

**FOREST REPORT**  
**FINCAS OF WALDMENSCHEN S.A.**  
(SUBSIDIARY OF THE GENERATION FOREST EG)  
**2020**



**FINCAS: LA REINA, LA PONDEROSA, LA CONEXIÓN, GATÚN 1**  
**IMPLEMENTATION OF THE OPERATIONAL PLAN 2020**

**2020**

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## 1. Introduction

Below, we present the annual technical report on the work in the cooperative's four active reforestation projects.

The activities were approved by the Executive Board of the cooperative "The Generation Forest eG" as part of the budget for 2020.

The report contains important key data and results from 2020. This data is presented for the La Reina, La Conexión, La Ponderosa and Gatún 1 projects.

Tables one to four contain data on the tree species, the year of planting, the planting density and the proportion of the total area.

Tables five to eight show the work effort per specific activity for each plot.

Table nine contains explanations of the terms used in the individual papers.

The condition of the older reforestations is shown in growth diagrams. For the younger reforestations, we look at survival rates and growth quality.

In addition to reforestation and tree care, reforestation management and maintenance includes the following: soil protection measures, pest and disease control, fire protection measures and the maintenance work on the forest roads.

It is also important to note that the Covid-19 pandemic resulted in a shortage of manpower and consequently the overall work effort had to be reduced.

## 2. Reforested area by finca: year of planting, tree species and density

Table 1: Reforestation at La Reina

Finca	Area	Trivial name	Tree species	Distance	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total (hectare)	
Reina	25.4 ha	Teak	<i>Tectona grandis</i>	3x3	12									<b>12</b>	
		Cocobolo-Rosewood	<i>Dalbergia retusa</i>	4x4			2.7		2					4.7	
		Dyer's mulberry (Mora)	<i>Maclura tinctoria</i>							1					1
		Spanish cedar	<i>Cedrela odorata</i>							1					1
		Roble	<i>Tabebuia rosea</i>							2					2
		<b>Total planted</b>				12		2.7		6					20.7
		<b>Protected area</b>													4.7
		<b>Total area</b>													25.4

**Table 2: Reforestation at La Ponderosa**

Finca	Area	Trivial name	Tree species	Distance	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total (hectare)	
La Ponderosa	48.81 ha	Cocobolo-Rosewood	<i>Dalbergia retusa</i>	3x6								4.7		4.7	
		Tiger wood	<i>Astronium graveolens</i>	3x6									0.29		0.29
		Spanish cedar	<i>Cedrela odorata</i>	3x6									1.26		1.26
		Roble	<i>Tabebuia rosea</i>	3x6									3.5		3.5
		Mahogany	<i>Swietenia macrophylla</i>	3x6									0.17		0.17
		Almendro	<i>Dipteryx oleifera</i>	3x6									0.072		0.072
		Total planted											10		10
		<b>Still to be reforested</b>												35	35
		<b>Protected area</b>													4
		<b>Total area</b>													48.8

**Table 3: Reforestation at La Conexión**

Finca	Area	Trivial name	Tree species	Distance	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total (hectare)		
La Conexión	48.8 ha	Aceituno	<i>Simarouba amara</i>	5x3							0.31			0.31		
		Alcarreto	<i>Aspidosperma spruceanum</i>	5x3								0.57			0.57	
		Alcarreto	<i>Aspidosperma spruceanum</i>	5x6								0.28			0.28	
		Almendro	<i>Dipteryx oleifera</i>	5x3								0.64			0.64	
		Almendro	<i>Dipteryx oleifera</i>	5x6								0.1			0.10	
		Bateo	<i>Carapa guianensis</i>	5x3								0.3			0.30	
		Cocobolo-Rosewood	<i>Dalbergia retusa</i>	5x3								0.4			0.40	
		Maria chiquita	<i>Calophyllum brasiliense</i>	5x3								0.87			0.87	
		Maria grande	<i>Calophyllum bidentata</i>	5x3								0.13			0.13	
		Maria grande	<i>Calophyllum longifolium</i>	5x6								0.32			0.32	
		Bulletwood	<i>Manilkara bidentata</i>	5x3								0.8			0.80	
		Bulletwood	<i>Manilkara zapota</i>	5x6								0.35			0.35	
				<b>Total planted</b>												5.07
				<b>Natural forest</b>												43.73
				<b>Total area</b>												48.80

