now. This anticipated, cognizant action will be a great advantage and beneficial to the whole nation. It will mean conservation for the forest for the present generation and pre-

servation of scenic areas for the use and enjoyment of future generations.

At present the Philippine National Park Service is the only government entity that manages extensive parks and related areas for recreational purposes. It administers about 228,184 hectares (roughly 571,000 acres) of forest parks and related areas as national parks and about 65,000 hectares (162,000 acres) of game refugees and bird sanctuaries. This whole park area represents roughly only 2 percent of the total forest area (13.2 million hectares) (Lansigan, 1959) administered by the Philippine Forest Service. This percentage of park area is very much smaller compared to the ratio of the U.S. national parks and related areas (26 million acres) (U.S. Bureau of Census, 1963) with that of the Forest Service (186 million acres) amounting to 14 percent. The U.S. Forest Service provides recreational areas within the national forest system while the Philippine Forest Service does not. This does not include similar areas of the various other United States federal, state, and local agencies that are directly or indirectly engaged in recreational pursuits. The present recreational area of the Philippines should be increased in proportion to its population growth.

To remedy the situation, the setting aside of portions of its forest with recreational potentials is worth considering by the Philippine forest Service. Some of the "Forest Reserves" administered by the Philippine Forest Service, like those of the United States national forests, contain unique virgin stands and unusual scenic values which should be preserved for use by the park. At present the Forestry Bureau manages and exploits its forest resources on a sustained yield basis through the "selective logging" method. Timber extraction is either granted on a short-term or long-term license agreement in the form of a timber concession. The forest holdings usually involve from a few hundred hectares to over 100,000 hectares in extent. It usually takes 20 to 30 years to exhaust the usable timber in a big concession. This forest concession is exploited for its commercial value without regard to its recreational value. Large acreages of forest areas with recreational potentials have been and are being destroyed and commercially exploited at a much faster rate at the present than ever before.

Recreation is not included within the broad policy of the present management plan of the Service. Its inclusion in the set up is worth studying. Delineation of potential recreational lands within the forest reserves could be done in connection with the nation's over-all survey of existing forest resources. Areas declared as potential recreational lands do not necessarily mean complete exclusion from timber exploitation. But exploitation should be limited to the minimum consistent with maintenance of recreational values at a suitable level of quality. Plan and design of logging roads in this case could be developed by the concessioner's staff, subject to the approval of the Service. Strict compliance of the conditions specified would depend heavily on the part of the concessioner. The service itself is undermanned, and probably could not greatly tighten its supervision over about 1,600 logging operators having an approximate concession area of 5.0 million hectares widely dispersed throughout the island (Lansigan, 1959). Approval for logging roads could be complied with by the concessioner without serious handicap since only a small portion of his large concession is operated in any one year, and only a small part of this is likely to have recreational potentials sufficient to be set aside. This potential recreational area would be determined by the Service's staff, in close collaboration with the Park Service personnel who are directly qualified on this field.

This recreation drive has to be initiated and intensified to arouse recreation and conservation consciousness on the Filipino people. It is a project of national significance

which would largely contribute to the well-being of the nation. Implementation of the system would be a major step forward in a coordinated national recreation effort. It would have to "carry its own torch" for national recognition. Lack of recreation personnel and funds would at first handicap the recognition of forest recreational needs, but this would undoubtedly be forthcoming later as outdoor recreation gained prominence. What is needed at present is a "starter" to break the barrier of a long-range recreational objective. Its primary concern is to assure the supply of potential recreational lands for future development. Its reservation would also mean erosion control, protection of watershed areas, and other protective influences while awaiting future development. This is a "must" for the Philippines since the country is plagued with socio-economic ills such as "kaingin-making" and "squatting" in public parks and forests. Prompt action is needed to prevent the irresponsible spoilation or extinction of this irreplaceable heritage as a result of the present activities. It is a very real race between forest destruction and preservation.

The United States started its conservation movement some sixty years ago only after realizing that the forests were not really "inexhaustible." The conservation campaign has been so intensive that today practically every piece of land is considered for its proper future utility. Recreation has played a major role in its economy. Recreation, as an industry, ranks third in the United States, exceeded only by manufacturing and agriculture (U.S.D.A., Forest Service. 1958). Most, if not all of its public lands and forest-managing agencies in the federal, state, and local level are directly or indirectly providing recreational opportunities to the public. "Pub lic opinion" in the United States is strong. Most of the recreational lands have been acquired through the citizens' own initiative and effort in bringing needs to the responsible persons for action. This is in contrast to the Philippines. The government takes the initiative of bringing the parks to the people to be appreciated, used, and enjoyed. This attitude of the Filipino people on recreational pursuits may well need to change if they want more action from their government.

What appears to be most needed at present in the Philippines is to develop a good quality, well-planned and well-designed recreational area based on the modern recreational methods and practices used in some economically advanced countries like the United States. This would serve as a model for all people to see, use, enjoy, and at the time achieve recreational experiences through actual outdoor participation. The Makiling National Park under the administration of the University of the Philippines would seem to be the most feasible and suitable site to carry out this idea. This park is the most visited and most accessible national park at present in Luzon. It has also the distinction of being the first national park ever proclaimed as such. People of many different walks of life come to visit this place for educational and recreational purposes. Congressmen, senators, and different political figures are visitors of the area. University students from Manila and neighboring cities and civic organization groups also make their educational and recreational trips to this place. This could prove to be successful demonstration area to create recreation and conservation consciousness among these intellectual park visitors. At present the park has limited, disorganized recreational facilities which do not produce recreational satisfaction. The plan, design, and construction of recreational facilities are obsolete and substandard compared with the present modern methods and practices. A thorough renewal and replanning of this area, based on the latest concepts of modern design, should definitely change the recreational atmosphere to which people have been so long exposed.

The development of a modern recreational area and facilities in this place could serve two major purposes. One is as a train-

ing laboratory for forestry students who plan to seek employment with the Park Service. The other is that it would serve as a model demonstration area for the whole national park system in the Philippines. Landscape architects and other recreational specialists would have to take charge of this pioneering undertaking. Successful park management this place should spur the development and improvement of the present park system and possibly the creation of new ones as outdoor recreation gains more nationwide recognition.

There is no question as to the importance of outdoor recreation. Internationally and nationally, it is well recognized and accepted. It is anticipated, however, that unless cooperation and coordinated action among different forest and land-management agencies are solicited in recreational pursuits, outdoor recreation will have a long way to go for nationwide recognition. The United States has not achieved its present pioneering position in outdoor recreation overnight. Years of advocating the importance of forest conservation and preservation of scenic values were responsible for the realization of its dreams. "This is a civilization painfully and only recently carved in conflict with the forces of nature—farms from unbroken prairie and cities from wilderness (ORRRC, Study, Final Report, 1962).

RECOMMENDATIONS

Based on the observations acquired by the analyst in this study of some public parks and recreational areas in the United States, the following are recommended as recreational management procedures and practices which may be advantageously adapted to Philippine conditions now or in the future:

1. The status or boundaries of national parks should not be changed except for a compelling reason and then only by congressional action, as in the case of the United States. When only the authority of presidential proclamation is needed endangers the permanency of the parks through political manipulation by "pressure groups." The national welfare and interest should take priority in public park management over and above self-interest or partisanship of individuals. Political influence should be confined to representative policy-making functions and removed from the administrative management of government operations. Park managers warrant more autonomy in the discharge of their duties, without political pressures or interference.
2. The general objective and guiding principle of public park management both in the United States and the Philippines is "to protect and conserve its scenery, natural and historic objects and wildlife therein for the benefit and enjoyment of present and future generations." Therefore, it follows that timber exploitation and minor forest products utilization should be held to a minimum or eliminated to avoid possible spoilation of the beauty and rare natural features of these parks which are not replaceable. Interpretive programs should be expanded and effective tools for interpretation should be adopted like the methods used by the U.S. National Parks Service to make the people more understand and appreciate nature and outdoor life. For instance pictorial displays of interesting national park features and the use of "dioramas" which is the latest innovation adopted by the National Park Service which will greatly add to recreational experience of park visitors. Modern museum exhibits serve to a recreational area what a display window is to a department store. They inform and stimulate curiosity and interest in the area. Guided and self-guided tours are also helpful.
3. The Parks and Wildlife Office which administers all national parks of the

Philippines should be provided with funds sufficient to develop and improve park areas, especially in this infant stage of recreational development. This involves equipping the office with adequate technically-trained personnel specifically geared to natural phenomenon interpretation and administration work.

4. The Philippine national park system lacks diversified and colorful publications or brochures describing or portraying in detail the story of each park and the interesting features found therein which are worth seeing or visiting. In the United States, the National Park Service, Forest Service, and State Park agencies have adequate publications on individual parks, as well as for the whole recreational opportunity. These are distributed free to people upon request. Except for tourist guide books, published by a few commercial agencies, the Philippine parks have not been given publication coverage. It appears certain that if given more publicity they would attract larger numbers of foreign and local visitors. Tourism is one of the significant sources of economic growth in terms of goods and services generated as a result of money spent by recreationists in a country, and therefore it should be encouraged through development of more interest in recreational and scenic resources.

5. The hiring of landscape architects whose training is concentrated upon planning and designing of recreational facilities. These professionals understand the principles and methods necessary to successful outdoor recreational development more than do others who are employed in resource management. The hiring of landscape architects would seem to be of great help in the designs of modern public recreational facilities, consistent with economic development, that are suited to natural environment.

6. Establishment or construction of visitor centers. It should be of great advantage to the Philippine National Park system if visitor centers could be installed, particularly in the larger parks for people to obtain information and see pictorial displays of geologic, archeologic, and historic interest of the park area. Movie exhibitions or illustrated nature talks, such as those conducted by the U.S. National Park Service in visitor centers, could be adopted to make Philippine park visits more entertaining and worthwhile. At present, the Philippine Parks and Wildlife Office conducts audio-visual exhibitions only on important occasions, and only to a limited extent, due to lack of adequate equipment and documentary films about national sciences.

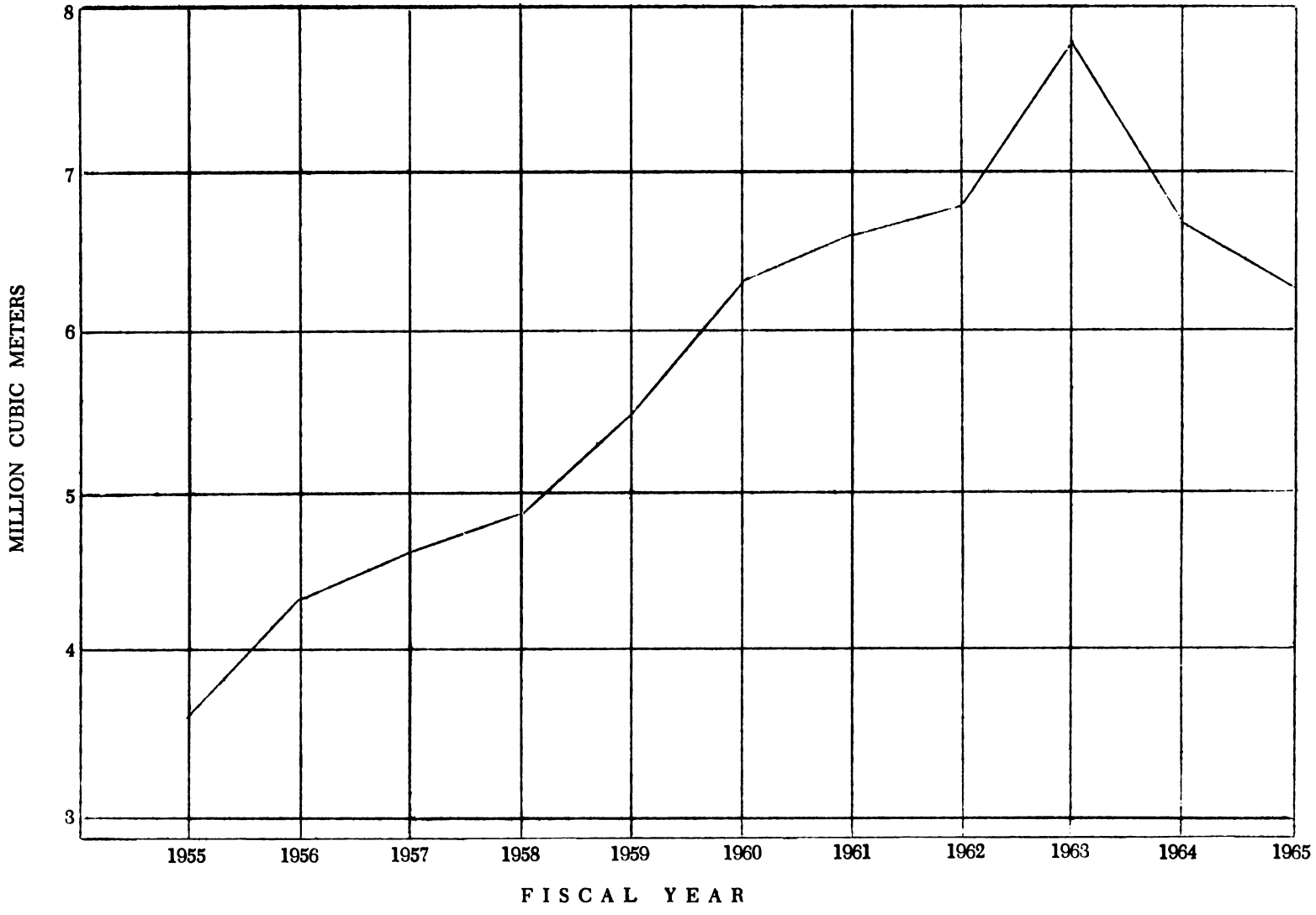
7. The hiring of historians and park naturalists to explain to park visitors the origin, existence or importance of natural features found in such park. The national parks in the Philippines are still short of men with technical training in the natural park phenomena. Even in big and frequently visited national parks, naturalists are either lacking or in some cases not actually trained in this particular work. There is need to give more attention in disseminating factual information to park visitors for their acquaintance and enlightenment of the natural environment. It is only in closer understanding of nature that people begin to appreciate and enjoy the natural wonders.

8. The Philippine Bureau of Forestry, like the U.S. Forest Service which administers and manages large tracts of public forest areas on a "multiple use" basis, should spare potential recreation-

(*Continued on page* 48)

(*Continued from page* 33)

TIMBER PRODUCTION, PHILIPPINES
1955 TO 1965



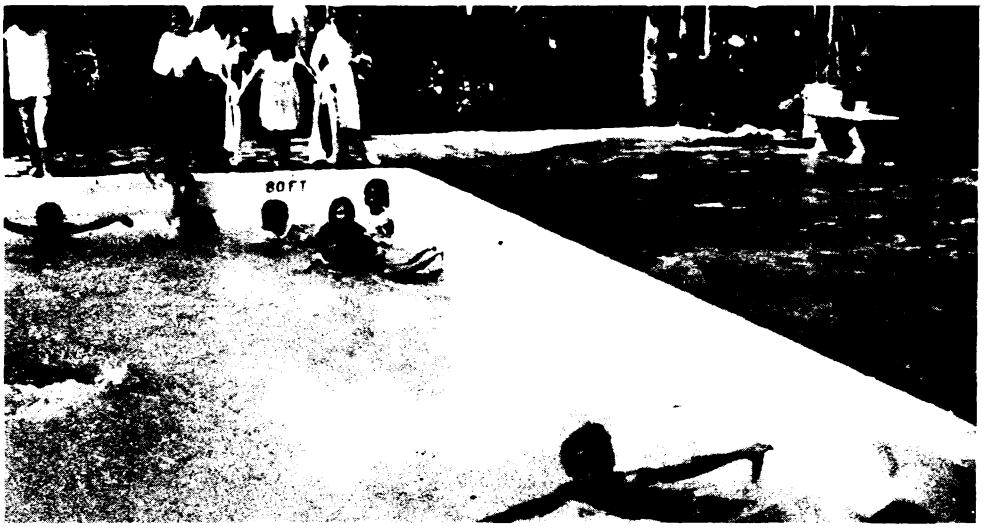
OUTDOOR RECREATIONAL MANAGEMENT

Priceless natural heritage once misused and abused can never be restored. It is therefore our bounden duty to protect and preserve what we still have today.

An upsurge of outdoor recreation participation in the Filipino way of life is being felt nationwide.

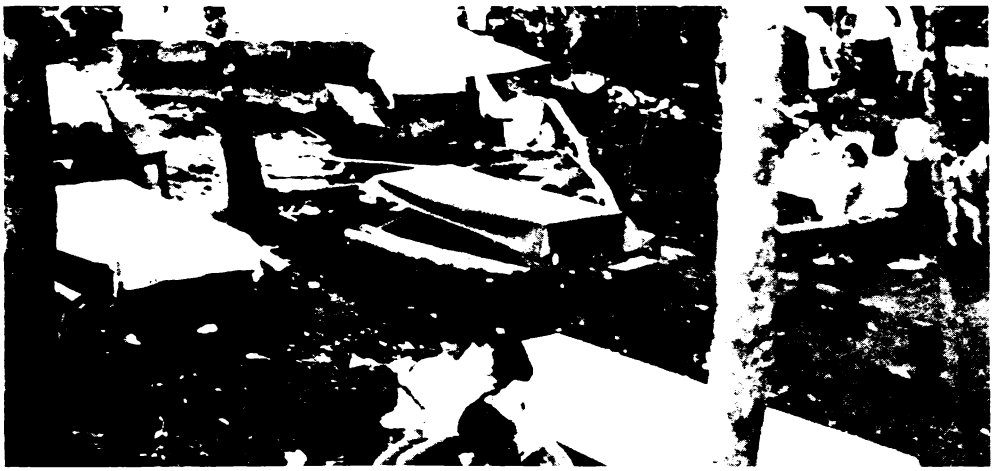
Due to limited public outdoor recreational areas and facilities a bumper-to-bumper situation such as this is a common sight in the Makiling Forest (formerly a national park) during the summer months.

Camping is very popular in economically advanced countries like the United States. A "trailer house" such as this may find its use in the Philippines soon as she gains economic intensification.



Bathing or swimming is the most sought activity by the pleasure-seekers. Hence, the provision of a swimming pool is a "must" in an ideal recreational area.

Where the excusionists are, the vendors follow. Vendors stalls should be uniform and properly designed. Stalls above are unsightly and fire hazards.



Adequate, durable, and well-designed picnic tables should be strategically orderly installed in a picnic area for the use and enjoyment of the forest visitors. Ill-designed, irregular, and light picnic tables such as shown above are not to be encouraged.

Interpretive and informative signboards should be placed in strategic places to guide and instruct the excusionists.

Students enjoy holding outdoor competitions in the Makiling National Park as part of forestry day and moving-up day celebrations.

Timber Research, Engineering and Industry Development

by
F. M. LAURICIO[1]

INTRODUCTION

There are few industries, if any, that do not used wood or timber in one form or another. Because of this the timber industry becomes economically important to our country. Of the legions of users, the construction field has, perhaps, the most to offer to the growing timber industry. This is because timber is a basic engineering raw material. A major part of the timber supply, whether sawn or in its round form, is used in situations where strength is of prime consideration.

Early wood construction was crude and mostly based on the trial-and-error method. It was not until the development of engineering during the latter half of the 18th century that timber utilization in structures graduated from the largely empirical approach of early constructions to one based on sound engineering principles.

This academic approach to its efficient utilization as a construction material has been further fortified during the past half century with the emergence of laboratories primarily charged with the task of making wood as a reliable material of construction. The U.S. Forest Products Laboratory, for instance, was established in Madison, Wisconsin, in 1910; the one in Princes Risborough, England in 1927, and at about the same time, the Division of Forest Products of the Commonwealth Scientific and Industrial Research Organization of Australia also came into being.

Paradoxically, wood research engineering in the Philippines started at about the same time, but did not receive much impetus to equal the achievements of these three giants of the field. Many countries now have established their own laboratories—including those that are, normally, wood importing — and even expanded their field of operations beyond the scope of the organizers of the early laboratories. Since their establishment, these laboratories have been accummulating vast amounts of information on the properties of timber in general and those of individual species in particular. The collective information thus resulted in understanding better the structural and related qualities of timber. And with the aid of sound engineering principles, timber has been used more and more efficiently and economically in structures, and the timber industry, in turn, has grown from a mere backyard hobby to a profitable business enterprise.

MORE RESEARCH AND NEW DEVELOPMENT

The main problems, however, in the use of sawn timber in structures are: (1) the wide variability in its strength and related properties principally due to the influence of a variety of natural causes beyond control in products of nature; (2) its severe limitations in size and span which are entirely dependent on tree size; and (3) its apparent vulnerability to the elements and biological agents. Because of these, timber gave way to steel and concrete in large scale structural jobs, although it is preferred for a variety of lightweight construction.

The economic pressures that were brought about and made to bear on most countries during World Wars I and II, stirred the

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imagination of the adherents of timber, most particularly engineers and scientists. In countries like the United States, Canada, England, Australia and the Scandinavians, for example, efforts were directed to more researches, resulting in outstanding progress achieved in the fields of joints and fastenings for timber and various other factors associated with timber structures.

These led to the development of improved or new jointing media and jointing techniques, like the split-ring and shear plate connectors for large structures, and the toothed plate connectors for relatively light structures. These developments permitted the building of remarkedly large timber structures and spared steel for other uses that contributed more to the war efforts.

Considerable research on related lines had also been conducted, bringing about the formulation of glues for wood laminated structures suitable to various fabrication techniques and exposure conditions in service, as well as the development of the glued laminated timber industry.

With the availability of glues for laminated structures, it became possible to design joints capable of developing 100 percent the strength of timber and the building of large beams, arches and other structural components in sizes and spans far exceeding the maximum possible with ordinary solid wood. The glued laminated timber industry, though originally invented in Germany, received much impetus only after considerable researches were conducted by the U.S. Forest Products Laboratory in Madison. Many laminating plants and related engineering industries have been established in the United States and similar ones were put up in various countries. Glued laminated timber beams and arches have found acceptance as material in building large auditoriums, churches and other structures of complex shapes with spans up to over 300 feet.

Research was also carried out to develop structural plywood, which is now being used in stressed-skin construction and in the fabrication of very light-weight, built-up members for long-span structures.

Considerable research has also brought about the formulation of wood preservatives and fire retardant chemicals to increase durability to offset much of the causes for people's prejudice on the use of wood in large structures.

More recent achievements of timber technology are reflected in the development of the shell roof and folded plate constructions. These types of construction are gaining acceptance not only for aesthetic reasons due mainly to their novelty of form, but also to their light weight and low cost.

By and large, the ever growing awareness of the unlimited potentialities of timber for modern engineering structures has encouraged the intensification of timber research at the various laboratories of the world. These researches continually provide the tools of utilization, broadening knowledge in the field of timber technology and industry development.

STATUS IN THE PHILIPPINES

While the debate is still going—on how much of a timber country we are, it is obvious that the Philippines as a nation has not yet taken too much advantage of the advancements in timber engineering technology.

We have a good number of large lumber mills and plywood plants in our country, but still it appears that quality lumber and plywood are only good for the foreign market, while the domestic market has but to contend with the "rejects" after export selection. Thus, we have yet to develop a structural grade of plywood.

We now have one laminating plant in the country, but it is still struggling through the same malady of many a pioneering venture—poor quality control and inadequate plant management. We also have two large adhesive recombining plants in the country.

There has been a big increase in the use of creosoted poles and preservative-treated lumber for the last five years or so, and a healthy tendency for their preference, respectively, in concrete buildings and residences is very obvious nowadays.

The only timber fasteners manufactured in the country are nails and bolts. We still have to see our architects and engineers work out a true shell or folded plate structure out of wood.

Attempts have been made to pre-stress wood, but a number of fundamental properties of wood have still to be investigated for good construction design.

At any rate, proven Filipino ingenuity will eventually mature well enough to utilize these advancements in wood engineering. This mature attitude towards development calls for keener interest in education and research in technology. These qualities are but expected of the leaders of the wood industry.

FPRI RESEARCH STUDIES

The efficient structural utilization of timber starts with research—the determination of its strength and physical properties and the effect of factors related to such properties. Incidentally, the Forest Products Research Institute plays a major role in further advancing the development of timber enginering in this country. Its share is to help provide the country's need for research information through the publication of the results of its investigation as well as to provide expert guidance to the wood industry.

The Institute, with only nine years since its establishment, has now accummulated a substantial amount of research data on the values of the strength and related properties of 135 species of Philippine woods. This collective information is being published in various technical magazines, and reprints are being made available at the Institute for free distribution to interested parties. Information on timber joints in conjunction with the use of mechanical fastenings like nails, bolts, and spikes has also been obtained.

These accomplishments of the Institute, in so short a time, favorably compare with the accomplishments of similar laboratories in other countries for the same length of time. However, the fact remains that this country lags behind others in timber research and engineering. Perhaps, the main reason is that earlier attempts had not been fully appreciated and that funds had been inadequate.

Whatever achievements the Institute has accomplished so far represent only a beginning—the first phase of a big job that lies ahead. The next phase of the job is just being started—that of promulgating stress-grading rules and specifications and of recommending the working stresses for Philippine timbers based on the grades. This will give engineers and architects self-confidence in designing structures so to afford consumers the right quality for the price they pay. Tangible results along these lines may be attained in the next two or three years. The third phase will probably dwell on the formulation of criteria and specifications for improved methods of design and new engineering applications of timber.

When the timber merchants are able to supply stress-graded timber, when the lumber manufacturers fully understand the value of and practice quality control, and when the engineers are able to design timber structures efficiently and economically with confidence and find new engineering applications of timber, then and only then can it be said that one of the Institute's objectives has been happily realized.

