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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 Netherlands 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

the Philippines I have estimated 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 probably other with hundred 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.

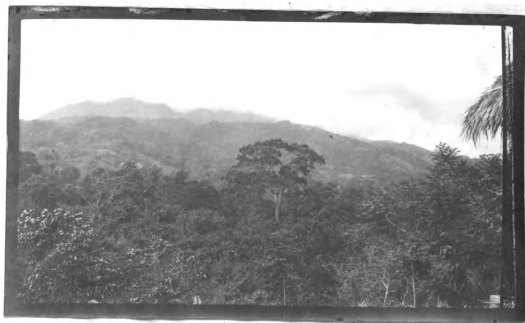


Fig. I. Dipterocarp Forest on Mount Maquiling, Los Banos, Laguna. Bagtikan Iauan (*Parashorea plicata*), in center foreground.



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

<u>Scientific name</u>	<u>Common or trade name</u>
Anisoptera thurifera (B)	Palosaris
Dipterocarpus grandiflorus (B)	Apitong
" vernicifluus (B)	Panna
" affinis	Macachac

<u>Shorea albiflora</u>	<u>Chamaecarpus indica</u>
<u>Shorea albiflora</u> (B)	Manachan or daligadigan
" <u>plurata</u>	Yacil
<u>Parashorea plicata</u>	Baglio-lanun
<u>Pentacme costata</u> (B)	Mite-lanun
<u>Shorea balangeran</u>	Guiseo
<u>Shorea furfuracea</u>	Alnon-lanun
<u>Shorea guiso</u> (B)	Guijo
<u>Shorea malanona</u>	Malanona - lanun
<u>Shorea polymorpha</u> (B)	Tangile (Philippine mahogany)
<u>Shorea negrosensis</u>	Red lanun (Philippine mahogany)
<u>Shorea sumatrana</u>	Maya-is-lanun
<u>Vatica</u> 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 Davao Province, Philippine Islands, between 14°32' and 14°35' north latitude and 120°22' and 120°37' longitude East of Greenwich and is known as the Cadwallader-Gilson Concession Area. The area is now being logged by the above company under a twenty year licence agreement,

March 10, 1917.

The southern side of Baker Peak is a broad, low, conical volcano rising to about 1400 meters above sea level. The slopes of the mountain run to the east, the west, south and north forming a large fan shaped base. A narrow flat coastal plain is found on the East side this is entirely absent on the South and West. To the North the plain extends 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 small amount of *D. glaucescens*.

The hill is located on the East coast of the Province and the logging operations up to 1916 had been confined to the Eastern slope.

Station with the first areas cut over it was found that *S. latifolia* (Schlechtendahl) was abundant in the thin skinned barbed, shagbark barbed, forest and species were coming in to the exclusion of the *S. latifolia* trees. Shade produced by logs, and a gradually increasing shade is evident that the most tolerant trees are killed out. This old cutting area had never been logged over.

The cutting area of 1910 has very good reproduction in a few places but where undergrowth has a good start no trees of large size 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 slashings. 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	Dead
		Height	
Lauan (Pentacme contorta):	13	None	4

February 27, 1913

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

April 14, 1914

Species	Seedlings	Over one year	Dead
		Height	
Laurel (Pentstemon confertus)		26 cm.	9
" " "		28 "	
" " "		2-35 "	
" " "		40 "	
" " "		2-45 "	
" " "		58 "	

Location: about 600 meters, N 50 W, from the first logging camp of 1912. In an old logging trail of 1910. Size: two meters square. Altitude: 200 meters. Gradient: 5%. Exposure: East. Soil: clay. Soil cover: none. No shade.

Within a radius of 30 meters there are five seed bearing laurels (Pentstemon confertus) 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 laurel (Pentstemon confertus) seedlings were coming in over the entire road-way. The plot was taken to learn if this particular species would be resistant 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 23, 1912 to February 27, 1913 the area, which was originally a garden of *Sida acuta* L., probably 50% of the original seedlings died. During this dry season there were occasional showers and had the soil been as dry as the present one it is doubtful if any seedlings could have survived. At the last counting over 50% had died as a result of exposure to the sun and consequent insolation.



Fig. VI. White leaved (*Portulaca oleracea*) 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 leaved has made a good showing but a glance at Fig. VI shows plainly that the taller that could be produced from low seedlings grown in the open is more than likely to be crooked, knobby

and killed the tender lower. May 21. A clearly the effect of the frost killing out the tender lower and producing a short thickly branched plant.

Plot No. 2

September 25, 1912

Species	Seedlings:	Over one year:	Dead
		Height	
Asitong (Distemonocarpus grandiflorus)		120 cm.	
" " "		100 "	
" " "		75 "	
" " "		70 "	
" " "		30 "	
" " "		2-30 "	
Lamal (Pteris caudatifolia)		100 "	
" " "		50 "	
" " "		30 "	
" " "		20 "	
Tasogan (Strobilactis philippinensis)		60 "	
" " "		20 "	
Palosais (Anisoptera thurifera)		40 "	
Bilacat (Zizyphus tenuifolia)		50 "	

February 27, 1913

Species	Seedlings:	Over one year:	Dead
		Height	
Asitong (Distemonocarpus grandiflorus)		165 cm.	
" " "		120 "	
" " "		100 "	

Species	Seedlings	Over one year	Dead
		Height	
Apitong (<i>Dipterocarpus grandiflorus</i>)		105 cm.	
" " "		73 "	
" " "		2-60 "	
Lauan (<i>Pentstemon confertus</i>)		100 "	1
" " "		50 "	
" " "		20 "	
" " "		11 "	
Palawan (<i>Anisostemum thurifera</i>)		20 "	
Balant (<i>Syzgium zomulatus</i>)		72 "	
Palawan (<i>Calophyllum blancoi</i>)	1		
Tamayuan (<i>Strombosia philippinensis</i>)	1		
" " "	1		
Malaikmo (<i>Celtis philippinensis</i>)	3		
Unknown	2		
Forest seeds	1		

April 14, 1914

Species	Seedlings	Over one year	Dead
		Height	
Apitong (<i>Dipterocarpus grandiflorus</i>)		133 cm.	
" " "		136 "	
" " "		132 "	
" " "		94 "	
" " "		75 "	
" " "		65 "	

April 14, 1914 (continued)

