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REPRODUCTION IN A DIPTEROCARP FOREST OF THE PHILIPPINE ISLANDS

Thesis for Degree of Master of Forestry

Deville Demio Wood

1917

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Introduction

The object of this thesis is to give some data on the reproduction in a Dipterocarp forest and so far as the writer knows this is the first data systematically gathered under natural conditions in the Philippine Islands. Growth measurements have been recorded and published but these would have been of far greater value had reproduction notes been taken at the same time to give an idea of what tree species might be expected to follow the present forest in Dipterocarp regions.

These data were collected over a period of nearly two years and although not covering a sufficient period to form absolute conclusions, they may be of aid in future work of this kind.

Extent and Importance of Dipterocarp Forests

Dipterocarp forests are found in India, Burma, the Federated Malay States, the Netherland Indies, Dutch Borneo, Brunei, Sarawak, British North Borneo and the Philippine Islands. This may be called the natural distribution in commercial quantity of the family Dipterocarpaceae as known at present. The best developed stands of Dipterocarp forests are no doubt found in the Philippine Islands, the whole of Borneo, Burma and India.

From the lumberman's and forester's standpoint these forests are the most important to be found in the Eastern Tropics. Between 1910 and 1915, inclusive, the total output of Dipterocarp timber in

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the Philippine Islands averaged 84% of the total cut. Between 1912 and 1915, inclusive, Dipterocarp timber averaged 75% of the total cut of British North Borneo. From this it is safe to say that at least 50% of all timber cut in the countries named above, is Dipterocarp species.

Although there are no figures available it is assumed that 60% to 75% of all timbers exported from the Philippine Islands are Dipterocarps. Some of these timbers such as tanguile (Shorea polysperma), and red lauan (Shorea negrosensis) are now being exported to America and Europe under the name of Philippine mahogany. Both are of fine texture, easily worked and to the layman are not distinguishable from the true mahogany (Swietenia mahogani). Other Dipterocarps that are being exported for furniture, veneer and interior finish are white lauan (Pentacme contorta) and almon (Shorea furfuracea and Parashorea plicata). These are sometimes stained and also sold as Philippine mahogany.

Description of a Dipterocarp Forest

When reference is made to a certain stand of timber as being a Dipterocarp forest it must not be inferred that the whole stand is made up of Dipterocarps only. Quite the contrary is true. There are not, so far as known, pure virgin stands of any one species in the Eastern Tropics. In temperate North America one refers to a stand of white pine or yellow pine and at once thinks of a pure stand of one of the other as the case may be. But that is not true of an Eastern tropical forest. When a forest is referred to as being Dipterocarp it infers that the bulk by volume belongs to this

family but grouped to either with hundreds of other species.

Dipterocarp species are generally only slightly buttressed and have a clean straight bole with a minimum of taper. The crowns are large and wide spreading making even shading over the forest floor. The trees are seldom deformed and it is not unusual to find a large stand with trees one hundred feet to the first branch, and three to five feet in diameter. From the first branch upwards the taper is more pronounced.

Soil, wind and rainfall influence the character of the forests to a great extent. Certain Dipterocarp species have adapted themselves to moist lowlands while others grow on the rocky hill sides and the exposed ridges. Those growing on the ridges are generally found to be windfirm and intolerant while those on the lowlands are tolerant and not windfirm.

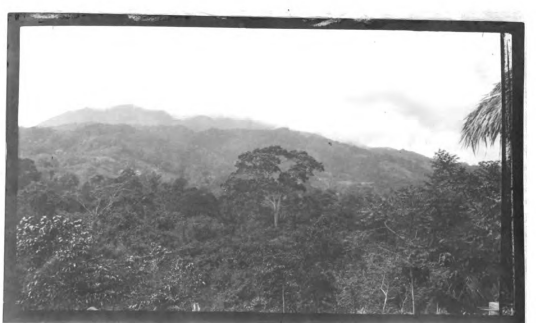

Fig. I. Dipterocarp forest on Mount Maquiling, Los Banos, Laguna. Bagtican lauan (Parashorea plicata), in center foreground.

Fig. II. Typical Dipterocarp forest. Northern Luzon. Note clean straight boles.

The Dipterocarps

There are about 350 species belonging to the family which have been described and new ones are continually being found within its range. Over forty of these are found in the Philippines.

The following is a list of the more important Dipterocarps found in the Philippine Islands. Those marked with the letter B are on the area discussed:

Family Dipterocarpaceae

Scientific name	Common or trade name
Anisoptera thurifera (B)	Palosapis
Dipterocarpus grandiflorus (B)	Apitong
" vernicifluus (B)	Panao
" affinis	Hagachac

Scientific Names	Common or Trade Names
Hopea acuminata (B)	Manggachapui or dalingdingan
" plicata	Yacal
Parashorea plicata	Bagtikan lauan
Pentacme contorta (B)	White lauan
Shorea balangeran	Guisoc
Shorea furfuracea	Almon-lauan
Shorea guiso (B)	Guijo
Shorea malaanonan	Malaanonang - lauan
Shorea polysperma (B)	Tanguile (Philippine mahogany)
Shorea negrosensis	Red lauan (Philippine mahogany)
Shorea squamata	Mayapis-lauan
Vatica sp.	Kalunti

There are several other Dipterocarps found in the Philippine Islands but on account of their small size or scattered distribution are not commercial while other Dipterocarp species of similar texture and appearance are mixed and sold with one or more of the above and placed on the market under one of their trade names. Many of the species are so closely related that it is often impossible to identify the wood without botanical material.