For timber technology to continue progressing and for the timber industry to retain its place among those in the peak of economic growth, the continuance of research, sensitive to their needs, is necessary. For this, the Institute is dedicated to do service as long as it deserves the support of the government and the public.

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AN ADMINISTRATIVE STUDY . . .

(*Continued from page* 44)

al lands from commercial exploitation for future recreational use if necessity arises.

9. Some of the antiquated park laws should either be repealed, modified or updated to suit the present social, economic, and political situation of the country. This is essential to keep abreast with modern recreational methods and practices based on the nationwide recreational trends and needs.
10. Since land transportation in the Philippines is handicapped by geographical barriers, development of local parks such as provincial parks should be considered aside from the national parks. These will be financed and maintained by the provinces where the parks are located similar to the State Park system of the United States. However, some provinces have comparatively less income than others. In this case the national government has to subsidize them by providing funds for park purposes.
11. The Kaingin Research" which is a nationwide five-year joint project of the colleges of Agriculture and Forestry of the University of the Philippines financed by the Philippine National Science Development Board and the Council on Economic and Cultural Affairs of New York to study the socio-economic implications of kaingin-making, should be vigorously pursued to end the socio-economic ills that have plagued the country. Kaingin-making coupled with destructive logging methods have depleted the country's forest wealth at an alarming rate. This applies particularly to both forest reserves and national park areas. Early suppression of this social malady should greatly redound to the optimum and the preservation of a unique, scenic wise utilization of forest resources and and priceless heritage for the use and enjoyment of present and future generations.
12. Outdoor recreation requires the use of a broad and diversified range of national resources. Its management policies vary among agencies and change according to public demand, political pressures, as well as economic and social imperatives. Therefore, cooperation, coordination, national interest and welfare, and mutual understanding among various land and forest-managing agencies in the Philippines are encouraged, if outdoor recreation is to gain national recognition and acceptance.

Survival and Growth of Moluccan Sau in Mt. Makiling as Affected by Planting Spacing and Kind of Planting Materials[1]

by
IRENEO L. DOMINGO

Two of several questions that must be resolved before a large scale planting operation is conducted are the kind of planting materials to be planted and the spacing to which the planting materials are to be set in the planting area. One must employ the kind of planting material that will give the highest survival and fastest growth. In addition, one must set the plants at distances which will be most advantageous in terms of more survival, faster growth, complete utilization of the site, and better forms of the individual trees.

For Moluccan sau (*Albizzia falcata* Backer), these informations are not yet known. The study reported in this paper was set up in an effort to gather these informations. Specifically, the objectives of the study were to find the best kind of planting materials and to determine the best spacing of planting.

EXPERIMENTAL PROCEDURE

Experimental Design.—

The study was established in August to October, 1963 on a split-plot design with three different spacings of planting in the main plots, four different kinds of planting materials in the sub-units, and six blocks served as replicates (see layout). The following treatments were used:

1. *Spacing of Planting*
   a. 1 m. x 1 m.
   b. 2 m. x 2 m.
   c. 3 m. x 3 m.
2. *Kinds of Planting Materials*
   a. Seeds (direct seeding)
   b. Potted seedlings
   c. Bareroot seedlings
   d. Pruned seedlings

Preparation of Planting Materials

Seeds.—The seeds used in the study were obtained from Bukidnon and Agusan through the Reforestation Administration. No pretreatment was given to either the seeds used for direct seeding or the seeds sown in nursery seedbeds or seedflats for the other study treatments. No repellent was used on the seed in direct seeding.

Potted Seedlings.—All the seedlings used in the study were grown under ordinary nursery operations. Potting was done when the seedlings from the seedbeds or seedflats were about four to six centimeters tall. The potted seedlings were allowed to grow for 5 to 8 months before planting in the experimental area. The pots used were 7" x 8" polyethylene plastic film bags that

[1] This study was conducted under the UPCF-PHIMCO cooperative *Albizzia falcata* research project in Mt. Makiling which is being financially supported by the Philippine Match Company, Ltd., Manila. The author is Assistant Professor of Silviculture at the College of Forestry and In-charge of the project. This study was begun by Mr. F. P. Mauricio, then a member of the faculty and formerly In-charge of the project, now connected with the Nasipit Lumber Company in Agusan.

were .002 mm. thick and milk cans with a height of 10 cms. and an inside diameter of 7 centimeters. Unfortunately, the seedlings potted with plastic bags and those cans were not separated. This would have made possible the determination of their comparative efficiency in terms of survival and growth.

Bareroot Seedlings.—The bareroot seedlings used in the study were prepared under ordinary techniques, consisting of trimming extra-roots and lateral roots and a portion of the crown and puddling of the roots after trimming.

Pruned Seedlings.—The pruned seedlings were prepared by cutting off the stem about 1/3 to 2/3 their height, the lateral roots were removed and long tap-roots were cut at the point where the swell ends.

Experimental Area.—

The experiment was conducted on a three-hectare land near the junction of the road going to the peak of Mt. Makiling and the road going to the white earth pit with an elevation of about 400 meters above sea level. It has a southeastern aspect, originally covered with a second growth forest vegetation and scattered bananas, and with a small gully running across the middle. It is adjacent to a kaingin in the east and to the experimental lot of the Forest Products Research Institute in the south.

Site Preparation. — Before planting, the forest vegetation was completely removed. Large trees were felled on contract basis. The slash and other debris were disposed of by either hauling them outside of the area or by burning them inside the area.

Planting.—

The planting was done from the later part of August to October, 1963.

Potted Seedlings.—The hole method was used in planting the potted seedlings. This consisted of opening up a hole in the soil with the aid of a spade then setting the seedling on the center of the hole after which the soil was returned. The seedlings were removed from the cans by holding each can with one hand and pounding gently at the sides several times with a stick while slowly rotating the can in the hand after which the seedling is pulled out gently with the ball of earth around the root system intact. In some seedlings, though, the soil around the roots was broken in which case the nature of the seedlings was not different from bareroot seedlings. The cans had to be removed this way because slits at the sides were not made before potting. For the seedlings potted with plastic film bags, the plastic bags were just slit-opened with a bolo or a knife.

Bareroot and Pruned Seedlings. — The bareroot and pruned seedlings were planted by the slit method with a planting bar and by the dibble method using a sharpened ipil-ipil pole, 2 meters long and 2 inches in diameter as improvised dibble.

Direct Seeding.—Two or more seeds were sown in spots at the pre-determined spacing. The spots were cultivated before sowing. The seeds were not coated with any repellent before sowing.

Data Collection.—

After the planting operation was over, the planted seedlings (bareroot and potted seedlings) were individually measured for height. About a year later (June-September, 1964) the trees were again measured for height with a four-meter pole graduated in centimeters. Plants that died were noted down in the record sheets. In addition to height and mortality, the tree diameters were also measured at breast height (dbh) with a direct-reading diameter steel tape.

In the second year (July-October, 1965), the trees were again measured. This time, a Haga hypsometer was used for measuring

the height since the use of graduated pole was no longer practical because the trees had already grown very tall. The same diameter tape, however, was used in measuring the diameters.

The following were the data gathered for analysis:

1. First year survival or number of seedlings alive after the first year divided by the number of seedlings planted and the quotient multiplied by 100 to express it in percent.

2. First year height growth or the first year height minus the initial height.

3. First year diameter. First year diameter growth could not be determined because no diameter measurements were made immediately after planting.

4. Second year survival, computed by dividing the number of trees alive at the end of the second year by the number of seedlings alive at the end of the first year multiplied by 100 to express it in percent.

5. Second year diameter growth or the second year diameter minus first year diameter.

6. Second year height growth or the second year height minus the first year height.

7. Diameter and height coefficient of variation. It was observed that the trees in the second year were very variable, from very small trees to large trees. To get an expression of the variability of the diameter and height as affected by the variables, the coefficients of variation of the trees in each sub-plot was computed by the formula:

$$C.V. = \frac{\sqrt{\frac{\Sigma X^2 - (\Sigma X)^2/n}{n-1}}}{\Sigma X/n} \times 100$$

Where: X=individual tree dbh or height
n=number of trees in each sub-plot
Σ=sum of
C.V.=coefficient of variation in percent

Data Analyses.—

The various sets of data were analyzed separately by the analysis of variance method. The direct seeding and pruned seedling parts of the study were complete failures and, therefore, excluded in the analyses. Likewise, the data for the 3 m. x 3 m. spacing were excluded in the analyses because some plots were not planted and in other plots, values were not taken due to a landslide brought about by typhoon "Dading" on the later part of June, 1964.

Before the survival data were analyzed, they were first transformed to degrees by arcsin transformation method using Table A.10 of Steel and Torrie (1960) to ensure independent and normal distribution of the experimental error as required to have a valid application of tests of significance in the analysis of variance.

RESULTS

The direct seeding part of the study was a complete failure because of African snails (*Achatina fulica* Boudich) that fed on the newly germinated seedlings. The seedlings were eaten at night following germination. No germination count was taken because the seedlings were eaten immediately at night and counting the germinations would have involved examination at night of every spot planted which was impossible (Mauricio, 1965).

The treatment that involved pruned seedlings was also a complete failure at the end of the first year after planting. Only the potted and bareroot seedlings had a certain degree of success and, therefore, these were the only ones included in the data analyses.

Effects of Spacing.—

1. *Survival.*—At the end of the first year after planting, the seedlings planted at 1 m. x 1 m. spacing had a mean survival of 34.1 percent and those planted at 2 m. x 2 m. spacing had 40.8 percent or a difference of 6.7 percent in favor of the seedlings planted at 2 m. x 2 m. spacing (Table 1). At the end of the second year, the trees that survived after the first year in the 1 m. x 1 m. spacing had a mean survival fo 85.69 percent and those in the 2 m. x 2 m. spacing had 76.56 percent of a difference of 9.13 percent (Table 3).

The differences in survival in the first year (6.7 percent) and in the second year (9.13 percent) were both not significant which means that there was no advantage gained in planting at 1 m. x 1 m. over 2 m. x 2 m. spacing or *vice versa* as far as survival in both the first and second year is concerned (Tables 2 and 4).

Since spacing did not cause any significant difference in survival either in the first year or in the second year, the two-year survival for the 1 m. x 1 m. spacing (32.0 percent) was not significantly different from the 2 m. x 2 m. spacing (33.8 percent) (Tables 5 and 6).

TABLE 1. Average first year survival in percent of Moluccan sau in Mt. Makiling as affected by spacing of planting and kind of planting materials.

Planting Material	Spacing		Mean	Diff.
	1 m. x 1 m.	2 m. x 2 m.		
Potted Seedlings	54.1	68.4	61.3	
				44.9
Bareroot Seedlings	16.7	16.1	16.4	
Mean	34.1	40.8	37.4	
Difference	6.7			

TABLE 2. Analysis of variance of first year survival (transformed to degrees) of Moluccan sau in Mt. Makiling.

Source of Variation	df	SS	MS	F
Replicates	5	696.09	139.22	3.578 n.s.
Spacings, Sp	1	95.20	95.20	
Error (a)	5	194.56	38.91	2.447 n.s.
Planting Materials, Pm	1	4,595.99	4,595.99	102.911**
Sp x Pm	1	118.82	118.82	2.660 n.s.
Error (b)	10	446.59	44.66	
TOTAL	23	6,147.25		

For this and succeeding tables:
n.s.—Not significant at the 5 percent level.
** —Significant at the 5 percent level.
* —Significant at the 1 percent level (highly significant).

TABLE 3. Average second year survival in percent of Moluccan sau in Mt. Makiling.

Planting Materials	Spacing		Mean	Diff.
	1 m. x 1 m.	2 m. x 2 m.		
Potted Seedlings	91.80	82.80	87.30	12.35
Bareroot Seedlings	85.69	76.56	81.12	
Mean				
Difference	9.13			

TABLE 4. Analysis of variance of second year survival (Transformed to degrees) of Moluccan sau in Mt. Makiling.

Source of Variation	df	SS	MS	F
Replicates	5	2,723.20	544.64	5.88*
Spacings, Sp	1	193.80	193.80	2.09 n.s.
Error (a)	5	463.19	92.64	
Planting Materials, Pm	1	240.66	240.66	1.97 n.s.
Sp x Pm	1	468.07	468.07	3.83 n.s.
Error (b)	10	1,220.56	122.06	
TOTAL	23	5,309.48		

TABLE 5. Average two-year survival in percent of Moluccan sau in Mt. Makiling.

Planting Materials	Spacing		Mean	Diff.
	1 m. x 1 m.	2 m. x 2 m.		
Potted Seedlings	49.8	56.7	53.2	40.6
Bareroot Seedlings	14.2	10.9	12.6	
Mean	32.0	33.8	32.9	
Difference	1.8			

TABLE 6. Analysis of variance of two year survival (Transformed to degrees) of Moluccan sau in Mt. Makiling.

Source of Variation	df	SS	MS	F
Replicates	5	967.50	193.50	9.35*
Spacings, Sp	1	10.19	10.19	0.49 n.s.
Error (a)	5	103.47	20.69	
Planting Materials, Pm	1	4,392.92	4,392.92	152.64**
Sp x Pm	1	63.80	63.80	2.22 n.s.
Error (b)	10	287.77	28.78	
TOTAL	23	5,825.65		

2. *Diameter Growth.*—As explained earlier, the growth in diameter during the first year after planting could not be determined because no diameter measurement was taken immediately after planting. It is assumed, however, that initial diameter was homogenous. But even if initial diameter was not homogenous, the design of the experiment took care of the heterogeneity, if any, of initial diameter. The diameter data taken at the end of the first year, therefore, instead of the diameter growth, were analyzed.

At the end of the first year after planting, the seedlings planted at 1 m. x 1 m. spacing had a mean diameter of 3.76 cms. while those planted at 2 m. x 2 m. had 3.66 cms. or a difference of 0.10 cm. During the second year, diameter growth (not diameter) for the 1 m. x 1 m. spacing was 4.68 cms. and 6.97 cms. for the 2 m. x 2 m. spacing or a difference of 2.29 cms. in favor of the latter (Tables 7 and 9). The difference of 0.10 cm. in diameter in the first year was not significant but the 2.29 cms. difference in diameter growth in the second year was highly significant (at the 1 percent level). (Tables 8 and 10). This means that spacing had no effect on diameter growth of Moluccan sau during the first year after planting but has a great effect during the second year after planting.

TABLE 7. Average diameter in centimeters of one year old Moluccan sau in Mt. Makiling.

Planting Materials	Spacing		Mean	Diff.
	1 m. x 1 m.	2 m. x 2 m.		
Potted Seedlings	3.63	3.95	3.79	
				0.15
Bareroot Seedlings	3.90	3.38	3.64	
Mean	3.76	3.66	3.71	
Difference	0.10			

TABLE 8. Analysis of variance of diameter of one year old Moluccan sau in Mt. Makiling.

Source of Variation	df	SS	MS	F
Replicates	5	8.34	1.67	1.497 n.s.
Spacings, Sp	1	0.05	0.05	0.045 n.s.
Error (a)	5	5.59	1.12	
Planting Materials	1	0.12	0.12	0.218 n.s
Sp x Pm	1	1.04	1.04	1.891 n.s.
Error (b)	10	5.48	0.55	
TOTAL	23	20.62		

TABLE 9. Average second year diameter growth in centimeters of Moluccan sau in Mt. Makiling.

Planting Materials	Spacing		Mean	Diff.
	1 m. x 1 m.	2 m. x 2 m.		
Potted Seedlings	3.54	5.74	4.64	
				2.37
Bareroot Seedlings	5.82	8.20	7.01	
Mean	4.68	6.97	5.82	
Difference	2.29			

TABLE 10. Analysis of variance of second year diameter growth of Moluccan sau in Mt. Makiling.

Source of Variation	df	SS	MS	F
Replicates	5	6.50	1.30	0.93 n.s.
Spacings, Sp	1	31.54	31.54	22.23**
Error (a)	5	7.00	1.40	
Planting Materials, Pm	1	33.64	33.64	21.84**
Sp x Pm	1	0.04	0.04	0.03 n.s.
Error (b)	10	15.40	1.54	
TOTAL	23	94.12		

3. *Height Growth.*—The mean first year height growth for the 1 m. x 1 m. spacing (277.4 cms.) was not significantly different from the mean first year height growth for the 2 m. x 2 m. spacing (237.6 cms.) (Tables 11 and 12). The same was true for the second year height growth (Tables 13 and 14).

TABLE 11. Average first year height growth in centimeters of Moluccan sau in Mt. Makiling.

Planting Materials	Spacing		Mean	Diff.
	1 m. x 1 m.	2 m. x 2 m.		
Potted Seedlings	306.0	268.0	287.0	
				59.0
Bareroot Seedlings	248.8	207.2	228.0	
Mean	277.4	237.6	257.5	
Difference	39.8			

TABLE 12. Analysis of variance of first year height growth of Moluccan sau in Mt. Makiling.

Source of Variation	df	SS	MS	F
Replicates	5	29,838.50	5,967.70	1.104 n.s.
Spacings, Sp	1	9,520.17	9,520.17	1,762 n.s.
Error (a)	5	27,022.33	5,404.47	
Planting Materials, Pm	1	20,886.00	20,886.00	6.179*
Sp x Pm	1	20.16	20.16	— n.s.
Error (b)	10	33,802.84	3,380.28	
TOTAL	23	121,090.00		

TABLE 13. Average second year height growth in meters of Moluccan sau in Mt. Makiling.

Planting Materials	Spacing		Mean	Diff.
	1 m. x 1 m.	2 m. x 2 m.		
Potted Seedlings	3.37	4.68	4.02	
				0.75
Bareroot Seedlings	4.80	4.74	4.77	
Mean	4.08	4.71	4.395	
Difference	0.63			

TABLE 14. Analysis of variance of second year height growth of Moluccan sau in Mt. Makiling.

Source of Variation	df	SS	MS	F
Replicates	5	16.39	3.28	7.45*
Spacings, Sp	1	2.33	2.33	5.30 n.s.
Error (a)	5	2.22	0.44	
Planting Materials, Pm	1	1.33	1.33	2.42 n.s.
Sp x Pm	1	4.79	4.79	8.71*
Error (b)	10	5.49	0.55	
TOTAL	23	32.55		

4. *Variability.*—The trees in the 1 m. x 1 m. sub-plots were more variable in diameter than the trees in the 2 m. x 2 m. sub-plots. The mean coefficient of variation in the former was 44.2 percent and 32.0 percent for the latter or a difference of 12.2 percent which was highly significant (Tables 15 and 16). For 1 m. x 1 m. spacing, tree diameter ranged from 1.0 cm. to 20.0 cms. For the 2 m. x 2 m. spacing, tree diameter ranged from 1.5 cms. to 21.2 cms.

Spacing, however, did not cause a significant difference in variation in tree height although there was a range of 1.0 to 16.0 meters. The mean coefficient of variation for tree height in the 1 m. x 1 m. was 28.6 percent and 23.4 percent in the 2 m. x 2 m. or a difference of 5.2 percent which was not significant (Tables 17 and 18).

TABLE 15. Coefficient of variation of diameter of two year old Moluccan sau in Mt. Makiling.

Planting Materials	Spacing		Mean	Diff.
	1 m. x 1 m.	2 m. x 2 m.		
Potted Seedlings	50.0	36.9	43.4	10.6
Bareroot Seedlings	38.3	27.2	32.8	
Mean	44.2	32.0	38.1	
Difference	12.2			

TABLE 16. Analysis of variance of the coefficient of variation of diameters of two year old Moluccan sau in Mt. Makiling.

Source of Variation	df	SS	MS	F
Replicates	5	380.74	76.15	1.66 n.s.
Spacings, Sp	1	877.25	877.25	19.18**
Error (a)	5	228.67	45.73	
Planting Materials, Pm	1	685.87	685.87	14.70**
Sp x Pm	1	5.90	5.90	0.12 n.s.
Error (b)	10	466.68	46.67	
TOTAL	23	2,645.11		

TABLE 17. Coefficient of variation in percent of heights of two year old Moluccan sau in Mt. Makiling.

Planting Materials	Spacing		Mean	Diff.
	1 m. x 1 m.	2 m. x 2 m.		
Potted Seedlings	33.4	25.0	29.2	
				6.4
Bareroot Seedlings	23.9	21.8	22.8	
Mean	28.6	23.4	26.0	
Difference	5.2			

TABLE 18. Analysis of variance of the coefficient of variation of heights of two year old Moluccan sau in Mt. Makiling.

Source of Variation	df	SS	MS	F
Replicates	5	588.06	117.61	3.93 n.s.
Spacings, Sp	1	165.90	165.90	5.55 n.s.
Error (a)	5	149.44	29.89	
Planting Materials, Pm	1	246.40	246.40	5.68*
Sp x Pm	1	59.22	59.22	1.36 n.s.
Error (b)	10	433.91	43.39	
TOTAL	23	1,642.93		

Effects of Kind of Planting Materials.

1. *Survival.*—At the end of the first year after planting, the potted seedlings had a mean survival of 61.3 percent and the bareroot seedlings had only 16.4 percent or a difference of 44.9 percent which was highly significant (Tables 1 and 2). In the second year, survival of the potted seedlings that were alive at the end of the first year was 87.30 percent and 74.95 percent for the bareroot seedlings or a difference of 12.35 percent which was not significant (Tables 3 and 4). This means that the significant difference in two-year survival due to kind of planting materials as can be seen in Tables 5 and 6 was due to the difference in survival in the first year and not in the second year. In other words, the kind of planting materials (potted vs. bareroot) caused an effect on survival in the first year but not in the second year.

2. *Diameter.*—At one year after planting, the kind of planting materials did not cause any difference in mean diameter. Potted seedlings had a mean diameter of 3.79 cms. and 3.64 for bareroot seedlings or a difference of only 0.15 cm. which was not significant (Tables 7 and 8). In the second year, the analysis showed a significant 2.37 cms. advantage of the bareroot seedlings over the potted seedlings (Tables 9 and 10). This result, there is no reason for bareroot seedlings to have a faster diameter growth in the second year after planting them potted seedlings. It is likely that the apparently significant 2.37 cms. advantage was due to spacing. It should be borne in mind that in the second year, the bareroot seedlings

actually had a wider spacing than the potted seedlings even if both kinds of planting materials were originally planted at the same spacing because of heavier mortality in the first year (Tables 1 and 2).

3. *Height Growth.*—The kind of planting materials affected height growth in the first year but not in the second year. The first year height growth was 287.0 cms. for potted seedlings and 228.0 cms. for bareroot seedlings or a significant advantage of 59.0 cms. of the former over the latter in the first year (Tables 11 and 12). In the second year, mean height growth was 4.02 meters for the potted seedlings and 4.77 for the bareroot or an insignificant difference of only 0.75 meter (Tables 13 and 14).

4. *Variability.*—The coefficients of variation in dbh and in height for the potted seedlings (43.4 percent for dbh and 29.2 percent for height) were significantly higher than the coefficients of variation for bareroot seedlings (32.8 percent for dbh and 22.8 percent for height) (Tables 15-18). This however, should again be viewed with caution. This apparently higher height variability for potted seedlings is again likely to be due not to the kind of planting materials but to wider spacing.

DISCUSSIONS

As mentioned earlier, the direct seeding part of the study was a complete failure because all germinations were immediately eaten by snails. The fact that the seeds directly sown were neither carried away by ants nor eaten by rodents and that there were plenty of germinations is enough reason to speculate that, had it not been for the snail attacks, direct seeding of Moluccan sau in Mt. Makiling would have been successful. One problem, therefore, in direct seeding is how to control snails. Considering the abundance of snails in Mt. Makiling, snail control would be a very difficult task especially because the use of any poison seems to be impractical due to the heavy precipitation in Mt. Makiling that would tend to wash it away. There are other methods, of course, of snail control such as hand picking, enclosing the seedlings with wire screens, etc. But even these methods are not practical. Hand picking is impossible because of the number of the snails. Besides, hand picking has to be done at night when the snails are out to eat the newly germinated seedlings which is impossible. Enclosing each seed spot with a wire screen will not also be practical because it is expensive and the screen must be fine-sieved because even very small snails attack the small seedlings. If fine-sieved screens are used, the amount of light received by the seedling will be greatly reduced and, thus, will kill the seedling because Moluccan sau is intolerant to shade (Bernard, 1953).

Even granting that snails are not a problem, still a question that remains is whether or not the small seedlings will be able to compete with the low vegetation around the seeding spots. The very young Moluccan sau seedlings has a slow growth until about the 10th week when it begins to grow rapidly (Mauricio, 1965). Before the small seedlings pick up rapid growth, however, it will be offered competition by herbaceous and other weeds. Since it is intolerant to shade, it might die before it reaches the age of 10 weeks when it picks up rapid growth. It can be argued that the seedlings can be cleaned but cleaning will have to be done more frequently than the bigger-sized nursery raised seedlings and, therefore, very expensive. It seems, therefore, that direct seeding of Moluccan sau is not feasible under Mt. Makiling conditions.

The pruned seedlings were doing fine at one to two months after planting. Some had produced sprouts and the others had not but were still alive. Average survival was 97.06 percent (Mauricio, 1965). It was surprising, though, to find out at the end of the first year after planting that the treatment

was a complete failure. Even those that had produced sprouts at one to two months after planting had died. The author is at a loss to offer any explanation to this phenomenon as he was not yet incharge of the project then. If the sprouted pruned seedlings were cleaned of competing plants particularly the Uoke vine, then they could not have died to weed competition. It is possible that the pruned seedlings produced sprouts because of the stored food in the taproot and in the stem. However, the sprouts died when the stored food was consumed and was not replaced because of the inability of the taproot to produce functional roots.