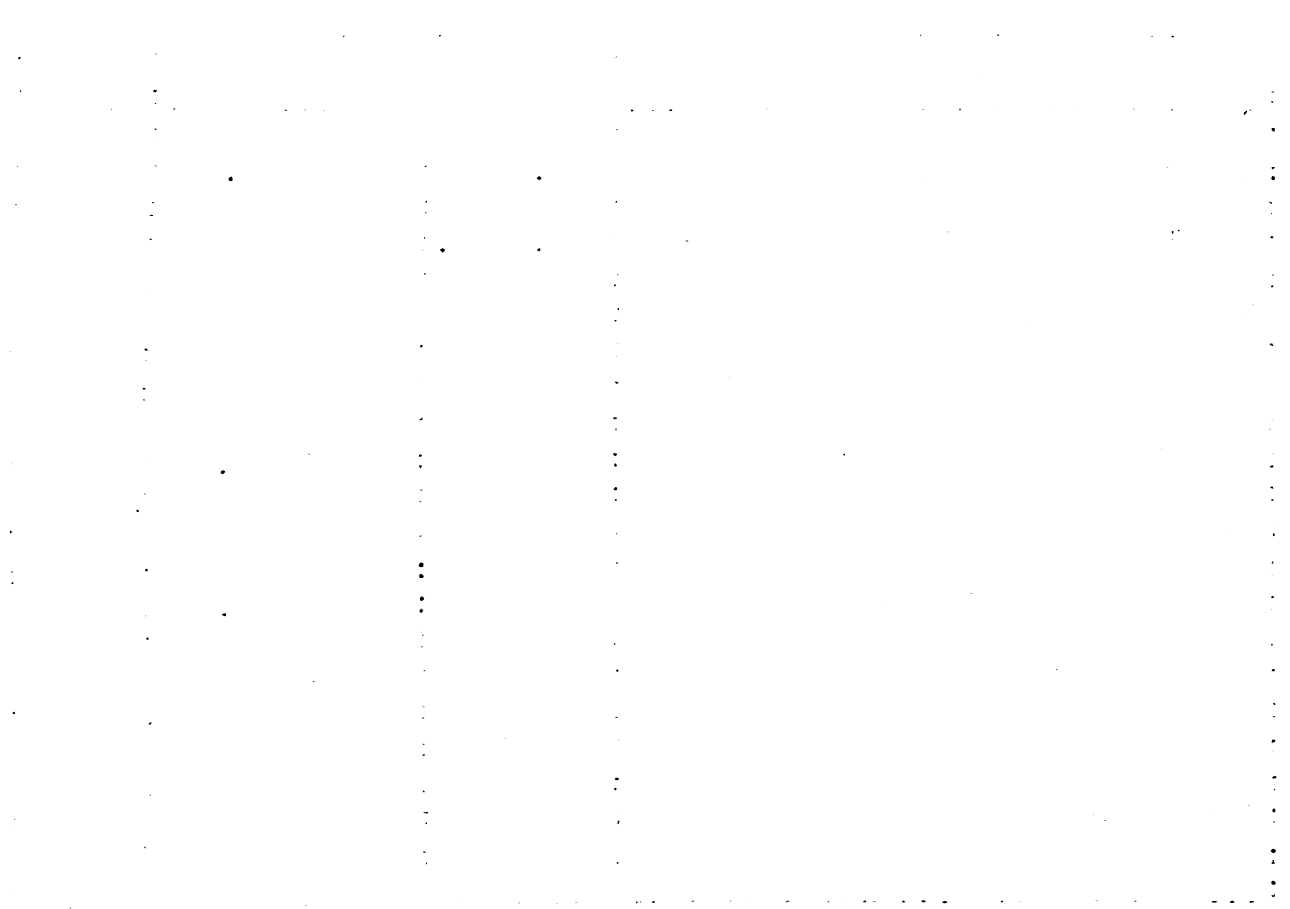
Species	Scientific Name	Height	Number	Notes
Albizia	(Dichrocarpa glabra Willd.)	.30 M.	24 ea.	
"	"	.28 M.		
Leucaena	(Pithecellobium dulce)		1	
Bauhinia	(Zizyphora mucronata)		1	
Pala Maria	(Calophyllum blancoi)		20 ea.	
Cordia	(Pavonia amarilla)	1		
Tournefortia	(Scaevola taccada)		26 ea.	
Melastoma	(Callis phillyloides)		25 "	2
Uncaria		1		1
Forest tree		3		

Loc. 412: about 500 meters N 45 E of plot No. 1. In cutting area of 1910. Size: 2 meters square. Altitude: 275 meters. Gradient: 10%. Exposure: Northeast. Soil: clay, moist. Soil cover: leaves, branches and timber. Well shaded.

Many good trees of different species.

Plot No. 2 has been in a well protected location in the cutting area of 1910. This area has not been damaged by fire to any great extent and little new growth is now there. As a result, the young seedlings have a start which will eventually overtop the brush.

Within a radius of 30 meters there are good trees of the following



Indigenous trees:

Lakan, six,	Average diameter 30 cm.
Apitong, fourteen,	" " 40 -60 cm.
Balangeta, five,	" " 25 -30 cm.
Tabalao, two,	" " 25 cm.
Almag, 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

: S p e c i e s	: Seedlings	: Over one year	: Dead
		Height	
: Mulatino (<i>Celtis philippinensis</i>)	: 3	:	:
: Cuyang (<i>Parkia thuriana</i>)	: 1	:	:
: Balacat (<i>Zizyphus zornatus</i>)	: 1	:	:
: Kulis (<i>Momcydon edule</i>)	: 2	:	:
: Unknown	: 1	:	:
: Rattan (<i>Calamus</i> sp.)	: 7	:	:
: Forest weeds	: 29	:	:

February 27, 1913

: S p e c i e s	: Seedlings	: Over one year	: Dead
		Height	
: Mulatino (<i>Celtis philippinensis</i>)	: 1	:	: 2
: Cuyang (<i>Parkia thuriana</i>)	: 1	:	:
: Balacat (<i>Zizyphus zornatus</i>)	: 1	:	:
: Kulis (<i>Momcydon edule</i>)	: 1	:	: 1

February 27, 1913

Species	Seedlings	Over one year	Dead
		Height	
Balanageta (Diospyros villosa alba)			3
Kulis (Mecocylon edule)	3		
Malaikno (Celtis philippinensis)			1
Unknown	4		
Forest weed	24		5