**Table 4: Reforestation at Gatún 1**

Finca	Area	Trivial name	Tree species	Distance	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total (hectare)		
Gatún 1	48.8 ha	Alcarreto	<i>Aspidosperma spruceanum</i>	5x3							1.92			1.92		
		Berba	<i>Brossimum alicastrum</i>	5x3								0.37			0.52	
		Santa Maria	<i>Calophyllum brasiliense</i>	5x3								2.24			2.24	
		Carapas	<i>Carapa guianensis</i>	5x3								2.10			2.10	
		Cocobolo	<i>Dalbergia retusa</i>	5x3								7.75			7.75	
		Cocobolo	<i>Dalbergia retusa</i>	3x3								1.95			1.95	
		Almendro	<i>Dipteryx oleifera</i>	5x3								2.21			2.21	
		Bulletwood	<i>Manilkara bidentata</i>	5x3								1.93			1.93	
		Caobillo	<i>Tapirira guianensis</i>	5x3								0.75			1.09	
		Golden cedar	<i>Terminalia amazonia</i>	5x3								1.19			1.84	
		Golden cedar	<i>Terminalia amazonia</i>	3x3								3.04			3.04	
				<b>Total planted</b>												26.58
				<b>Protected area</b>												22.22
		<b>Total area</b>												48.80		

### 3. Execution of the work at the individual fincas

The following tables show the number of working days per activity in 2020.

**Table 5: Work effort at La Reina**

Work effort at La Reina in 2020													
	January	February	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Total
Activity	Working days	Working days	Working days	Working days	Working days	Working days	Working days	Working days	Working days	Working days	Working days	Working days	Working days
Working with the chainsaw	0.0	4.9	2.1	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	9.1
Removal of strangle plants	0.0	0.0	0.0	6.8	0.0	6.8	0.0	6.8	0.0	6.8	0.0	0.0	27.2
Maintenance of fences	0.0	0.0	4.9	4.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.9
Fertilisation	0.0	0.0	0.0	0.0	0.0	26.0	0.0	0.0	0.0	0.0	0.0	0.0	26.0
Marking for thinning	0.0	10.0	3.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.9
Thinning	0.0	0.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0
Removal of root shoots (teak)	0.0	0.0	0.0	17.9	6.0	6.0	6.0	6.0	6.0	6.0	6.0	0.0	59.5
Delimiting (Cocobolo)	0.0	9.9	4.9	4.9	0.0	4.9	0.0	4.9	0.0	4.9	0.0	0.0	34.6
Fire protection	0.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	14.0	0.0	0.0	0.0	21.0
Erosion protection	0.0	0.0	0.0	0.0	5.0	0.0	5.0	0.0	5.0	0.0	5.0	0.0	20.0
Monitoring	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
<b>Total</b>	<b>0.0</b>	<b>31.8</b>	<b>26.9</b>	<b>34.6</b>	<b>12.0</b>	<b>43.7</b>	<b>11.0</b>	<b>17.7</b>	<b>26.0</b>	<b>17.7</b>	<b>11.0</b>	<b>0.0</b>	232.3



