

Audit Report on Forest Plantations.

Agua Fría, District of Chepigana, Province of Darien,
Republic of Panama.

Elaborated for:

WALDMENSCHEN eG

Presented by:

EcoWood
Panama Services, S.A.

Forest Registry: DRPM-PF008-2017



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Introduction.

The purpose of this document is to audit the commercial plantations of the La Reina Project owned by the company WALDMENSCHEN eG located in the community of Quebrada Limón, Province of Darién, Panama.

For the development of this document, we receive all the project documentation from the client. Once it was confirmed that our company was selected to perform the audit, the technical and administrative team of Futuro Forestal provided all the necessary inputs for the proper development of this consultancy and information such as: electronic files containing the Forestry inventory database, Management Plan, list of planted species, among other general project information; In the same way, we received the cartographic files of the farm that makes up the forestry project.

Basically, the methodology of the audit consisted of routes in the plantation, verification in the Permanent Monitoring Plots (PPM), all with an area of 1,000 m² respectively.

Below we present the general customer and project evaluated based on planted area and years of planting.

Table 1. General information of the Client & Forestry Projects – WALDMENSCHEN eG

Customer Name:	WALDMENSCHEN eG		
Customer Address:	Clayton, 923 A, Panamá, Ciudad de Panamá.		
Customer Representative:	Andreas Eke – Director		
Customer Telephones:	(507) 317 - 1431	Customer's Mail:	aeke@futuroforestal.com
Report date:	16/11/2018		
Visited Farm:	La Reina	Date of visit:	November 14, 2018
Planned Area [ha]:	20.7	Area planted with Teak [ha]:	12
Other Species [ha]:	8.7	Workers:	1
Auditor Leader EcoWood Panama Services:	Angel R. Flores	Additional Member EcoWood Panama:	James F. Laing
This report is confidential and its distribution is limited to the representatives of the client and the members of EcoWood Panama Services, and whoever the client decides			

1. Revision of the Objectives.

Overall objective:

- Carry out a forestry audit in the La Reina project in order to evaluate the current status of the plantation trees.

Specific objectives:

- Review the forest management applied in the plantation.
- Evaluate environmental aspects (good practices and opportunities for improvement)
- Assess the performance that the company uses to optimize the potential of the soils and innovate in the forestry industry.
- Verification of documents such as forest management and registration plans.
- Prepare forestry audit report.

As detailed in the objectives, the purpose of this audit is to evaluate the current status of the plantation and the impact of applied forest management on the development and / or growth of the biological asset of the La Reina Project; The forestry audit is based on field inspection, review of documents, review of the database of consecutive measurements, and interviews with key management and operational personnel of the company.

2. Forestry Plantation Context – La Reina – WALDMENSCHEN eG.

WALDMENSCHEN eG. is a cooperative with interest in the reforestation of regeneration forests in the tropics and subtropics

At the time of the audit, these were the data of areas registered by the farm.

Table 2: Farms and Areas (ha) according to Cartographic Records (La Reina, November 2018)

<i>FARM</i>	<i>Province</i>	<i>Year of Acquisition</i>	<i>Species</i>	<i>Planned Area</i>	<i>Property Area</i>
<i>La Reina</i>	Darién	2013	<i>Tectona grandis</i>	20.7	25.4

Source: Waldmensch eG cartographic records, November 2018.

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3. Applied Forest Management in Plantations.

Due to the fact that the plantations are still quite young (planted in 2013 - 5 years old) and that they received thinnings of a sanitary nature, the management review was based mainly on the pruning and cleaning regime. These reviews were made during the field visits.

In general, we can certify that at the time of the forestry audit the plantations presented good cleanliness and vigorous trees; In general terms, the status of all farms is good, both in applied silvicultural management, as well as the phytosanitary status of the plantation.

The thinning patterns are adjusted to the ranges foreseen in the growth charts, and therefore the growth projections can be justified from the classification by diameter.

3.1. Cleaning (Control of weeds): As mentioned in the introduction to this report, the plantation is generally clean, which is an important and favorable aspect for the growth of trees.

Similarly, it can be observed that the "Undergrowth" is largely composed of broadleaf species, which is very positive in terms of biodiversity and soil conservation.

Another favorable aspect observed in the field was the control of teak sprouts, which could be competition for soil nutrients; This is due both to the height of the plantation trees and the cleanings carried out in a timely manner during the year.

3.2. Pruning: during the inspection it was possible to appreciate the prunings executed in the present year and the branches that were observed were new, and taking into account that the dry season approaches, it was concluded that the next pruning could be carried out next year without any problem.

It is important to continue with this work of pruning until achieving at least 6 - 8 meters of clean shaft for future thinnings to be able to sell long wood which is quoted better in the lumber market.

Because of the age of the plantation, 1 - 2 pruning per year could be programmed and preferably executed at the beginning of the rainy season and in this way concentrate growth in the tree trunk and not in the branches.

The importance of executing this activity in a timely manner is to avoid thick branches and huge wounds. During the audit, the trees have clean shaft from knots, suckers and wounds, were observed.

3.3 Thinning: During the audit attention was paid to thinning executed in the teak plantation; It was observed that the remaining teak trees are of good quality in the form of a shaft with growth good for the age of the plantation. This gives a greater economic value to the plantation because the thinnings executed have improved the structure of the canopy in qualitative and quantitative aspects.

Forest thinning involves cutting certain trees to gradually reduce the number of trees in the plantation in order to concentrate growth on the best individuals. Initially, in a pure plantation, a high number of individuals are planted to make the trees grow more straight, with fewer lateral branches and a commercial shaft with good shape; However, the competition for water, light, nutrients should not be so excessive since this can harm the good development of the trees.