April 14, 1914

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

Plot No. 5
September 26, 1913

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

February 27, 1913

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

April 14, 1912

Species	Seedlings	Over one year:	Dead:
		Height	
Kulis (Mameaylon edule)			1
Guljo (Stora guljo)	1		
Alugay (Euphorbia alugay)	2		
Ukno m	4		1
Rattan (Calamus sp.)	4		
Forest weed		300 cm.	
" "	10		15
Mitleran (Forest weed) (Hemilanthus populneus)		400 cm.	
" "		300 "	
" "		250 "	
" "			2

Plot No. 6

September 26, 1912

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

February 27, 1913

Species	Seedlings	Over one year:	Dead:
		Height	
Lumn (Pentstemon confertus)	1		
Kulis (Mameaylon edule)	1		
Rattan (Calamus sp.)	2		
Forest weed	43		

April 14, 1914

Species	Seedlings	Over one year:	Dead
		Height	
Lumn (Portulaca oleracea)			1
Kallis (Hemiphanthus)			1
Kalligay (Climacium dendroideum)	1		
Unknown	5		
Rattan (Calamus sp.)		2	
Forest weed	9		28
Mildura (Forest weed) (Hemiphanthus)			
" " "		2- 450 cm.	
" " "		300 "	
" " "		250 "	
" " "		2- 200 "	

Plot No. 7
September 23, 1912

Species	Seedlings	Over one year:	Dead
		Height	
Alupog (Euphorbia cinerea)	1		
Unknown	2		
Bamboo (Schizostachyum mucronatum)	2		
Forest weed	24		

February 27, 1913

Species	Seedlings	Over one year:	Dead
		Height	
Alupog (Euphorbia cinerea)	1		
Balinghway (Buchanania arborescens)	1		
Unknown	3		
Bamboo (Schizostachyum mucronatum)	1		
Forest weed	34		

April 14, 1914

Species	Seedlings	Over one year	Dead
		Height	
Almag (Euphorbia cinerea)		20 cm.	
Bellingway (Euchromia arborescens)		45 "	
Unknown	11		1
Bellco (Schizoclelea guianensis)		-1	
Forest weed	9		17
Maladison (Forest weed) (Hemilau- this populneus)		2-200 "	1

Plot No. 8
September 26, 1912

Species	Seedlings	Over one year	Dead
		Height	
Bolanga (Diospyros pilosanthra)	1		
Bellingway (Euchromia arborescens)	2		
Unknown	1		
Forest weed	22		

February 27, 1913

Species	Seedlings	Over one year	Dead
Bolanga (Diospyros pilosanthra)	1		
Bellingway (Euchromia arborescens)			2
Unknown	3		
Forest weed	18		7

April 14, 1914

Species	Seedlings	Over one year	Dead
		Height	
Almag (Euphorbia cinerea)	1		
Bolanga (Diospyros pilosanthra)		180 cm.	
Unknown		2 (small)	1
Forest weed	4		11

Plat. No. 9
September 26, 1912

Species	Seedlings	Over one year:	Dead
		Height	
Alupag (Euphorbia cinerea)	1		
Unknown	2		
Bamboo (Schizostachium mucronatum)	1		
Forest weed	9		

February 27, 1913

Species	Seedlings	Over one year:	Dead
		Height	
Lanun (Pentstemon confertus)	1		
Alupag Euphorbia cinerea)	1		
Guijo (Shorea guiso)	1		
Unknown	1		1
Bamboo (Schizostachium mucronatum)	1		
Forest weed	25		

April 14, 1914

Species	Seedlings	Over one year:	Dead
		Height	
Lanun (Pentstemon confertus)			1
Alupag (Euphorbia cinerea)		100 cm.	
Guijo (Shorea guiso)		40 "	
Unknown	3		1
Climbing bamboo (called bejo be- fore)		1	
Forest weed	3		20
" "		2-100 cm.	
Maladuron (Forest weed) (Hem- istylus parviflorus)		250 "	

Plot No. 10

October 26, 1912

Species	Seedlings	Over one year	Dead
		Height	
Forest seed	25		

February 27, 1913

Species	Seedlings	Over one year	Dead
		Height	
Forest seed	28		1

April 14, 1914

Species	Seedlings	Over one year	Dead
		Height	
Ampang (Euphorbia cinerea)	1		
Kalingang (Cinnamomum mercedol)	1		
Unknown	2		
Forest seed	7		19
Meladuron (Forest seed) (Homalium- tius populneus)	1	300 cr.	
" "	1	350 "	

The following description applies to plots Nos. 3 to 10 inclusive:

Location: 1000 ft. above sea level; 1000 ft. from the edge of the forest; 1000 ft. from the edge of the forest; 1000 ft. from the edge of the forest. 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 50 meters of the plots:

Lawa (Pentace conferta) nine,	average diameter 35 c .
Balaugeta (Diospyros pilosellera) seven,	" " 20 "
Tyalao (Kraema heterophylla) one,	" " 40 "
Linsin (Parinari griffithiana) two,	" " 40 "
Guijo (Shorea guiso) three,	" " 15 "
Cupang (P. alba timoriana) four,	" " 10 "
Bunba (Lagerstroemia speciosa) two,	" " 10 "
Malikmo (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 favorable 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.

Pl. 12, 13
 Dec. 26, 1912

Species	Seedlings	Over one year	Dead
Lumn (Pentstemon confertus)	2	42 cm.	
" " "		32 "	
" " "		40 "	
Palosotis (Anisoptera thurifera)			
Bolougata (Diospyros pilosanthera)	1		
Alupag (Euphorbia cinerea)	1		
Bilucce (Garcinia sp.)	2		
Forest seed	43		

February 27, 1913

Species	Seedlings	Over one year	Dead
Lumn (Pentstemon confertus)	2	100 cm.	
" " "		98 "	
" " "		78 "	
" " "		100 "	
Palosotis (Anisoptera thurifera)			
Bolougata (Diospyros pilosanthera)	1	36 "	
" " "		68 "	
Alupag (Euphorbia cinerea)			
Bilucce (Garcinia sp.)	2		
Forest seed	51		