The findings on the remaining treatments are interesting. As found out in this study, spacing of planting did not exert any effect on survival either in the first year or in the second year after planting. The kind of planting material, however, did exert a great effect on survival in the first year although not in the second year. The first year survival of the potted seedlings was significantly higher by 44.9 per cent over the bareroot seedlings. These findings confirm the popular beliefs which are logical. The potted seedlings, being planted with an undisturbed ball of soil around their roots and, therefore, the roots are not exposed to the elements, have an uninterrupted growth and, therefore, have a high chance of surviving in the new environment in the planting area. On the other hand, the bareroot seedlings have their roots exposed to the elements and sometimes get dry. A number of their roots are injured during the process of lifting, in handling, and even during planting. The injured roots, the exposure of the roots to the elements, and the removal of the soil around the roots, all contribute to decreased absorption of moisture and soil nutrients, thus, create a "shock" effect on the plant.

As for spacing, there was no effect on survival, at least in the first two years, because the canopy of the trees has not become too crowded even in the 1 m. x 1 m. spacing, and, therefore, there was still no great limitation to the growing space for each tree. Besides, the crown of Moluccan sau is not naturally dense such that even if the canopy is somewhat closed at the end of the second year, still enough light, although diffused, reached the crowns of the trees that were overtopped. It is expected, however, that, as the trees get older and bigger, spacing will eventually exert an effect on survival by causing the dying of the overtopped trees. This is especially so because Moluccan sau is intolerant to shade (Barnard, 1953). Mortality occurred principally in the first year and negligible in the second year. This is expected because the trees had already established themselves after the first year.

In the case of diameter growth, there was no effect of either spacing or the kind of planting material in the first year but in the second year, spacing exerted a considerable effect. It was also shown that the bareroot seedlings had a significantly faster second year diameter growth. As stated earlier, however, this should be viewed with caution, that the bareroot seedlings had actually a wider spacing in the second year than the potted seedlings because the former had a much lower survival than the latter and, therefore, the higher second year diameter growth of the bareroot seedlings may have been actually due to wider spacings. As for the fact that spacing had no effect on the first year diameter growth, the same reason as the one advanced for survival can be presented, *i.e.*, there was still no competition for growing space during the first year. In the second year, competition for growing space has begun as the crowns then began to close, and since diameter growth is very sensitive to competition or density (Smith, 1957), second year diameter growth was higher in the 2 m. x 2 m. than in the 1 m. x 1 m. spacing.

First and second year height growth was also not affected by spacing, again, for the

reason that there was still not very much competition for growing space. The first year height growth was affected by the kind of planting material, *i.e.*, the potted seedlings had a faster year height growth than the bare-root seedlings, again, for the reason that there was no interruption, hence, continuous, of growth in the case of the potted seedlings as against the "shock" in the case of the bareroot seedlings. This effect, however, was not maintained in the second year, perhaps because the bareroot seedlings had then fully recovered. The fact that in the first year, height growth was affected by the kind of planting material but diameter growth not, suggests that after planting height growth starts ahead and proceeds at a faster rate than diameter growth. The fact that in the second year, diameter growth was affected by spacing but height growth was not also suggests that diameter growth is more sensitive to density than height growth, which is in agreement with what Swith (1957) has found.

The individual trees in each sub-plot varied in diameter and in height. This was expected. The trees did not have a uniform diameter neither did they have a uniform height. The dispersion of the individuals about the mean is represented by the standard deviation. Knowing the standard deviation, however, is not enough to be able to compare the variability of diameter or height between different spacings because, as found out, mean dbh and mean height were not the same in all subplots. Since diameter or height populations with larger means would naturally tend to show greater standard deviations than populations with small means, the standard deviation was not suitable as an index of variation. For example, a population with a mean of 10 may have a standard deviation of 2 and a population with a mean of 80 may have a standard deviation of 16. These two populations have different standard deviations but if the coefficient of variation, or the ratio of the standard deviation to the mean, is taken (20 percent in each case), it can be shown that the two populations have the same relative variability. In other words, the coefficient of variation is a device to facilitate comparison of variability about different sized means (Freese, 19__).

The analysis of the coefficients of variation showed that the trees in the 1 m. x 1 m. spacing were more widely dispersed about the average size than the trees in the 2 m. x 2 m. In other words, in the 1 m. x 1 m., many small trees can be found and at the same time bigger trees are present. In the 2 m. x 2 m. spacing, the trees are relatively of a more uniform size than those in the 1 m. x 1 m. spacing. This phenomenon is especially true of dbh in the second year. For height, the difference between 1 m. x 1 m. and 2 m. x 2 m. was not significant. This shows further that dbh is more sensitive to spacing or density than height. As the stands become older and bigger, the difference in the variation in height between the two spacings is expected to increase and become significant. This phenomenon, perhaps can be explained by the fact that as the trees grow together, there are faster growing and there are slower in growth. Those that are left behind will continue to be behind and those that are ahead at the start will continue to be ahead. The gap will even be widened because the rate of the growth of those that are ahead will be maintained if not increased whereas the rate of growth of those that are left behind will be decreased due to continued decrease in available light. This decrease in available light may be brought about by the closing in of the canopy of the trees that are higher.

The great variation in dbh in the second year after planting is an indication that Moluccan sau stands respond to natural pruning and thinning at rather an early age especially when grown in a close spacing. The effect of spacing on natural pruning and

thinning, is therefore, a good subject of another study.

SUMMARY

For Moluccan sau, there are no information available on the best planting spacing and on the planting material that can best be planted. To gather these informations, a study was established in 1963 on a split-plot design with three planting spacings in the main plots and the kinds of planting materials in the sub-units. The study was replicated six times. Height and diameter measurements were made during the months of July to October in 1964 and 1965.

The results showed that direct seeding was a failure due to the attacks of African snails (*Achatina fulica* Boudich). The pruned seedlings were also complete failure. For the remaining treatments, *i.e.,* potted vs. bareroot seedlings and 1 m. x 1 m. xs. 2 m. x 2 m. spacings, the following were found:

1. Spacing did not have any effect on survival either in the first year or in the second year after planting.

2. Spacing did not have any effect on diameter growth in the first year but diameter growth in the second year was significantly faster in the 2 m. x 2 m. than in the 1 m. x 1 m. by 2.29 centimeters.

3. Spacing did not have any effect on height growth either in the first year or in the second year.

4. Diameter of the trees in the 1 m. x 1 m. was more variable than the diameter of those in the 2 m. x 2 m. Variation in height, however, was not affected by spacing.

5. Survival in the first year of the potted seedlings was significantly higher than the survival of the bareroot seedlings but they had about the same survival in the second year. Mortality occurred principally in the first year and negligible in the second year.

6. Diameter growth in both years was about the same for potted and bareroot seedlings.

7. The potted seedlings had significantly faster height growth in the first year than the bareroot seedlings. In the second year, however, height growth was about the same for both kinds of planting materials.

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Improvements in the Utilization of Lower Quality Philippine Woods[1]

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ABSTRACT

There is a big gap between the number of wood species (3,800) growing in Philippine forests and that of the commercial species (about 100) currently being utilized. Studies conducted at the Philippine Forest Products Research Institute include means of maximizing the utilization of the more important species such as the lauans, apitongs, guijos and yakals, as well as utilizing the so-called lower quality woods.

With studies limited only to lumber, plywood and wood-based panel products, the means of achieving the first objective calls for a method of improving the recovery of high-grade lumber mainly through orientation of sawing face and knowledge of lumber grading, as well as through another method called taper sawing. In veneer manufacture, studies dwelt on rotary-veneer cutting and drying to determine their suitability for producing quality veneer. For plywood manufacture, the gluing qualities and bond strength characteristics of the species were first studied to determine their suitability.

The effort to utilize lesser-known woods may be seen in the manufacture of such products as blockboard, overlays, floor tiles, woven-veneer face panels, fiberboard and hardboard. Prospects of broadening their uses may be achieved primarily through research and the integration of over-all operations.

INTRODUCTION

The forest resources of the Philippines are quite extensive. Of the total land area amounting to 29.7 million hectares, about 28 percent (8.3 million hectares) is commercial forest. There are about 3,800 species, predominantly hardwoods, in this forest but less than 100 species find their way to the market under present conditions. Possibly 200 species more are available in sufficient size and quantity for use in the future.

The utilization of the greater bulk of this number of species has always posed a problem. Some, the so-called "weed species," often pose a serious problem in forest management. They sprout quickly after logging and grow rapidly, thus tending to interfere with the growth of the preferred species. Others are inherently small trees which are not useful for any purpose except as fuelwood.

To classify the quality of Philippine woods so as to pinpoint the species which are of lower quality than the others without taking into consideration the end uses would be erroneous. By defining the end use, the many factors that influence log quality can be isolated and their effects appraised.

The Philippine Bureau of Forestry has established the grading rules for Philippine logs. The rules define that there will be two peeler grades, two veneer grades, four saw-

[1] Special paper presented at the Sixth World Forestry Congress held in Madrid, Spain, in June, 1966.

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log grades, poles and piles. With this classification, it is possible to define the characteristics of each grade and, consequently, the end use which each grade could be processed into. For example, peeler and veneer grades are preferred for processing into lumber and veneer, sawlog grades are suitable for lumber only, while poles and piles connote the end use of this grade. The establishment of this system of grading points out that, within each grade, there are differences in quality characteristics even though both can be used for the same purpose. However, this system does not indicate that logs belonging to any grade are necessarily unprofitable for processing. In this connection, lower quality Philippine woods could be defined, in general terms, as a species not generally suitable for a specific end use.

The advantages of utilizing lower quality woods are manifold. Generally there will be increased marketability for this species, which consequently will give greater profits; conservation of the forest resources can be effected and it could pave the way for the manufacture of specialty items which can assume considerable value either in the local or export market.

Improvements in the utilization of lower quality woods can best be described by the methods in achieving this purpose. This paper describes some of the methods used in the Philippines based upon studies at the Forest Products Research Institute, University of the Philippines, and, to some extent, on the current practice of the local wood-using industry. The scope is limited to lumber, plywood and wood-based panel products manufacture.

METHODS FOR IMPROVING UTILIZATION

Lumber manufacture

The lumber industry in the country started a long time ago when the first sawmill was reportedly established during the Spanish regime. At present there are 327 operating sawmills with a total capital investment of approximately ₱81.5 million, and an aggregate daily capacity of about 4 million bd. ft. The lumber industry is presently confined to the manufacture of lumber for local and export markets.

All the principal species comprising the lauans, apitongs, guijos and yakals are being used in lumber manufacture. Others like molave, narra, tindalo, ipil, akle and banuyo are sawn for their natural beauty and durability. To bring out the natural beauty of some of these species, they are either quarter-sawn or plain sawn.

Approximately two-thirds of the country's overall log production is exported and about a third is left for processing. The situation is such that logs left for processing are generally rejects, which do not come up to export grades. Although the rejected logs are generally defective, certain amount of good lumber can still be produced if the proper technique of sawing is employed, thus increasing the utility of these poorer quality logs.

A study was conducted to determine the quantity, by grades, and the value of the lumber yield from logs being rejected for export with, for comparative purposes, a few peeler logs included. The results of these studies pointed out that mill practices have some bearing on the lumber grades obtainable when sawing either inferior or high grade logs.

The method of improving the recovery of high grade lumber was found to consist of two measures, namely: (1) orientation of sawing face with defects such that knots, holes, conks and bumps are at the edges of the boards, and (2) knowledge of lumber grading, which can immensely help in producing export grade lumber of fairly good quantity from inferior logs. The percentages of lumber recovered from sawlogs, using the American National Hardwood Lumber Association's (NHLA) grading rules, are as follows:

FAS (First and Second grade)	6 percent
No. 1 common	35 percent
No. 2 common	26 percent
No. 3 common	19 percent
Below grade	14 percent

Another method tested, for increasing both the quantity of lumber and the percentage of high grade material available in a piece of log, was taper sawing. So far, taper sawing has never been practiced by commercial sawmills in the Philippines.

A study was initiated at the Institute to determine the benefits derived from such method, specifically to determine the quantity and quality of lumber recovered by taper sawing and to gather data on both taper and nontaper sawing methods for volume and grade recovery comparison. Results indicated that there was a significant difference between the mean yields of the two methods of sawing. An average increase of 7 percent lumber recovery was obtained from taper-sawed billets on log tapers ranging from 1.22 to 2.73 centimeters per lineal meter. Taper sawing increased the percentage recovery of FAS and No. 1 common lumber. If combined, both grades constituted 49.16 percent of the total lumber from taper-sawed billets as compared to 35.59 percent from nontaper-sawed billets. As a result, the value of lumber from taper-sawing amounted to 25 percent more than the lumber value recovered from nontaper sawing.

Plywood and other wood-based panel products

(a) Veneer and plywood—This industry started in the Philippines in 1936 with the establishment of one plant. Now there are 35 mills with a combined installed annual capacity of some 805 million sq. ft. of plywood and 928 million sq. ft. of veneer. Domestic consumption of plywood has been increasing at an annual average rate of 4.6 percent, except in 1958 when a slump in construction activity was experienced. Since then, up to 1964, the domestic market has been very lucrative due to the construction activity going on throughout the country. Likewise, from 1961 to 1964, veneer and plywood exports increased significantly.

Since 1958, the Forest Products Research Institute has undertaken several studies on the rotary-veneer cutting and drying of Philippine woods. These projects were undertaken primarily to determine the suitability of each species for the production of good-quality veneer. For each species, therefore, the veneering requirements have been such that it is either suitable for use as faces, core or back. The criteria set forth in the evaluation of veneer quality were designed rigidly enough to compensate for semi-precision measurements in commercial operations.

This method is indicative, therefore, because it separates species having good veneering characteristics from species having poorer quality. Insofar as poor quality veneer is concerned, the causes are analyzed and all possible remedies for upgrading it are tried. An example of this method has been applied to an abundant species locally named "toog."

This species, although not considered inferior to any other species, was found to be unsuitable for veneer when cut cold in the rotary lathe because of the development of severe checks. The veneer produced, however, had beautiful grain and it was thought that if processed properly it would provide an attractive face veneer. Studies were expanded to include both the structure and processing variables. After a thorough experimentation, it was found that high-quality veneer could be produced when it was preheated to 180°F in water for 24 hours. Thus it was shown that improved utilization was effected on the basis of first establishing a criterion and subsequently finding remedies to solve the problem.

Similar studies have also been undertaken on species, which, by reason of their fast rate of growth, show promise as raw material for veneer manufacture. These are pursued because when the supply of the desir-

able woods, such as the dipterocarps, becomes inadequate and their costs increase proportionately, these fast-growing species may be used as substitute component in a plywood assembly. Results have indicated that among the several species tested, kaatoan bangkal (*Antocephalus cadamba*) has shown promise as face stock. The others are considered suitable for corestock only.

The utilization of Philippine woods for plywood is also limited by their gluing qualities. Gluing quality involves a lot of variables from the inherent wood variability to the variables involved in the pressing operation. Work at the Forest Products Research Institute has been confined to the individual testing of species, first to determine whether a species can be glued satisfactorily, and second, to determine the effect of pressure, pressing temperature and pressing time on the bond strength and compresssion of plywood made from each species. From these studies, definite processing variables are established to serve as guides in commercial operations. Under these circumstances, a species is either gluable or not gluable and, if not gluable, it is rejected for plywood manufacture.

The utilization of lower-quality plywood[3] from Philippine woods has followed world trends. It is a practice in some furniture plants to put on them plastic overlays to improve surface appearance. Overlays used are Formica and thin melamine sheets printed with different wood grains.

Further utilization of lower-quality Philippine woods have been made possible by the manufacture of blockboard by some companies engaged in the manufacture of plywood. This product is now finding its place in the expert market. Its popularity among manufacturers, however, is based on the concept of waste utilization, although to a certain extent, it is an outlet of low grade lumber from inferior quality logs and, for some purposes, inferior quality veneer.

Some other building materials, with construction similar to that of plywood, have been produced at the FPRI and are being introduced for mass production. These are the floor tiles, either as an all-wood construction or a composite consisting of bamboo for faces and veneers as core, crossbands and back. Another is the woven-veneer face panels, where the face is composed of woven slats in intricate designs. All these products, however, are primarily designed to utilize wood wastes and as outlets for lower-quality Philippine woods.

(b) *Fiberboard* — Hardboard was first manufactured in the Philippines in 1957 when the first and only plant was established. The industry has progressed considerably and has since expanded its original capacity to supply the demand in the local market. Medium-density boards are also presently manufactured.

The improvements in the utilization of lower-quality Philippine woods in this regard have been primarily oriented in the mixing of species and finding the right proportion of each to give the desired quality of the product. This is undertaken because of the heterogeneous growth in the forests of the region where the mill procures its raw materials. In this connection, plantation-grown species, generally regarded as having lower quality, are utilized for the manufacture of hardboard.

PROSPECTS FOR IMPROVING UTILIZATION OF LOWER QUALITY PHILIPPINE WOODS

There are presently two broad approaches for improving the utilization of lower-quality Philippine woods. The first and most important concerns research. In this regard, the following measures should be undertaken:

(a) The properties (chemical, mechanical, physical, seasoning and wood pre-

(*Continued on page* 70)

[3] Lower quality plywood in this sense depends upon the grade description established for classifying the face ply which usually applies to all thicknesses. In the Export Standard for Philippine Hardwood Plywood, the definitions of each grade are embodied.

Reaction Wood

by
TEOFILO M. LINDAYEN[1]

Reaction wood refers to tissues formed on the wide side of an irregular log cross-section. It is considered to be an abnormal type of wood. Generally, reaction wood is found in leaning stems and branches of softwoods and hardwoods.

Reaction wood includes two types of abnormal wood, namely; compression wood and tension wood. The first is associated with softwoods, and the second with hardwoods. Compression wood is reported to be more widely known and recognized. Generally, it is formed on the underside of inclined stems and branches. In view of its position, compression wood was at one time thought to be the result of a response to or a reaction against mechanical pressure. It is for this reason, that it has been called compression wood.

On the other hand, information on tension wood is meager since tension wood is not as conspicuous as compression wood that its occurrence has not been more widely recognized. It is formed on the upperside of leaning trunks and branches of hardwoods. As in compression wood the pith is off-center; however, in tension wood the pith is nearer the lower side. The term tension wood was adopted because its formation was considered to be the result of tension (stretching) stresses or forces.

STRUCTURE AND PROPERTIES OF REACTION WOOD:

A. COMPRESSION WOOD

Macroscopic appearance — Compression wood in contrast to normal wood of a particular species is darker, denser and harder. The difference in color can be better observed on freshly-cut, clean cross-sections or freshly-dressed surfaces. An oval or elliptical cross-section of a log and a smoother appearance or more cleanly-cut surface than that of normal wood indicate the presence of compression wood.

Compression wood is characterized by the eccentricity of the pith in the stem cross-section. Found on the lower side, its growth rings are wider and more marked than those of normal wood found on the upper side. However, within any growth ring the early- and latewood is not well-defined. Therefore, in some gymnosperms where growth rings are not sharply marked off, the compression wood may appear as a solid band wood extending over few to many growth rings depending on the severity of this irregularity.

Micro-structure — Under the microscope, distinctive differences can be noted between normal and compression wood both on transverse and longitudinal sections. In the transverse section, the tracheids of compression wood are typically rounded in outline or appearance and contain many intercellular spaces between individual cells.

On the other hand, the normal wood tracheids show more rectangular or hexagonal shape in the cross-section and lack intercellular spaces. Furthermore, there is no marked demarcation line between early- and latewood within the same annual ring as compared to normal wood due to the gradual change in thickness of cell walls of tracheids or fibers of compression wood, while in normal wood the change is more abrupt. In longitudinal sections the most striking feature of a compression wood is the presence of

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spiral checks in cell walls which are absent in the normal wood.

Chemical composition—Compression wood has a higher lignin content and less cellulose content than normal wood. In addition, it appears that lignin of the former's secondary wall follows a characteristic radial pattern, while that in normal wood appears more of a concentric arrangement. Some investigators suggested that the comparatively higher lignin content is related to certain abnormalities of compression wood.

Properties—One distinguishing feature of compression wood is its abnormally high longitudinal shrinkage as compared with normal wood. The extent of longitudinal shrinkage, however, depends on the severity of compression wood; when high longitudinal shrinkage is observed, it tends to indicate the presence of compression wood. Upon seasoning, bowing occurs due to excessive and unequal longitudinal shrinkage of compression wood. Where bands of compression wood are found adjacent to normal rings, there is greater tendency for bending, twisting and splitting due to differential shrinkage.

Generally, compression wood is denser than normal wood; however, it is usually weaker than normal wood. Compression wood, too, is difficult to nail as well as to work with tools.

Utilization—As a general rule, compression wood is not a serious timber defect for carpentry, house-building and heavy construction. It causes trouble for the more exacting jobs where there is no room for distortions. Logs containing pronounced compression wood should be sawn into wide boards or planks so that movements of compression wood may be restrained by the adjacent normal wood, where longitudinal shrinkage is quite negligible.

Pulping qualities of compression wood are rather not promising for the manufacture of paper and other products. Pulp from this kind of wood is lower in cellulose content and higher in lignin content than that of normal wood; consequently, pulp yield is lower and difficult to bleach due to its dark color. Fiber tracheids are also shorter than those of normal wood and tend to disintegrate more readily in the grinding process and reduces thereby the strength of the pulp.

B. Tension wood

Macroscopic appearance — Tension wood in angiosperms is not always as discernible as compression wood in gymnosperms. This probably explains why the former is not being thoroughly studied. It is normally associated with the eccentricity of the pith in the stem cross-section; the wider rings on the upper side of the lean is just the reverse in compression wood. The off-centered condition of the pith, the presence of silvery or lustrous zones, and the wider growth rings than the remainder of the surface all indicate the presence of tension wood.

Definite bands of tension wood appear much darker than normal wood within the same piece of wood. They are dense, hard and, in general appear similar to compression wood. In many species, particularly tropical woods, these properties are not easily detected on the cross-cut surfaces. However, one of the most characteristic features is the extreme fibrous mass or wooliness of sawn longitudinal surfaces.

Micro-structure — Anatomically, tension wood is characterized by the presence of so-called gelatinous fibers which differ from normal wood fibers by possessing very much thickened inner (or gelatinous) layers. Oftentimes, this layer appears detached from the secondary wall and, on the cross-section, it is convoluted in appearance. In some instances, it completely occupies the cell cavity and appears to be dense in jelly-like mass.

It has been reported that in definite bands of tension wood, vessels are smaller and fewer than those in normal wood.

As to the length of wood fibers, some investigators have reported that tension wood fibers are slightly longer than normal wood fibers.

Chemical composition—Tension wood has higher cellulose content and lower lignin content than normal wood.

Properties—Tension wood and compression wood have some properties in common. For instance, both have high longitudinal shrinkage and bowing upon drying. Tension wood is harder and denser and usually stronger than normal wood. Sawing and other machining operations are slowed down as more time on sharpening saws and cutters is involved. The quality of the machined surface of wood is inferior and the appearance of the finished article is likely to be below standard.

A piece of wood having combined normal and tension wood would have distortions in the forms of bow, spring or twist, especially in relatively-thin boards and small-dimension stock. Internal stresses may cause splitting, especially if the tension wood is concentrated on one side of the piece.

Buckling of veneers is caused by the different longitudinal shrinkage of tension and normal wood. In a thin veneer, this type of buckling is sometimes associated with numerous small splits. Collapse in seasoning is also due to tension wood. This is especially liable to occur where the tension wood is in well-defined bands following the growth rings.

Utilization—The effect of tension wood on utilization depends upon the intensity of development and the purpose for which the timber is made. As a general rule, the tendency to warping and splitting is minimized in timber of large dimensions or in relatively short, thick pieces. Distortion is more likely to occur in thin timber pieces and in small dimension stock; in dealing with material of this kind, it is advisable to eliminate tension if the shape and stability of the finished article are important considerations.

However, pulps made from tension wood has higher tearing strength, easier to bleach due to its slightly longer fibers, and lower lignin content, respectively, than pulps from normal wood. Their extreme fibrous or wooly characteristic and low lignin content render difficulty in sawing logs because the fibrous mass chokes the sawcut and causes overheating. The former also influences the peeling characteristics of rotary-cut veneer since the fibers are lifted giving the veneer a rough surface and the veneer on drying buckles.

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QUALITY PHILIPPINE WOODS . . .

(*Continued from page* 66)

vation) of all potentially important species must be studied intensively and as quickly as practicable in order to have the information ready when these species are needed. Studies of this kind have been completed in countries that have a long history of forest products research. In the Philippines, with a large number of wood species not yet analyzed or studied, this matter merits high priority.

(b) The natural durability of Philippine woods are expected to vary within species in such a manner that others are inferior. Termites are especially plentiful in the Philippines so that enormous damage has always been prevalent annually on constructions made of wood. To increase the utilization of less-durable species, wood preservation should extensively be resorted to.

The second approach relates to the integration of operations based on two schemes as follows:

(a) Integration of raw material production and procurement with industry development, as in the case of scientific forest management and the development of wood-based panel industries, so as to effect fuller and more profitable utilization of the forest resources and to enhance national industrialization.

(b) Integration with other forest products industries with a view to using lower quality woods and the employment of vertical and horizontal product integration.

However, it may be emphasized that integration involves an estimation of an economic area of operation dependent upon whether local or export markets are available, and whether the end products of integrated operations could stand competition in local and foreign markets against similar products produced in developed countries.

*General Information on Flood Damage Mitigation**

by
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The flow of rivers is caused by water released on the earth's surface by precipitation from the atmosphere. A portion of such water is disposed of by evaporation and plant transpiration and does not reach any stream. The remainder either percolate into the ground, most of it eventually emerging and entering a stream, or else enter the stream directly by surface runoff. Such runoff may occur promptly or be delayed, depending upon conditions of surface storage and topography. In the Philippines intense flood producing rains generally come with typhoons.