Location and Description of the Area Studied

The area studied is located in the Southern half of Bataan Province, Philippine Islands, between 14°32' and 14°35' north latitude and 120°32' and 120°37' longitude East of Greenwich and is known as the Cadwallader-Gibson Concession Area. The area is now being logged by the above company under a twenty year licence agreement,

[illegible] 1907.

The southern half of [illegible] is an extinct volcano rising to about 1400 meters above sea level. The slopes of the mountain run to the sea on the West, South and East forming a large fan shaped base. A narrow flat coastal plain is found on the East but this is entirely absent on the South and West. To the North the slopes spread out and form a low divide between the old volcano and the mountain range to the North. The entire mountain is covered with a good stand of virgin timber with a [illegible] of Dipterocarpaceae.

The mill is located on the East coast of the Province and the logging operations up to 1916 had been confined to the Eastern slope. Starting with the first areas cut over it was found that lago (Schizostachyum [illegible]) a thin walled bamboo, climbing bamboo, forest weeds and weeds were coming in to the exclusion of the desirable tree species. Shade produced by lago, and especially climbing bamboo is so dense that the most tolerant tree seedlings are killed out. This old cutting area had never been burned over.

The cutting area of 1910 has very good reproduction in a few places but where undergrowth has a good start no tree seedlings are found. The shade produced by undergrowth up to a certain elevation is evidently too dense for the intolerant species.

The areas logged the latter part of 1911 and during 1912 suffered more or less from very destructive fires in the slashing. The destruction wrought by these fires is very evident as nearly all of the trees left standing were either seriously injured or killed out-

right and, of course, no seedlings were left. The permanent effect of these fires cannot be determined at present. The officers of the lumber company were of the opinion that reproduction would be better after such fires had passed on account of the dense shade being destroyed.

Fig. III. Logged area in Bataan Province on area studied.

Fig. IV. Same as fig. III after severe burn.

Fig. V. A burned over cutting area where nothing was left but dead standing timber.

The Experimental Plots

In all of the plots a seedling is taken to be any plant one year or less in age and all plants over one year old are given in heights in centimeters.

Plot No. 1

September 25, 1912

Species	Seedlings	Over one year Height	Dead
Lauan (Pentacme contorta)	13	None	4

February 27, 1913

Species	Seedlings	Over one year Height	Dead
Lauan (Pentacme contorta)	9		8

Species	Seedlings	Over one year Height	Dead
Lemon (Pentacme contorta)		26 cm.	9
" " "		28 "	
" " "		2-35 "	
" " "		40 "	
" " "		2-45 "	
" " "		58 "	

Location: About 600 meters, N 50 W, from the first logging camp of 1913. In an old logging trail of 1910. Size: two meters square. Altitude: 250 meters. Gradient: 55. Exposure: East. Soil: clay. Soil cover: none. No shade.

Within a radius of 30 meters there are five seed bearing lemons (Pentacme contorta) with an average diameter of 33 centimeters.

This plot is located in an old logging trail which had been cleared of all vegetation to a width of about fifty feet. The soil had been stirred up by the skidding of logs and the conditions for seeding-in were excellent.

When this plot was first laid out in September 1912, white lemon (Pentacme contorta) seedlings were coming in over the entire road-way. The plot was taken to learn if this particular species would be resistent to the heat and drying effect of the sun in an exposed situation. That is to find if it would be possible to burn cut over areas with the assurance of securing a stand of timber of one species when sufficient seed trees were left.

From September 25, 1913 to February 27, 1914 inclusive, which may be considered a period of true dry weather, practically 50% of the seedlings had died. During this dry season there were occasional showers and had the season been as dry as the preceding one it is doubtful if any seedlings would have survived. At the last counting over 50% had died as a result of exposure to the sun and consequent insolation.

Fig. VI. White Lauan (Pentacme contorta) seedlings in plot I on April 14, 1914.

On April 14, 1914 over 50% of the original seedlings had died and no new ones had appeared. This is very good considering the exposed condition under which they were growing.

If resistance to insolation were the only factor to be considered the white Lauan has made a good showing but a glance at Fig. VI shows plainly that the timber that would be produced from Lauan seedlings grown in the open is more than likely to be crooked,knotty

[illegible] Fig. VI [illegible] clearly the effect of the [illegible] in killing out the tender leaders and producing a short thickly branched plant.

Plot No. 2

September 25, 1912

Species	Seedlings	Over one year Height	Dead
Apitong (Dipterocarpus grandiflorus)		120 cm.	
" " "		100 "	
" " "		75 "	
" " "		70 "	
" " "		30 "	
" " "		3-20 "	
L[illegible] (P[illegible] contorta)		100 "	
" " "		50 "	
" " "		30 "	
" " "		20 "	
Tamayuan (Strombosia philippinensis)		60 "	
" " "		20 "	
Palosapis (Anisoptera thurifera)		40 "	
Balakat (Zizyphus zonulatus)		50 "	

February 27, 1913

Species	Seedlings	Over one year Height	Dead
Apitong (Dipterocarpus grandiflorus)		355 cm.	
" " "		[illegible] "	
" " "		[illegible] "	

February 27, 1914 (Continued).