April 14, 1914

Species	Seedlings	Over one year	Dead
Lumn (Pentstemon confertus)	2	2- 140 cm.	
" " "		130 "	
" " "		70 "	
" " "		60 "	
Palosotis (Anisoptera thurifera)		135 "	
Bolougata (Diospyros pilosanthera)		50 "	
" " "		40 "	
Alupag (Euphorbia cinerea)		70 "	
Bilucce (Garcinia sp.)		150 "	
" " "		130 "	
Forest seed	8		11
Maluduron (Forest seed) Houlstonias			
" " " (Poulstonias)		16- 400 "	6
		(average)	

Plot No. 12
September 26, 1912

Species	Seedlings	Over one year	Dead
		Height	
Lumn (Pentstemon contorta)	1		
Paleopsis (Anisoptera thalifera)	2		
Panic (Dipterocarpus paniciflorus)	1		
Bolopeta (Diospyros villosiflora)	2		
Bilueo (Garcinia sp.)	2		
Palo Maria (Calophyllum blancei)	1		
Forest seed	41		

February 27, 1913

Species	Seedlings	Over one year	Dead
		Height	
Lumn (Pentstemon contorta)	1		
Paleopsis (Anisoptera thalifera)	2		
Panic (Dipterocarpus paniciflorus)			1
Bolopeta (Diospyros villosiflora)	1		1
Bilueo (Garcinia sp.)			
" "		3 sprouts	
Palo Maria (Calophyllum blancei)	2		
Balinghasay (Buchanania arborescens)	1		
Alupog (Euphorbia cinnamomea)	1		
Forest seed	61		

April 14, 1914

Species	Seedlings	Over one year	Dead
		Height	
Lumn (Pentstemon contorta)		50 cm.	
Paleopsis (Anisoptera thalifera)		170 "	
" " "		90 "	
Bolopeta (Diospyros villosiflora)		95 "	
Bilueo (Garcinia sp.)		70 " (Sprout)	
" " "		60 " "	
" " "		50 " "	
" " "		40 "	
Palo Maria (Calophyllum blancei)		110 "	
" " " "		90 "	
Balinghasay (Buchanania arborescens)		43 "	
Alupog (Euphorbia cinnamomea)		80 "	
Pessalingin (Cinnamomum sp.)	1		
Kilangay (Cinnamomum mercedei)	1		
Forest seed	8		20
Malaburan (Forest seed) (Homalium- thunbergianus)		15- 400 cm.	9
		(average)	

1. The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that proper record-keeping is essential for ensuring the integrity and transparency of financial data. This section also outlines the various methods used to collect and analyze data, highlighting the need for consistency and reliability in the information gathered.

2. The second part of the document focuses on the challenges faced by organizations in implementing effective data management systems. It identifies common pitfalls such as data redundancy, inconsistent formatting, and lack of standardization. The text provides practical advice on how to overcome these challenges, including the use of standardized templates and the implementation of robust data governance policies. It also discusses the importance of regular audits and updates to ensure that the data remains current and accurate.

3. The third part of the document explores the role of technology in enhancing data management processes. It discusses the benefits of using specialized software tools for data collection, storage, and analysis. The text highlights the importance of selecting the right technology based on the organization's specific needs and budget. It also addresses the security concerns associated with digital data storage and provides recommendations for implementing strong security measures to protect sensitive information. Finally, the document concludes by emphasizing the ongoing nature of data management and the need for continuous improvement and adaptation to changing requirements.

The following description is of the plots Nos. 11 and 12:

Location: East end of S. of end of 1911 log line railroad and 10 meters E of end of building 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

: S p e c i e s	:Seedlings:	Over one year:	Dead
:	:	Height	:
:Lemon (Pentacme conferta)	: 1	:	:
:Balinghasay (Buchenania arborescens)	: 1	:	:
:Unknown	: 1	:	:
:Rattan (Calamus sp.)	: 1	:	:
:Forest weed	: 32	:	:

February 27, 1913

: S p e c i e s	:Seedlings:	Over one year:	Dead
:	:	Height	:
:Lemon (Pentacme conferta)	: 1	:	:
:Balinghasay (Buchenania arborescens)	: 1	:	:
:Bolongeta (Diospyros pilosanthera)	: 1	:	:
:Balinget (Zizyphus sp.)	: 1	:	:
:Unknown	: 1	:	:
:Rattan (Calamus sp.)	:	:	: 1
:Forest weed	: 38	:	: 2

April 14, 1914

: S p e c i e s	:Seedlings:	Over one year:	Dead
:	:	Height	:
:Lemon (Pentacme conferta)	:	: 62 cm.	:
:Balinghasay (Buchenania arborescens)	:	: 120 "	:
:Bolongeta (Diospyros pilosanthera)	:	: 30 " (Sprout)	:
:Balinget (Zizyphus sp.)	:	:	: 1
:Unknown	:	: 135 "	:
:Forest weed	: 9	:	: 1
:Meladuron (Forest weed) (Homalium populneum)	13-	422 cm. (ex. lat.)	:

Plot No. 14
 Feb. 26, 1913

Species	Seedlings	Over one year	Dead
Larch (<i>Pseudotsuga canadensis</i>)	1		
Balsam (<i>Abies balsamea</i>)	1		
Hemlock	1		
Forest seed	34		

February 27, 1913

Species	Seedlings	Over one year	Dead
Larch (<i>Pseudotsuga canadensis</i>)	2		
Balsam (<i>Abies balsamea</i>)	1		
Balsam (<i>Abies balsamea</i>)	1		
Forest seed	47		

April 14, 1914

Species	Seedlings	Over one year	Dead
Larch (<i>Pseudotsuga canadensis</i>)		2-30	
Balsam (<i>Abies balsamea</i>)		40 "	
Forest seed	5		17
Hemlock (<i>Pseudotsuga canadensis</i>)		24-400	
		(av. 100)	

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

Location: Same location as plots Nos. 11 and 12, 1/2 way up -
 bers W. of plot No. 11. Size: 2 meters square. Altitude: 350 m -
 bers. Gradient: 30%. Exposure: North. Soil: clay, rich in humus
 and light. Shade during part of the day.

The large percentage of larch found in plots Nos. 11, 12, 13,
 and 14 is all of one species, belonging to the European variety
 and called *Hemlock*. It is believed to be the common ancestor of the
 United States larch and is very striking and no doubt is merely a transitional
 species being easily distinguished and eventually crossed out by the
 more vigorous American species. The shade plot is produced in a

1. The first part of the document discusses the importance of maintaining accurate records of all transactions.

2. It then goes on to describe the various methods used to collect and analyze data, including interviews, surveys, and focus groups.

