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Evaluation Report of Forest Project LA ALDEA Teak plantation property of Life Forestry Group

Zusammenfassung

Mein Name ist Dr. Diego Perez. Ich komme aus Costa Rica und habe Dort eine deutsche Schule besucht. Ich habe unter anderem in Europa Forstwirtschaft studiert und an der Universität von Helsinki meine Dissertation über Teak verfasst. Heute leite ich eine Beratungsgesellschaft für forstwirtschaftliche Themen in Costa Rica.

Ich habe das Waldprojekt "La Aldea", in San Carlos, Alajuela, Costa Rica, vom 23-25 September 2009 im Auftrag der Life Forestry Group evaluiert. Mein Auftrag war die Erstellung eines unabhängigen Gutachtens über den Zustand und die Leistungsfähigkeit der Plantage, die Analyse des aktuellen Wachstums und die daraus resultierenden Erwartungen bezüglich Wachstums und zukünftiger Erträge.

Die Teak-Plantage "La Aldea" weist eine für die Region San Carlos typische Wachstumsrate auf. Die Messunterlagen der Jahre 2006, 2007, 2008 sowie die aktuellen Messungen, die ich im Rahmen des Gutachtens durchgeführt habe, zeigen im Allgemeinen eine positive Zunahme mit einer Lineartendenz im jährlichen Wachstum.

Die 2009 ausgeführten Messungen weisen darauf hin, dass in den kommenden Jahren sogar ein deutlich höheres Wachstum möglich ist, als auf den übrigen Teakwäldern in diesem Gebiet. Im Vergleich mit den wissenschaftlich überprüften Wachstumskurven für Teakholz in Costa Rica, liegt das "La Aldea Projekt" zwischen dem Medium und den hohen Wachstumskurven. Das lässt einen möglichen DBH (Diameter at Breast Height = Brusthöhendurchmesser) zwischen 33 und 42 cm am Ende des Rotationszeitraums erwarten.

Die Plantagen sind ausgezeichnet gepflegt, die Durchforstung zeitig gemacht, die Ästung bis zur empfohlenen Höhe durchgeführt und die Holzstämmen sind von guter Qualität. Das Terrain ist flach bis hügelig und erweist sich mit Steigungen bis 10% als ideal für die Kultivierung des Teakholzes. Der Boden ist tief genug (mehr als 60 cm) für den Anbau von Teakholz-Wurzeln, die bereits heute Tiefen von bis zu 45 cm erreichen.

Alle gemessenen Bäume sind fortlaufend nummeriert und geocodiert und verfügen über eine Aluminiumplakette mit entsprechender Bezeichnung. Es gab keinerlei Hinweise auf mögliche Schädlinge oder Krankheiten. Das Waldprojekt "La Aldea" weist als Teakholz-Plantage zwar Elemente einer Monokultur auf, es ist jedoch in einem natürlichen Waldökosystem eingebettet, und funktioniert daher als Teil eines Biosystems für eine artenreiche Tier- und Pflanzenwelt.

Dr. Diego Perez



INTRODUCTION

The forest project La Aldea, located in San Carlos, Alajuela, Costa Rica, was evaluated during September 23-25 as requested by Life Forestry Group. An independent evaluation of the plantation performance was the aim of the visit, focusing on the actual growth and yield status and the possible future trends.

The evaluation was based on a field visit where growth and yield variables were measured, next to the revision of soil, plantation site, plantation quality, and other basic parameters of importance in a forest project. A comparison with other forest projects in the area as well as with growth curves developed for teak in Costa Rica is included in this report, aiming at presenting a preliminary benchmark indicator for the company and its investors.

METHODOLOGY

The different 14 sectors on which the teak project La Aldea has been divided were visited during the field evaluation. Forest measurements were carried out on each sector (number depending on the size), for a total of 41 measuring points (see blue marks in Figure 1). On each measuring point, the DBH and total height of 5 trees were measured, and the basal area (BA) was measured using a Basal Area Factor Prism. The number of trees was calculated as Stand BA/Average BA of trees.