Species	Seedlings	Over one year Height	Dead
Apitong (Dipterocarpus grandiflorus)		105 cm.	
" " "		73 "	
" " "		3-60 "	
Lauan (Pentacme contorta)		100 "	1
" " "		50 "	
" " "		30 "	
" " "		11 "	
Palosapis (Anisoptera thurifera)		20 "	
Balakat (Zizyphus zonulatus)		72 "	
Palomaria (Calophyllum blancoi)	1		
Tamayuan (Strombosia philippinensis)	1		
" " "	1		
Malaikmo (Celtis philippinensis)	3		
Unknown	2		
Forest seeds	1		

April 14, 1914

Species	Seedlings	Over one year Height	Dead
Apitong (Dipterocarpus grandiflorus)		138 cm.	
" " "		136 "	
" " "		133 "	
" " "		94 "	
" " "		75 "	
" " "		65 "	

Species	Seedlings	One year old [illegible]	Dead
Apitong (Dipterocarpus grandiflorus)	.60 M.	54 cm.	
" " "	.23 M.		
Lauan (Pentacme contorta)			1
Balakat (Zizyphus [illegible])			1
Palo Maria (Calophyllum blancoi)		20 cm.	
Cupang (Parkia timoriana)	1		
T[illegible] (Sterculia philippinensis)		26 cm.	
M[illegible] (Celtis philippinensis)		25 "	2
Unknown	1		1
Forest weeds	3		

Location: about 300 meters N 45 [illegible] of plot No. 1. In cutting area of 1910. Size: 2 meters square. Altitude: 275 meters. Gradient: 15%. Exposure: Northeast. Soil: clay, moist. Soil cover: leaves, branches and timber. Well shaded.

Many seed trees of different species.

Plot No. 2 was taken in a well protected location in the cutting area of 1910. This area has not been damaged by fires to any great extent and altho [illegible] growth in many places [illegible], the young seedlings have a start which will eventually overtop the brush.

Within a radius of 30 meters there are seed trees of the fol-

[illegible]:

Lauan, six,	Average diameter	30 cm.
Apitong, fourteen,	" "	40 -60 cm.
Bolongeta, five,	" "	25 -30 cm.
Tambulao, two,	" "	25 cm.
Alupag, one,	" "	60 cm.

The reproduction found about this plot is good and with this number of seed trees the area will be re-seeded each year and no doubt a sufficient number will survive to restock the area.

Plot No. 3

September 26, 1912

Species	Seedlings	Over one year Height	Dead
Malaikmo (Celtis philippinensis)	3		
Cupang (Parkia timoriana)	1		
Balacat (Zizyphus zonulatus)	1		
Kulis (Memecylon edule)	2		
Unknown	1		
Rattan (Calamus sp.)	7		
Forest weeds	29		

February 27, 1913

Species	Seedlings	Over one year Height	Dead
Malaikmo (Celtis philippinensis)	1		2
Cupang (Parkia timoriana)	1		
Balacat (Zizyphus zonulatus)	1		
Kulis (Memecylon edule)	1		1

February 27, 1913.

Species	Seedlings	Over one year Height	Dead
Bolongeta (Diospyros pilosanthera)	1		
Unknown	3		
Rattan (Calamus sp.)	7		
Forest weed	40		

April 14, 1914

Species	Seedlings	Over one year Height	Dead
Maleikmo (Celtis philippinensis)			3
Cupang (Parkia timoriana)			1
Balacat (Zizyphus zonulatus)			1
Kulis (Memecylon edule)			1
Unknown	3	3	
Rattan (Calamus sp.)		7	
Forest weed		19	16
Malaburun (Forest weed) (Homalanthus populneus)		400 cm.	
" "		250 "	
"		55 "	
Unknown sprout	1		

Plot No. 4

September 26, 1912

Species	Seedlings	Over one year Height	Dead
Bolongeta (Diospyros pilosanthera)	3		
Kulis (Memecylon edule)	3		
Maleikmo (Celtis philippinensis)	1		
Forest weed	29		

February 27, 1913

Species	Seedlings	Over one year Height	Dead
Balogeta (Diospyros pilosanthera)			3
Kulis (Memecylon edule)	3		
Malaikno (Celtis philippinensis)			1
Unknown	4		
Forest weed	24		5

April 14, 1914

Species	Seedlings	Over one year Height	Dead
Kulis (Memecylon edule)			3
Unknown	7	50 cm.	2
"		38 "	
Forest weed	11		17
Maladuron (Forest weed) (Homalanthus populneus)		300 cm.	

Plot No. 5
September 26, 1912

Species	Seedlings	Over one year Height	Dead
Malaikno (Celtis philippinensis)	2		
Unknown	2		
Rattan (Calamus sp.)	1		
Forest weed	29		

February 27, 1913

Species	Seedlings	Over one year Height	Dead
Malaikno (Celtis philippinensis)			2
Kulis (Memecylon edule)	1		
Unknown	6		
Rattan (Calamus sp.)	4		
Brush	31		

April 14, 1912

Species	Seedlings	Over one year Height	Dead
Kulis (Memecylon edule)			1
Guijo (Shorea guiso)	1		
Alupay (Euphorbia cinerea)	2		
Unknown	4		1
Rattan (Calamus sp.)	4		
Forest weed		200 cm.	
" "	10		15
Malabonan (Forest weed) (Homalanthus populneus)		400 cm.	
" "		300 "	
" "		250 "	
" "			2

Plot No. 6

September 26, 1912

Species	Seedlings	Over one year Height	Dead
Unknown	1		
Rattan (Calamus sp.)	2		
Forest weed	45		

February 27, 1913

Species	Seedlings	Over one year Height	Dead
Lauan (Pentacme contorta)	1		
Kulis (Memecylon edule)	1		
Rattan (Calamus sp.)	2		
Forest weed	43		