**Table 6: Work effort at Gatún 1**

Work effort at Gatún 1													
	January	February	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Total
<b>Activity</b>	Working days	Working days	Working days	Working days	Working days	Working days	Working days	Working days	Working days	Working days	Working days	Working days	Working days
Crop protection (weed control)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Liming	0.0	0.0	104.0	104.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	208.0
Fertilisation	0.0	0.0	0.0	0.0	0.0	78.0	0.0	0.0	0.0	0.0	0.0	0.0	78.0
Removal of high brush	0.0	0.0	0.0	0.0	104.0	104.0	0.0	0.0	0.0	0.0	0.0	0.0	208.0
Cutting back the ferns	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Removal of understorey vegetation Planting rows	0.0	52.0	104.0	0.0	104.0	0.0	0.0	104.0	0.0	0.0	104.0	0.0	468.0
Herbicide use for ferns	0.0	0.0	52.0	26.0	0.0	52.0	0.0	52.0	0.0	52.0	0.0	0.0	234.0
Replanting	0.0	0.0	0.0	0.0	0.0	13.0	0.0	0.0	0.0	0.0	0.0	0.0	13.0
Planting	0.0	0.0	0.0	26.0	26.0	26.0	0.0	0.0	0.0	0.0	0.0	0.0	78.0
Phytosanitary control	0.0	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	71.5
<b>Total</b>	<b>0.0</b>	<b>58.5</b>	<b>266.5</b>	<b>162.5</b>	<b>240.5</b>	<b>279.5</b>	<b>6.5</b>	<b>162.5</b>	<b>6.5</b>	<b>58.5</b>	<b>110.5</b>	<b>6.5</b>	<b>1358.5</b>

**Table 7: Work effort at La Ponderosa**

Work effort at La Ponderosa													
	January	February	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Total
<b>Activity</b>	Working days	Working days	Working days	Working days	Working days	Working days	Working days	Working days	Working days	Working days	Working days	Working days	Working days
Removal of grasses (tractor)	0.00	0.00	6.00	0.00	0.00	0.00	6.00	0.00	0.00	0.00	0.00	0.00	12.00
Survey of the finca	0.00	0.00	0.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.00
Cultivation of the seedlings	0.00	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00
Planting	0.00	0.00	0.00	20.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.00
Creation of the planting lines	0.00	0.00	0.00	10.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00
Control of grasses with herbicides	0.00	0.00	0.00	0.00	12.50	7.50	0.00	12.50	0.00	12.50	0.00	0.00	45.00
Planting	0.00	0.00	0.00	0.00	0.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00
Phytosanitary control	0.00	1.00	1.00	1.00	1.00	1.00	0.50	0.50	0.50	0.50	0.50	0.50	8.00
Removal of competing vegetation next to planting holes	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	10.00	0.00	10.00	0.00	30.00
Removal of competing vegetation from the forest area	0.00	0.00	0.00	0.00	0.00	0.00	12.00	0.00	12.00	0.00	0.00	0.00	24.00
Total	0.00	1.00	27.00	71.00	43.50	58.50	28.50	13.00	22.50	13.00	10.50	0.50	289.00

**Table 8: Work effort at La Conexión**

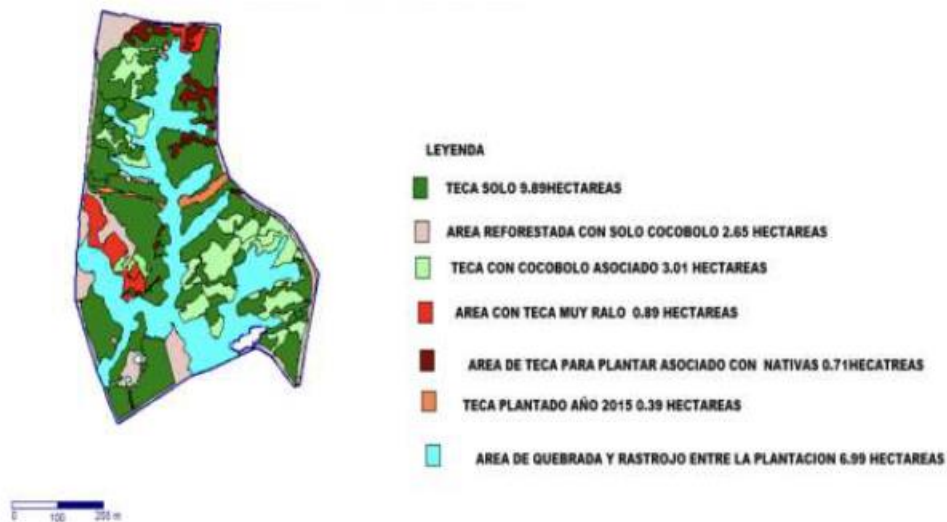
Work effort at La Conexión in 2020													
	January	February	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Total
<b>Activity</b>	Working days	Working days	Working days	Working days	Working days	Working days	Working days	Working days	Working days	Working days	Working days	Working days	Working days
Crop protection (weed control)	10.0	8.0	8.0	1.0	5.0	400.0	4.0	4.0	4.0	4.0	4.0	0.0	452.0
Liming	0.0	0.0	0.0	18.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0
Fertilisation	0.0	0.0	0.0	0.0	30.0	30.0	30.0	30.0	30.0	0.0	0.0	0.0	150.0
Removal of high brush	0.0	0.0	0.0	0.0	48.0	48.0	48.0	48.0	48.0	0.0	0.0	0.0	240.0
Fern removal	0.0	0.0	0.0	0.0	24.0	24.0	24.0	24.0	24.0	0.0	0.0	0.0	120.0
Removal of understorey vegetation from planting rows	0.0	0.0	0.0	0.0	0.0	84.0	84.0	84.0	98.0	0.0	0.0	0.0	350.0
<b>Total</b>	10.0	8.0	8.0	19.0	107.0	190.0	190.0	190.0	204.0	4.0	4.0	0.0	934.0