Ordinarily, where there is a flood problem the river lies in an alluvial plain. For most of the time it confines itself to a well-defined bed, bounded by the banks, which bed occupies only a fraction of the alluvial plain. If the surface runoff resulting from rainfall exceeds the capacity of the bed, the river overflows onto the alluvial plain. This is a flood. It becomes of economic importance if the plain has been settled and developed by man.

It is to be noted that there is nothing abnormal about a flood as such. The area between high banks, which we call "the river", is nature's device for handling ordinary flows. If we occupy the alluvial plain we must expect to be flooded periodically, or else we must interfere with the course of nature by keeping the excess water away from its destined course. Mankind has always settled upon and developed alluvial plains, and always will, since in many respect they are ideal for agriculture, cities and transportation routes. But in one way or the other, by accepting flood damages or by constructing flood control works, the price of this occupation must invariably be paid.

The flood problems in this country may be categorized as follows:

1. Inundation due to: (1) overflow of banks, (2) obstruction on account of blocking of natural streams, (3) inadequate land drainage of low lying areas, (4) sea tides and (5) denudation of river catchment area.
2. Erosion of river banks.
3. Changes in river course.

When there is excessive precipitation and inadequate channel capacity to carry the flood waters, the rivers overflow their banks. Even when flooding is not due to excessive precipitation, inundation may occur on account of inadequate waterways at road and railway river crossing or other encroachments. This aggravate flooding by causing backwater upstream of the construction. Flooding may also occur due to congestion at confluences and mouths of rivers. Besides, rainwater may stagnate on low lying areas for want of proper drainage. This, however is essentially a drainage problem. High tides resist flood flows of rivers and thus accentuate inundation. Although the tide period in itself may be relatively short, it takes the inundation areas longer to drain back and in the meantime the next tide intervenes. Prolonged flood-

* Report of the Sub-Committee on Floods, Presidential Committee on Relief & Rehabilitation.

ing thus results. Denudation of river catchment areas increases the frequency and magnitude of ordinary floods. The effect on the magnitude of major floods, however is negligible.

Another problem posed by floods is bank erosion. This erosion may adversely affect vast stretches of fertile agricultural lands adjacent to river banks, or it may affect towns or urban concentrations involving damage to industry, vital communication lines, etc.

Changes in river bed courses often complicate flood problems. With abrupt variation in bed slopes and heavy sediment charge, unstable river sometimes develop tendencies for changing their course. Another change of river course is typified by oscillatory beds, where the rivers emerging from a gorge swing from side to side in the flood plain within more or less specified limits.

Methods of Controlling Floods or Reducing Losses

The main object of flood control is to minimize to the extent possible, loss of life and property resulting from the occurrence of floods. The methods of reducing flood losses fall into two general categories. Firstly are the methods for physically controlling floods by lowering flood heights and/or reducing areas of overflow, and of checking bank erosion. Secondly are the methods which do not attempt to reduce flood flows or flood levels but aim at reducing or redistributing the resulting flood losses.

I. The methods of physically controlling floods are as follows:

1. Embankment or levees to bar out floods.
2. Reservoirs and detention basins to store or detain the excess volume of flood flows.
3. Channel improvement to increase the carrying capacity of the river proper.
4. Diversion channels and floodways to divert part of the flood discharge into other natural or artificial channels and spillways.
5. Raising of haibtation above heights.
6. Watershed improvement.

Embankments or Levees

Flood embankments are the oldest known forms of flood protection works and have been used extensively for this purpose. These serve to prevent inundation, when the river spills over its natural banks. Embankments are the only means of barring out floods on tidal plains and delta regions.

In general, embankments are a satisfactory method of flood protection when properly designed and executed, and adequately maintained. But a suitable combination of this method with other methods such as storage dams, detention basins, floodways, etc., is more efficient and desirable.

It is of utmost importance to have a satisfactory arrangement for the maintenance and repairs of embankments once these are constructed. No embankment is expected to survive the onslaughts of a river for any length of period if its maintenance is neglected. It is necessary to have a speedy means of communication and transport along embankments so that in an emergency, steps can be taken to prevent any disaster. The embankments should be closely watched during the flood season, and sufficient material and equipment be kept in handy for dealing with any breaches.

In the Philippines a number of rivers flowing through alluvial plains have protective dikes or levees in some reaches; notable among these are the Pampanga and Agno Rivers.

Reservoirs

Floods occur when the river flow exceed that which the river can carry within its banks. Reservoirs moderate floods by with-

holding peak flows and later releasing the stored water in regulated quantities. To be of optimum value, reservoirs for flood control must have an adequate capacity for dealing with all, except possibly phenomenal floods. In flood moderation by means of reservoir, no protection is afforded to that part of the drainage area which lies above the storage dam. But because of the nature of the terrain above such dams it is not often that protection is required. The beneficial effects of storage for flood reduction grow progressively less downstream of the dam not only due to contribution from uncontrolled tributaries, but also due to inadequate channel storage capacity.

The cost of such artificial reservoirs is generally prohibitive and in most cases economically unjustified. In the absence of accrual of other benefits such as power, irrigation, water supply, etc., reservoirs intended only for flood control are placed at an economic disadvantage since these come into use only for short period each year. As a rule, therefore, flood protection by means of storage or detention dams can only be contemplated in special cases such as the protection of very important centers immediately downstreams, or of a relatively small valley with dense population.

With the improved method of construction and the care which is bestowed on in the design of dams the chances of failure of a dam are now getting increasingly remote. There have, however, been failures of dams and the lesson learned should not altogether be forgotten. In the event of the failure of a dam the ensuing damage is catastrophic. This fact is worth keeping in view particularly in areas where flood problems are predominating and where the occurrence of earthquakes cannot be precluded.

No dam exclusively intended for flood control has yet been built in the Philippines. Instances of such dams in other countries are also exceptional.

Detention Basins

As distinct from reservoirs created by building dams, detention basins are the creation of nature improved and regulated by man to serve his needs of flood moderation. As a rule, rivers flowing through the alluvial build up their banks higher than the adjoining lands. Swamps and lakes get created where drainage of adjoining land is obstructed by this process of bank raising by river spills. During high floods, where the river is not embanked or diked, water spills and flows into these depressions, later to flow back into the river. This process bring about flood moderation in the river downstream.

The flood absorbing depth of a detention basin being a function of flood lift in the river, is normally limited to a few feet. Therefore to be effective, the area of the detention basin has to be relatively large. Also the bigger the river the greater the size of detention basin required for moderating floods.

Swamps and natural lakes in the plains generally have gently sloping sides and a rise of a few feet in the water level there often leads to submergence of large areas of marginal lands. These marginal lands can be saved from flooding by confining the swamp or lake area within a ring levee, making arrangement for the drainage of the area thus protected by providing suitable drainage gates. The capacity of natural detention basins can be considerably increased by dyking around, and its utility enhanced by providing regulating devices at their intakes and exits.

Flood moderation by means of detention basins where feasible, is generally the cheapest form of flood control. The land under the swamps or marshes hardly requires much land compensation, and the control works being of low head are relatively inexpensive.

This method of controlling floods finds application on some rivers in the country. For instance, the Candaba and San Antonio Swamps in Central Luzon serve as natural

detention basins for the flood flows of the Pampanga River. The plan for controlling the floods of the Cotabato River in Mindanao centers on the utilization of the huge natural retarding capacity of the Liguasan Marshes. Another application of this method is found in the plans for the drainage of Manila and Suburbs which proposes that flows in excess of the bank flows of the Marikina River be diverted directly into Laguna Lake by building a canal upstream of the confluence of the Marikina and Pasig Rivers. Such diversion will eventually eliminate floods in the City of Manila and Suburbs, due to uncontrolled overflows of the Pasig River.

Channel Improvement

A river or stream can be made to carry its discharge at lower levels by improving its hydraulic conditions. Such improvements may consist of one or more of the following:

1. Enlarging the channel cross-section.
2. Channel clearance.
3. Straightening the channel.
4. Use of cut-offs to reduce length of channel.
5. Lining the channel.

The enlargement of the channel of a large river by widening or deepening for purposes of flood relief is generally feasible only in short reaches such as those lying within towns or such other situations where other methods of flood control are not feasible.

Channel clearance, which can take the form of removing snags from river bed, removing jungle growth from shoals in the river or removing sand bars and other obstructions in the river channel, when carried out judiciously and over a length of period can lead to permanent improvement in the flow condition in the river.

The use of cut-offs and straightening of the river channel can give it a steeper grade and consequently higher velocities and lower flood heights for a given discharge.

Lining of a river channel will improve its coefficient of roughness and thus enable it to pass greater floods for the same water level, or keep the banks from receding landwards owing to erosion.

Channel improvements over long lengths have been attempted on some rivers in this country. These have enabled flood heights to be reduced along most of the length of the rivers. Lining of rivers with a view to stabilizing its banks has been done on a number of rivers. Revetments or bank protection works have been constructed to protect adjacent lands and valuable properties, roads and bridges, which are threatened by erosion. Also, waterway has been increased on a number of bridges on some rivers.

Diversion Channels and Floodways

When floods in a river cannot be moderated to safe flows by means of reservoirs, or when flood waters cannot be led safely through a particular reach of river even by building embankments, it is sometimes possible to resort to diverting part of the flood flow into another channel or on to land where damage would be comparatively small.

The excess water of a river during floods can be diverted into one or more of the following ways:

1. From one river into another.
2. Directly into the sea.
3. Into natural lakes or depression.
4. Into certain specified areas diked or otherwise.

Diversion of excess water from one river into another is feasible only when the receiving river has the capacity to take such diverted flood discharge without creating serious problems along its own course.

Diversion of flood waters directly into the sea is generally resorted to for reducing flood damage in the lower reaches of a river as in the delta areas. The splitting up of the river into a number of channels at its delta is a natural process of flood diversion.

Diversion of flood waters into lakes or depressions has been dealt with in paragraphs on detention basins. To be useful, such lake or depression has to be upstream of the flood plain to which relief is to be afforded.

In cases where embankments are not designed to cope with very great floods, breaching sections or spillways are provided in these embankments to allow escape of excess flood waters into selected areas where the resulting damage would be least.

The method of floodways or diversion which provides a safety valve in the case of very great floods, can avert or minimize what otherwise might prove to be catastrophic damage.

Raising of Habitations Above Flood Heights

When it is not economically feasible to preclude floods from a certain area or when it is otherwise undesirable to prevent the annual inundation of areas during the flood season, raising of habitations or other important places is resorted to, to prevent damage to property and inconvenience to inhabitants. While submersion of cultivated land for some period is permissible and is even welcomed in certain places, it is evident that flooding of habitations even for a short period is very harmful and is to be prevented to the extent possible. The raising of villages or barrios in areas which are subject to annual flooding, enables people to live in security against floods, although at times surrounded by water. Enough space should be raised at such habitations to provide shelter for the livestock and stores. This method of facing floods can be with advantage to use in low lying localities which are exposed to annual flooding and where flood moderation or prevention is otherwise not feasible.

Watershed Improvement

The main cause of flood damage is not so much the excessive flow of water in rivers as the sediment which most of them have to transport. Excessive sediment charge is one of the principal causes for the meandering of streams, which cause heavy devastation by carving out new channels. If, therefore, a basic remedy is to be sought to the flood problem in the country, efforts will have to be directed towards reducing the excessive sediment which flows in the more damaging rivers. This means carrying out extensive and intensive land management measures in the catchment areas of these rivers.

Soil conservation measures are designed to retard the speed of run-off and to minimize soil erosion and consequently the sediment load in the river. Floods cannot be entirely prevented by soil conservation measures. Medium floods, however, can be moderated and thus their frequency lowered by such measures. The effect of these measures on very high floods is insignificant. But soil conservation serves, even during very high floods, the important purpose of preventing excessive loss of soil.

The advantages of proper land management do not restrict themselves to the diminution of flood discharge including sediment and reduction of flood damage. They increase the agricultural yields and increase the productive potential of forests and grasslands. Soil conservation is, therefore, essentially a land development program and its effect on flood prevention is additional to the improved capability of the soil.

It is generally accepted that the ground covered with vegetation will ordinarily suffer less erosion than bare ground, and the more complete and dense the cover of vegetation the greater will be the tendency for

increased infiltration and thus reduce surface runoff. In a soil conservation program, changes and manipulations of plant cover will involve introduction of suitable vegetation on bare soil, change from erosion-inducing to soil-protecting crops, introduction of suitable crop rotations, use of cover crops, prohibition of cultivation on steep slopes, use of fertilizers, etc. These corrective measures come under proper land use of croplands.

In grasslands or in forests where grazing is permitted, an important factor adversely affecting vegetation is over-grazing and browsing. This not only depletes the volume of growth but also reduces the plant density and brings the change to less palatable and usually less erosion-resisting species. Trampling of the soil hardens it which adversely affects the soil structure and accelerates runoff and reduces the infiltration. Cultivation of grasses, legumes and shrubs, some tree growth, and improved pasture management are vital for grasslands.

Proper management of forestlands, namely, reforestation, normal regeneration, fire control, elimination of shifting cultivation or "kaingin", logging and sawing practices, make for the continuation of a normal and dense forest cover in perpetuity.

The additional land management measures include terracing, contour dyking, contour cultivation and cropping, gully plugging, check dams, retaining walls, outlet structures, and other similar structures. These affect the frequency and infiltration and erosion, and thus indirectly affect the frequency and discharge of floods and sediment transportation.

For purposes of flood control it may be assumed that soil conservation practices alone would be effective in small watersheds with moderate rainfall and their effect would progressively decrease with the greater intensity of the downpour spread over a long period and over large watersheds.

II. The methods which do not attempt to reduce flood flows or flood levels but aim at reducing or redistributing flood losses fall under the following headings:

1. Evacuation
2. Zoning
3. Changes in buildings and their use
4. Flood insurance

Evacuation

One method of avoiding or reducing to a minimum the damage arising from floods is by evacuation of property located in areas which are subject to frequent and recurring floods. This method, however, presents administrative difficulties. People as a rule are unwilling to move from areas where they have been living for some length of time unless the situation becomes so dangerous that they perforce have to quit. It is however necessary in national interest to weigh up the advantage of any such evacuation against not only the expenditure involved in affording protection and relief to the flood affected people, but also the loss and damage which the people concerned sustain from such floods. Under certain circumstances evacuation is preferable to flood control where the latter cannot be carried out adequarely, because it eliminates unnecessary human suffering, and unlike flood control it entails no subsequent operation and maintenance expenditure. This method of relief should always be given consideration in order to provide an economic yardstick for other proposals.

Zoning

Due partly to increasing population and partly to development in various spheres of national activities there is an increasing encroachment on the waterways of the various rivers. Each river rightfully requires a certain waterway to enable it to pass its less frequent but very high floods. Because such very high floods do not at times occur for

a number of years, people get tempted to encroach on this waterway, and considerable loss ensues when a very high flood occurs later. A good deal of this loss may be avoided by flood zoning whereby areas along a river are demarcated and declared as the waterway necessary for passing very high floods in river. If expensive and easily damageable assets are not created within such zones, loss will be kept within limits. Effective steps should be taken in demarcating flood zones on the major rivers and in preventing or dissuading people from creating valuable assets within these zones. These steps will include legislative action and rigid enforcement.

Changes in Building and in their Use

Where buildings and installations cannot be removed out of the way of recurring floods, a good deal of damage can be avoided by strengthening the foundations, floors and frames of these buildings, and removing valuable property like baggage, machinery, equipment, offices, etc., to higher floors where floods cannot cause serious damage. This is particularly applicable to towns or cities located on river banks.

Flood Insurance

In certain countries flood insurance has been considered in recent years. Under this scheme people living in flood affected areas are required to pay a premium commensurate with the flood damage occurring, relief is afforded to the sufferers from the insurance funds. In certain cases flood damages are also repaired from such insurance money. Flood insurance as a method of affording relief to flood sufferers is worthy of consideration, although, unlike fire and other forms of insurance, it applies to only a limited segment of population, and therefore, may demand such high rates of premium as to question its practicability.

FLOOD PREDICTIONS AND WARNING

Although some progress has been made in the matter of flood prediction, this still continues to be inadequate and unsatisfactory. While it is possible for the Philippine Weather Bureau to forecast the paths of typhoons and depressions, methods and procedures have not yet satisfactorily been developed to indicate the magnitude of resulting floods. However, the Weather Bureau in coordination with the Bureau of Public Works is presently undertaking a number of activities aimed at a pilot flood warning scheme for the Pampanga River Basin and adjacent areas.

It is known that major floods in Philippine rivers occur when the typhoon path passes northeast of their catchment areas. Not all such typhoons, however, cause major floods and in some parts of the country, notably the Agusan catchment area, major floods occur outside of the typhoon season. There does not seem to be any relation between the distance of the typhoon center from the catchment area of a river, and the magnitude of a resulting flood. Nor is there any relation between typhoon intensity and flood magnitude. A mere depression may cause a major flood.

It is not possible at present to predict with a reasonable semblance of accuracy, the occurrence and mangitude of impending floods in Philippine rivers. However, when the path of a typhoon is predicted to follow a course which will pass northeast of a river catchment area, this should be taken as an alert signal to be prepared for the possible occurrence of a destructive flood.

Flood Damages in the Philippines

Flood damages in the Philippines are bound to increase with the agricultural and industrial development of normally flooded areas, not so much, because of any increase in the frequency of magnitude of flood producing rainstorms, but because of the ever increasing amount of damageable properties that are placed within reach of flood waters. The most highly developed agricultural and industrial areas in the Philippines are the

Central Plain of Luzon and the Manila Delta, respectively. These are also the areas where flood damages are greatest. It is estimated that the current over all average annual flood damage in the Philippines is in the order of ₱60 million. The flood of August 1960 in the Pampanga River Basin alone, caused damages in the order of ₱18 million. The devastating floods of February 1962 in Mindanao caused damages in the amount of ₱19.4 million. The results of the statistical analysis based on flood damage surveys in thirteen (13) river basins show an aggregate average annual loss in these basins of ₱28.6 million (See Table I). These losses occur from year to year and show how severe has been the drain on national wealth due to floods.

TABLE I — Average Annual Flood Losses

River Basin	Location	Average Annual Flood Losses
1. Pampanga River System	Pampanga, Nueva Ecija and Bulacan	₱ 8,435,000
2. Agno River System	Pangasinan & Tarlac	2,482,000
3. Gumain-Porac-Caulaman Rivers	Pampanga & Bataan	365,000
4. Pasig-Potrero River	Pampanga	346,000
5. Bicol River	Camarines Sur	1,131,000
6. Albay River	Albay	528,000
7. Laoag River System	Ilocos Norte	165,000
8. Cagayan River	Cagayan	900,000
9. Ilog-Hilabangan Rivers	Negros Occidental	755,000
10. Jalaur River	Iloilo	269,000
11. Panay River	Capiz	739,000
12. Rio Grande de Mindanao	Cotabato	2,586,000
13. Pasig-Marikina Rivers	Manila and Rizal	9,900,000
	TOTAL	₱28,601,000

PRECAUTIONARY MEASURES:

1. Occupants of dwellings situated close to banks of rivers subject to sudden rise in water levels during rainstorms, should be prepared to evacuate to high ground, when typhoon warnings are issued. Do not sleep or spend the night in such dwellings when there are indications of fast rising water levels in the river coupled with continuing strong rains.
2. Evacuation plans should be made in advance. Each member of the family should be given specific instructions and responsibilities in case of evacuation.
3. Occupants of dwellings affected by swift currents should evacuate to high areas when the depth of flood is still below knee depth.
4. When a typhoon warning is announced batten down or secure weak habitations against being carried away by swift currents.
5. Do not go swimming or boating on rivers when in flood.
6. Drink only boiled water during and immediately after a flood.
7. Eat only well cooked food during the flood emergency. Protect left-overs against contamination.
8. Avoid unnecessary exposure to the elements.
9. Submit to immunization against cholera, dysentery and typhoid as required by health authorities.

Determination of Wood Waste in the Sawmills[1]

by
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F. D. VIRTUCIO[3]

ABSTRACT

The results of waste studies conducted in a circular sawmill showed a total waste of approximately 983 board feet of wood material for every 1,000 board feet of lumber sawn, i.e. waste was nearly equal to production. Similar studies made in two band mills, showed, however, that for every 1,000 board feet of lumber produced there was developed a total waste of 470 board feet of wood material, or waste was almost one-half only of production.

INTRODUCTION

Any program of wood waste utilization and any planning of integrated operations in sawmills must be preceeded by fairly reliable studies to determine the quantity and form of waste available for processing. The quantity and quality of available raw material for any given volume of production is a major factor for most manufacturing enterprises.

The primary purpose of the study was to determine the quantity of sawmill residue potentially available in sawmill operation, both circular and band mills. To determine the volume of each form of waste developed in sawing 1,000 board feet of lumber manufactured was another objective of this study. This information will form the basis of estimates of wood wastes and residue developed in sawmills on regional and national levels.

The interest in regard to the determination of wood waste in sawmills has been generated from several inquiries directed to the Forest Products Research Institute on the volume of residue accummulated in the manufacture of lumber. In response to these inquiries, a study was conducted at two representative band mills in Manila and one circular mill in Mindanao.

PROCEDURE OF THE STUDY

To obtain a fairly accurate estimate of the volume of wood waste in the sawmill operation, logs of representative sizes and grades were selected for the study. The study logs were followed individually, tallying separately the various forms of wastes developed at each stage of manufacture from the headsaw to the sorting table.

The study crew was composed of five members who were stationed at strategic positions in the mill and who were assigned to measure and record the waste.

Fine Residue (Sawdust)

1. *Headsaw*—Sawdust from the headsaw was tallied like a piece of lumber with the kerf as the thickness, the average depth as the width, both in inches, and the length of the log in feet as the length of the piece. Separate sawdust tally for each log was kept.

2. *Edger*—Sawdust developed at the edger was also tallied, as in the headsaw, by individual logs. The saw kerf was the basis for its thickness. The thickness in inches and length in feet of every board that

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[1] Waste studies were conducted with the assistance of M. J. Sagrado, M. A. Eusebio and A. Tongacan, all technologists of the Forest Products Research Institute.

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passed through the edger were actually measured. These two measurements corresponded the width and length, respectively, of the rectangular solid wood converted into sawdust of the edger. With these measurements, the sawdust was determined by tallying the number of cuts in each board.

3. *Band resaw*—The kerf of the band resaw was determined. The thickness or width in inches and length in feet of each cant resawed were tallied by the number of cuts made. If a cant or flitch was resawed parallel to its width, the width of the cant was measured and tallied as the width of the piece representing the sawdust waste. If resawed parallel to the thickness of the flitch, the thickness was recorded as the width of the piece representing the sawdust waste.

4. *Trimmer*—The kerf of the trim saw, the thickness and width of each lumber trimmed were tallied. The thickness, width and length of each trim cut, were equal to the saw kerf, thickness and width of the board, respectively.

The volume in board feet of solid wood converted into sawdust in the headsaw, edger, and band resaw was determined by multiplying the three measurements in each case, divided by 12. The sawdust volume in board feet at the trimmer was determined by multiplying the three measurements, divided by 144 because all the measurements here were in inches.

Solid Residue

1. *Slabs*—Every piece of slab was measured on its total length in feet, maximum thickness and maximum face width in inches. The volume in board feet was determined by multiplying the product of these three measurements by a factor of 0.67 (5)[4] and then divided by 24.

2. *Edgings*—Total length, maximum thickness and maximum face width of each piece of edgings were actually measured. The volume of this item in board feet was equal to the product of the length in feet, width and thickness in inches, divided by 24.

3. *Lumber Trim*—Almost all trims were rectangular in form. Three measurements, all in inches, were made of each piece of trim to determine the thickness, width and length. The volume in board feet of rectangular trim was equal to the product of the three measurements in inches, divided 144. For the few triangular trims that were noted, the volume was equal to 1/2 of the corresponding rectangular trim.

The green-chain tally was based on lumber recovered from individual logs, segregated by grades in order to determine whether the grades had an influence on the amount of residue developed, especially from the edging and trimming operations where upgrading was being practiced to produce export grade lumber.

WOOD WASTE IN CIRCULAR MILL

The results of the study in the circular mill were based on 60 representative logs with a total gross volume of 79.94 cubic meters or 33,895 board feet. The results of the study are schematically presented in Figure 1a. Of the total log gross volume, percentagewise, the lumber recovery was 44.6 percent, sawdust 18.6 percent, slabs 9.6 percent, edgings 8.9 percent and lumber trims 6.5 percent. The defective portions of the logs, which consisted of brash centers, heart checks, and other natural defects, were tallied not as waste but as defects estimated to be 11.8 percent of gross volume.