In addition, the planted area of two sectors (sector 4 and sector 12) was verified by means of GPS measurements and the software GPS TrackMaker Pro, this in order to partially validate the planted area reported by the company in the official map (areas with red flags in Figure 1). In addition, two trees were tracked with the GPS in order to offer their coordinates for validation purposes (green dots).

The soil was also examined in order to look for any possible indicator of actual or future nutrient limitations.

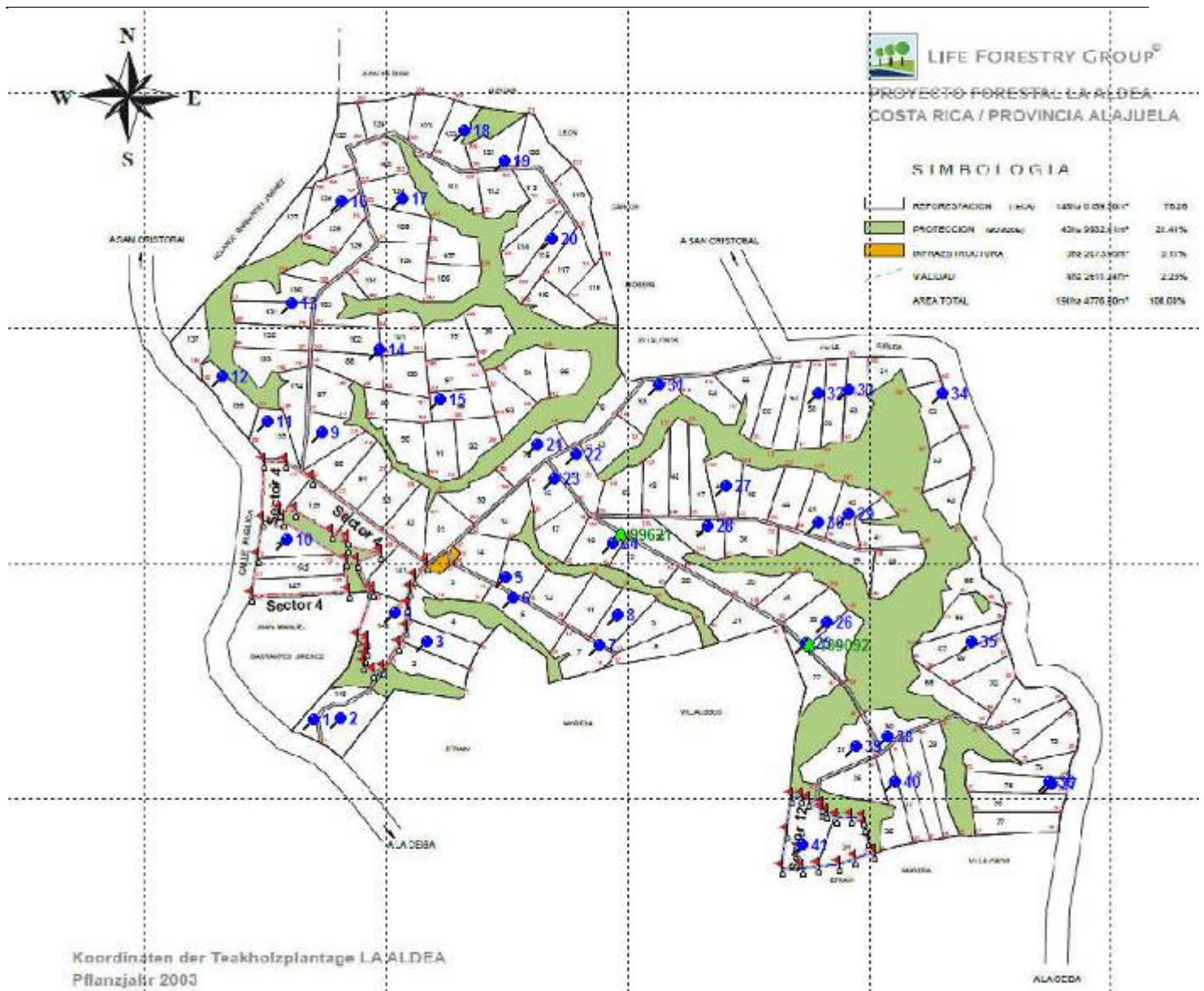


Figure 1. Location of the 41 sampling points (blue dots) where growth measurements were taken during the field visit. Red flags correspond to size verification measurements of planted area.

Results

The summary of the sampling points is presented in Table 1.

Table 1. Summary of the measurements carried out at different sampling points of La Aldea Project.

Plot	Sector	DBH (cm)	MAI DBH	H (m)	MAI H	BA (m ² /ha)	N (#/ha)
1	1	15.4	2.6	14.4	2.4	13.0	694
2	2	15.0	2.5	14.3	2.4	12.0	679
3	3	15.1	2.5	13.3	2.2	12.0	667
4	4	14.3	2.4	12.7	2.1	10.0	619
5	3	13.8	2.3	10.9	1.8	10.0	667
6	3	16.2	2.7	12.1	2.0	10.0	483
7	3	15.0	2.5	14.4	2.4	14.0	796
8	3	13.9	2.3	11.7	2.0	12.0	791
9	6	13.2	2.2	12.0	2.0	10.0	726
10	4	13.6	2.3	10.3	1.7	12.0	826
11	5	13.2	2.2	12.3	2.0	11.0	801