April 14, 1914

Species	Seedlings	Over one year Height	Dead
L[illegible] (Port[illegible])			1
K[illegible] ([illegible])			1
Kalingag (C[illegible] mercadoi)	1		
Unknown	5		
Rattan (Calamus sp.)		2	
Forest weed	9		28
Mal[illegible] (Forest weed) (Hem[illegible]-[illegible])		2- 450 cm.	
" " "		300 "	
" " "		250 "	
" " "		2- 200 "	

Plot No. 7
September 28, 1912

Species	Seedlings	Over one year Height	Dead
Alupag (Euphoria cinerea)	1		
Unknown	2		
Bamboo (Schizostachyum mucronatum)	2		
Forest weed	24		

February 27, 1913

Species	Seedlings	Over one year Height	Dead
Alupag (Euphoria cinerea	1		
Balinghasay (Buchanania arborescens)	1		
Unknown	3		
Bamboo (Schizostachyum mucronatum)	1		
Forest weed	34		

April 14, 1914

Species	Seedlings	Over one year Height	Dead
Alupag (Euphoria cinerea)		20 cm.	
Balinghasay (Buchanania arborescens)		45 "	
Unknown	11		1
Bamboo (Schizostachyum mucronatum)		-1	
Forest weed	9		17
Maladuhon (Forest weed) (Homalanthus populneus)		2-200 "	1

Plot No. 8
September 26, 1912

Species	Seedlings	Over one year Height	Dead
Bolongeta (Diospyros pilosanthera)	1		
Balinghasay (Buchanania arborescens)	2		
Unknown	1		
Forest weed	22		

February 27, 1913

Species	Seedlings	Over one year	Dead
Bolongeta (Diospyros pilosanthera)	1		
Balinghasay (Buchanania arborescens)			2
Unknown	3		
Forest weed	18		7

April 14, 1914

Species	Seedlings	Over one year Height	Dead
Alupag (Euphoria cinerea)	1		
Bolongeta (Diospyros pilosanthera)		180 cm.	
Unknown		2(small)	1
Forest weed	4		11

Plot No. 9
September 26, 1912

Species	Seedlings	Over one year Height	Dead
Almaciga (Burlonia cinerea)	1		
Unknown	2		
Bamboo (Schizostachium mucronatum)	1		
Forest weed	9		

February 27, 1913

Species	Seedlings	Over one year Height	Dead
Lauan (Pentacme contorta)	1		
Almaciga Burlonia cinerea)	1		
Guijo (Shorea guiso)	1		
Unknown	1		1
Bamboo (Schizostachyum mucronatum)	1		
Forest weed	25		

April 14, 1914

Species	Seedlings	Over one year	Dead
Lauan (Pentacme contorta)			1
Almaciga (Burlonia cinerea)		100 cm.	
Guijo (Shorea guiso)		40 "	
Unknown	3		1
Climbing bamboo (called bejo before)		1	
Forest weed	3		20
" "		2-100 cm.	
Maladuron (Forest weed) (Homalanthus populneus)		250 "	

Plot No. 20

October 26, 1912

Species	Seedlings	Over one year Height	Dead
Forest weed	25		

February 27, 1913

Species	Seedlings	Over one year Height	Dead
Forest weed	28		1

April 14, 1914

Species	Seedlings	Over one year Height	Dead
Alupag (Euphorbia cinerea)	1		
Kalinong (Cinnamomum mercadoi)	1		
Unknown	2		
Forest weed	7		19
Maladuron (Forest weed) (Homalanthus populneus)	1	300 cm.	
" "	1	350 "	

The following description applies to plots Nos. 8 to 10 inclusive:

Location: [illegible] ; 1911 [illegible]. Size: 2 meters square. Altitude: 240 meters. Gradient: 20%. Exposure: East. Soil: clay, moist, well drained. Soil cover: chips, leaves and old branches. Partly shaded all day.

The above eight plots were laid out in two rows of four plots long and two plots wide.

The following seed trees are within a radius of 30 meters of the plots:

Lauan (Pentacme contorta) nine,	average	diameter	35	cm.
Bolongeta (Diospyros pilosanthera) seven,	"	"	20	"
Tadalao (Kreana heterophylla) one,	"	"	40	"
Liusin (Parinarium griffithianum) two,	"	"	40	"
Guijo (Shorea guiso) three,	"	"	15	"
Cupang (Parkia timoriana) four,	"	"	[illegible]	"
Banaba (Lagerstroemia speciosa) two,	"	"	30	"
Malaikmo (Celtis philippinensis) two,	"	"	15	"

In the above plots the large number of forest weeds is very noticeable and resistance of the young seedlings to these forest weeds will be an interesting study.

The location of these plots is very favourable for reproduction with this number of seed trees and the evenly distributed shade. With sufficient seed trees in the vicinity these plots should have shown a greater number of seedlings of desirable species.

[illegible]
[illegible] 26, 19[illegible]

Species	Seedlings	Over one year Height	Dead
Lauan (Pentacme contorta)	2		
" " "		40 cm.	
" " "		30 "	
Palosapis (Anisoptera thurifera)		40 "	
Bolongeta (Diospyros pilosanthera)	1		
Alupag (Euphoria cinerea)	1		
Bilucao (Garcinia sp.)	2		
Forest weed	43		

February 27, 1913

Species	Seedlings	Over one year Height	Dead
Lauan (Pentacme contorta)	2		
" " "		100 cm.	
" " "		98 "	
" " "		75 "	
Palosapis (Anisoptera thurifera)		100 "	
Bolongeta (Diospyros pilosanthera)	1		
" " "		36 "	
Alupag (Euphoria cinerea)		68 "	
Bilucao (Garcinia sp.)	2		
Forest weed	51		