Volume of Fine Residue

Sawdust from the headsaw, edger, band resaw and the trimmer had the greatest volume developed compared to each of the other individual waste items. This amounted to 18.6 percent of the total gross volume of the logs studied, and 42.7 percent of the

[4] Numbers in parentheses refer to the literatures cited at the end of this paper.

total volume of waste tallied. The total fine residue produced per thousand board feet of lumber manufactured was 420 board feet. The breakdown of fine residue with respect to the point of occurrence in the mill operation is as follows:

a. *Headsaw.*—There were 1,154 cuts made by the headsaw on the 60 logs sawn, developing 5,300 board feet of solid wood into sawdust. Each log had an average of 19.23 cuts and the boards sawn were primarily 2-inches in thickness. The headsaw-sawdust in relation to log volume was 15.7 percent of the gross scale. In terms of the production, 353 board feet of solid wood were converted into sawdust by the headsaw in cutting 1,000 board feet of lumber.

b. *Edger*—Out of the total log gross volume of 33,895 board feet, 937 board feet of solid wood were developed into sawdust at the edger. Basing on the lumber tallied from the study logs, the edger-sawdust amounted to 63 board feet per thousand board feet of lumber sawn.

c. *Band resaw*—There were 1,600 board feet of 2-inch and thicker materials that went into the resaw or equivalent to 4.7 percent of the total volume of the logs studied. In resawing this material, a total of 67 board feet of sawdust was developed, or equivalent to 0.2 percent of the log gross volume. Based on the general recovery, 3 board feet of sawdust were developed for every thousand board feet of lumber recovered. However, on the basis of the quantity of lumber that passed through the resaw, 54 board feet solid wood were developed as sawdust in resawing 1,000 board feet of lumber.

d. *Trimmer*—The volume of sawdust developed by the trimmer was quite small. It amounted only to 0.04 percent of the total volume of the study logs. In trimming 1,000 board feet of lumber, only 1.00 board feet of equivalent solid wood was converted into sawdust at the trimmer.

Volume of Solid Residue.

The volume of solid residue in the form of slabs, edgings, and lumber trims was greater than the volume of fine residue. The aggregate volume of solid residue amounted to 57.3 percent of the volume of waste. If compared to the lumber recovery, the volume of solid residue was more than one-half of the volume of lumber produced. For every 1,000 board feet of lumber, 563 board feet of residue was tallied. The amount of individual solid waste items developed is as follows:

a. *Slabs*—The 60 logs sawed yielded 304 pieces of slabs with an aggregate volume of 2,930 board feet and which was 9.6 percent of the total gross volume of the logs (Fig. 1a). This volume comprised 21.9 percent of the total volume of waste tallied. For every 1,000 board feet of lumber manufactured this waste items amounted to 215 board feet.

b. *Edgings*—There were two sources of edgings in this particular operation studied, namely: (1) edgings, developed at the edger and (2) edgings developed at the band resaw. The edgings that developed in the latter was the result of straightening the tapered cants and dog boards in order to produce the best possible grades of export lumber. The combined volume of the edgings from these two sources amounted to 8.9 percent of the total volume of the study logs or 200 board feet per 1,000 board feet lumber production. This waste item was 20.4 percent of the total volume of sawmill residue.

c. *Lumber trim*—As shown in Figure 1a, lumber trim constituted 6.5 percent of the volume of the logs. Expressed on the basis of lumber production, lumber trim amounted to 148 board feet in sawing 1,000 board feet of lumber. Compared with all other waste items, the lumber trim was the smallest having the volume of only 15.0 percent of the aggregate volume of circular mill residue.

The volume of wood waste developed in the band mill operation was found to be relatively smaller compared to the volume of waste developed in circular mills. Graphical comparison of the percentages of the volume of lumber recovery and incidental waste in the operation of these two types of headrigs is shown in Figure 1. In the band mill operation, based on the 143 logs studied, the lumber recovery averaged 60.2 percent of log gross volume (Fig. 1b) while in the circular mill operation, the average lumber recovered was only 44.6 percent of the gross volume of the logs sawn (Fig. 1a). This means that only 39.8 percent of log gross volume was being wasted in the band mill while 55.4 percent of the volume of the logs went to waste in circular mill operation. The 39.8 percent of wood waste in band mill was broken down as follows: sawdust 16.3 percent, edgings 6.9 percent, lumber trim 3.7 percent, slabs 2.8 percent and the remaining 10.1 percent was tallied as defects.

The following is a discussion on the occurrence of each individual waste items being developed in band mill operation:

a. *Sawdust*—As in circular mill, sawdust constituted the greatest volume of waste. It is the accummulated fine residue coming from the headsaw, edger, and resaw. The total accummulation of this waste item was 263 board feet per 1,000 board feet of lumber produced or 55.6 percent of the entire volume of waste (Tables 1 & 2). In this particular study, sawdust produced at the trimmer was found to be negligible.

b. *Edgings* — The second largest waste item in the band mill operation studied was the edgings. The accummulation of edgings for every 1,000 board feet of lumber produced amounted to 108 board feet or 22.7 percent of the total volume of waste tallied (Tables 1 & 2).

c. *Lumber trims* — Lumber trimmings is the next to edgings in volume of occurrence. In cutting 1,000 board feet of lumber, the trimmer wasted 58 board feet. This volume was accummulated as a result of squaring the ends of the boards and also in cutting out some end defects of the lumber. Of the total waste, lumber trim was 12.3 percent.

d. *Slabs* — Accummulation of slabs from the logs studied amounted to 44 board feet in the manufacture of every 1,000 board feet of lumber. This amount comprised 9.4 percent of the entire volume of wood waste developed in the band mill. It was noted that slabs in the band mill was very much smaller in volume than in the circular mill studied. This was due to the practice of thin slabbing in the band mill, a practice which was not generally followed in the circular mill.

SUMMARY

1. The volume of wood being wasted in the manufacture of lumber in the circular mill was more than in the band mill. Of the volume of logs sawn, the former wasted an average of 55.4 percent, recovering only 44.6 percent of lumber while the latter wasted 39.8 percent and recovered an average of 60.2 percent lumber.

2. The volume of sawdust developed was more in circular mill than in the band mill. For every thousand board feet of lumber manufactured, the sawdust volume in circular mill was 420 board feet while only 263 board feet in the band mill or a difference of 157 board feet (Table 1). This was due to the thicker kerf of circular headsaw than that of the band headsaw.

3. In terms of the percentage distribution of the total volume of waste, independently in each operation, the solid residue in circular mill was 57.3 percent and 42.7 percent sawdust, while in the band mill, the solid residue was 54.4 percent and sawdust was 55.6 percent.

4. Slabbing in the circular mill was thicker than in the band mill. The volume of slabs developed in the former was 9.6 per-

cent of log gross volume or 215 board feet uper 1,000 board feet of lumber manufactured. In the latter, the volume of slabs was only 2.8 percent of log gross volume or 44 board feet per 1,000 board feet lumber production. However, this difference was primarily due to the sawyer's practice that varies from mill to mill regardless of type.

5. The lumber trim in circular mill was also more, 6.5 percent of log gross volume, than in the band mill with only 3.7 percent on the same basis. This variation, as in slabbing, was due to trimming practices.

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TABLE 1. Summary table of waste items per thousand board feet of lumber manufactured.

Waste items	Volume in board feet	
	Circular mill	Band mill
1. Sawdust	420	263
2. Slabs	215	44
3. Edgings	200	108
4. Lumber trim	148	58
Total	983	473

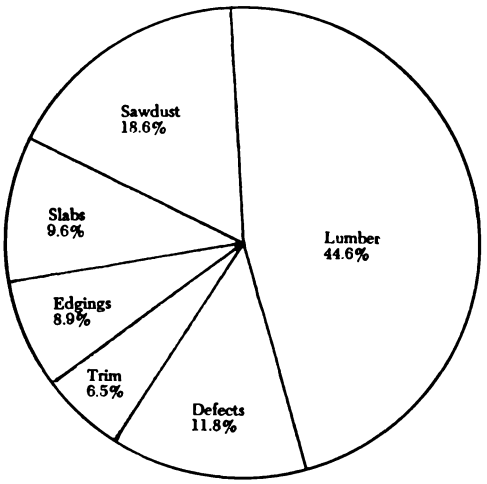

FIG. 1a. Data for circular mill

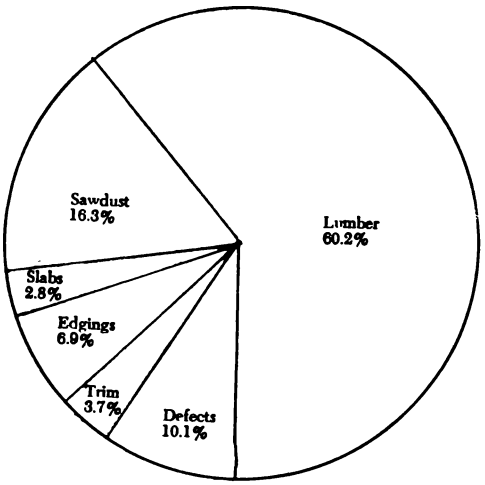

FIG. 1b. Data for band mill

FIGURE 1. Graphical comparison of volumes of wood residue and lumber produced in circular and band mill operations based on log gross volume.

TABLE 2. Percentage distribution of waste items developed in in circular and band mill operations.

Waste items	Circular mill	Band mill
1. Sawdust	42.7	55.6
2. Slabs	21.9	9.4
3. Edgings	20.4	22.7
4. Lumber trim	15.0	12.3
T o t a l	100.0	100.0

SHRINKAGE ALLOWANCE FOR KILN-DRYING AND AIR-DRYING GREEN LUMBER OF SOME PHILIPPINE COMMERCIAL WOOD SPECIES

Shrinkage is the reduction in the size of wood during drying. It is due to the contraction of the thickness of the walls and diameter of the fibers of the wood resulting from the removal of "bound" or "hygroscopic" water from the cell walls below the fiber saturation point. The aggregate of all the unit reduction in size of the cells of a piece of wood at any moisture content is the total shrinkage at this moisture content.

Fundamentally, the shrinkage of wood refers to the decrease in dimension resulting from the volumetric loss of "bound" water from the wood cells. The amount of "bound" water present in wood varies widely between species due to differences in density anatomical structure, and presence of soluble substances. Consequently, the extent to which wood shrinks with a given moisture content varies widely between woods of different species. Shrinkage of wood also varies between trees of the same species as well as between boards of the same tree, and even between parts of a piece of wood. This variation is influenced by the anisoptropic behavior of wood, grain direction, presence of tension and compression wood, shape and size, presence of knots, improper conversion, and effect of drying conditions.

Published shrinkage properties of wood in general, are the results of studies made by slowly air-drying clear test specimens. This method is the widely accepted standard for deriving shrinkage properties of wood. With proper test procedure, this method could take care of all the factors that influence the shrinkage of wood, except the effect of drying conditions. Values derived from this method, therefore, are reliable only when the method of seasoning the lumber is the same as that used for the test specimens.

In case of kiln-dried lumber experiments have shown that at normal kiln temperatures (200°F. max.), most species exhibited greater shrinkage than those obtained from the standard test method. This is attributed to the effect of compression stresses that developed in the interior part of the wood while it is still wet, as a result of the tensile stresses on the surface brought about by the shrinking of the surface as it dries below the fiber saturatoin point but prevented to shrink fully by the wet interior. Under accelerated drying conditions, the surface of a piece of wood develops high tensile stresses because of the restrained shrinkage. Consequently, high compression stresses are also produced in the center of the piece which is necessary to maintain equilibrium of forces or avoid deformation and/or mechanical failure. As the wet interior dries below the fiber saturation point, it develops a greater shrinkage because wood, if subjected under compression stresses when wet, will have a greater shrinkage when dried if it assumes normal shrinkage. The magnitude of the restrained shrinkage that developed on the surface at the early stage of drying, on the other hand, decreases at the later part of drying, the moment the stresses reverse. The unrecovered shrinkage that remains on the surface after drying is a "set" (tension set), known as casehardening. This can be successfully relieved by proper application of final conditioning treatment.

The following table gives the green dimensions with allowances for shrinkage, and the expected final dimensions when kiln-dried or air-dried to 12 percent moisture content of some Philippine commercial species. This table can be of great importance to sawmillers and manufacturers alike. Great losses are occasioned by under-sized stocks when insufficient allowances are made for the shrinkage which is inevitable during drying. The reverse is true, that unnecessary losses can occur through over-sizing green materials. All figures in the table under air-dried are based from averages taken from 1 x 1 x 4 inches clear specimens using the standard test method, while the figures under kiln-dried are based from average shrinkage of random size of boards taken during the process of kiln-drying.

Dimensions of lumber not within the table could be calculated proportionately. For example, the shrinkage allowance in width of a 16-inch board will be about twice of that of an 8-inch board, and the shrinkage of a 4-inch thick board will be about twice of a 2-inch thick board.

A piece of lumber that needs to be surfaced to any desired dimension after the seasoning process should be provided with dressing allowance to be added to the green dimensions. The standard dressing allowance, irrespective of thickness and width and the nature of sawing is one-eight (1/8") of an inch.

TABLE 1 — Green dimensions, with shrinkage allowances, and the expected final dimensions when kiln-dried or air-dried to 12 percent moisture content of some Philippine commercial species[1]

SPECIES	RADIAL							TANGENTIAL						
	Thickness (in.)		Width (in.)					Thickness (in.)		Width (in.)				
	1	2	4	6	8	10	12	1	2	4	6	8	10	12
Almon	1-1/16	2-1/8	4-3/16	6-9/32	8-3/8	10-15/32	12-9/16	1-3/64	2-3/32	4-1/4	6-3/8	8-1/2	10-5/8	12-3/4
	1-3/64	2-3/32	4-1/8	6-3/16	8-1/4	10-5/16	12-3/2	1-1/32	2-1/16	4-1/8	6-3/16	8-1/4	10-15/32	12-9/16
Apitong	1-3/32	2-3/16	4-1/4	6-3/8	8-1/2	10-5/8	12-3/4	1-1/16	2-1/8	4-3/8	6-9/16	8-3/4	10-15/16	13-1/8
	1-3/32	2-3/16	4-1/4	6-3/8	8-1/2	10-5/8	12-3/4	1-1/16	2-1/8	4-3/8	6-9/16	8-3/4	10-15/16	13-1/8
Bagtikan	1-5/64	2-5/32	4-3/16	6-9/32	8-3/8	10-15/32	12-9/16	1-3/64	2-3/32	4-5/16	6-15/32	8-5/8	10-25/32	12-15/16
	1-3/64	2-3/32	4-1/8	6-3/16	8-1/4	10-5/16	12-3/8	1-1/32	2-1/16	4-3/16	6-9/32	8-3/8	10-15/32	13-9/16
Dagang	1-3/32	2-3/16	4-3/16	6-9/32	8-3/8	10-15/32	12-9/16	1-5/64	2-5/32	4-3/8	6-9/16	8-3/4	10-15/16	13-1/8
	1-1/16	2-1/8	4-1/8	6-3/16	8-1/4	10-5/16	12-3/8	1-1/32	2-1/16	4-1/4	6-3/8	8-1/2	10-5/8	12-3/4
Lauan, Red	1-3/64	2-3/32	4-1/8	6-3/16	8-1/4	10-5/16	12-3/8	1-1/32	2-1/16	4-5/16	6-9/32	8-3/8	10-15/32	12-9/16
	1-3/64	2-3/32	4-1/8	6-3/16	8-1/4	10-5/16	12-3/8	1-1/32	2-1/16	4-5/16	6-9/32	8-3/8	10-15/32	12-9/16
Lauan, White	1-3/64	2-3/32	4-1/8	6-3/16	8-1/4	10-5/16	12-3/8	1-1/32	2-1/16	4-5/16	6-9/32	8-3/8	10-15/32	12-9/16
	1-3/64	2-3/32	4-1/8	6-3/16	8-1/4	10-5/16	12-3/8	1-1/32	2-1/16	4-5/16	6-9/32	8-3/8	10-15/32	12-9/16
Mayapis	1-5/64	2-5/32	4-1/8	6-3/16	8-1/4	10-5/16	12-3/8	1-1/32	2-1/16	4-5/16	6-15/32	8-5/8	10-25/32	12-15/16
	1-3/64	2-3/32	4-1/8	6-3/16	8-1/4	10-5/16	12-3/8	1-1/32	2-1/16	4-3/16	6-9/32	8-3/8	10-15/32	12-9/16
Panau	1-5/64	2-5/32	4-3/16	6-9/32	8-3/8	10-15/32	12-9/16	1-3/64	2-3/32	4-5/16	6-15/32	8-5/8	10-25/32	12-15/16
	1-1/16	2-1/8	4-1/8	6-3/16	8-1/4	10-5/16	12-3/8	1-1/32	2-1/16	4-1/4	6-3/8	8-1/2	10-5/8	12-3/4
Tangile	1-5/64	2-5/32	4-3/16	6-9/32	8-3/8	10-15/32	12-9/16	1-3/64	2-3/32	4-5/16	6-15/32	8-3/8	10-15/32	12-9/16
	1-3/64	2-3/32	4-1/8	6-3/16	8-1/4	10-5/16	12-3/8	1-1/32	2-1/16	4-3/16	6-9/32	8-1/4	10-23/32	12-15/16

[1] Upper figures are the required green dimension of boards when kiln-dried to 12% M.C. and lower figures are the required green dimension of boards when air-dried to 12% M.C.

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BRASH CENTER OR "BRITTLEHEART"

Brash center or "brittleheart" refers to a defect of a piece of timber causing it to fail abruptly without heart or punky heart. This defect lowers the value of timber especially those for export and renders them unfit for many useful purposes. One of the serious adverse effects of brittleheart is the failure of timber in service without warning. Furthermore, brittleheart causes the rejection of large cores in both the plywood and matchmaking industries. Wood considered brashy would also produce paper of inferior quality, considering that broken fibers are comparatively shorter than unbroken ones, hence paper produced from this kind of fiber is less in strength.

A log with brittleheart is characterized by carroty appearance, torn grain at the end of the log, low density areas of light-colored heartwood and fuzzy appearance in longitudinal surfaces when planed. In eucalyptus, it was observed that the boundary between brittleheart and normal wood was not necessarily concentric about the pith, nor was it regular in vertical cross section.

Some theories have been advanced as to the causes of brash center in wood: — stresses and heart. Long-term stresses cause failure in longitudinal compression especially with the increase in magnitude as the tree increases in diameter. It was shown that these stresses are of an order that could cause compression failures of wood in the central portion of the tree. Further test indicated that continued growth and increased stresses cause the expansion of brittleheart in wood of higher density nad much greater compressive strength. The greatest internal stresses caused by the weight of the tree in this way could account for only a small proportion of stress required to cause failure. Heart as another cause of brash center is that center of the tree affected by decay or brittle in the absence of decay. The outstanding characteristic of heart is its brittleness and low impact strength which may be 50 percent or less than the impact strength of the normal wood. It was found also that the toughness values of *Eucalyptus robusta* grown in Hawaii as defined by brash center failure, has but 29 percent the toughness of normal wood.

Macroscopically, brittleheart could be detected by inspection, knife and splinter tests. Inspection test although not as reliable as the latter tests may be used by careful observation at the end of the log the difference in color and density. Generally, brittleheart portion is light-colored, low in density and with torn fibers. By this method it is oftentimes difficult to detect normal wood from brashy wood because there are instances in which there is no difference in appearance. Knife test is used by lifting up a small sliver. A straight, clean fracture of the sliver indicates the presence of brittleherat. Breaking of small splinters between fingers reveals laso the presence or absence of brash center. Abrupt and clean fracture shows the presence of such defect compared with normal wood which breaks with difficulty thus causing splintering of fibers. Sections prepared from brash wood reveal the presence of compressioa failures across the fibers. Broken fibers of macerated wood as observed in a microscope are further evidences of brittleheart.

In the Philippines, dipterocarp species which constitute about 75 percent of the stand of forest are commonly affected by brittleheart. It prevails at the center, sometimes adjacent to the center of the log particularly at the base or butt-log. In some instances it was found to be most widespread in the upper portions. These observations agree with the finding in some eucalyptus species growing in Australia.

Seventeen dipterocarp species under 6 genera collected from Agusan, Cagayan, Laguna and Quezon provinces were studied as to the occurrence of brash center. Results of the observation, including

the origin and diameter of these species, are shown in table 1. The knife and splinter tests revealed that a great variation in the amount of brittleheart was observed in different species. This difference may be due to the resistance or susceptibility of the species to brittleheart to geographical location, crown density and exposure of the species to wind. Furthermore, the study of different trees of a single species generally tend to show that the percent of brittleheart is proportional to the diameter. This, however, does not hold true with bagtikan from Agusan with 5.96 percent defect (diameter—65 cm.), and 4.95 percent (diameter—70 cm.). The average percent defect of brittleheart in the descending order are as follows: manggasinoro—26.50; mayapis —16.00; tangile—12.77; red lauan—12.76; white lauan—12.10; malapanau—6.59 almon—5.50; bagtikan—5.46; malaanonang—5.16; afu—3.92; manggachapui—3.50 apitong—3.00; broad-winged apitong — 1.00; thick-leafed narig — 1.00; dagang — 0.96; guijo—0.46; and panau—0.34. Studies on Northern Mindanao species reveal that the percent of brittleheart of mayapis, tangile, and white lauan more or less agree with the present finding of the same species collected from Agusan, Cagayan and Laguna. Previous finding on red lauan however, by the same author shows that this species from Northern Mindanao has higher percentage of defect (15%) than those of the same species collected from Cagayan (12.76%).

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TABLE 1. Data showing the average percentages of brittleheart by splinter and knife tests.

Species	Origin	Diameter (cm.) Butt	Top	Average	% defect Butt	Top	Average
1. Afu	Cagayan	80.20	76.80	78.50	3.14	4.70	3.32
2. Almon	Quezon	100.00	—	85.00	8.00	—	5.50
3. Apitong	Quezon	75.00	—	75.99	3.00	—	3.00
4. Bagtikan	Agusan	65.00	—	67.50	5.96	—	5.46
		70.00			4.95		
5. Broad winged apitong	Quezon	60.00	—	60.00	1.00	—	1.00
6. Dagang	Laguna	80.00	—	80.00	0.96	—	0.96
7. Guijo	Laguna	55.00	—	55.00	0.46	—	0.46
8. Malaanonang	Cagayan	103.30	65.60	84.45	2.45	7.87	5.16
9. Malaparau	Cagayan	66.75	54.55	60.65	5.47	7.71	6.59
10. Manggachapui	Quezon	65.00	55.00	60.00	6.00	1.00	3.50
11. Manggasinoro	Cagayan	75.20	65.90	70.55	24.21	28.90	26.50
12. Mayapis	Quezon	65.00	—	65.00	16.00	—	16.00
13. Panau	Laguna	50.00	—	50.00	0.34	—	0.34
14. Red lauan	Cagayan	93.25	92.00	92.63	13.89	11.62	12.76
15. Tangile	Agusan	65.00	—	67.50	10.88	—	12.25
		70.00			13.62		12.77
	Cagayan	77.25	69.50	73.38	10.27	16.30	13.29
16. Thick leafed narig	Laguna	60.00	45.07	52.50	1.00	1.00	1.00
17. White lauan	Laguna	60.00	—	60.00	12.00	—	12.10

FPRI Highlights

FPRI SURVEYS FUNGAL PROBLEMS OF LOGGING COMPANIES IN MINDANAO

A survey of fungal problems in 8 logging companies in Mindanao was conducted by Eleuterio Mendoza of the Pathology Section from June 3 to 1, 1966. His findings are:

1. Heart (center) rot was very common on commercial tree species, especially on those overmatured ones. Many foresters and fellers claimed that about 20 to 30 percent of the standing commercial-size trees were considered as culls due to heart rots.

2. Logging injuries on the residual trees serve as the most common avenue of entrance for center rot fungi. Observations made on trees injured 10 years ago in Bislig Bay Lumber Co. showed that the trees were unhealthy looking. One was felled and was found to have center rot.

3. Sapstain and decay in logs and lumber were not considered important problems by the companies visited because they have modern logging equipment which facilitates the transporting of felled trees from the forest to the log ponds or yards. Three out of the 8 companies export green lumber to the U.S. These companies treat their lumber with anti-stain chemicals before shipment to the U.S.A.

4. Two diseases were observed in the nurseries of these companies: damping off of *Albizzia falcata* seedlings and powdery mildew of *Samania saman*. The lumbang plantation of the Nasipit Lumber Co. appears to be suffering from a root rot disease. Their *Eucalyptus saligna* trees exhibited dieback symptoms. The bark cracked and a dark exudate was observed. Detailed symptomatological study of the disease in Lumbang and Eucalyptus trees is very important so that the pathogens could be discovered and control measures applied.

* * *

FPRI RESEARCHERS RETURN FROM INDIA

Two ranking technologists of the Forest Products Research Institute who were sent to India as scholar-trainees returned recently after a year's training and study at the Forest Research Institute and Colleges in Dehra Dun (India).

Pancracio V. Bawagan and Enrique C. Amio, assistant division chief and section chief, respectively, of the Chemical Investigation Division, took up post-graduate courses on Advance Diploma in Pulp and Paper Technology (D.F.R.I.) under the Colombo Plan, with the Indian government as their sponsor.

At the same time, Bawagan trained for some months in mill practice and conducted research on bamboo cellulose, while Amio, who also trained for sometime in an Indian pulp and paper mill, did research work on the production of rayon grade pulp from jute sticks.

According to them, Indian research trends in pulp and paper technology dwell more on basic researches, such as the influence of hemi-cellulose on paper strength, lignin and cellulose chemistry, as well as researches on the production of rayon grade pulp from bamboo and jute sticks.

Both technologists also noted that almost all the paper mills there are now producing pulps for processing into paper, which is not so in this country where most of our paper mills depend mainly on imported pulps.

They added that the paper mills in India utilize all available fibrous materials, such as jute sticks, grasses, sugarcane bagasse, bamboo, waste wood, jute sacks, cotton waste and rags.

Both technologists had earlier gone abroad — Bawagan, to the U.S. Forest Products Laboratory in Madison, Wisconsin, and Amio, to Japan to train in forest products processing.

* * *

RESEARCH STAFFER WINS U.S. AWARD

Emmanuel D. Bello, a researcher of the Forest Products Research Institute (U.P.), has won the second place award in the 17th Wood Award competition of the U.S. Forest Products Research Society.

His winning entry, entitled "The Effect of Transverse Compressive Stress on the Equilibrium Moisture Content of Wood," was based on his master's degree thesis earlier submitted to the New York State University College of Forestry at Syracuse.