**Table 9: Explanation of terms for the activities**

<b>Description of the most common maintenance tasks in reforestation</b>	
Crop protection (weed control)	Removal of vegetation that competes with the planted trees for light and nutrients.
Removal of competing vegetation next to the planting holes	Removal of vegetation with a machete, one metre wide around the tree.
Removal of understorey vegetation from the planting rows	Removal of vegetation from the planting row, this clearing is done in alternation with the clearing of the planting points to save costs.
Removal of strangle plants	Removal of vegetation growing up the trees
Fern removal	Ferns are a strong competition for planted trees.
Removal of high brush	Cutting off branches of shrubs that cast high shadows so that the seedlings get more light.
Liming	Use of lime compounds to regulate the pH value, only when the pH value is below 5, applied to the soil around the seedlings.
Fertilisation	Addition of fertilisers.
Replanting	Replanting dead or damaged trees
Removal of root shoots	Elimination of regrowth at the tree root.
Delimiting	Removal of low branches
Delimiting at height	Removal of branches over 7 metres high.
Removal of shoots	Shoots are new branches on the trunk. They should be removed when they are very tender in order to obtain a good quality of wood.
Topiary	This is the removal of low branches from young trees to get them to reach a commercial height.
Marking for thinning	Selection and marking of trees to be removed at an early age in order to give more space to others.
Thinning	Removal of selected trees to make room for the best trees to grow.
Soil conservation	Work to reduce water erosion. It involves the creation of physical barriers to prevent erosion gullies in the rainy season.
Fire protection	Clearance of boundaries and firebreaks, removal of combustible material from leaves and sticks.
Fence maintenance	Repairing fences in order to prevent livestock from entering farms
Phytosanitary control	Constant control of pests and diseases, as well as leafcutter ants.
Monitoring	Measurement of diameter and height growth of trees.

## 4. Fincas at a glance

### 4.1. Map of La Reina at a glance



**Table 10 Growth data of La Reina**

Teak planting (2012)	Average growth across different age groups in 2021					
	Years	Diameter at chest level (dbh) in cm	Height (h) in m	Average annual increase (MAI dbh) in cm	Average annual increase in height (MAI h) in m	Volume / Tree *
2.1	2015	7.1	5.9	3.37	2.81	0.0049
3.7	2017	12.5	10.5	3.38	3.38	0.0306
5.4	2019	16.6	16.4	3.07	3.07	0.0812
6.4	2020	21.7	18.0	3.38	3.38	0.1382
7.5	2021	23.4	19.8	3.12	3.12	0.1613

\*Volume calculation with commercially usable stem height.