3. The next section outlines the results of the study, showing that there is a significant correlation between the variables being studied.

4. Finally, the document concludes with a discussion of the implications of the findings and suggestions for future research.

5. The study was conducted over a period of six months, during which time a total of 100 participants were interviewed.

6. The data collected was then analyzed using statistical software, which revealed that the results were highly significant.

7. In conclusion, the study has shown that there is a strong relationship between the variables being studied, and that this relationship can be used to predict future outcomes.

8. The findings of this study have important implications for the field of research, and will be used to inform future studies.

9. The study was funded by the National Science Foundation, and the results will be published in a peer-reviewed journal.

10. The study was conducted in accordance with the highest standards of research ethics, and all participants gave their informed consent.

Genes and will be more of a nurse crop than the other kinds of Sorghum seed. This will be in coming over the layer part of the burned area, and in parts of the area cut over in 1910 but not noticed in the lower agricultural land.



Fig. VII. White lupine (*Pentstemon contorta*) grown in shade of Mulberry (*Moraleanthus populneus*).



Fig. VIII. Maladuron (*Homalanthus populneus*) which has made the best natural cover crop for white lapan (*Pentacme contorta*).

Plot No. 15
April 22, 1913

: Species	: Seedlings	: Over one year	: Dead
		: Height	
: Ambion (<i>Trema umbellensis</i>)	: 4	:	:
: Maluduron (Forest weed) (<i>Homalan-</i>	:	:	:
: <i>thus populneus</i>)	: 2	:	:
: Forest weed	: 11	:	:
: Weed (<i>Blumea balsamifera</i>)	: 11	:	:

April 14, 1914

Species	Seedlings	Over one year:	Dead
		Height	
Anablon (Trema adolensis)		100 cm. (tree top.)	3
Meladuron (Forest weed) (Homalanthus populneus)		400 cm.	1
Forest weed	1	100 "	9
" "		80 "	
Weeds (Blumea balsamifera)		6-150 cm.	5

Plot No. 16
April 22, 1913

Species	Seedlings	Over one year:	Dead
		Height	
Anablon (Trema adolensis)	2		
Meladuron (Forest weed) (Homalanthus populneus)	1		
Weed (Blumea balsamifera)	14		
Weeds	2		
Grass	1		
Vine	1		

April 14, 1914

Species	Seedlings	Over one year:	Dead
		Height	
Anablon (Trema adolensis)			2
Meladuron (Forest weed) (Homalanthus populneus)		350 cm.	
Forest weed	4		
Weeds (Blumea balsamifera)		4-150 " (av. hgt.)	10
Weeds			2
Grass			1
Vine		1	

Plot No. 17
April 22, 1913

Species	Seedlings	Over one year:	Dead
		Height	
Cumpang (Parkia timoriana)	1		
Anablon (Trema arborescens)	1		
Forest weed	2		
Weed (Blumea balsamifera)	6		
Weed	2		

April 14, 1914

Species	Seedlings:	Over one year:	Dead:
		Height	
Curing (Parkia tinctoria)			2
Anaden (Trematolobium)			1
Unknown	1		
Melastoma (C. ...)			
Shrub (populous)		450 cm. (counted in first count)	
Forest seed	3		2
Seeds (Elaeagnus)		4- 200 cm. (average)	2
Seeds			2

Plot No. 18
April 22, 1913

Species	Seedlings:	Over one year:	Dead:
		Height	
Curing (Parkia tinctoria)	2		
Unknown	3		
Seed (Elaeagnus)	15		
Seeds	3		

April 14, 1914

Species	Seedlings:	Over one year:	Dead:
		Height	
Curing (Parkia tinctoria)			2
Anaden (Trematolobium)		500 cm. (counted in first count)	
Unknown		200 cm.	
"		65 "	1
Forest seed	5		
Seeds (Elaeagnus)		3- 300 cm. (average height)	7
Seeds			3

Plot No. 19

April 22, 1913

Species	Seedlings	Over one year	Dead
		Height	
Cupang (Parlatia timoriana)	1		
Balanoceta (Diospyros pilosanthera)	1		
Teed (Blumea balsanifera)	13		
Weed	1		
Forest seed	5		
Grass	1	60 cm.	

April 14, 1914

Species	Seedlings	Over one year	Dead
		Height	
Cupang (Parlatia timoriana)			1
Balanoceta (Diospyros pilosanthera)		140 cm.	
Weeds (Blumea balsanifera)		5- 300 "	8
Weeds	1	1	
Forest seed	4	2- 300 cm.	3

Plot No. 20

April 22, 1913

Species	Seedlings	Over one year	Dead
Balanoceta (Diospyros pilosanthera)	1		
Anabian (Trema arborescens)	1		
Teed (Blumea balsanifera)	9		
Weeds	2		
Grass	1		

April 14, 1914

Species	Seedlings	Over one year	Dead
		Height	
Balanoceta (Diospyros pilosanthera)		40 cm.	
Anabian (Trema arborescens)		600 " (6 cm. diameter)	
Teed (Blumea balsanifera)		5- 200 cm.	4
Weeds			2
Forest seed		140 "	
Forest seed	1	250 "	

1. The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that proper record-keeping is essential for the integrity of the financial system and for the ability to detect and prevent fraud. The document also notes that records should be kept for a sufficient period of time to allow for a thorough review if necessary.

2. The second part of the document outlines the specific requirements for record-keeping. It states that all transactions must be recorded in a clear and concise manner, and that the records must be accessible to all authorized personnel. The document also requires that records be kept in a secure location and that they be protected from unauthorized access or destruction.

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3. The third part of the document discusses the role of the auditor in ensuring the accuracy of the records. It states that the auditor must perform a thorough review of the records and must report any discrepancies or irregularities to the appropriate authorities. The document also requires that the auditor maintain a separate set of records to document the results of the audit.

4. The fourth part of the document outlines the consequences of failing to comply with the record-keeping requirements. It states that any individual or organization that fails to maintain accurate records may be subject to disciplinary action, including fines and suspension. The document also notes that failure to comply with the requirements may result in the loss of the organization's right to participate in the financial system.