Bello's coveted award, which won for him an honorarium of $250 and a certificate of merit, will be received in his absence by Dr. Christen Skaar, his former major professor at Syracuse, during the Society's annual meeting sometime this month (July) in Minneapolis, U.S.A.

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NACIDA OFFICIALS VISIT INSTITUTE

Ranking officials of the NACIDA led by Jose Roño and Hilarion Pilapil, board chairman and deputy administrator, respectively, conferred recently with officials of the Forest Products Research Institute (U.P.) in College, Laguna to discuss the feasibility of applying the results of some FPRI studies to actual cottage industries for the benefit of the national economy under NACIDA's sponsorship. They also toured the Institute's laboratories to observe first-hand the various research activities being conducted there.

The other NACIDA visitors include Narda Camacho, board member; Mrs. E. G. Ramirez, Consultant; Mrs. C. Montoro, G. Garcia, R. de los Reyes, M. Duba, I. Gatmaitan, Miss V. Samano, H. Masankay, R. Tan and E. Pastrana.

* * *

FPRI RESEARCHERS TRAIN IN FRANCE

Nine technologists of the Forest Products Research Institute left recently for France to undergo training along different aspects of forest products research utilization for 12 months under the sponsorship of the French Government.

The trainees, who represent the five technical divisions of the Institute, are: Romulo C. Eala, Rogelio L. Flores, Angel C. Mañgahas, Jaime R. Navarro, Ernesto B. Ordinario, Justo P. Rojo, Edwardo P. Villanueva, Felizardo D. Virtucio and Isidro T. Zamuco.

* * *

WOOD IDENTIFICATION COURSE HELD

A two-week summer course on wood identification was conducted by the Forest Products Research Institute (U.P.) in College, Laguna as a public service feature of the Institute.

According to Director Manuel R. Monsalud, the wood identification course, was particularly intended for trade school instructors, wood-working teachers, lumber dealers, contractors, general wood users and others who would be interested in knowing how to properly identify various types of wood.

The course, which was conducted at the main building of the FPRI, involved daily lectures, discussions and actual demonstrations and practices in the complex process of wood identification.

A nominal fee of ₱5.00 was charged each trainee, while the expenses for board and lodging were similarly borne by either the participant himself or his employer.

At the end of the course, each trainee was given, free of charge, a set of commercially important wood samples which he could use as future reference or as a teaching device in wood identification.

* * *

FPRI DIRECTOR ATTENDS WORLD MEET

Director Manuel R. Monsalud of the Forest Products Research Institute (U.P.) recently attended the 6th World Forestry Congress held in Madrid, Spain, as one of the Philippine delegates and, concurrently, as technical adviser on forest products research and utilization to Rep. Eladio A. Caliwara of Quezon, chairman of the House committee on forests and head of the Philippine delegation.

Director Monsalud presented at this international meeting three papers, entitled: The Philippine Forest Resources—Their Fuller Utilization and Relation to World Trends; Improvements in the Utilization of Lower Quality Philippine Woods; and Technical Cooperation Between the Philippine Forest Products Research Institute and Foreign Laboratories on Forest Products and Research.

At the same time, Director Monsalud, on invitation of FAO Director N. A. Osara, attended the preparatory meeting in Madrid of the FAO committee on forest development in the tropics "to study technical, economic and social problems relating to the development of tropical forests, particularly in developing countries, having regard to production, utilization and conversion aspects as well as to the marketing of forest products."

* * *

FPRI MAN TAKES RADIOISOTOPE COURSE

AUGUSTO P. BATI, a technologist of the Institute, recently completed with high honors the 22nd Session of the Radioisotope Techniques Training Course under the aegis of the National Science Development Board.

Graduating as Third Honorable Mention in a class of 24 trainees representing both government and private entities, Bati took up more than a score of "atomic" subjects, ranging from nuclear physics to isotope techniques and autoradiography, during the six-week course conducted at the NSDB compound.

Main objective of the course was to familiarize the participants, all of whom are researchers and technologists, on the principles, techniques and practical uses of radioisotopes.

For the wood-using industries, and more so for research institutions such as the Forest Products Research Institute, radioisotopes bear significant applications in such activities as: gamma-ray measurements of defects in poles and trees, moisture determination in wood chips using gamma-ray scattering, thickness and density measurements of fibers, biological tests on wood, improving the properties of wood by impregnation with monomers and irradiation, and study of the wear and tear of machine parts and wood-cutting tools.

* * *

FACTORS AFFECTING THE DRYING OF WOOD

To dry kiln operators and those engaged in the drying of wood, it is important to know why and how moisture travels through wood, where and how evaporation takes place, what factors influence drying, and how these factors influence drying rate and the behavior of wood during drying.

In drying a piece of wood, most, if not all, of its moisture is evaporated from the surfaces. Since most of this moisture is contained within the wood, it follows that the bulk of it must find its way through the surfaces before it can be evaporated. As wood dries, some forces or system of forces must be present to cause the movement of the moisture from the interior to the surfaces.

Wood is a hygroscopic material and will absorb or give off moisture according to the nature of its surroundings. If immersed in water or placed in a moisture-saturated air, it will absorb moisture until it reaches a saturated condition. On the other hand, if wood is exposed to drier air, it will lose moisture into the air until it attains the equilibrium moisture content, at which conditions, the absorption power of the air is equal to that of the wood.

The mechanism by which moisture moves through wood is a complicated process involving a number of interrelated factors. Although valuable information has been made available on this subject, much still remain to be gained from a thorough understanding of the phenomena involved. It is known, however, that in the drying of wood, where air or a mixture of air and steam vapor is the drying medium, three fundamental and interlocking factors are essential to accomplish drying. These are the temperature of the drying medium, its humidity, and the rate and direction of its movement over the surfaces of the lumber. All of these factors must be present in their proper proportion to properly season lumber and other wood products.

* * *

THE PRESERVATION OF BAMBOO

Bamboo is an important construction material for low-cost housing especially in the rural areas. Because of its abundance, size and strength, it is extensively used as material for furniture, fish traps, bridges, fences, rafts, etc. Its relatively long fibers, too, have been found suitable for pulp and paper making.

Experience in the use of bamboo for certain purposes has shown that young bamboo culms of many species once cut and dried, are highly susceptible to biological and physical deteriorations. Fast deterioration is observed in bamboos exposed to severe weather conditions, or used in contact with moist soil. Biological destructions are caused by termites, powder-post beetles and fungi. Physical deterioration is enhanced by the alternate action of sunlight and rain which adversely affects the strength of bamboo. Field tests have shown that most bamboo species have low durability, averaging from 1/2 to 2 years in use. The use of more durable bamboos under proper construction designs will help overcome these problems. Increased serviceability is expected of bamboos that are chemically treated or cured.

Preservation treatments of green bamboos with zinc chloride, ASCU, copper sulfate, boric acid, and borax applied by (a) the Boucherie process and its various modifications, (b) soaking, and (c) spraying, etc., have been investigated.

Results have shown that age. moisture content, anatomical structure, and form of bamboos, together with the types of preservatives used are factors that influence treatment.

* * *

THE PROBABLE MECHANISM OF THE DISCOLORING ACTION OF FUNGI IN WOOD

Blue Stain

The so-called blue-stain commonly found in the sapwood of timbers is due to fungi, especially

species of *Ceratocystis* and Diplodia with dark-brown hyphae. (Hyphae are minute vegetative thread-like structures). The dark coloring of the hyphae of these groups of fungi could be attributed to the presence of melanin pigments found within their hyphae. If blue-stained wood is examined under the microscope, numerous dark-brown hyphae can be seen without any sign of blue-staining in the walls. The bluish tinge, which is visible to the naked eye, is due to a phenomenon explained as being in a form of refraction induced by the scattering of light rays striking the very fine dark hyphae, as seen through translucent cell walls. Analogous to this phenomenon is the presence of bluish tinge on diluted milk or fresh cigarette smoke.

Other Types of Staining

While blue-stain is by far the most severe form of fungal staining of timber, other types of discoloration occur not infrequently in both softwoods and hardwoods. They are caused by a variety of fungi such as species of *Penicillium*, *Fusarium* and *Graphium*. Many of these stains are brightly colored and most of them are due to the secretion of soluble pigments by the particular fungi. These pigments diffuse onto the surrounding areas. It is like placing a few crystals of copper sulphate in the bottom of a tall jar filled with water and letting the mixture stand undisturbed, where the blue color of the copper ions spreads slowly throughout the liquid. Known as molecular diffusion, the copper ions will deffuse through the molecules of gaseous, liquid, and solid substances. In the process of staining by these particular group of fungi, the pigments secreted by the mycelium can be compared to the copper sulphate crystals, while the wood elements and high moisture content of the wood as the solid and liquid, respectively, through which the pigment ions could diffuse.

White Rot and Brown Rot

There are two broad classes of wood-rot. One is white-rot, found in decomposed wood which is usually white, and the other is brown-rot which reduces the wood into a carbonaceous mass with varying shades of brown. If the attacking fungus is a brown-rotter, the cellulose complex is removed and apparently absorbed by the fungus. This cytolytic action usually leaves a brown, friable mass resembling charcoal in brittleness composed mainly of the elements of the lignin complex. This gives the brownish color to the decomposed wood. In a brown-rot, all components of the wood including the lignin, are decomposed. The bleaching effect induced by all white rotting fungi is probably explained by the destruction of pigments in the wood rather than by lignin destruction. This is not true, however, to the bleaching associated with white pocket rots because the pockets will ultimately contain areas of almost pure cellulose fibers naturally white in color.

Narrow zone lines, usually black but sometimes dark brown, are common phenomenon of many decays. They are frequently formed in the white rots but are rare in the brown rots, and they are more common in decayed wood of hardwoods than in conifers. The brown coloring of the zone lines could also be caused by the phenomenon of refraction or diffusion as assumed in the staining fungi. This assumption could only be true at the very early stages of decay wherein no major delignification has yet taken place. The coloring of the zone lines and the zone lines themselves eventually disappear as decay progresses, be it either a white rot or a brown rot. Some researchers also attribute the zone lines in infected wood to the reactions between two wood—inhabiting fungi occupying the same substratum. Unfortunately, investigations along this line of research are inadequate to clarify their occurrence.

THE PATH WE CHOOSE

Some paths wander through shady woods, following winding creeks, seeking beauty of verdant plains, and wilds of mountain peaks. While others creep through gloomy swamps, reeking with damp decay, with never a gleam of sunshine to light the dreary day.

And thus it is that each of us shall have a choice to make, and we must plan most carefully which of the paths to take. For as we travel life's long road, our dreams of great success will come to us if we work with faith and eagerness.

The way we play our part in life, and why we win or lose, depends to quite a large extent upon the path we choose.

—Monitor

Here & There

President Ferdinand E. Marcos being briefed by FPRI Director Monsalud on the versatility of the trees on the forestry campus and the research activities of the Institute on the various ways of utilizing Philippine woods. With the president are Rep. Manuel Concordia (Laguna), Governor F. San Luis, presidential aide Hanz Menzi and former FPRI Director E. de la Cruz.

Rep. Eladio A. Caliwara of Quezon underscores the importance of trees to the national economy and the extensive reforestation efforts of Spain, before FPRI officials and employees, at the simple tree-planting ceremonies, at the institute, during the Arbor Week.

The Philippine delegates to the 6th World Forestry Congress in Madrid, Spain, headed by Congressman Caliwara, Chairman of the House Committee on forests, planting a pine tree seedling for the delegation on the Spanish College of Forestry campus, as one of the highlights of the world confab.

Standing (l to r): For. Martin Reyes, Chief, Forest Research Div., Bureau of Forestry, Congressman Caliwara, holding spade, Max Caliwara, Secretary to the delegation head, Messrs. Pedro Picornell and Jose Puyat, of the Paper Industries of the Philippines and Philippine Chamber of Wood Industries, respectively. In front, holding the seedling, (l to r): Congressman Jack Soriano (Pangasinan) and FPRI Director Monsalud.

Dr. H. O. Fleischer, director of research in forest products and wood engineering of the U.S. Forest Service stresses the role of scientific research, both basic and applied, in wood utilization, during a joint convocation of the FPRI and the College of Forestry, in the College Auditorium.

Prof. D. Jacalne, Chairman of Forestry Information and Extension Department beside the winning float (MOST SYMBOLICAL) at the Loyalty Day Parade.

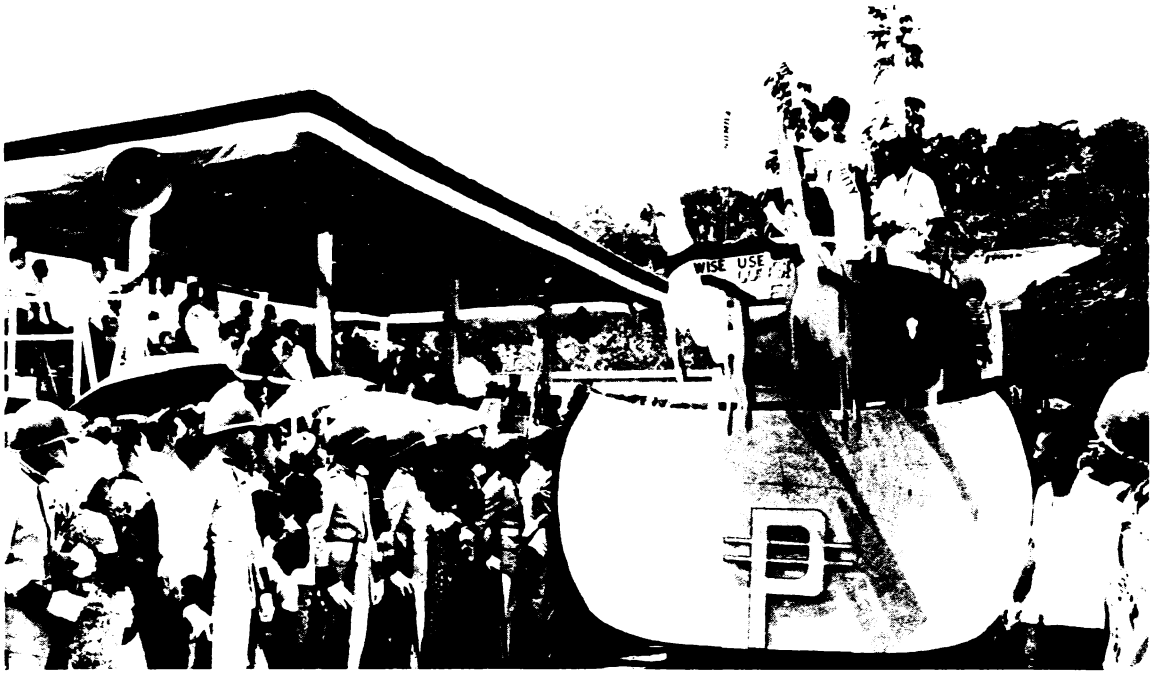
Dean Lantican in a huddle with U.P. Officials (l to r): Dean Lantican, U.P. Pres., Dr. Herrera (facing map), Dr. N. Tablante and Prof. A. Villaflor.

At the merienda for Pres. Romulo and party (l to r): Dr. N. Tablante, Miss E. Cabauatan, Dean D. Lantican, Pres. Romulo, Dean Emeritus G. Zamuco, Dr. F. Orillo and Under secretary of Agriculture, Vice Pres. (Los Baños Affairs) and Dean D. Umali.

Forester Sana handing his donation (Basketball) to the President of the Forestry Student Body, T. Tabayoyong, and F. C. Basketball Team Capt., R. Romero.

The Philippine Lumber Producer's Association plays host to Dr. F. Kim, forestry expert of the FAO of the United Nations. (stationed at Bangkok), at the Penthouse, Bayview Hotel. (l to r): Mr. Antonio de las Alas, PLPA honorary president, Dr. Kim, delivering his speech, Mr. Nicolas Capistrano Jr., PLPA president, and Director Antonio Quejado, of the Bureau of Forestry.

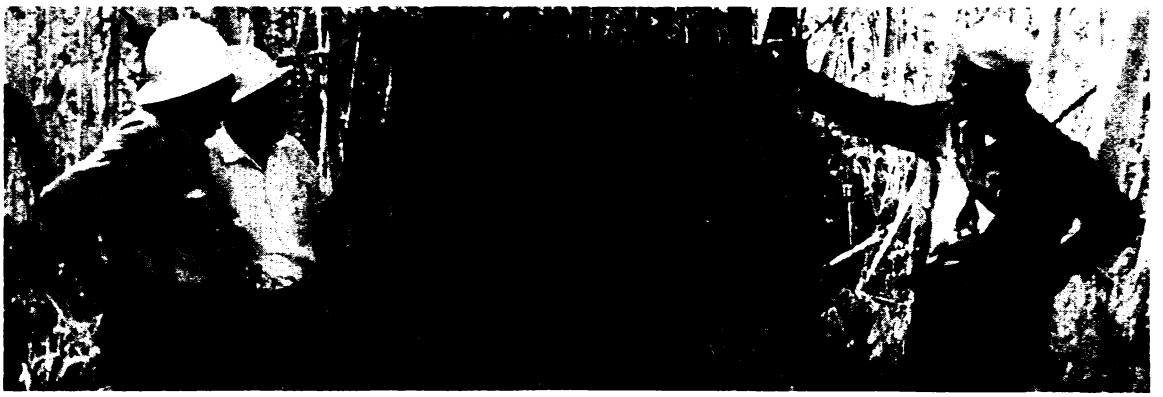
Prof. Walter Liese, Director of Forestry Products Laboratory of Reinbek boi, Hamburg, West Germany conferring with FPRI officials on possible ways of solving their problems. He is on a lecture-tour in underdeveloped countries.



The FPRI first prize-winning float at the Loyalty Day Parade Celebration, at which President Marcos is the guest of honor and principal speaker.

President Romulo, Undersecretary and V.P. for UP Los Baños Affairs Umali, Dr. Herrera and members of the faculty of both the Colleges of Forestry and Agriculture listen to the briefing by Dir. Monsalud on the activities of the FPRI.

Congressman E. Caliwara registers as a "freshman" student in the College of Forestry during the Registration Week in the College of Forestry. He is shown here filling the forms while Dean Lantican (sitting), Prof. Recto, College Secretary and FPRI Director Monsalud look on.

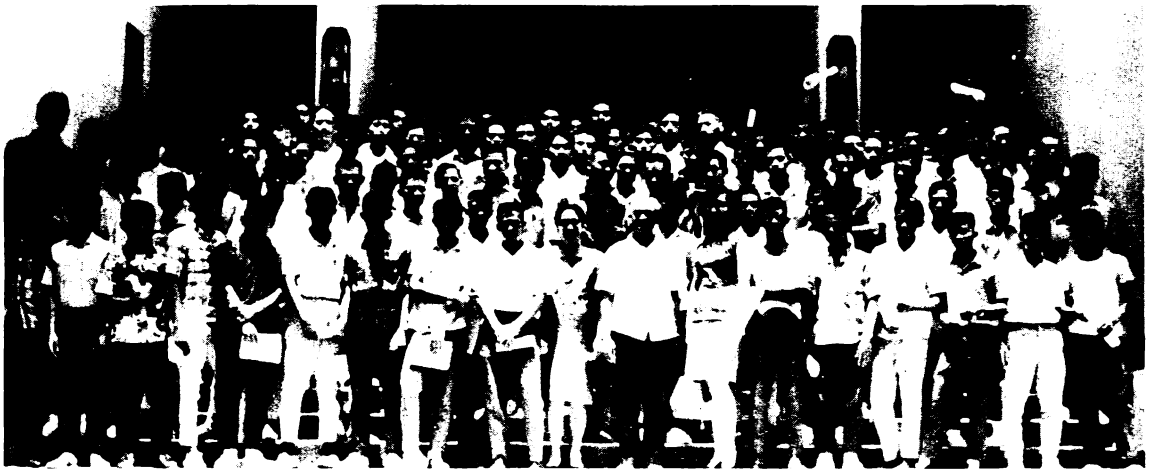


Congressman Caliwara visits the Albizsia Falcata nursery of the Nasipit Lumber Co., a cooperative project with the Bureau of Forestry and the Reforestation Administration.

The College of Forestry Float adjudged the most symbolical float at the C. A. Loyalty Day Celebrations. The College of Forestry Float consistently won in previous Loyalty Day Festivities.

At the U.P. 1966 Faculty Conference in Baguio.

College of Forestry Delegates Dean Lantican, Prof. O. Valderrama, and Prof. N. Vergara (front row) with Prof. Abejo, President of the U.P. Faculty Association and Mr. E. Cajucom (fifth row).



The Freshman Class after their orientation program. Mrs. Ramirez and Mrs. Gavino, of the U. P. Counselling and Testing Center, were the main speakers. With them is Prof. Blando, College Counselor.

Dean Lantican briefing U. P. President Romulo on the College of Forestry history, policies and plans. The College of Forestry Faculty hosted the U. P. President, U. P. (Diliman) and C. A. Officials at a merienda after the meeting.

Governor Evangelista delivering a speech during the Arbor Week ceremonies.

Division Superintendent and Mrs. F. Ablan planting their tree during the celebration.

First Lady of Laoag City planting her tree.

Governor J. E. Evangelista planting his tree during the arbor week celebration.

District Forester Bernabe S. Zumel assisting in a tree planting ceremony at Sarrat, I. Norte.

Tree planting by Mayor C. Balmaceda Jr.

THE COLLEGE OF FORESTRY FACULTY AND STAFF BASKETBALL TEAM
(MAA CHAMPION, 1966-67)

Kneeling, (l to r): Vic Manarpaac, Boy Encabo, Tony Principe, Knepp Zabala, Flor Tesoro and Cris Rebugio. Standing, same order: Jun Revilla, Jess Rola, Rey de la Cruz, Dom Faustino Jr. (Capt.), Boy Antonio, Willie Reboton and Boy Calara.

FSBO officers taking their oath of office at the Induction Ceremonies (l to r): E. Luna, D. Pinaroc, (Sgts.-at-arms); F. Macaranas (PRO); A. Bernardo (Athl. Manager); V. Buenaflor (Bus. Mgr.); A. Madlaing (Auditor); M. Machacon (Treasurer); M. Bonita (Secretary); T. Sarigumba (Vice Pres.) and T. Tabayoyong (President). Not pictured C. Sagrado (College Councilor to the U.P. Student Council).

THE COLLEGE OF FORESTRY VARSITY BASKETBALL TEAM 1966-'67

Standing, (l to r): Paquito Caliva (Scorer and Timer), Aristoteles Soller, Vivencio Apolinario, Jose Lapinid, Roberto Romero (Capt.), Mercedes Dairo (Muse), Nelson Yanez, Domingo Ramel Jr., Jose Garduque, Saveniano Cafe, and Dominador Faustino Jr. (Coach). Kneeling, (l to r): Leoncito Dancel, Romeo Escudero, Cesar Pantaleon, Eleazar Abesamis and Danilo Sacramento.

Students and employees of the U.P. College of Forestry arrive at the arbor week planting area.

Students and employees receiving assignments in the field prior to the planting of Mahogany seedlings.

Students of the College of Agriculture and Forestry plant Fire tree seedlings along the Los Baños Highway. Free drinks are being served, courtesy of the Los Baños Municipal Council.

Forestry in the News

RP WOOD TRADE GAINS MOMENTUM

Gaudencio S. Mañalac, president of the Philippine Chamber of Wood Industries and director of the Philippine Chamber of Industries, yesterday said that the development of industry and natural resources in the ECAFE has gained momentum with the past series of ECAFE conferences here, in Bangkok and in New Delhi, India and elsewhere, which he had attended.

Japan ahead

Mañalac observed that Japan is the only country in Asia who has progressed rapidly in economy because Japan was able to adopt economic policies suitable to her conditions, in accordance with the mode of life of her people and in consonance with the goal set by her own leaders.

The PCWI president said that "though the Philippines started its reconstruction and rehabilitation of economy three years after independence, it was not until 1961 that it has regained the rate of pre-war level of growth in its agricultural production."

"But even while we rehabilitated and reconstructed the agricultural pattern of our economy in 1949, the need to industrialize the country was felt and plans and actions programs were adopted to bring about a long felt need of our people," Mañalac added.

Mañalac noted that in 1949, a system of import and exchange control was adopted by the Philippines with the primodial aim of channeling the foreign exchange holdings of the country.

Mañalac added that the system is also aimed at providing more employment opportunities and adjusting the import-export economy.

Capacity good

He pointed out that "while the Philippines had a very late start in the pursuit of industrialization, our industrial entrepreneurs, nevertheless, have demonstrated the capacity to adopt themselves to western methods."

* * *

AGUSAN PC FACES HOUSE PROBE

The House national defense committee yesterday set for 10 a.m. Monday its inquiry into complaints of PC abuses in Agusan made by Rep. Jose C. Aquino of that province.

Rep. Constantino C. Navarro (L, Surigao del Norte), acting committee chairman, said Forestry Director Antonio Quejado and Col. Prudente Mar. Francisco, Agusan provincial commander have been invited to shed light on the charges.

Took sides

Aquino complained that PC troops used force and took sides in the right-of-way dispute in Agusan between the R. C. Aquino Timber & Plywood Co. and the Bueno Industrial & Development Corp.

Navarro said the controversy has built up into "explosive proportions" despite the intervention of Malacañang. It centers, he said, on the use of a ₱3-million road built by the Aquino firm to link his forest concession areas to the national highway.

Trouble, according to Navarro, has arisen from the implementation of the Supreme Court decision to the effect that the Bueno firm may use the logging road provided it contributes to the maintenance.

Relieved, returned

As a result of the dispute, Colonel Francisco was relieved and then returned to his Agusan post several times.

"We want to go down to the roots of this peace and order problem before bloodshed erupts," Navarro said.