April 14, 1914

Species	Seedlings	Over one year Height	Dead
Lauan (Pentacme contorta)	2		
" s " "		3- 140 cm.	
" " "		130 "	
" " "		70 "	
" " "		60 "	
Palosapis (Anisoptera thurifera)		135 "	
Bolongeta (Diospyros pilosanthera)		50 "	
" " "		40 "	
Alupag (Euphoria cinerea)		70 "	
Bilucao (Garcinia sp.)		150 "	
" " "		130 "	
Forest weed	8		11
Maladuron (Forest weed) Homalanthus populneus)		16- 400 " (average)	6

Plot No. 12
September 26, 1912

Species	Seedlings	Over one year Height	Dead
Lauan (Pentacme contorta)	1		
Palosapis (Anisoptera thurifera)	2		
Panao (Dipterocarpus vernicifluus)	1		
Bolongeta (Diospyros pilosanthera)	2		
Bilucao (Garcinia sp.)	2		
Palo Maria (Calophyllum blancoi)	1		
Forest weed	41		

February 27, 1913

Species	Seedlings	Over one year Height	Dead
Lauan (Pentacme contorta)	1		
Palosapis (Anisoptera thurifera)	2		
Panao (Dipterocarpus vernicifluus)			1
Bolongeta (Diospyros pilosanthera)	1		1
Bilucao (Garcinia sp.)			
" "		3 sprouts	
Palo Maria (Calophyllum blancoi)	2		
Balinghasay (Buchanania arborescens)	1		
Alupag (Euphoria cinerea)	1		
Forest weed	61		

April 14, 1914

Species	Seedlings	Over one year Height	Dead
Lauan (Pentacme contorta)		50 cm.	
Palosapis (Anisoptera thurifera)		170 "	
" " "		90 "	
Bolongeta (Diospyros pilosanthera)		95 "	
Bilucao (Garcinia sp.)		70 "(Sprout)	
" "		60 " "	
" "		50 " "	
" "		40 "	
Palo Maria (Calophyllum blancoi)		110 "	
" " " "		[illegible] "	
Balinghasay (Buchanania arborescens)		43 "	
Alupag (Euphoria cinerea)		80 "	
Pagsahingin (Canarium sp.)	1		
Kalingag (Cinnamomum mercadoi)	1		
Forest weed	8		29
Malaburon (Forest weed) (Homalanthus populneus)		15- 400 cm. (average)	9

The following description applies to plots Nos. 11 and 13:

Location: [illegible] meters S of end of 1911 logging railroad and 15 meters N of end of skidding railroad used in 1911. Size: 2 meters square. Altitude: 385 meters. Gradient: 30%. Exposure: North. Soil: clay, well drained and moist. Soil cover: leaves, chips and old branches.

Very little shade during part of the day.

Plots Nos. 11 and 12 adjoin each other and are located in an area near the burned area of June 1911.

Plot No. 13
September 26, 1912

Species	Seedlings	Over one year: Height	Dead
Lauan (Pentacme contorta)	1		
Balinghasay (Buchanania arborescens)	1		
Unknown	1		
Rattan (Calamus sp.)	1		
Forest weed	32		

February 27, 1913

Species	Seedlings	Over one year: Height	Dead
Lauan (Pentacme contorta)	1		
Balinghasay (Buchanania arborescens)	1		
Bolongeta (Diospyros pilosanthera)	1		
Balacat (Zizyphus sp.)	1		
Unknown	1		
Rattan (Calamus sp.)			1
Forest weed	38		2

April 14, 1914

Species	Seedlings	Over one year: Height	Dead
Lauan (Pentacme contorta)		62 cm.	
Balinghasay (Buchanania arborescens)		120 "	
Bolongeta (Diospyros pilosanthera)		30 "(Sprout)	
Balacat (Zizyphus sp.)			1
Unknown		135 "	
Forest weed	9		1
[illegible] (Forest weed) (Homalanthus populneus) 15- 400 cm. (av. hgt.)			

Plot No. 14
[illegible] 26, 1912

Species	Seedlings	Over one year	Dead
Lauan (Pentacme contorta)	1		
Balacat (Zizyphus sp.)	1		
Unknown	1		
Forest weed	34		

February 27, 1913

Species	Seedlings	Over one year	Dead
Lauan (Pentacme contorta)	2		
Balacat (Zizyphus sp.)	1		
Balinghasay (Buchanania arborescens)	1		
Forest weed	47		

April 14, 1914

Species	Seedlings	Over one year Height	Dead
Lauan (Pentacme contorta)		2- 30 cm.	
Balinghasay (Buchanania arborescens)		40 "	
Forest weed	5		17
[illegible] (Forest weed) (Homalanthus populneus)		24- 400 " (av. [illegible])	

The following description applies to plots Nos. 13 and 14:

Location: Same location as plots Nos. 11 and 12, lying 15 meters W. of plot No. 11. Size: 2 meters square. Altitude: 365 meters. Gradient: 30%. Exposure: North. Soil: clay, [illegible] and [illegible]. Shade during [illegible] of the day.

The large percentage of [illegible] in plots Nos. 11, 12, 13, and 14 is all of one species, belonging to the Euphorbiaceae family and called [illegible]. Its resemblance to the [illegible] of the United States is very striking and no doubt it [illegible] species being [illegible] and eventually crowded out by the more vigorous [illegible] species. The [illegible]

dense and will be more of a nurse crop than the other kinds of [illegible]-
[illegible] wood. This small tree is coming up over the larger part of the burned area, and in parts of the area cut over in 1910 but was not noticed in the lower agricultural land.