Plot No. 21

April 22, 1913

Species	Seedlings	Over one year	Dead
		Height	
Andromeda (Thevetia peruviana)	1		
Seed (Blumea balsamifera)	18		
Seed	4		
Forest seed	9		
Vine	1		

April 14, 1914

Species	Seedlings	Over one year	Dead
		Height	
Andromeda (Thevetia peruviana)			1
Seeds (Blumea balsamifera)		8- 200 cm. (over height.)	5
Seeds			4
Forest seed		160 cm.	7
" "		250 "	
" "	3		
Vine			1

Plot No. 22

April 22, 1913

Species	Seedlings	Over one year	Dead
		Height	
Balanocarpus (Diospyros glauca)	1		
Forest seed	4		
Seed (Blumea balsamifera)	10		
Seeds	4		
Cross	1 clump		

April 14, 1914

Species	Seedlings	Over one year	Dead
		Height	
Balanocarpus (Diospyros glauca)		95 cm.	
Brush	3		4
Seed (Blumea balsamifera)		9- 250 "	1
Seed			4
Cross	1 clump		

The following description is taken from the 15 to 22 inch-
side:

Location: approximately 172 meters north from station 32 of the
Siam Lopping 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 ra-
dius of 100 meters and more have been killed. The vegetation on
these plots is representative of the class which is coming in in all
such areas and the chance for such areas to be re-seeded naturally
by some desirable tree species is practically impossible.



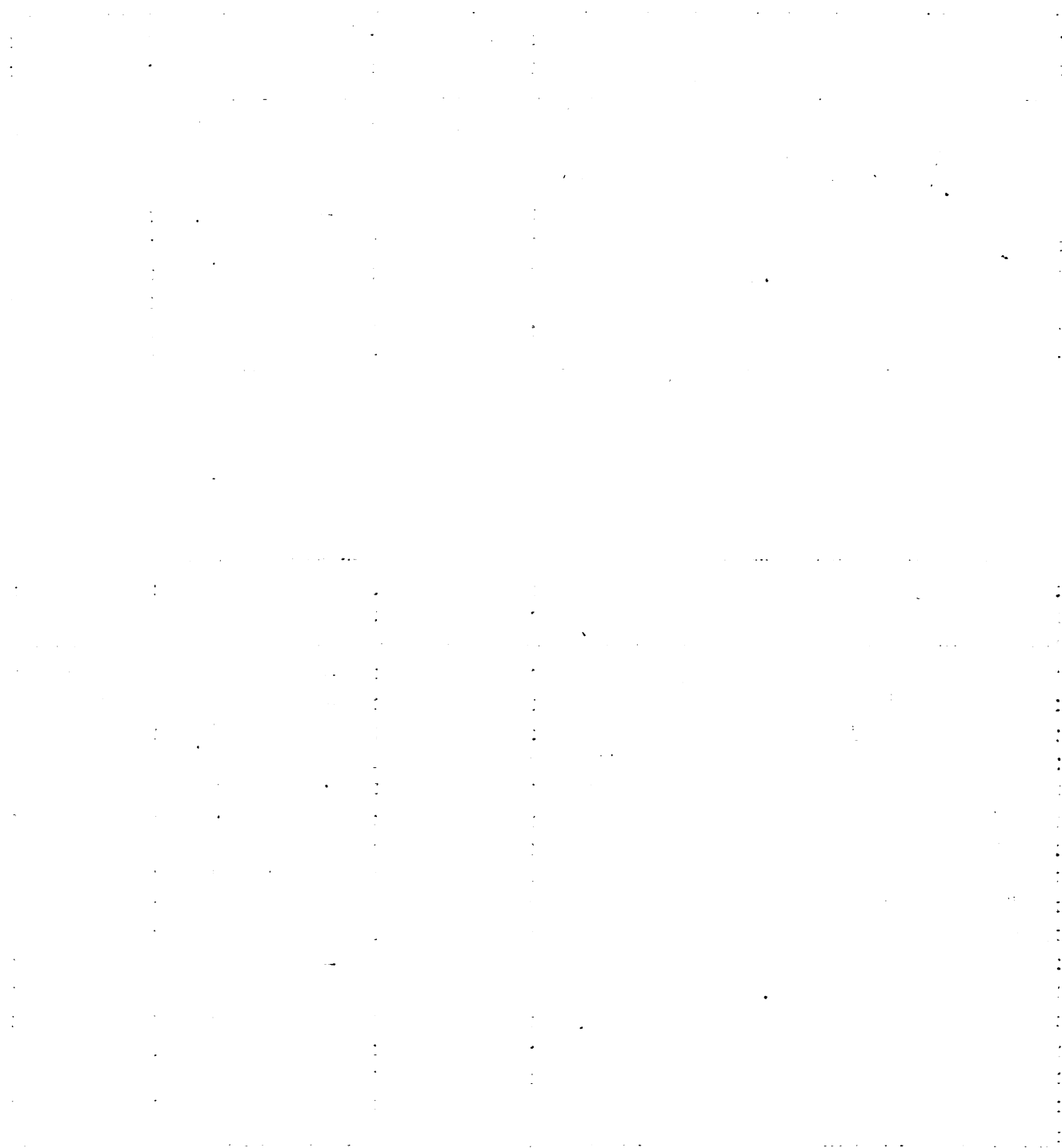
Fig. IX. Sanlong (*Blumea balsamifera*) coming in on all severely
burned areas to the exclusion ^{on} of tree species.

May 2, 1913

Species	Seedlings	Over one year	Dead
		Height	
:Lemon (Pentstemon contorta)	: 5	:	: 1
:Alupag (Euphorbia cinerea)	: 1	:	:
:Palo Maria (Calophyllum blancoi)	: 1	:	:
:Unknown	: 2	: 1- 150 cm.	:
:Forest seed	: 27	:	:
:Rattan (Calamus sp.)	: 2	:	:
:Grass	: 1 (clump)	:	:
:Vine	: 2	:	:

April 15, 1914

Species	Seedlings	Over one year	Dead
		Height	
:Lemon (Pentstemon contorta)	:	: 2- 30 cm.	: 2
:Lemon "	:	: 1- 35 "	:
:Palo Maria (Calophyllum blancoi)	:	: 50 "	:
:Belasata (Diospyros villosiflora)	: 1	:	:
:Unknown	:	: 75 "	:
: "	: 4	: 40 "	:
: "	:	: 25 "	:
:Brush (Balanis)	:	: 45 "	:
: "	:	: 30 "	:
:Brush	: 9	:	:
: "	:	: 4- 25 "	:
:Rattan (Calamus sp.)	:	: 35 "	:
: "	:	: 40 "	:
:Vegetable	:	:	: 1
:Grass and vines	:	:	: "