12	5	13.4	2.2	11.3	1.9	11.0	775
13	5	14.3	2.4	12.5	2.1	12.0	743
14	6	14.9	2.5	12.0	2.0	12.0	686
15	6	13.4	2.2	11.5	1.9	14.0	990
16	5	17.3	2.9	13.5	2.3	14.0	593
17	6	14.7	2.4	11.2	1.9	12.0	709
18	5	17.2	2.9	15.8	2.6	16.0	690
19	5	16.2	2.7	12.3	2.0	10.0	488
20	5	16.0	2.7	11.8	2.0	13.5	675
21	6	14.2	2.4	12.2	2.0	13.5	852
22	7	13.5	2.3	11.3	1.9	10.0	699
23	3	18.0	3.0	15.2	2.5	16.0	632
24	3	16.7	2.8	12.7	2.1	14.0	641
25	9	17.3	2.9	14.0	2.3	12.0	513
26	8	13.2	2.2	10.5	1.8	8.5	619
27	7	13.8	2.3	11.3	1.9	10.0	667
28	8	13.1	2.2	11.3	1.9	10.0	742
29	7	14.9	2.5	12.4	2.1	9.0	513
30	8	15.7	2.6	12.2	2.0	12.0	618
31	7	15.3	2.6	11.8	2.0	12.0	653
32	7	11.2	1.9	8.0	1.3	8.0	818
33	7	13.2	2.2	10.6	1.8	8.0	583
34	7	13.0	2.2	9.5	1.6	10.0	749
35	14	13.4	2.2	10.2	1.7	11.0	780
36	14	11.6	1.9	9.7	1.6	7.0	662
37	14	12.7	2.1	8.7	1.4	6.0	471
38	10	16.1	2.7	13.7	2.3	16.0	786
39	11	14.5	2.4	12.3	2.1	10.0	602
40	13	14.3	2.4	12.8	2.1	11.0	689
41	12	14.5	2.4	11.4	1.9	11.0	668
Average		14.6	2.4	12.0	2.0	11.4	684

The forest plantation La Aldea presents an average DBH of 14.6 cm and a total height of 12.0 m, for a yearly annual growth averaging 2.4 cm and 2.0 m, respectively. A basal area of 11.4 m²/ha and a stand density of 684 trees/ha suggests an appropriate and intensive management, optimizing the site potential for the best possible growth performances.