Fig. VII. White lauan (Pentacme contorta) grown in shade of Maladuron (Homalanthus populneus).

Fig. VIII. Maladuron (Homalanthus populneus) which has made the last natural cover crop for white lauan (Pentacme contorta).

Plot No. 15
April 22, 1913

Species	Seedlings	Over one year Height	Dead
Anabion (Trema mabolnensis)	4		
Maladuron (Forest weed) (Homalanthus populneus)	2		
Forest weed	11		
Weed (Blumea balsamifera)	11		

April 14, 1914

Species	Seedlings	Over one year Height	Dead
Anahlon (Trema amboinensis)		100 cm. (broken top.)	3
Maladuron (Forest weed) (Homalanthus populneus)		400 cm.	1
Forest weed	1	100 "	9
" "		80 "	
Weed (Blumea balsamifera)		6- 150 cm.	5

Plot No. 16
April 22, 1913

Species	Seedlings	Over one year Height	Dead
Anahlon (Trema amboinensis)	2		
Maladuron (Forest weed) (Homalanthus populneus)	1		
Weed (Blumea balsamifera)	14		
Weeds	2		
Grass	1		
Vine	1		

April 14, 1914

Species	Seedlings	Over one year Height	Dead
Anahlon (Trema amboinensis)			2
Maladuron (forest weed) (Homalanthus populneus)		350 cm.	
Forest weed	4		
Weed (Blumea balsamifera)		4-150 " (av.hgt.)	10
Weeds			2
Grass			1
Vine		1	

Plot No. 17
April 22, 1913

Species	Seedlings	Over one year Height	Dead
Cumang (Parkia timoriana)	1		
Anahlon (Trema amboinensis)	1		
Forest weed	2		
Weed (Blumea balsamifera)	6		
Weed	2		

April 14, 1914

Species	Seedlings	Over one year Height	Dead
Cupang (Parkia timoriana)			1
Anabion (Trema orientalis)			1
Unknown	1		
M[illegible](C[illegible]d) (Homalanthus populneus)		450 cm.([illegible] in former count)	
Forest seed	3		2
Weeds (Blumea balsamifera)		4- 200 cm. (average.)	2
Weeds			2

Plot No. 18
April 22, 1913

Species	Seedlings	Over one year Height	Dead
Cupang (Parkia timoriana)	2		
Unknown	3		
Weed (Blumea balsamifera)	15		
Weeds	3		

April 14, 1914

Species	Seedlings	Over one year Height	Dead
Cupang (Parkia timoriana)			2
Anabion (Trema orientalis)		500 cm.	([illegible] in first count)
Unknown		200 cm.	
"		65 "	1
Forest seed	5		
Weeds (Blumea balsamifera)		8- 300 cm. (average height)	7
Weeds			3

Plot No. 19

April 22, 1913

Species	Seedlings	Over one year Height	Dead
Cupang (Parkia timoriana)	1		
Bolongeta (Diospyros pilosanthera)	1		
Weed (Blumea balsamifera)	13		
Weed	1		
Forest weed	5		
Grass	1 clump		

April 14, 1914

Species	Seedlings	Over one year Height	Dead
Cupang (Parkia timoriana)			1
Bolongeta (Diospyros pilosanthera)		140 cm.	
Weeds (Blumea balsamifera)		5- 300 "	8
Weeds	1	1	
Forest weed	4	2- 300 cm.	3

Plot No. 20

April 22, 1913

Species	Seedlings	Over one year	Dead
Bolongeta (Diospyros pilosanthera)	1		
Anabion (Trema amboinensis)	1		
Weed (Blumea balsamifera)	9		
Weeds	2		
Grass	1		

April 14, 1914

Species	Seedlings	Over one year Height	Dead
Bolongeta (Diospyros pilosanthera)		40 cm.	
Anabion (Trema amboinensis)		600 " (6 cm. diameter)	
Weed (Blumea balsamifera)		5- 300 cm.	4
Weeds			2
Forest weed		240 "	
Forest weed	1	250 "	

Plot No. 21

April 23, 1913

Species	Seedlings	Over one year Height	Dead
Anabiong (Trema amboinensis)	1		
Weed (Blumea balsamifera)	13		
Weeds	4		
Forest weed	9		
Vine	1		

April 14, 1914

Species	Seedlings	Over one year Height	Dead
Anabiong (Trema amboinensis)			1
Weeds (Blumea balsamifera)		8- 200 cm. (aver. hgt.)	5
Weeds			4
Forest weed		160 cm.	7
" "		250 "	
" "	3		
Vine			1

Plot No. 22

April 23, 1913

Species	Seedlings	Over one year Height	Dead
Bolongeta (Diospyros pilosanthera)	1		
Forest weed	4		
Weed (Blumea balsamifera)	10		
Weeds	4		
Grass	1 clump		

April 14, 1914

Species	Seedlings	Over one year Height	Dead
Bolongeta (Diospyros pilosanthera)		95 cm.	
Brush	3		4
Weeds (Blumea balsamifera)		9- 250 "	1
Weeds			4
Grass	1 clump		

The [illegible] Nos. 15 to 21 inclusive:

Location: approximately 172 meters north from station 32 of the main logging railroad as shown on map of the 1912 cutting area. Size: two meters square. Altitude: about 370 meters. Gradient: 18%. Exposure: South. Soil: clay, dry, well drained. Soil cover: none. No shade except that furnished by weeds, grass, and brush.