May 2, 1913

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

April 15, 1914

Species	Seedlings	Over one year	Dead
		Height	
Pango (Dipterocarpus vernicifluus)		50 cm.	
" " "		40 "	
" " "		25 "	
Guljo (Shorea guiso)		20 "	
Bilueo (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 "	
Veeds	10		

May 2, 1913

Species	Seedlings	Over one year	Died
		Height	
Lanun (<i>Pentstemon contortus</i>)	2		
Pala Maria (<i>Calophyllum blancoi</i>)	1		
Unknown (tree sp.)	4		
Forest weed	34		
Grass	2		
Rattan (<i>Calamus</i> sp.)	2		
Reeds	1		

April 15, 1914

Species	Seedlings	Over one year	Died
		Height	
Lanun (<i>Pentstemon contortus</i>)	1		
" " "		20 cm.	
" " "		30 "	
Pala Maria (<i>Calophyllum blancoi</i>)		45 "	
Alang-alang (<i>Eulalia cinerea</i>)		35 "	
Calumpang (<i>Clusia rosea</i>)	1	45 "	
" " "			
Unknown (tree sp.)	2		
" " "	1		
" " "		30 "	
" " "		45 "	
" " "		2-140 "	
Forest weed	32		2
Grass	2		
Rattan (<i>Calamus</i> sp.)			2
Reeds	2		

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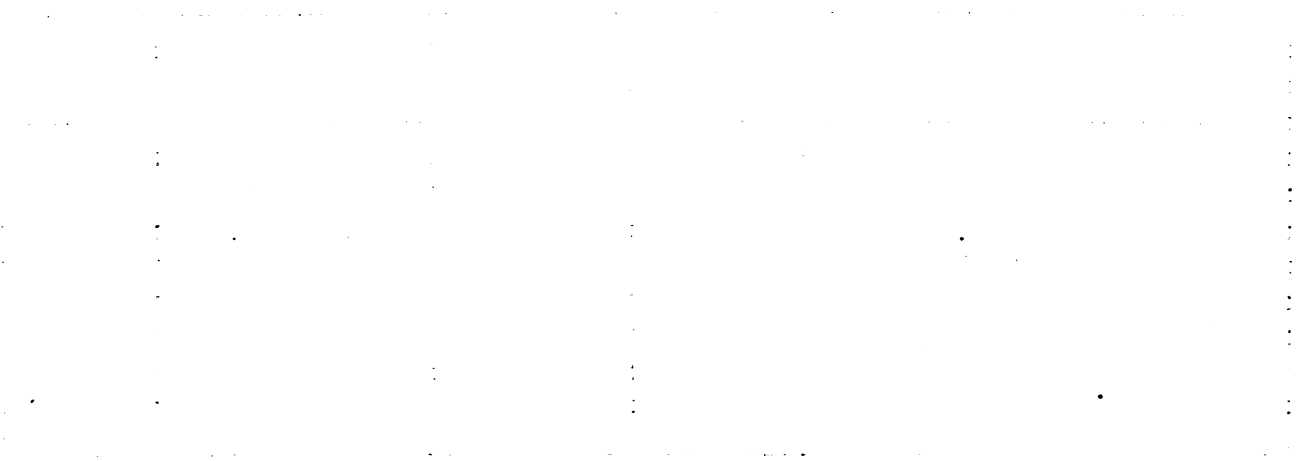
PLANT. 26

May 2, 1913

Species	Saplings	Over one year	Dead
		Height	
Lemon (Poncirus aurantiaca)	1		
Bolangeta (Diospyros pilosanthera)	1		
Unknown (tree sp.)		235 cm.	
" "	2		
Form. L. sp.	27		
R. L. sp. (C. L. sp. sp.)	7		
C. L. sp.	2		

April 15, 1914

Species	Saplings	Over one year	Dead
		Height	
Lemon (Poncirus aurantiaca)			1
Bolangeta (Diospyros pilosanthera)		20 cm.	
Culintang (Cinnamomum mercadoi)	2		
Unknown (tree sp.)	12		
" "		45 "	
" "		70 "	
Form. L. sp.	52		
R. L. sp. (C. L. sp. sp.)	4		3
C. L. sp.	1		1



May 2, 1913

Species	Seedlings	Over one year	Dead
		Height	
Lemon (Pentstemon confertus)	2		
Bolongeta (Diospyros pilosanthra)	1		
Pala Maria (Calophyllum inaequal)	1		
Unknown (tree sp.)	7		
Forest weed	9		
Rattan (Calamus sp.)	9		
Grass	8		
Reed	1		

April 15, 1914

Species	Seedlings	Over one year	Dead
		Height	
Lemon (Pentstemon confertus)		35 ca.	1
Bolongeta (Diospyros pilosanthra)		20 "	
Panna (Dipterocarpus vernicifluus)		25 "	
Unknown (tree sp.)		20 "	3
"		35 "	
"		70 "	
"		85 "	
Forest weed	5		3
Rattan (Calamus sp.)			9
Grass			8
Reeds	4		

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May 2, 1913

Species	Seedlings	Over one year: Height	Dead
Luan (Pentstemon contorta)	1	160 cm.	1
Palomalis (Anisoptera thurifera)	2		
Palo Maria (Calophyllum blancoi)	4		
Unknown (tree sp.)	17		
Forest weed	5		
Rattan (Calamus sp.)	7		
Woods			

April 15, 1914

Species	Seedlings	Over one year: Height	Dead
Luan (Pentstemon contorta)			1
Palomalis (Anisoptera thurifera)		165 cm.	
Palo Maria (Calophyllum blancoi)		40 "	1
Unknown (tree sp.)		2- 30 "	
"		2- 40 "	
Forest weed	23		
Rattan (Calamus sp.)	5		
Woods	1		6

May 2, 1913

Species	Seedlings	Over one year	Dead
		Height	
Lemon (Pentstemon carolinensis)	1		
Asplenium (Diplazium grandiflorum)		50 cm.	
Bolanderia (Diospyros glabra)	1		
Pala Maria (Cyclophyllum sp.)	1		
Ulmus (Ulmus sp.)	4		
Forest land	16		
Woods	8		