The committee is now looking into various complaints of alleged unjustified killings of criminal suspects by armed forces personnel.

* * *

ARBOR WEEK CONTEST

The Arbor Week on-the-spot essay writing contest sponsored by the Children's Museum and Library will be held from 9 to 11:30 a.m. Sunday, July 10, at the Aurora A. Quezon Elementary School, Cordillera St., Quezon City. Dionisio S. Salazar is the contest chairman.

Filipino youth and other nationals residing in the Philippines not over 21 years are eligible to participate.

Topics will be announced a few minutes before writing time. A composition in English or Pilipino must be from 750 to 1,200 words.

Laminated certificates will be awarded to the first three top winners and certificates to honorable mentions.

The last day for submission of entries to the Arbor Week poetry contest sponsored by the CMLI has been extended to July 24.

Entries from Filipino youths and other nationals residing in the Philippines not over 21 years may either be in English or Pilipino based on the general theme "Magtanim Upang Umunlad."

Each entry must not be less than 12 lines nor more than 24, typewritten on ordinary-sized bond paper, double-spaced in quadruplicate, signed with the author's pseudonym. Real name, pen name, address, and age of the contestant must be written on a separate sheet, enclosed in a sealed envelop and attached to the entry.

The first three top winners in each language division will receive laminated certificates and three honorable mentions will be awarded certificates.

Entries and inquiries regarding these contests must be sent to: Dionisio S. Salazar, Contest Chairman, Children's Museum and Library, Inc., East Ave., Quezon City, P.O. Box 1610, Manila or Tels. 2-62-23, 2-09-01 and 8-10-40.

* * *

CRACKDOWN ON DUMMIES

Probe of foreigners in timber industry eyed

DAVAO CITY, July 8—Solicitor General Aquino Barredo will look into the citizenship of aliens engaged in the timber industry.

The country's chief government prosecutor made this announcement during the induction of the officers of the Small Concessionaires and Loggers Association here recently.

Against FM directive

The SCLA, composed of 146 loggers in the city and province of Davao and headed by City Councilor Jose Salcedo Quimpo, has voiced strong objection to the directive of President Marcos stopping the operation of loggers with a concession of less than 20,000 hectares.

Issued last month through Forestry Director Antonio Quejado, the directive requires the so-called small loggers to form a cooperative within one year or cease operation.

Barredo explains

Justifying the President's directive, Barredo explained that the purpose of the much-criticized directive is to develop the timber industry "and not just to export logs."

In trying to soothe the feelings of the small concessionaires, the solicitor general said Director Quejado had assured him that henceforth no new directive will be issued without consulting him (Barredo).

Also under the President's controversial directive, the concessions of big-time loggers will be reduced to 100,000 hectares each and the excess to be given to the members of the cooperative of small loggers. —R

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FORESTRY MEN FACE RAPS FOR SMUGGLING

Chinese ship loaded with unmarked logs

President Marcos, in a memorandum, Thursday instructed the director of the bureau of forestry to dismiss bureau personnel responsible for the illegal export of logs.

The President issued the memorandum after receiving a report from Gen. Pelagio Cruz (Ret.), chairman of the Anti-Smuggling Action Center (ASAC) that the ss Tainan, of Taiwan registry, was apprehended with a shipment of unmarked and otherwise illegally cut logs in Dingalan Bay.

One of the vigorous campaigns now being waged by the administration is that against illegal logging, in view of the menace that the denudation of Philippine forests presents to the economy and the security of the country, particularly in the loss of watersheds and the danger of floods.

In his memorandum, the President ordered acting Forestry Director Antonio Quejado to investigate the shipment at once with a view to pinpointing responsibility for releasing for export the logs discovered on the Taiwanese vessel.

He told the forestry director to pinpoint the officials and employes involved in the venality and dismiss them at once. In addition, he instructed that all logs for export must be double-checked, marked and validated.

The President emphasized that all forestry personnel must be apprised of his determination to cancel illegal exports of logs, and that those found guilty of conniving with log smugglers and illegal operators be dismissed immediately.

The President underlined the fact that such illegal activities had deprived the government of much-needed revenue.

* * *

Criminal neglect

GOV'T OFFICIALS FAIL TO CHECK DENUDATION

NATIVIDAD, Pangasinan, May 10—(PNS)—The complacency of both the local and national authorities have contributed to the steady denudation of Caraballo Mountains and surrounding forests.

Their failure, which over the long years amount to criminal neglect, is now threatening this town with severe economic hardship in the years ahead.

Civic movement

Because of this threat, some civic-spirited citizens are spearheading a civic movement aimed at (1) jolting government officials out of their complacency into action in protecting the municipal forests; and (2) taking direct action to preserve the town's natural resources.

Among these private citizens is Benito Miranda, retired school teacher, who has spearheaded a fight against the toleration by municipal officials of the indiscriminate destruction of the municipal forests.

During a meeting sponsored by the Presidential Assistant on Community Development, Miranda assailed the municipal authorities for their failure to adopt measures to protect the forests of this town.

Not his concern

In answering Miranda, a high-ranking municipal official reportedly said that the destruction of the Caraballo Mountains was not his concern but the concern of the national government.

Miranda observed that the destruction of forest resources had been aggravated by the non-prosecution of those who have violated the forestry laws and by the seeming unconcern of local officials over the rape of the forests.

Proving furthermore that some municipal officials had no inkling whatsoever about the importance of forests to this town, Miranda recalled that the municipal government had once asked for the release of a vast tract of communal forest to private persons in order to augment the revenue of the municipal government.

Future dim

Miranda said that this act was one of mortgaging the future of this community for the immediate needs of the municipality.

The Natividad Varsitarians Association, an organization of college students from this town, has joined the crusade launched by Miranda against the destruction of forests in this town.

In a letter to Miranda, the group expressed appreciation to the former school teacher for his "profound concern for the well-being of the coming generations of our town.

Youth's view

"We, the youth, feel the same way as you do for in the near future the responsibility of moulding the destiny of our lethargic town will lie in our hands," the varsitarians said.

The organization also assailed the inaction of the municipal officials toward the rape of the forests.

Value of forests

In castigating the municipal officials, the youth said that "it is unfortunate that our municipal officials did not have a clear understanding of the value of our forests."

The local youth organization offered to support Miranda in his drive to preserve the forests of Natividad and thus save the town from a bleak future.

* * *

CANCELLATION OF TIMBER LICENSE URGED

BUTUAN CITY, July 9—(PNS)—Brig. Gen. Segundo P. Velasco, chief of constabulary, and Forestry Director Antonio Quejado have recommended to President Marcos the cancellation of the timber license granted to Rafael C. Aquino, president and general manager of a logging firm bearing his name, on Dec. 16, 1963, covering an area of 52,095 hectares of timberlands in Agusan.

The recommendation was made on the basis of the findings of PC and bureau of forestry officials who recently inspected the concession area being disputed by Aquino and Valeriano Bueno, president and general manager of the Bueno Industrial and Development Corporation, in compliance with a presidential directive to settle the conflict between the two lumbermen.

At the same time the constabulary and forestry personnel in Agusan were directed by Velasco and Quejado to enforce strictly the forest laws and regulations to both warring factions in this case and in implementation of the presidential directive. the constabulary likewise was ordered to collect all firearms in the name of both Aquino and Bueno.

According to the findings of the PC-forestry team, the Rafael C. Aquino timber and plywood company allegedly had violated the provisions of his permit for road right-of-way which passes through the concession area of the Bueno industrial and development corporation by conducting illegal operations therein. The permit expired on June 30, 1964.

A provision in the permit stated that all logs cut in the area of Bueno industrial should be turned over to the licensee. In the same permit, there was a stipulation allowing the owner of the concession the use of the road which was constructed by the Rafael C. Aquino timber and plywood company. All the checkpoints established by Aquino along this road were removed by the PC-forestry implementing team in accordance with President Marcos' order.

* * *

PRUNING ROOTS OF MAHOGANY

COLLEGE, Laguna, July 9—(PNS)—Prune the roots of mahogany seedlings nad make them grow sturdier.

This is the advice of researchers at the UP college of agriculture in Los Baños, Laguna.

According to the researchers, pruning the roots of the seedlings while still in the seedbed induces their development.

There are less deaths among root pruned seedlings when planted in the field, the researchers said.

Here's how to prune the roots of seedlings:

Get a spade with a sharp blade and thrust it at a 45-degree angle against the seedbed and four to five inches away from the stem of the seedlings. Do this again on the other side of the seedbed to insure that the top root is severed.

After a few days, remove the seedlings that have wilted, in two and one-half months the root-pruned seedlings will be ready for field planting.

* * *

Business of the Times

LOGGING STILL ON IN SAMAT

Unconfirmed reports have it that logging operations continued to unabated at the Mt. Samat national park reservation despite President Marcos' edict declaring the area off-limits for log cutting. The Chief Executive was reportedly impelled to make such a declaration after seeing the thorough denudation of the reservation during his last visit when he placed a marker on the site where he fought.

* * *

UNIFORMS FOR FOREST GUARDS SET

BAGUIO, June 1—Forestry Director Antonio A. Quejado ordered all forest guards of the bureau of forestry to wear uniforms while on official duty effective July 1, this year.

The directive was embodied in Forestry Memorandum Order No. 75, issued by Quejado recently.

The forestry head said that the innovation "would avoid or minimize mistaken identities and impostors as forestry officials apprehending violators of forestry rules and regulations."

Gray suit

The uniform will be a long-sleeved shirt, trousers, cap and belt will come in gray Pag-asa fabric for purposes of economy.

Forest guards shall display their official badges on the left front pocket of their shirt while on duty.

As a complement to the uniform, forest guards will also wear shoulder patches.

The prescribed pair of shoes in either black leather or rubber shoes.

* * *

The right angle from which to approach any problem is the try angle.

Misfortune can't keep dogging us if we become dogged enough.

Makiling News

BAGUIO REGIONAL FORESTRY EXTENSION OFFICE APPROVED

The authority to establish a Regional Forestry Extension Office in Baguio City was approved by the Board of Regents on its 748th meeting held last July 22, as a result of the recommendation of the President of the University.

In his recommendation to the Board of Regents, U.P. President Carlos P. Romulo justified the creation of the regional office as one which will accelerate the forestry extension drive in the Northern Luzon area in line with the provisions of R. A. 3523 to promote a nationwide program on public information and education in forestry.

Meanwhile, Prof. Domingo V. Jacalne, chairman of the Department of Forestry Extension, said that it is the first of four regional forestry extension offices to be established in the country. He added that the regional offices are intended to help carry out effectively the various programs and activities of forestry extension work.

The regional forestry extension office in Baguio City will be opened sometime in September, disclosed Prof. Jacalne.

* * *

SUMMER CLASSES TURN OUT 16 GRADUATES

The graduation of 16 candidates for the BSF degree and Ranger Certificate from the U.P. College of Forestry at the end of the 1966 Summer Classes was approved by the College faculty during their meeting held at the Conference Room, Wood Technology Building, last August 10.

Candidates for the BSF degree were: Candido T. Agbisit, Laureano B. Lingan, Laureano L. Marzan, Herculano A. Maulit, Roberto L. Rosales, Chamlong Saapaisarl, Alfredo M. Sadioa, Arturo C. Sazon, Angel U. Soriano and Eufemia Tamolang.

For the Ranger Certificate were: Wilfredo P. Carbonel, Amado V. Ramos, Rizalino M. Tavita, Cesar G. Ursua and Renato B. Rivera.

* * *

UPCF WINS CASES ON ILLEGAL KAINGIN

The U.P. College of Forestry won on criminal cases No. 599, 600 and 601 filed at the municipal court of Sto. Tomas, Batangas on June 30, 1966 against Isabelo Borja, Benigno Borja, Victorino Toralba and Abelardo Toralba.

In rendering the decision, Judge Loreto M. Guevara said that the accused having found guilty beyond reasonable doubt of violating Sec. 2751 of the Rev. Adm. Code, as further amended by Rep. Act No. 3701, are hereby sentenced as follows:

Crim. Case No. 599—the accused Isabelo Borja shall suffer imprisonment of Six (6) months, plus a fine of ₱339.68 (which is four times the ₱82.92 government charges), under paragraph (c), Sec. 2759.

Crim. Case No. 600—the accused Benigno Toralba shall suffer imprisonment of Six (6) months, plus a fine of ₱729.56 (which is four times the ₱182.92 government charges), under par. (c), Sec. 2751 of the Rev. Adm. Code, as further amended by Rep. Act No. 2759; and

Crim. Case No. 601—the accused Victorino and Abelardo Torralba shall suffer imprisonment of Six (6) months, plus a fine of ₱967.92 (which is four times the ₱241.98 government charges), under par. (c), Sec. 2751 of the Rev. Adm. Code, as further amended by Rep. Act No. 2759.

The decision further stated that said accused shall suffer imprisonment at the rate of one (1) day for every ₱2.50 fine in case of insolvency.

The cases were filed on March 9, 1966 by Prof. Rodrigo C. Fabro, superintendent of the Makiling Forest, against the accused for violation of the provisions of Sec. 2751 of the Rev. Adm. Code, as further amended by Rep. Act No. 3701, which prohibits destruction to public forests (known as "kaingin" system) and providing penalties thereof. The public forests alleged to have been destroyed are located in Sitio Bilog-Bilog, San Antonio, Sto. Tomas, Batangas.

Legal officer for the College was Atty. Romualdo Eclavea and the defense counsel was Atty. Claro Almeda.

During the trial the prosecution presented testimonial and documentary evidence which established the fact that the accused were caught by Forest Rangers in Mt. Makiling on February 25, 1966 in the ack of working their respective kaingin in Sitio Bilog-Bilog. Likewise, in their joint affidavit

dated March 31, 1966 they admitted having made destruction to public forests in the said sitio. This affidavit was admitted as evidence and it established the fact beyond reasonable doubt.

* * *

DFE'S 4-H FORESTRY PROJECT APPROVED BY NATIONAL COUNCIL

The proposed 4-H Forestry Project of the Department of Forestry Extension was formally accepted by the National 4-H Club Advisory Council of the Philippines, Inc., during the council's meeting on August 10, this year. With the addition of the forestry project, 4-H club members all over the country have now 10 different projects to undertake or select from.

Meanwhile, Prof. Domingo V. Jacalne disclosed that under the 4-H Forestry Project, there are five specific projects to be implemented. These are tree appreciation, tree identification, wood collection, Christmas tree growing project, and fuelwood production project.

* * *

VERGARA DETAILED WITH PES

Prof. Napoleon T. Vergara, chairman of the Department of Forest Resources Management and assistant professor of forestry economics, is at present temporarily detailed with the Presidential Economic Staff in Manila, effective July 25 until December 31, 1966.

Prof. Vergara will work for at least two days a week with the Agricultural Program Office as a consultant on forestry economics and forest conservation. He is expected to do the following.

1. Submit an appraisal on the present policies on forest utilization conservation as a basis for policy recommendations to the President.

2. Prepare an implementing plan for the reorganization of the three forestry agencies in the country.

3. Initiate appropriate steps in introducing stumpage system of timber valuation.

4. Assist in the evaluation of forestry matters brought to the attention of the President's office and requiring the usual staff analysis.

* * *

FM APPOINTS NEW UP REGENTS

Malacañang recently announced the appointments of three new members of the Board of Regents ot the University of the Philippines.

Appointed by Pres. Ferdinand E. Marcos were Executive Secretary Rafael Salas, Pio Pedrosa and Prof. *Emeritus* Tomas Fonacier.

Regent Pio Pedrosa is the president of the Chamber of Commerce of the Philippines, while, Regent Tomas Fonacier is the director of the University office of alumni relations.

* * *

TREE PLANTING CLIMAXES ARBOR WEEK CELEBRATION

The College of Forestry ended the nation-wide Arbor Week celebration with a whole-day mass tree planting in Mt. Makiling last July 30.

Some 12,000 seedlings of mahogany and rubber tree species were planted on a 10-hectare kaingined area on Mt. Makiling by the students, non-academic personnel and faculty members alike.

* * *

PASCUA DONATES SWIMMING POOL EQUIPMENT

Prof. Agustin Pascua who will retire from the service on August 25th, recently donated a set of equipment for the forestry swimming pool and pavilion. The donations consisted of one plastic water hose with complete accessories for toilet-water deposit.

Mr. Teofilo Ay-yad, in-charge of the forestry swimming pool and pavilion, received the donations in behalf of the College.

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VERGARA ELECTED PENSIONADO CLUB ADVISER

Prof. Napoleon T. Vergara, chairman of the Department of Forest Resources Management, was elected adviser of the forestry Pensionado Club last July 28, for the schoolyear 1966-1967.

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UPCF THAI ALUMNUS VISITS COLLEGE

Dr. Chongrak Prichananda from Thailand recently paid the UPCF a visit after several years of absence. Dr. Chongrak was on his way to Thailand from the United States where he finished his doctorate degree in forestry from Syracuse University.

The Thai visitor finished his Bachelor of Science in Forestry degree at the U.P. College of Forestry in 1957 and master's degree at the Oregon State University.

He is now a faculty member at Kasetsart University in Bangkok, Thailand.

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EXTENSION MAN CAUGHT IN TENDER TRAP

Mr. Anacleto C. Duldulao of the Department of Forestry Extension and the former Miss Ofelia Dilig of Balanga, Bataan were united during the simple nuptial ceremonies held at the Philam Homes Chapel last August 6 in Quezon City. The rites took place at 5:30 in the morning.

Mr. Jose D. Olivar and Forester Jose Rayos, College of Forestry administrative officer and chief of the Planting Stock Section, Reforestation Administration, respectively, stood as sponsors. Mr. Rogelio A. Camero of DFE was the best man.

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JCPIEF APPROVES ROLLING FORESTRY EXHIBIT PLAN

The members of the Joint Committee on Public Information and Education in Forestry, chairmanned by Prof. Domingo V. Jacalne, approved the plan to put up a rolling forestry exhibit in their meeting held last Aug. 11 at the Conference Room of the Wood Technology Building.

According to Prof. Jacalne, this project, which is one of the many aspects of public information and education in forestry, will provide the high school students a chance to know and understand some of the important values of forests, as well as the present problems of forestry and some of the essential practices and measures of forest conservation.

* * *

UPCF FACULTY GRABS BASKETBALL CHAMPIONSHIP GAME

The College of Forestry faculty basketball team grabbed the championship title this year when they gunned down College of Agriculture faculty team with the score of 77-69 during the championship game held at the Baker Hall last Aug. 3. The forestry team maintained its lead from the start to finish.

The annual basketball tournament was sponsored by the Makiling Athletic Association. The association is composed of faculty and non-academic personnel of the Colleges of Agriculture and Forestry and the International Rice Research Institute.

* * *

UP LAGUNA LAND GRANT SURVEY ENDS

The forest survey at the 3,500-hectare UP Laguna Land Grant area in the towns of Paete, Pakil and Pañgil was terminated recently. This was learned from Mr. Adolfo V. Revilla, Jr., faculty-in-charge and forest management specialist of the College of Forestry. Revilla was assisted by Mr. Neptale Q. Zabala, UPCF forest range management specialist.

According to Revilla, the survey had the following specific objectives, namely: (1) to estimate existing timber resource in the area; (2) to ascertain extent of logging operation; (3) to determine suitability of area or portion thereof for range purposes, agricultural and others; and (4) to locate permanent camp sites.

The survey, with an appropriation of ₱10,000, employed 20 new forestry graduates as timber cruisers and 12 laborers. The work lasted for 20 days.

* * *

LANTICAN CELEBRATES NATAL DAY

Dean Domingo M. Lantican of the College of Forestry celebrated his 41st natal day last August 4. A surprised "Ice Cream" party was tendered in the afternoon by the faculty and non-academic personnel of the College in honor of the celebrant.

After the party, Mr. Celso B. Lantican, chairman of the Faculty Activities Committee, presented a gift to the Dean.

Likewise, Prof. Domingo V. Jacalne, chairman of the Department of Forestry Extension, solemnly observed his 45th birthday anniversary on the same day.

* * *

POLLISCO THANKS DFE FOR MAKILING NEWS

Prof. Filiberto S. Pollisco sent a letter of thanks to Prof. Domingo V. Jacalne, chairman of the Department of Forestry Extension, for the copies of the *Makiling News* which he had received.

In his letter, Prof. Pollisco wrote that the *Makiling News*, which he shares with Prof. Enriquito D. de Guzman and some of UPCF's former American Visiting Professors, serves as the only connecting link between them and the College of Forestry. "Our thirst for news concerning any development in the Los Baños campus as well as the university in general is satisfactorily quenched by this college newsletter," added Prof. Pollisco.

Prof. Pollisco is presently enrolled at the State University of New York College of Forestry in Syracuse, New York, pursuing his Ph.D. degree in timber physics and mechanics.

* * *

TESORO FIRST CHILD DIES

The first-born child of Prof. & Mrs. Florentino O. Tesoro died last July 31 after living for five days only. The child was born at San Pablo City hospital and was named Jacinto Rolf.

Prof. Tesoro is at present in the Federal Republic of Germany undergoing special training in the field of wood science and technology.

Some members of the faculty and non-academic personnel of the College, headed by Dean Domingo M. Lantican, attended the funeral in Bay, Laguna.

* * *

UPFA MEETING ANNOUNCED

The U.P. Faculty Association (Los Baños Chapter) will hold its meeting tomorrow, August 16, 6:30 p.m., at the International House, College of Agriculture campus. This was learned from the announcement received by the Secretary's office.

Among the matters to be taken up are the following:

1. Proposed criteria for faculty promotion.
2. Program and social affairs committee report.
3. Agro-industrial fair.

Dinner will be served for ₱2.50 per plate.

* * *

NEW POLICY ON TRAVEL ABROAD BARED

The Office of the President of the Philippines recently issued Memorandum Circular No. 56 prescribing a new policy on official travel abroad of government officials and employees.

The memorandum, among others, states that no official travel of government personnel will be allowed, except in the following cases:

1. Where the trip will not involve the expenditure of government funds.

Trips under this category shall be those on official time only, that is at no government expense except salary. They shall however, be carefully screened with a view to determining whether or not the purpose thereof would eventually serve the public interest. Unless direct benefits are clearly shown, mere observations in fields of study or work allied to one's official duties shall not be considered sufficient justification.

2. Where the trip is for the purpose of complying with an international commitment of the Philippine Government.

This covers trips relating to Philippine Government commitments to international bodies or organizations, especially to the United Nations and its specialized agencies. Under this category, only the minimum number of officials shall be proposed, and where necessary, additional participants or delegates shall be enlisted from the Philippine diplomatic and consular missions abroad.

3. Where the trip would directly redound to the financial benefit of the country.

Among those falling under this category are trips the purpose of which is to solicit funds or negotiate loans needed for vital public projects.

4. Where the trip is in connection with a scholarship, fellowship or training grant.

Under this category are trips in connection with scholarships, fellowships, and training grants secured, arranged or sponsored by the Philippine Government or any of its instrumentalities, or those offered by outstanding foreign universities and foundations, and others of similar nature, in field of study or work allied to the grantee's official duties and where the Government will incur the least expense.

The memorandum further stated that those falling under the first three above-mentioned exceptions are subject to approval by the Office of the President and those under No. 4 by the Special Committee on Scholarship under the Chairmanship of the Secretary of Foreign Affairs.

* * *

Campus Notes

TABAYOYONG ELECTED FSBO PRESIDENT

Theodore R. Tabayoyong, the standard bearer of the Student Party, vested his arch-rival for the FSBO presidency, Allen Torrenueva of the Duty Above All Party, in an election held August 12.

Supported by the Zeta Beta Rho, Alpha Phi Omega, Upsilon Signa Phi and the U.P. Varrons, Ltd., President-elect Tabayoyong led the Student Party into a nearly complete sweep of the FSBO election. Tabayoyong garnered 178 votes, defeating the standard bearer of the DAAP by 24 votes.

The elected officers with their party designations are as follows:

President—Theodore Tabayoyong (SP); Vice-president—Terencio Sarigumba (SP); Secretary—Manuel Bonita (SP); Treasurer—Mariano Machacon (SP); Auditor—Arturo Madlaing (SP); Business Manager—Victor Buenaflor (SP); Athletic Manager —Anacleto Bernardo (Ind.); PRO—Florencio Macaranas (SP); Sergeants-at-arms—Domingo Pinaroc (SP); Esmeraldo Luna (SP); College Councilor — Carmelito Sagrado (SP).

The SP-controlled Student Council promised to pursue their party platforms during their term of office. The president-elect said that their paramount concern will be the making of the College of Forestry as a "Home Sweet Home" for the Students "Away From Home".

The college election was held simultaneously with the university election for officers of the U.P. Student Council.

* * *

COLLEGE OF FORESTRY ENROLLMENT

The Secretary's Office of the College of Forestry released the registration results for the first semester of school year 1966-1967 last August 4. It also gave the result on the freshman examination held July 2, 1966 which was taken by 161 students in the freshman year. Leading the list of examinees is Quimbo with a score of 92 out of 106 items.

* * *

SOLON IS LONE UPCF SPECIAL STUDENT

Rep. Eladio Caliwara of Quezon is at present enrolled as a special student at the College of Forestry, University of the Philippines.

He is taking up FS-1 (Introduction to Forestry) and a special study. The Congressman said he is taking up these courses to acquire more knowledge and skill in technical forestry so he could serve as a model to the youth regarding the importance of forestry to economic advancement and nation-building.

Caliwara (LP) who is also the Chairman of the Committee on Forests in the house of representatives, is the first congressman who has ever enrolled in this college.

* * *

UPCF ENROLLMENT BARED

The enrollment of the College of Forestry swelled to 597 this semester. This was revealed by the Secretary's Office after the late registration period.