Growth assessment for 2 to 10 year old plantations at the site				
Variables	Unit	low	regular	high
IMA DAP	cm/year	<2.4	2.5 a 3.0*	3.02 a 3.8*
IMA Height	m/year	<2.2*	2.33 a 3.14*	3.15 a 4.05*

**Table 11 Teak diameter classes, La Reina**

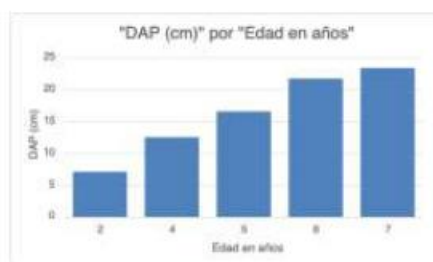
Average growth in diameter and height, by diameter class 2021 monitoring						
Diameter class (cm)	% of trees	DAP (cm)/ Class	Height (m)	Vol./Tree	IMA DAP	IMA H
18 a 22	35	20.41	19.56	0.12	2.7	2.61
22.5 a 28	55	23.56	19.73	0.17	3.1	2.63
28.5 a 33	10	29.84	20.15	0.26	4.0	2.69

This table shows the summary of growth by diameter class for the 2021 monitoring.

**Table 12 Teak stock density, La Reina**

Density of trees per hectare and their area share on the finca	
# Trees / ha current	% of the area
180 a 199	25%
200 a 239	25%
240 a 280	25%
300 a 380	13%
381 a 460	6%

Due to a strong wind in 2016, there was windthrow in the teak stock. The resulting gaps have since been filled with natural regeneration and individual plantations, which are not recorded in the monitoring.



*Diameter of different age classes*



*Tree height of different age classes*



*Tree volume of different age classes*



Teak stock at La Reina, 2020: In the dry season, the crown-forming trees, as well as some younger trees in the understory, lose their leaves. Growth data is usually recorded during the dry season. In the understory, you can see a variety of natural regeneration.





Cocobolo-Teak mixed stock, 2020: Cocobolo tends towards low bifurcation. Through the lateral competition with the teak trees, they however grow proportionately straight up.

**Table 13 Growth data of Cocobolo, La Reina**

Average growth of Cocobolo trees (2.7 ha) planted in 2015 by diameter class, 2021 monitoring			
Diameter class	%	Average DAP in cm	Average height in m
< 5 cm	19.0%	3.8	8
5 cm to 9.9 cm	57.0%	7.37	12.14
10 cm to 14.9 cm	19.0%	11.39	13.6
> 15 cm	5.0%	15.9	13.5
Current stock density: 560 trees / hectare			

Average growth of Cocobolo trees (2 ha) planted in 2017 by diameter class, 2021 monitoring			
Diameter class	%	Average DAP in cm	Average height in m
< 5 cm	65%	4.2	5.85
5 cm to 9.9 cm	35%	6.68	9.75
Current stock density: 420 trees / hectare			





Tigerwood (*Astronium graivolens*) and Dyer's mulberry (*Maclura tinctoria*), January 2021



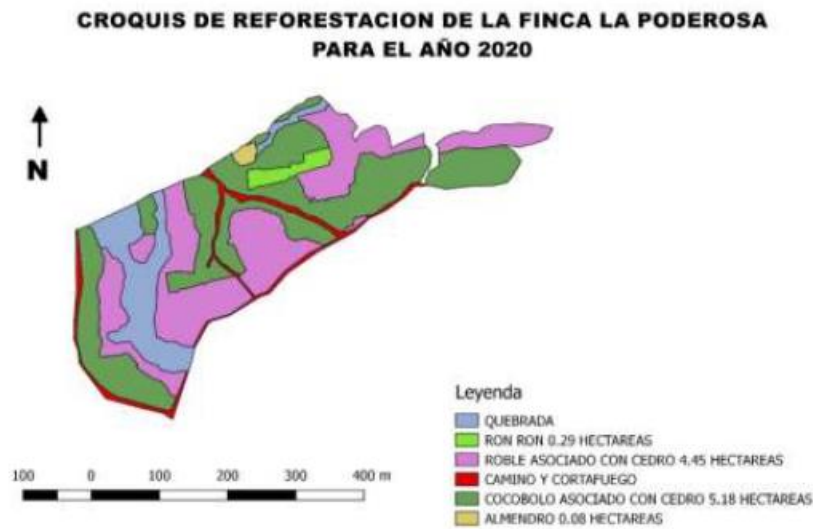
Teak stock at La Reina, 2020



The photo shows the teak trees at La Reina and an undergrowth of vegetation, which mainly comprises Mora and other species like tigerwood, cedar and Terminalia oblonga.