The DBH varies between 11.16 and 18.0 cm, for a Coefficient of Variation of 10.6%. The total height varies between 8.0 m and 15.75 m, for a Coefficient of Variation of 13.7%. Both coefficients suggest some stand variability which can be easily improved in the next thinning by eliminating the smallest (suppressed) trees of the stand.

Figure 2 shows the DBH distribution of La Aldea Project for 2009. A normal distribution is to be found, suggesting a good tree-size distribution with a data concentration around the Arithmetic Mean and two similar tails of suppressed and dominant trees distributed on both sides. A total of 25% of the trees are located below 12.9 cm (1st quartile or lower hinge), suggesting the removal of all those suppressed trees in the next thinning in order to shift forwards the mean and the distribution.

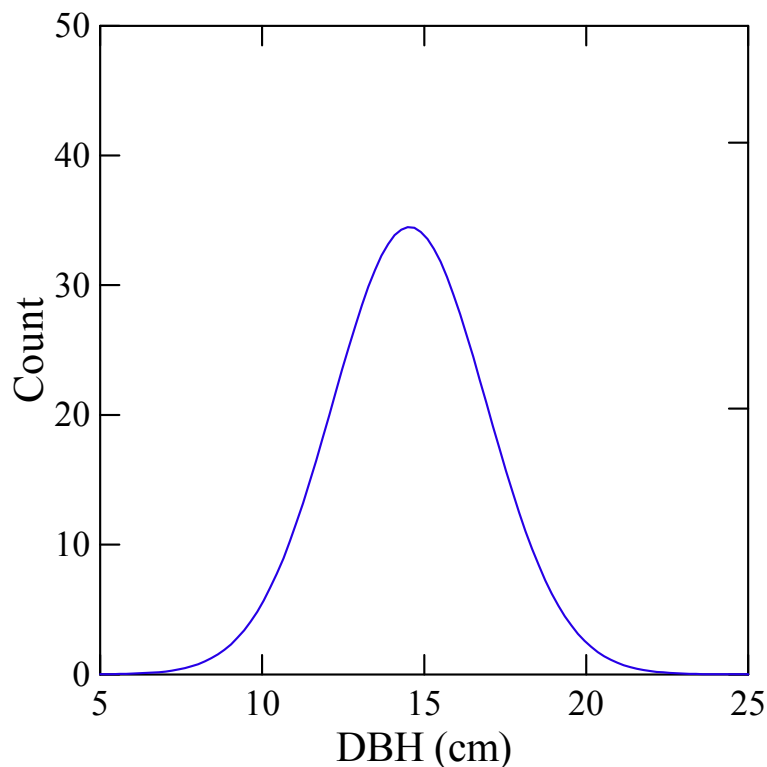


Figure 2. DBH distribution for the 2009 measurements carried out in La Aldea Project during the field evaluation.

Figure 3 shows the relationship between site occupancy (basal area) and the diameter (DBH) growth. There is a linear relationship that suggests that the best sectors have gain in diameter growth and stand volume and are under maximum growth rate at the moment (basal area reaching 17.0 m²/ha, ideal for teak).