Of the 597, 540 are "genuine" forestry students, one special student, 2 graduate students and 54 cross-registrants from the College of Agriculture. And of the 540 "genuine" forestry students, 360 are enrolled in the BSF curriculum and the rest in the Ranger curriculum.

* * *

UPCF SCHOLARS LISTED

The Office of the College Secretary recently released the names of students who are enjoying different scholarship grants. The College scholars are as follows: Catalino Blanche (R.A.) — (1.55), Florencio Macaranas (R.A.) — (1.6), Manuel Bonita (R.A.) — (1.6) and Eliezer Lorenzo (Alcantara and Sons) — (1.6).

The following are the entrance scholars: Eufrosina de Leon, Rogelio Jamorabon, Luis Lopez, Francisco Marsamolo, Canecio Munoz, Cenon Padolina, Reynaldo Raquisiaga, Jose Sargento, Alejandro Toledo and Gualberto Tortoza.

The new RA (Reforestation Administration) scholars are: Melanio Castro, Louis Laudencia, Antonio Oliva, Abraham Saguid and Danilo Taguilig.

The new BF (Bureau of Forestry) scholars are: Nelson Batalla, Virgilio Ramos, Alejandro Salinas Jr., Cosme Santiago and Rolando Uy Jr.

Meanwhile, a summary of the college enrollment runs as follows:

Freshmen:
BSF—186; Ranger—120.

Sophomore:
BSF—65; Ranger—60; Junior—69; Seniors—40. Total—597 (including one special student, two graduate students and fifty-four cross-registrants).

* * *

UPCF PARTICIPATES IN '66 ARBOR WEEK

In the nation wide celebration of Arbor Week from July 23-30, the U.P. College of Forestry led the community of Los Baños in the planting activities which was aimed towards the beautification of the national highway.

According to Prof. Lucio L. Quimbo, the overall vice-chairman of activities, there were 700 seedlings of Fire tree planted along the highway from the boundary of Calamba and Los Baños to the boundary of Bay and Los Baños. Students from both the College of Agriculture and College of Forestry, the municipal officials of Los Baños planted the seedlings supplied by the UPCF nursery.

"Make everyday an Arbor Day." This is the motto used in this year's weeklong celebration aimed at the higher appraisal of the indispensable trees. The vice-chairman added also that the achievement of the celebration's goal here is more than satisfactory. The full cooperation of the mayor, council members, barrio captains, and some private individuals who contributed plants made the celebration successful.

Aside from the highway beautification campaign, the UPCF nursery also supplied seedlings of Fire tree and Golden shower to the different Elementary schools of the Town. They are Maahas, Putho, Bayog, Mayondon, Anos, Lopez, Bambang Elementary schools, Los Baños Central school and Los Baños School of Fisheries.

Meanwhile, on July 30th the UPCF students and Faculty members planted 7,000 mahogany seedlings and 5,000 Para Rubber seedlings in the cleared area of Mt. Makiling. The students were grouped into crews and further grouped under the supervision of Faculty members. There were also Faculty representatives of the departments in the College of Agriculture. The program after lunch like in previous years was not held due to bad weather.

* * *

RESIDENCE HEAD BARES DORMITORY PROBLEMS

Forestry Residence Hall head, Sabino Igcasan said that accommodation is a grave problem of the dormitory. The Residence Hall at present is accommodating more than its capacity. Instead of having the total capacity 152 students, occupants now number 176 students. The accommodation problem was brought about by the new freshmen and the refusal of the Juniors and Seniors to leave the dormitory.

Lighting facilities is also a problem. Some of the rooms do not have complete florescents lamps. In some rooms, only one florescent lamp is functioning. Dormitory corridors have no electrical lamps. In addition, the dormitory lacks student assistants to maintain cleanliness during Saturdays and Sundays.

According to Mr. Igcasan, the College Administration Assistant, Mr. Olivar, ordered 200 folding chairs to replace all chairs, and they would be arriving soon. A new telephone line was also installed for callers in the Forestry and Agriculture campuses and the Los Baños vicinity.

* * *

FORMER KAINGIN RE-PLANTED

The entire Makiling Forest Department staff conducted a mass tree planting on a very recently vacated kaingin owned by the university located in Sitio Bulalo, Santa Cruz, Bay, Laguna last July 21, 1966. Headed by Chairman Rodrigo Fabro of the department, the party was able to plant an area of 2.03 hectares to 1000 mahogany, 250 narra and 250 ipil seedlings.

Said kaingin had been cultivated in the past by kaingero Sotero Baldo since 1943. By planting crops in the kaingin, he destroyed volume of timber for which destruction Baldo was held responsible by the university of the Philippines through the department of the Makiling Forests, College of Forestry. The kaingero was apprehended on March 26, 1965 and a day after that, he was notified to vacate the place and to face the court. On Baldo's appeal through his legal counsel, the U.P. agreed not to further follow up the case provided that Baldo would promise to leave the place, and relinquish all his rights over any improvements and

plants therein and to help in the re-planting of tree seedlings in the area.

* * *

MORE RANGERS FOR THE MAKILING FORESTS

Five additional forest guards were absorbed by the Department of Makiling Forests from the 1966 batch of ranger graduates. Their appointments took effect last June.

The five new rangers are: Ramon Sanchez, Generaldo Nicolas, Dominador Egargo, Teofilo Naoe, and Juanito Ordinario.

* * *

UPCF DEAN DISCUSSES COLLEGE PROBLEMS

In an interview with Dr. Domingo Lantican, the newly appointed Dean stressed housing as the number one problem of both faculty and students of the College of Forestry. He mentioned that lack of residential houses made some faculty members to resign and students in the dormitory are occupying rooms that cannot comfortably hold the present number of occupants. Accordingly the College had long been asked for assistance from the university but was told that there were no funds. The College also planned to get a loan from the GSIS but such move was deferred. It was argued that the construction of another dormitory would result in higher rentals for students.

Speaking on the method used in student recruitment, Dr. Lantican pointed out that the quality of students admitted does not depend on recruitment but rather on the "basic make-up of high school graduates." Furthermore, he said that we could not as yet use the results of the entrance examinations as the basis for screening the students' admission into the College.

Discussing the problems of General Education Staff, Dr. Lantican said that the administration had been criticized for not subsidizing this department in terms of scholarship grants abroad. However, the College dean made mention the fact that there is no provision in the college program that the faculty of the General Education Department be included in assistanship. According to him, the College is trying its best in helping General Education Staff in seeking scholarship abroad.

As for the Forestry Extension department's achievements and accomplishments, the Dean opined that it was very difficult to assess these, since they are abstract and intangible, and, naturally, difficult to evaluate.

* * *

FORESTRY GLOWING GOLDIES ON PARADE

With the resumption of athletic hostilities among the different units of the university here in Los Baños, the Forestry Glowing Goldies are once again in the limelights. This years' crop of athletes will be on their foes for the duration of the intramurals in their effort to bring home the honors, of not the general "championship," for the College of Forestry.

* * *

In basketball, making up the Forestry Glowing Goldies this year are eight mainstay and nine recruits, mostly from the Freshman and Sophomore students.

The old members are: Robert Romero (this year's skipper), Roger Andrada (co-capt.) Rolly Uanang, Guy Abesamis, Romy Escudero, Fred Dagondon, Peping Garduque, and Cesar Pantaleon.

The upcoming are: Save Cafe, Baldy Laccay, Leony Dancel, Jun Ramel, Joe Lapinid, Danny Sacramento, Teling Soller, Nelson Yanez and Ven Apolinario.

Though their first appearance had been unfortunate, they are still sure hot enough to grab the basketball title.

* * *

For their first debut, the newly completed forestry men's volleyball team lost from the Juniors last August with straight two set.

Composing the Men's Volleyball Glowing Goldies are Nick Fuente (captain), Pelusio Celzo, Mateo Saagundo, Jose Arances, Policarpio Martinez, Marcelino Viernes, Alfredo Pugal, David Corpuz, Oscar Gapuz, Eduardo Tabara, Amado Cenizan nd Marlyn Dumlao.

Because of the high-caliber performance showing by the Aggie Juniors on tackling their just assignment it is speculated by Volleyball afficionados that they will keep the title they captured last year.

* * *

In football, in the other hand, the seventeen promising goldies who recently passed the football tryouts held last August, at the Forestry Football playground will propel the forestry squad. This year's team will be composed of eleven regular players and six alternates.

The players are: Jirapun Kongsar (capt.), Somsak Charaenkosal, Patanan Nantarat, Vadhana Damasidhi, Boonab Pochakorn, Liban Bay-oan, Cecilio Bidal, Anacleto Bernardo, Romulo Balod, Paquito Caliva, Marianito Cajucom, Modesto Casison, Marlyn Dumlao, Romeo Escudero, Donato Sadioa, Theodore Tabayoyong and Marcelino Viernes.

Sunshine Corner

OUT OF DANGER

Johnny wanted to go with his big brother (aged twelve) to play with the Smith boys. "No, I can't take you with me," said the elder. "Why not?" "They'll teach you to swear, for one thing." "But you go with them yourself," was Johnny's argument. "Oh, but I swear already."

* * *

THE PESSIMIST

One vile morning in Flanders a captured German spy was being conducted to the place of his execution. As he plunged on through the mud with the escort and firing party, he complained continually about the weather. One of the soldiers became annoyed at last, and said: "You ought to grouse, you did. What about us? We got to march all the — way back!"

* * *

WORTH A TIP

On another occasion Solomon was horror-stricken to see his friend Cohen, after dining at a restaurant, give the waiter the munificent tip of ten shillings. "Cohen," he said, "vatever did you give the vaiter all that money for?" "Well," said Cohen, "look what a lovely fur coat he has given me!"

* * *

YES OR NO

A story is told of a brow-beating counsel, who habitually endeavoured to terrorise his opponent's witnesses. One witness rather tended to preface his replies with lengthy explanations. "I want yes or no," thundered counsel. "There is no need for you to argue the point!" "But there are some questions which cannot be answered by yes or no," mildly responded the witness. "There are not!" unwisely snapped the lawyer. "Oh," said the witness, "answer this then. Have you ceased beating your wife "

* * *

THE LOGICAL CONCLUSION

"Oh, mother, look at those little tiny cows," cried a child, gazing out of a railway carriage window. "Those are Highland cattle, dear," replied the mother; "they are always small." "Are they the ones they get the condensed milk from?" was the child's next querry.

* * *

PERFECTION

A dramatic critic was arguing with an actor friend on the merits of certain stage noterieties. He had faults to find in each and all of the famous stars, and the actor, getting impatient, eventually said: "Tell me, whom do you consider to be a really finished actor?" The answer came pat. "A dead one, my boy!

* * *

THE VALUE OF ART

Many stories are told of the "New Rich" and the Profiteer. Here is one: The munition king was showing a guest the treasures of his palatial mansion. Amongst other things was a collection of rare china, with one piece of extreme rarity. "Loot at that, my boy!" enthused the profiteer. "Wonderful piece that. Cost me three thousand. Only specimen in existence." "But aren't you afraid it might get broken, just standing on this cabinet?" questioned the guest. "Pooh — that's all right. It's fully insured!"

* * *

ONE FOR THE DOCTOR

Little Dorothy was ailing, so mother had taken her to see the doctor. "Put your tongue out, my dear," said he. A minute pink tip just showed itself between Dorothy's lips. "That won't do," said the doctor heartily. "Put it right out." Tears gathered in the little blue eyes. Then — "I can't. It's — It's joined on to me at the back."

* * *

PUTTING TWO AND TWO TOGETHER

The knowing little boy confided to a friend that he was expecting a little brother any minute. "But how do you know it'll be a brother?" said his friend. "Cause not so long ago mother was ill, and we had a little baby sister. And dad's been ill in bed a week!"

* * *

Literary Attempts

My Delusions: Preludes to Sanity with an in-

By

FLORENCIO MACARANAS

I hate everybody and everybody hates me. The whole damn world is whirling like mad, I wish it would crack up like my brain. Because I'm mad too. Mad at everything and everybody. And mad at myself — mostly.

I do the right things but they come out the wrong way. I do the wrong things but they still come out the wrong way. So I never do anything anymore except cry myself out the whole time, everyday, every moment and every damned second ticking, ticking, ticking. When will it ever stop? And where and when will it ever end?

Could be that I'm the only sane man on this world, and everybody else is crazy. Could be that all people except me are demented. They go on and off like a switch. The only difference is that they can not control the current at will. I could, hah!

Nobody understands me and I could understand nobody. And I don't understand myself too. Nothing could ever be understood in this life anyway. Maybe I should have been born inside out, with my entrails hanging and protruding. Ugh, how handsome a monster I would be. Everyone would hate me more than ever, but I won't care. Afterall, I don't love them. How could I?

Nobody loves me. That's good. I'm a poor orphaned waif. Abandoned, penniless, hungry and lonely. I walk the cold streets, sleep on the icy sidewalks, climb the highest trees, and shout myself out with all my might, louder than Tarzan could ever make, and louder than all the war cries of the men of Genghis Khan and Hitler put together. All you stupid imbeciles, come and get me for all I care. Cut me to pieces and pulverize me. Scatter my dust among the heads of millions walking to and fro and knowing not where to go or what to do.

Like me. Follow me all you morons and let us jump together head first into the freezing cold of hell. Those who want to burn themselves out may start climbing the stairway to heaven. There the air-conditioners are functioning, and whirring and whirring endlessly round and round until you are dizzy, dizzy, dizzy. You whirl and whirl, spin and spin, until the white ceiling of the room you are in, becomes as black as Satan.

Umm! I'm at home with Satan. Lucifer's my brother and Dracula my cousin. Handsome aren't they? And their wives are the most beautiful women. Vampires all. No matter how much they paint their faces, shade their eyes, curl their eyebrows, smack their lips and perfume their nauseating bodies, their sharpest fangs still show. And you stupid fools who call yourselves males could still afford to amount them in search of ecstasy that lasts only for a moment's moment? Oh you devils and demons, let us feast on the corpses of

those vile creatures the men call women. Those creatures who like to disrobe in front of the shouting throngs who grab and clutch and lose their minds.

Open the gates of hell and force them into the mud and mire of boiling, hizzing, murky liquid. That's what they all deserve. Come my friends and enemies, let us wallow and swim in our own filth. Kiss and embrace under the airless dampness of stone. Come!

Why can't that stupid fool of a fool recognize what is in my heart? Why couldn't he understand what I feel and think and want? I pity him as I pity the maggots feeding on the garbage of people who call themselves clean and sanitary. No, I don't hate him. Why should I? He has done nothing wrong to me, or rather he does wrong to me but he doesn't know it. Meanwhile I have to sacrifice. Needlessly, because I have no choice. Is there any? None. Damn it, none! "Father, forgive them for they know not what they are doing!" Mother forgive me for I know not what I am saying. I wanna go home.

Yaah! Help! Save me from these white clothed men. Why are they taking me away? They must be crazy!

Essay:

Of Men and Idealism

By

JEREMIAS A. CANONIZADO

There are certain basic attitudes and values which influence greatly the life of man. It is said that deep-rooted points of view, convictions and personal philosophies are life-enhancing influences which determine the pattern of one's thoughts, mode of conduct, and perspective in the various pursuits of life.

But the thing that keynotes all these is that seldom understood and all-pervading point of view called idealism. Many confuse it with certain self conceived attitudes framed for expediency, others regard it as lofty, impossible, and impractical. This is the result because the opportunity has not yet offered itself to them to feel the power and the throb of its compelling influence, to understand it as a source of inner strength when the mind and the spirit are forced to bow to the miseries and ashen materialism of man's existence, to grasp the magnetism of its effect in engaging the soul to taste the fact that "what is highest in spirit is also deepest in nature", and to feel the lifting experience of making it furnish one's guiding principles of life.

Ideals are ideas set on a pedestal, deep-seated points of view converted into philosophies of life and standards that are more or less lofty, if not unattainable. They are principles in which dwell the values that beautify life- integrity, moral purpose, individual worth, consistency of purpose, definite destination, and deep-rooted sense of confidence.

Idealism covers the various facets of conduct, outlook, impressions, and beliefs. But whatever phase idealism may cover, it furnishes man with a more complete consciousness of his individual worth, a deeper moral sense, and a keener intellectual respectability.

The search for an ideal woman may be the subject of idealism.

(*Continued on page* 108)

EDITORIALS:

FORESTERS AND INVOLVEMENT

The kaingin menace, the water crisis, log exportation, appointment of career men, all these involve foresters. In involvement, it is not only a matter of being vocal; it consists more of action. Foresters must not only say something, they must also do something—and fast.

So far, what has come out of the kaingin problems? Forest conservation? Etc. etc. etc.? So much has been said about them, but so little has been accomplished. It seems as if we have not yet begun. Or if we have, we haven't gone far yet. When will we?

Whether we like it or not, we are involved in politics. We are a part of the government and the government is run by politics. We can not go on just blaming politics right and left. We can not just go on passing the buck to the politicians. For years and years and years we have done only one consistent thing—blame the government.

Haven't we learned yet that blame has led our country to nothing more than change of administrations? We haven't changed for the better so far. And so with our forests. They have worsened.

That oft repeated phrase of "forest conservation" has become so monotonous to our ears. What does it mean to the common people? To crooks and cheaters and corrupted men? To men who have lost their sense of righteousness? Their conscience? Have we lost the guts to act like we should? Have we lost the guts to pinpoint the people we know are crooks?

Must we wait for congress to pass laws which, more often than not, are broken? Isn't there anything better to do than wait for somebody else to do jobs?

Foresters—please think of something—say it, and then do it yourself. Act. Please!!! - *fm*

THE FORESTER'S LIFE

There is a poem by J. A. LARSEN, entitled, "The Forester's Life". It runs thus:

"Seek not ease nor wealth nor wines,
Nor humans to adore thee;
But the friendship of the hills,
And the trail before thee.

Seek not idle merriment,
Fame nor praise nor glory.
But a will to which is bent,
Tasks that lie before thee."

We had the experience of showing this poem to a forester friend of ours, and you know what? He laughed! And he told us sarcastically, "That's what you want to do

at first, but once you get to know what your superiors themselves are doing, you won't have any choice unless you want to hang by your own rope!"

It isn't really shocking anymore. It seems to be an open secret that many of our foresters are acquiring things easily — in the deepest meaning of the word. Or to put it another way, it is a fact that many foresters who want to be true to their professional code of ethics are disillusioned. According to them, honesty in the forestry profession has gone to naught.

What do the newspapers of today say? "Honesty at present, can get you nowhere. It would just make you a pauper. So don't be a fool." Yes, don't be a fool. What is meant by "fool"? Is one who doesn't do what others are doing a fool? Is a pauper a fool? Maybe.

Is a non-crook a fool? Is a non-crook a crazy moralist, a stupid idealist? Is he a coward? How can he afford to see his wife and children hungry and still be honest? Must we do what others are doing because they would laugh at us if we don't? Do we have a distorted sense of morality, or worse. is there none at all?

Yes, we live for only a short time. We must make use of our lives the best way we can. After all, we live only once. We die only once. And we don't get caught even once. We never are really.

Most of the barbaric tribes may have been better. They did what they thought was right (although it may be wrong to us). But in our case, we do what we think is wrong because we can get away with it. Meanwhile, crooked foresters are laughing at what they call "pseudo-moralists" in the government service.

Let them. After all, laughter has its own echo. — *fm*

MEN AND IDEALISM . . .

(*Continued from page* 106)

Matter-of-factly, I know a man who made his idealism furnish him a by-law of conduct. He had an ideal, a woman. With the intense sophistication and artificiality around him, he searched for a woman with an air of unimpeachable dignity, poise, reserve, and natural warmth. For years, his search proved unavailing. In between those years, he almost gave up and clutched the belief that no such woman did really exist. But his indestructible faith in his idealism inspired him not to give up the search.

Then he found her incarnated into a breathing, living flesh.

The realization alone made him happy. He valued the culmination of his search with all his heart.

But the woman never knew. He never told her.

Despite of that, he made her the centri-thought of his life, the drive in his ambitions.

Spurred by her influence, he worked hard for the honor and dignification of that ideal; he worked hard to be worthy of that ideal.

This instance simply points out to the fact that ideals are man's self realizations of his solid inner character and inherent goodness and possibilities. On top of emphasizing the reality and worth of the self, of moral values and valid attitudes, idealism gives meaning and dignity to the individual self and furnishes man a basis for self-integration.

All these are true because idealism is a deep moral and personal conviction.

State University College of Forestry
at Syracuse University
Syracuse, New York 13210

September 29, 1966

Vice President Dioscoro Umali
College of Agriculture
University of the Philippines
College, Laguna, Philippines

Dear Jack:

Yesterday I wrote Director Osara informing him that Professor Webb has agreed to accompany me to the Philippines for a two months' study of the Forestry College at Los Baños and to help in outlining a program for developing graduate studies. Both Mrs. Shirley and Mrs. Webb will be accompanying us.

I might say that both Webb and I are very enthusiastic about returning to Los Baños, and hope that we can, indeed, be of real service in laying the groundwork for developing a center for graduate studies in tropical forestry in the Philippines. It is my hope that we can leave Syarcuse on or around December 1, and leave Los Baños to return on or about January 31.

I am enclosing an extra copy of this letter which I wish you would send on to Dean Lantican. Although final decision on timing and headquarters probably will be made by FAO, we have in mind that we would be headquartered at Los Baños and would appreciate his finding a suitable place for us to stay while there.

With best personal wishes,

Sincerely,

(Sgd.) HARDY L. SHIRLEY
Dean

* * *

Republic of the Philippines
Department of Agriculture and Natural Resources
BUREAU OF FORESTRY
Manila

August 3, 1966

The Editor
The FORESTRY LEAVES
U.P. College of Forestry
Los Baños, Laguna

S i r :

I am submitting herewith my article for the Arbor Week issue of the Forestry Leaves. I am also submitting a copy of my picture for possible publication together with the article.

Very truly yours,

(Sgd.) ANTONIO A. QUEJADO
Acting Director of Forestry

* * *

Duke University Library
Durham
North Carolina
27706

September 28, 1966

College of Forestry Librarian
University of the Philippines
College, Laguna, Philippines

Gentlemen:

We receive your excellent serial entitled FORESTRY LEAVES on exchange from you. We like to keep our holdings complete, and we are missing the following issues:

v. 11, no. 3, 1959 v. 15, no. 4, 1964
v. 12, no. 1, 1960 v. 16, no. 4, 1965

Would it be possible for you to supply us with replacement copies for these four numbers? We would appreciate it very much.

We hope to hear from you soon. Please address all correspondence and publications to the address which appears below in red. Thank you for your kind cooperation.

With the very best wishes,

Yours sincerely,

(Sgd.) (Mrs.) GEORGE ANNE MARSTON
Gifts and Exchanges

* * *

COMMONWEALTH SCIENTIFIC AND
INDUSTRIAL RESEARCH ORGANIZATION
Division of Forest Products, C.S.I.R.O.
P. O. Box 310,
South Melbourne, S.C. 5. Victoria, Australia,

October 3, 1966

The Librarian,
College of Forestry,
University of the Philippines,
Laguna, Philippine Islands.

Dear Sir,

For sometime you have been sending a copy of your publication to us regularly. However, the following issue failed to reach us:

Forestry Leaves v. 16 (4) 1965

As we would like to have a complete file of this periodical, perhaps you would be good enough to let us have another copy.

Yours faithfully,
(Sgd.) A. FORBES
Librarian

° ° °

Universidad de los Andes,
Facultad de Ciencias Forestales,
Biblioteca — Apartado No. 305
Merida, Venezuela

Mérida, 12 de Noviembre de 1965

Señores:

Estamos interesados en establecer canje con instituciones similares y afines.

Agradeceríamos el envío de publicaciones de nuestro interés.

Por el momento, podemos ofrecer en canje la REVISTA FORESTAL VENEZOLANA y la lista de duplicados adjunta.

Atentamente,

(Fdo.) MAYRA DE BURGOS
Directora de la Biblioteca

° ° °

Ministério da Agricultura
Instituto de Pesquisas e Experimentacâo
Agropecuárias do Leste

Sept. 5, 1966

University of the Philippines
College of Forestry
Library
College, Laguna, Philippines

Dear Sirs:

Our research institute (INSTITUTO DE PESQUISAS E EXPERIMENTAÁO AGROPECURIAS DO LESTE—IPEAL) of the Brazilian Ministry of Agriculture should like to come into contact with your institution, in order to have a regular exchange ot our respective publications. We will be pleased to send you any technical and research publication produced by our institution.

Your collaboration will be greatly appreciated.

Yours sincerely,

(Sgd.) ARCHIMAR BITTENCOURT BALEEIRO
Director of the IPEAL

° ° °

Republic of the Philippines
Department of Agriculture and Natural Resources
BUREAU OF FORESTRY
Region 8
Davao City

Z-Collections
(Ad for Forestry Leaves)

October 19, 1966

Professor Jose Blando
College of Forestry
College, Laguna

Dear Professor Blando,

I am forwarding to you the total amount of ₱540.00 representing actual collection as of today from different concessionaires here in Davao City as listed hereunder for the Ad in the Forestry Leaves as follows:

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2. Dacudao Enterprises	50.00
3. Davao Enterprises Corp.	150.00
4. Sarmiento Enterprises Inc.	140.00
T O T A L	₱540.00

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October 14, 1966	
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Some licenses here have also promised to give some amount to this Ad but until now they have not yet given us the amount. As soon as this amount will be received by me, I will loss no time to forward it to you.

Kindly acknowledge these money order, and the check as soon as you received.

Very truly yours,

(Sgd.) HIGINIO D. REBOSURA
Regional Director

FORESTRY LEAVES

Organ of the Student Body and Alumni of the College of Forestry, College, Laguna

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