The above plots were laid out in two rows of four plots long and two plots wide. These plots are located in the area severely burned over in the fire of June 1912 and all seed trees within a radius of 100 meters and more have been killed. The vegetation on these plots is representative of the class which is coming in on all such areas and the chance for such areas to be re-seeded naturally by some desirable tree species is practically impossible.

Fig. IX. Sandong (Blumea balsamifera) coming in on all severely burned areas to the exclusion of tree species.

Plot No. 23

May 2, 1913

Species	Seedlings	Over one year Height	Dead
Lauan (Pentacme contorta)	5		1
Alupag (Euphoria cinerea)	1		
Palo Maria (Calophyllum blancoi)	1		
Unknown	2	1- 150 cm.	
Forest weed	27		
Rattan (Calamus sp.)	2		
Grass	1 (clump)		
Vine	2		

April 15, 1914

Species	Seedlings	Over one year Height	Dead
Lauan (Pentacme contorta)		2- 30 cm.	2
Lauan " "		1- 35 "	
Palo Maria (Calophyllum blancoi)		50 "	
Bolongeta (Diospyros pilosanthera)	1		
Unknown		75 "	
"	4	40 "	
"		25 "	
Brush ([illegible])		45 "	
" "		30 "	
Brush	9		
"		4- 25 "	
Rattan (Calamus sp.)		35 "	
" "		40 "	
Weeds			do.
Grass and vines			"

Plot No. 24

May 2, 1913

Species	Seedlings	Over one year Height	Dead
Panao (Dipterocarpus vernicifluus)	3		
Guijo (Shorea guiso)	1		
Bilucao (Garcinia sp.)	4		
Unknown	6		
Forest weed	32		
Grass	12 clumps)		
Rattan (Calamus sp.)	2		

April 15, 1914

Species	Seedlings	Over one year Height	Dead
Panao (Dipterocarpus vernicifluus)		50 cm.	
" " "		40 "	
" " "		25 "	
Guijo (Shorea guiso)		20 "	
Bilucao (Garcinia sp.)		2- 20 "	
" "		2- 30 "	
Unknown		12- 20 "	
"		2- 30 "	
"		35 "	
"		45 "	
Forest weed		17- 20 "	
" "		30 "	
" "		35 "	
" "		45 "	
Rattan (Calamus sp.)		2- 35 "	
Weeds	10		

Plot No. 25

May 2, 1913

Species	Seedlings	Over one year Height	Dead
Lauan (Pentacme contorta)	2		
Palo Maria (Calophyllum blancoi)	1		
Unknown (tree sp.)	4		
Forest weed	34		
Grass	2		
Rattan (Calamus sp.)	2		
Weeds	1		

April 15, 1914

Species	Seedlings	Over one year Height	Dead
Lauan (Pentacme contorta)	1		
" " "		20 cm.	
" " "		50 "	
Palo Maria (Calophyllum blancoi)		45 "	
Alupag (Euphoria cinerea)		35 "	
Calingag (Cinnamomum mercadoi)	1		
" " "		45 "	
Unknown (tree sp.)	2		
" "	1		
" "		35 "	
" "		45 "	
" "		2-140 "	
Forest weed	32		2
Grass	2		
Rattan (Calamus sp.)			2
Weeds	2		

May 2, 1913

Species	Seedlings	Over one year Height	Dead
Lauan (Pentacme contorta)	1		
Bolongeta (Diospyros pilosanthera)	1		
Unknown (tree sp.)		255 cm.	
" "	2		
Forest floor	27		
Rattan (Calamus sp.)	7		
Grass	2		

April 15, 1914

Species	Seedlings	Over one year Height	Dead
Lauan (Pentacme contorta)			1
Bolongeta (Diospyros pilosanthera)		20 cm.	
Calingag (Cinnamomum mercadoi)	2		
Unknown (tree sp.)	12		
" "		45 "	
" "		70 "	
Forest floor	32		
Rattan (Calamus sp.)	4		3
Grass	1		1

May 2, 1913

Species	Seedlings	Over one year Height	Dead
Lemon (Pentacme contorta)	2		
Bolongeta (Diospyros pilosanthera)	1		
Palo Maria (Calophyllum [illegible])	1		
Unknown (tree sp.)	7		
Forest weed	9		
Rattan (Calamus sp.)	9		
Grass	8		
Weed	1		

April 15, 1914

Species	Seedlings	Over one year Height	Dead
Lemon (Pentacme contorta)		35 cm.	1
Bolongeta (Diospyros pilosanthera)		20 "	
Panao (Dipterocarpus vernicifluus)		25 "	
Unknown (tree sp.)		20 "	5
"		35 "	
"		70 "	
"		85 "	
Forest weed	5		3
Rattan (Calamus sp.)			9
Grass			8
Weeds	4		

Plot No. 28

May 2, 1913

Species	Seedlings	Over one year Height	Dead
Lauan (Pentacme contorta)	1		1
Palosapis (Anisoptera thurifera)		160 cm.	
Palo Maria (Calophyllum blancoi)	2		
Unknown (tree sp.)	4		
Forest seed	17		
Rattan (Calamus sp.)	5		
Weeds	7		

April 15, 1914

Species	Seedlings	Over one year Height	Dead
Lauan (Pentacme contorta)			1
Palosapis (Anisoptera thurifera)		165 cm.	
Palo Maria (Calophyllum blancoi)		40 "	1
Unknown (tree sp.)		2- 30 "	
"		2- 40 "	
Forest seed	23		
Rattan (Calamus sp.)	5		
Weeds	1		6