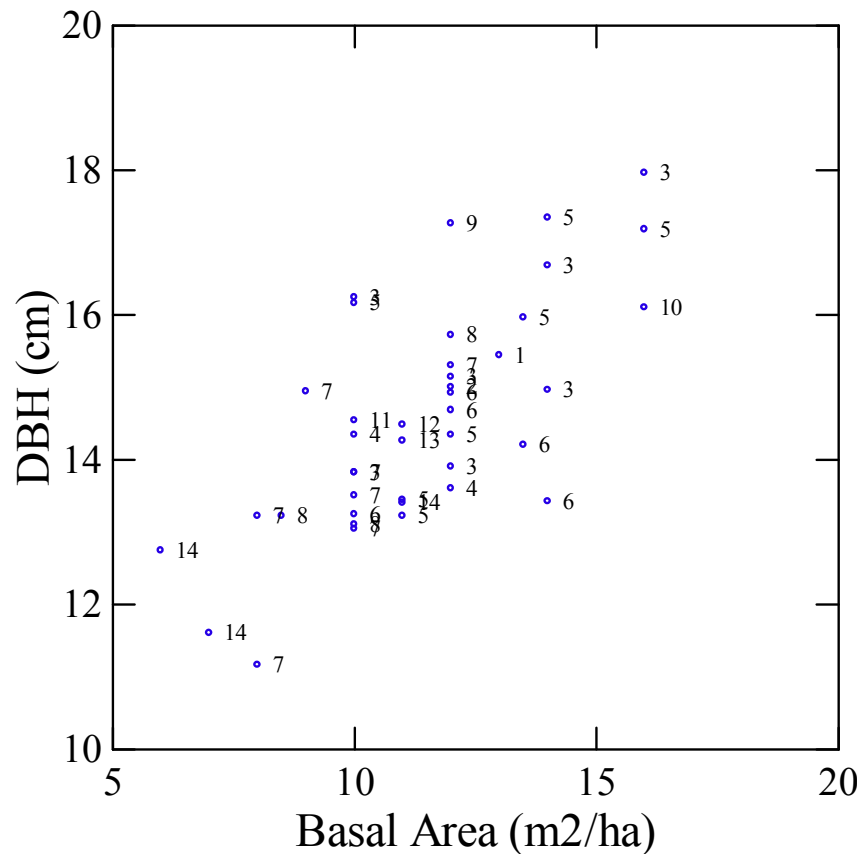


Figure 3. Relationship between Basal Area and DBH for the 2009 measurements of La Aldea Project. Dots correspond to the sampling points, numbers correspond to the project sectors.

The stand density (number of trees per hectare) presents a wide variation, which needs to be reduced in the next thinning intervention towards more homogeneity (Figure 4). There is a slight tendency of DBH to increase with decreasing stand density, suggesting a possible optimum at 700 trees/ha. Nevertheless, this tendency should be interpreted as an aid for decision-making in addition to other parameters such as annual growth increments, site occupancy, project expectations and management scenarios.

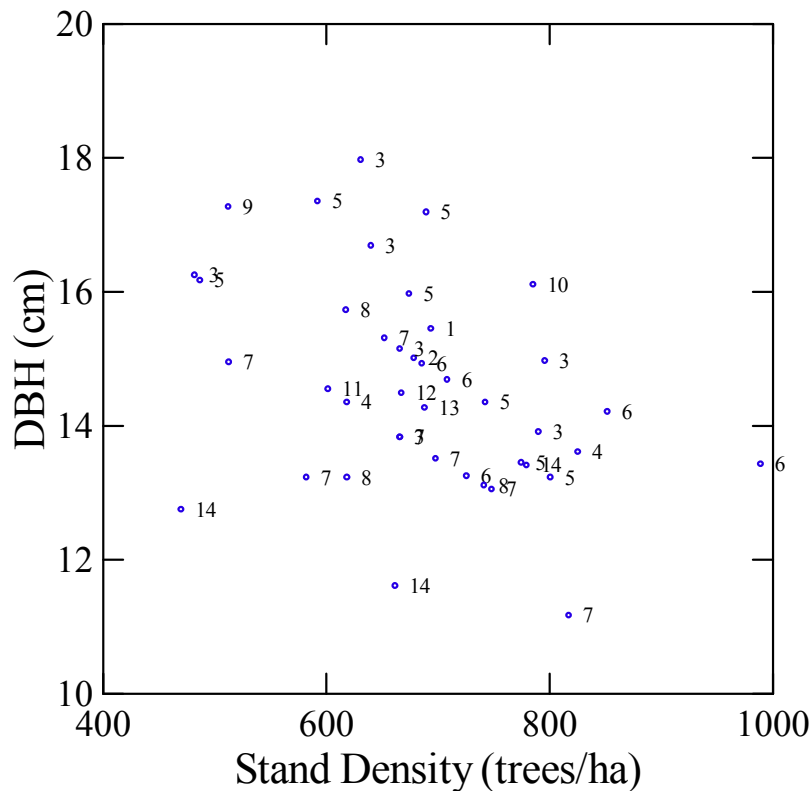


Figure 4. Relationship between stand density (number of trees per hectare) and DBH for the 2009 measurements of La Aldea Project carried out during the field evaluation.