April 15, 1914

Species	Seedlings	Over one year	Dead
		Height	
Lemon (Pentstemon carolinensis)		20 cm.	
Asplenium (Diplazium grandiflorum)		55 "	
Bolanderia (Diospyros glabra)		20 "	
Pala Maria (Cyclophyllum sp.)		55 "	
Pala Maria (Cyclophyllum sp.)		55 "	
Ulmus (Ulmus sp.)		2- 20 "	1
Forest land	14	2- 70 "	
" "			
Woods	8		

May 2, 1913

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

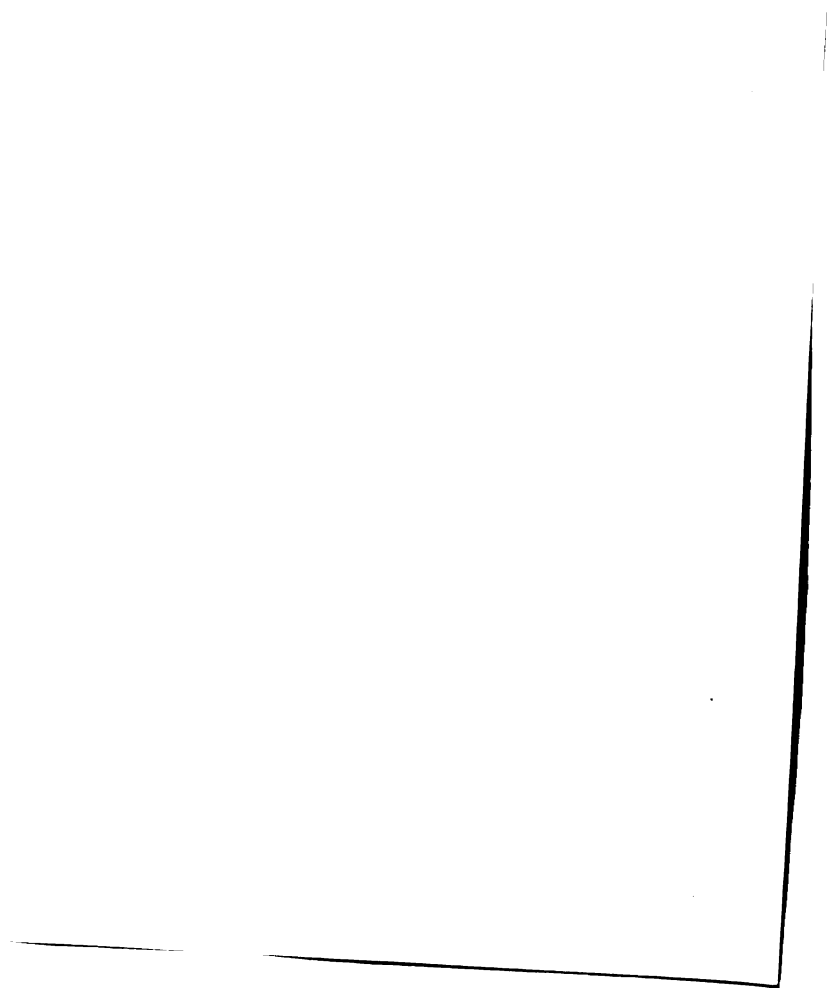
April 15, 1914

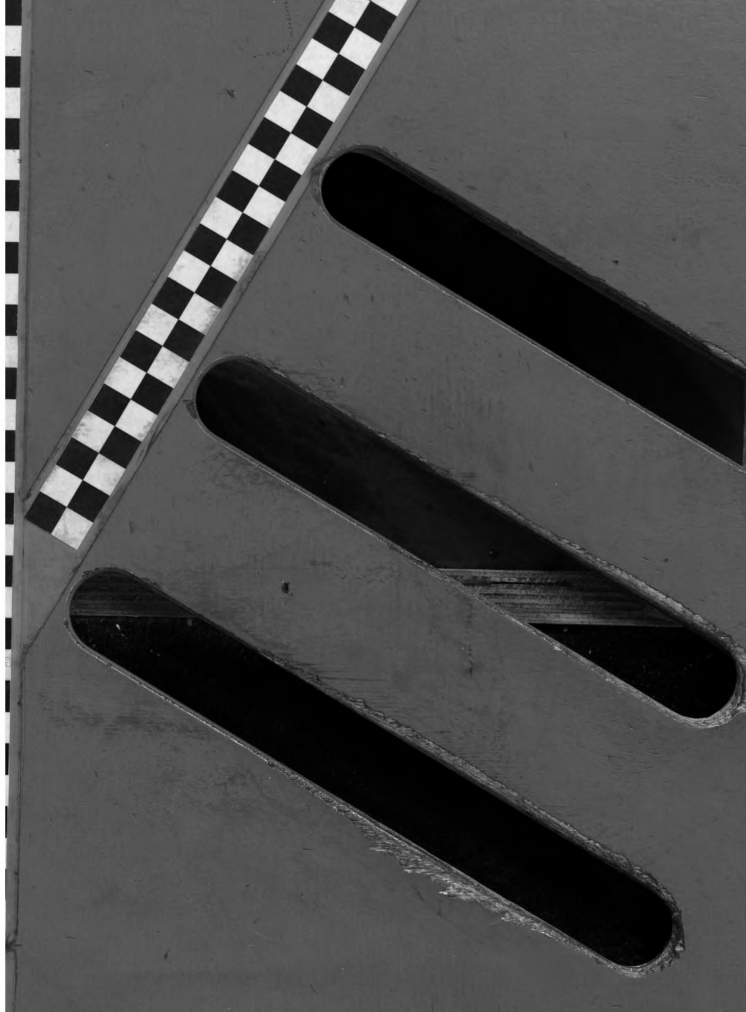
Species	Seedlings	Over one year	Dead
		Height	
Liana (Peltandra carolinensis)	1		
Palo Maria (Calophyllum thymocorydon)		35 cm.	
Unknown (tree sp.)	1		
" "		90 "	
" "		120 "	
" "		130 "	
Brush (Forest road)	14		2
Woods	3		

Summary

A description of the above plot concludes with the fact (1) the District has been made, up to the present time, made sufficient headway in persuading themselves to lead one to believe that they will grow in a short part of the stand of timber in the future; (2) climbing bamboo, beja and forest seeds thrive as soon as the forest is cleared up; (3) and that slash and ground fires destroy all seedlings, small trees and humans.

ROOM USE ONLY





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