This means that over time, it becomes necessary to reduce the number of trees by performing thinning. In the first years, trees with the following characteristics are usually eliminated: poor shape, bifurcated, inclined, suppressed, underdeveloped and diseased, and finally those of smaller diameter and height. From what has been observed in the field, the thinnings to date have been executed in a satisfactory manner, complying with the silvicultural parameters for the improvement of the plantation.

However, in the field you can see areas where there is an important "interaction between tops of the branches" which is why it is advisable to improve the spacing of the distribution, with another thinning that in our technical opinion should be determined according to the results of the next forest inventory.

3.4. Phytosanitary conditions: during the visit no trees were observed with the presence of pests and/or diseases. However, some trees burned by lightning were observed, which should be eliminated to avoid possible sources of disease.

3.5. Limits of the Plantation: it was observed in the field that the plantations have perimeter fences that clearly identify the limits of the project.

3.6. Fire Control and Prevention: an important aspect in reforestation projects is the Control and Prevention of Forest Fires. During the audit visit, it was observed that the project has its respective fire roads round.

One aspect to highlight at this point is that the company has planted Cocobolo trees (*Dalbergia retusa*) in the firebreaks. This aspect is well regarded for two reasons namely:

- Land use is potentiated
- Once these Cocobolo trees manage to grow and develop their crowns is better, they work to reduce the maintenance costs of firebreaks due to the effect of shade.

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4. Environmental aspects.

Major as explained in the first points of this audit report, the plantation has been applied timely, but the possibility of improving the spacing of the distribution in some sectors of the plantation must be evaluated.

Thinning contributes to a better growth of plantation trees, but also has a positive impact from the environmental point of view. The thinning diminishes the interaction between the canopy of the trees and in this way allows more sunlight to enter and favor the growth of undergrowth, benefiting biodiversity and soil conservation.

Following are some environmental aspects observed during the audit visit:

- In general, no damage due to soil erosion is observed.
- The plantation has a diverse undergrowth in mainly broadleaf species, this product of good silvicultural practices.
- The company has a monitoring plan identifying the species of natural regeneration and long-term ecological and economic potential.
- It was evident that the company maintains forest covered areas between water courses and the plantation as required by the Ministry of Forestry (former MIAMIBIENTE)
- The project has timber trees scattered on the plantation, which have an ecological potential and also provide commercial or internal use of the wood for the project.
- It was evidenced in the field that thinning trunks are left in the field, which work as green manure and soil erosion reducers.

We can mention that in some very specific points of the plantation, some signs of erosion by surface runoff were found, which will be corrected soon with erosion reducers using the wood of previous thinnings.

5. Plantation of Other Species of Commercial Value.

As indicated in the project description, the EcoWood review team paid attention to the information from the farm plans to show the effective areas and the review team concluded that the available maps are a sufficient basis for the project, to perform area calculations accurately.

During the field audit, the review team had sufficient opportunities to verify the planted areas and verify that the areas designated as plantations on the maps, including the age of planting. In general, GIS (geographic information system) information is realistic and consistent.

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Based on the available maps and the visit of one of the reforested areas, the EcoWood review team concludes that the planted area measured by the WALDMENSCHEN eG. company is accurate.

Below is the detail of the area reforested by species.

Table 3: Information on Forested Areas by Species (La Reina, November 2018)

Species	Scientific name	Area (Ha)
Teca	<i>Tectona grandis</i>	12
Mora	<i>Maclura tinctoria</i>	1
Cedro amargo	<i>Cedrela odorata</i>	1
Roble	<i>Tabebuia rosea</i>	2
Cocobolo	<i>Dalbergia retusa</i>	4.7
Total		20.7

An important point to mention, is the frequency of winds of the zone since some sectors of the teak plantations were affected by strong winds as we were explained in the field.

These areas have been reforested again, in this case with native species as shown in Table 3, enhancing the use of land with species of commercial value; An attractive point that distinguishes the farm both in forest management, as well as the options of generating commercial value to the project, is having repopulated the sites affected by the winds with the native species.

The native species selected have a high ecological as well as commercial value, such as the Cocobolo species (*Dalbergia retusa*), well known in the lumber market. On the other hand, we can observe that the native species have an optimal phytosanitary status and the growth is more than acceptable for their age, taking into account that they are interacting with teak plantations of greater age and growth.

Another interesting aspect is that special attention is now given to the Mora species (*Maclura tinctoria*), a species that can be used for poles and its bark can be extracted for dyes & colors.

6. Final Conclusions.

Following is a general description of the opinion of the review team of EcoWood Panama Services S.A. on forest management of the La Reina project:

- Applied forest management is appropriate, consistent and timely.
- No environmental faults were identified that could cause calls for attention or corrective actions for FSC certification or environmental inspections by the Miambiente.
- The review of EcoWood Panama Services identified satisfactory and high quality results in the fieldwork at the time of the field inspection.
- In general, commercial plantations reflect an optimum phytosanitary status.
- No trees affected by pests and / or diseases were observed.
- The forestry audit is based on interviews, field inspection, observations of silvicultural activities, review of documents, reports and records delivered by the client.

The team of EcoWood Panama Services reviewers concluded that the La Reina Project has established and maintains forest management in accordance with the provisions of its Management Plan and the results presented in this document of "**Forest Audit Report, Version 11 - 27-2018**" certifies that the conditions of growth in the field allow to validate the date, satisfactory results and according to the forest industry.

7. Annex A: Photographic Record - Forest Audit - La Reina (November 2018)



Panoramic view of commercial teak plantations - Audit Project La Reina - November 2018

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8. Annex B: Photographic Record - Forest Audit - La Reina (November 2018)



View of native species and conservation areas - Audit La Reina November 2018

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