## 4.2. Finca La Ponderosa

La Ponderosa, only partial area of the project is shown here.



**Table 14: Plantation at La Ponderosa, September 2020**

Finca La Ponderosa					
Plantation done on 22.09.2020					
Trivial name	Tree species	Trees planted	Area (ha)	Survival rate in %	Quality of the seedlings
Cocobolo-Rosewood	Dalbergia retusa	2581.0	4.7	95%	Excellent
Roble	Tabebuia rosea	1903.0	3.5	72%	Good
Spanish cedar	Cedrela odorata	695.0	1.3	84%	Good
Almendro	Dipteryx oleifera	40.0	0.1	83%	Good
Mahogany	Swietenia macrophylla	96.0	0.2	67%	Good
Tige wood	Astronium graveolens	162.0	0.3	64%	Moderate - good
Total		5477	10		



Photos of Finca La Ponderosa 6 months after the plantation.



Dalbergia retusa



Tabebuia rosea



Swietenia macrophylla



Tabebuia rosea



Tree row



Cedrela odorata

### 4.3. Finca Gatún 1

Map of Gatún 1



**Table 15: Plantation at Gatún 1:**

Finca Gatún 1				
Trivial name	Tree species	Distance	% survival	Quality of the seedlings
Alcarreto	Aspidosperma spruceanum	5x3	85%	Good
Berba	Brosimum alicastrum	5x3	40%	Moderate to poor
Santa Maria	Calophyllum brasiliense	5x3	99%	Excellent
Carapas	Carapa guianensis	5x3	85%	Good to very good
Cocobolo	Dalbergia retusa	5x3	90%	Good
Cocobolo	Dalbergia retusa	3x3	90%	Very good
Almendro	Dipteryx oleifera	5x3	65%	Moderate to poor
Bulletwood	Manilkara bidentata	5x3	95%	Good to very good
Caobillo	Tapirira guianensis	5x3	85%	Good
Golden cedar	Terminalia amazonia	5x3	98%	Good
Golden cedar	Terminalia amazonia	3x3	98%	Very good



Cocobolo (*Dalbergia retusa*) and Golden cedar (*Terminalia amazonia*)



Cocobolo (*Dalbergia retusa*) and Golden cedar (*Terminalia amazonia*)





Cocobolo (*Dalbergia retusa*) and Golden cedar (*Terminalia amazonia*)



*Carapa guianensis*, *Tapirira guianensis*



*Dalbergia retusa*



*Dalbergia retusa*, *Terminalia amazonia*



*Dipteryx oleifera*



Growth after 18 months: *Carapa guianensis*, *Tapirira guianensis*, *Calophyllum brasiliense*