May 2, 1913

Species	Seedlings	Over one year Height	Dead
Lanan (Pentacme contorta)	1		
Apitong (Dipterocarpus grandiflorus)		55 cm.	
Bolongeta (Diospyros pilosanthera)	1		
Palo Maria (Calophyllum inophyllum)	1		
Unknown (tree sp.)	4		
Forest weed	16		
Weeds	8		

April 15, 1914

Species	Seedlings	Over one year Height	Dead
Lanan (Pentacme contorta)		35 cm.	
Apitong (Dipterocarpus grandiflorus)		55 "	
Bolongeta (Diospyros pilosanthera)		20 "	
Palo Maria (Calophyllum inophyllum)		55 "	
Pagsahingin (Canarium sp.)		55 "	
Unknown (tree sp.)		2- 20 "	1
Forest weed	14	3- 70 "	
" "			
Weeds	8		

Plot No. 80

May 2, 1913

Species	Seedlings	Over one year Height	Dead
Unknown (tree sp.)		130 cm.	
Forest weed	16		
Weeds	1		1

April 15, 1914

Species	Seedlings	Over one year Height	Dead
Lauan (Pentacme contorta)	1		
Palo Maria (Calophyllum blancoi)		35 cm.	
Unknown (tree sp.)	1		
" "		90 "	
" "		120 "	
" "		130 "	
Brush (Forest weed)	14		2
Weeds	3		

Summary

A comparison of the above plot counts shows that (1) the Dipterocarps have not, up to the present time, made sufficient headway in reproducing themselves to lead one to believe that they will form an important part of the stand of timber in the future; (2) climbing bamboo, bojo and forest weeds thrive as soon as the forest is opened up; (3) and that slash and ground fires destroy all seedlings, small trees and lianas.

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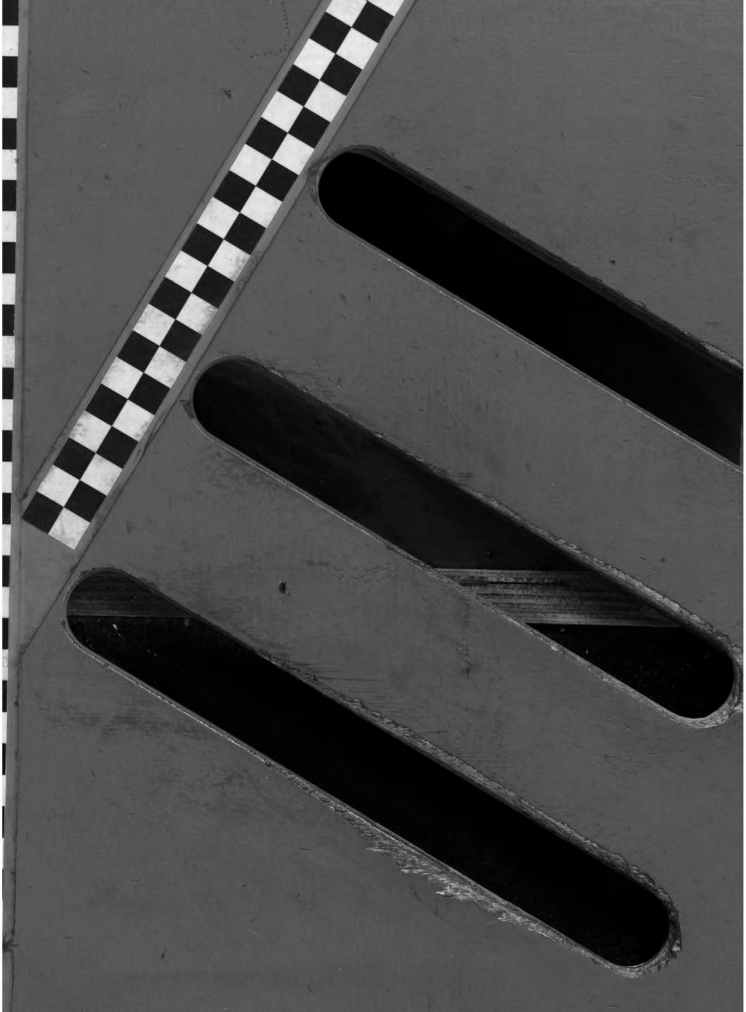

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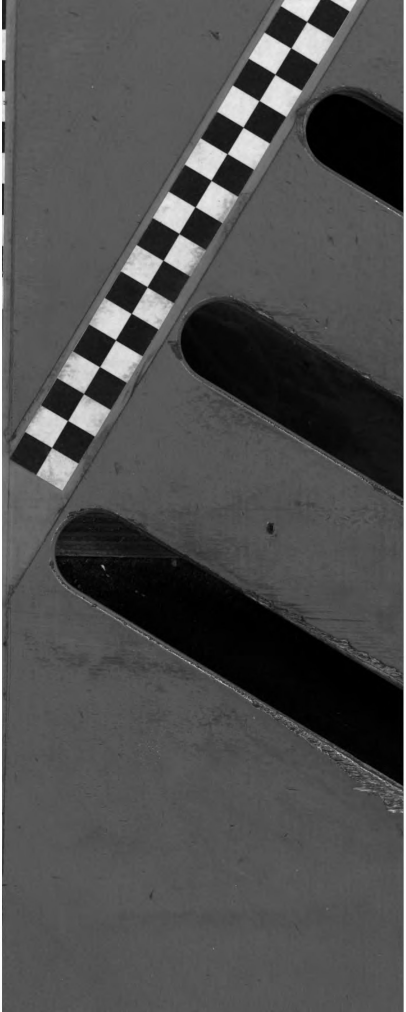

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