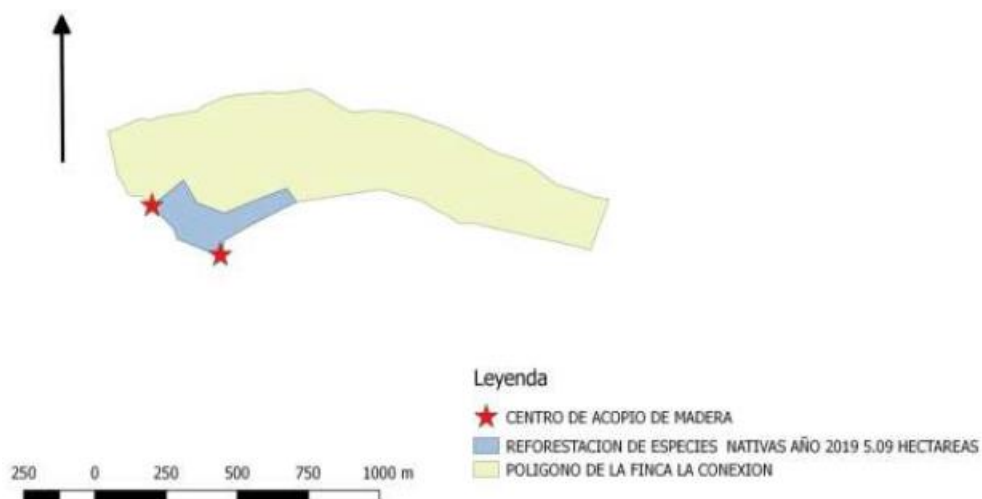


*Carapa guianensis* next to forest path



#### 4.4. Condition of the finca at La Conexión

CROQUIS DE LA UBICACION DE CENTRO DE ACOPIO DE MADERA EN LA FINCA LA CONEXION



**Table 16: La Conexión, plantation**

Finca La Conexión, Supervivencia, calidad de plántones , 18 meses.						
Scientific name	Name	Quantity	Distance (m)	Area (ha)	Survival rate %	Quality of the seedlings
Simarouba amara	Aceituno	206	5x3	0.31	99%	Very good
Aspidosperma spruceanum	Alcarreto	378	5x3	0.57	80%	Moderate to poor
Aspidosperma spruceanum	Alcarreto	93	5x6	0.28	75%	Moderate to poor
Dipteryx oleifera	Almendro	429	5x3	0.64	85%	Moderate to poor
Dipteryx oleifera	Almendro	34	5x6	0.1	75%	Moderate to poor
Carapa guianensis	Bateo	439	5x3	0.3	85%	Good
Dalbergia retusa	Cocobolo	312	5x3	0.4	90%	Good
Calophyllum brasiliense	Santa Maria	579	5x3	0.87	99%	Very good
Calophyllum longifolium	Maria grande	89	5x3	0.13	99%	Very good
Calophyllum longifolium	Maria grande	107	5x6	0.32	99%	Very good
Manilkara bidentata	Bulletwood	247	5x3	0.37	99%	Very good
Manilkara zapota	Bulletwood	117	5x6	0.35	99%	Very good
Total number of trees		3020		5.05		

## 5. Other project activities

### Phytosanitary control

Constant phytosanitary monitoring. Checking the species with the help of a specialist to see if they have a negative impact on the tree population.



### Soil protection

Since La Ponderosa was used as cattle pasture, soil conservation measures are necessary along the rivers and drainages.



The photo shows the natural drainage on Finca La Ponderosa. During the rainy season of 2020, there was heavy rainfall that caused water saturation in the soil. In the dry season of 2021, measures will be taken to counteract this.





## 6. Biodiversity

Our forests are slowly starting to provide a habitat for different species of animals. We will soon set up a permanent monitoring system for biodiversity and environmental monitoring, which will be necessary for the FSC certification.



"Bejuquilla Verde" (*Oxybelis fulgidus*), Finca La Reina



Mantled Howler Monkeys (*Alouatta palliata*), Finca La Ponderosa.



Bird's nest, Finca Gatún 1



Protected area, Gatún 1

## 7. Concluding remarks

1. The growth of the trees at Finca La Reina is appropriate to their age and species.
2. At Finca La Ponderosa, the growth rate and the initial growth exceeded expectations.
3. The growth rate of the trees at the fincas La Conexión and Gatún 1 is as expected. It should be said, however, that their growth is still very slow, because the soils in the region are very acidic and the plants therefore need longer to establish themselves.

For 2021:

- On the La Conexión and Gatún 1 plots, adjustments should be made in the liming and fertilisation.
- Soil analyses should be carried out on the Gatún 1 and La Conexión plots to check whether the planned fertilisation measures are sufficient.
- The high scrub vegetation on the site should be removed in some areas.
- Soil protection measures should be implemented on all areas.
- The Cocobolo trees in Gatún 1 should be pruned as they have reached the required heights and diameters.
- The system of monitoring plots will be established or extended to 2% of the total area on all fincas in the course of 2021.

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[Signature]

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