La Aldea project presents a similar growth rate than that found previously in other forest projects within the region of San Carlos (Figure 5). The company measurements of 2006, 2007, 2008, and the current measurement carried out for this evaluation (2009), shows in general a positive increment with a linear trend in yearly growth. The measurements carried out in 2009 suggest a possible better performance in the coming years than that reported for the species in the region. In relation to the growth curves for teak in Costa Rica (developed by Perez 2005¹), La Aldea project is located at present between the medium and the high growth curves, suggesting a possible DBH between 33.0 and 42 cm at rotation.

¹ Perez, D. 2005. Stand growth scenarios for *Tectona grandis* in Costa Rica. Academic dissertation, University of Helsinki. www.metla.fi/dissertations , Document #1.

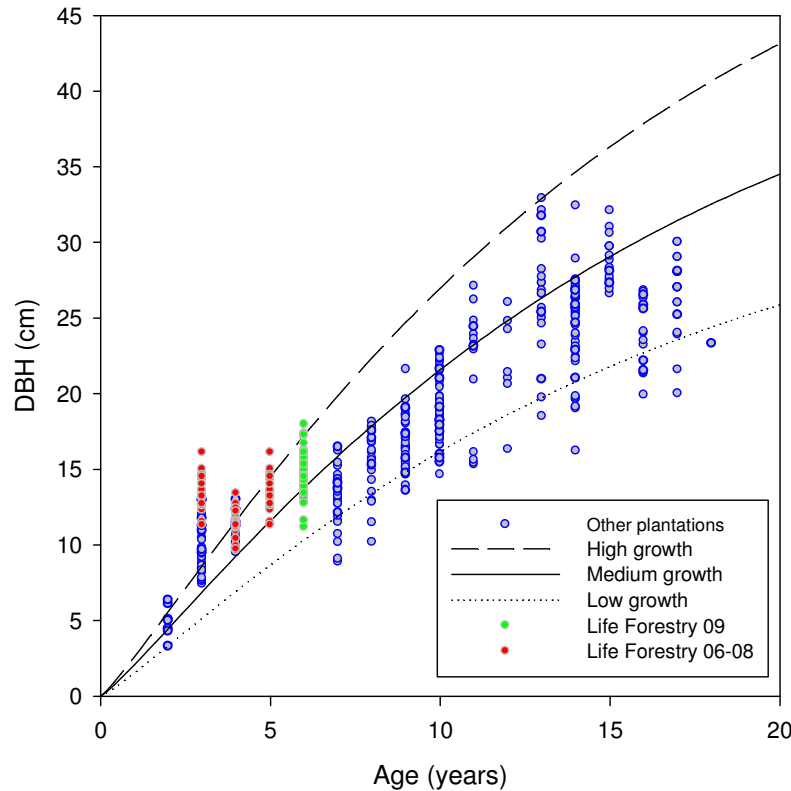


Figure 5. DBH measurements carried out between 2006 and 2008 by the company (red dots); measurements carried during the present evaluation in 2009 (green dots), measurements carried out in different plantations within the San Carlos region (blue dots), and growth curves developed for teak in Costa Rica by Perez (2005) compared.

Similar results were found for Total Height. La Aldea project presents a similar growth rate than that found previously in other forest projects in the region (Figure 6). In relation to the growth curves for teak plantations in Costa Rica, La Aldea project is located at present between the medium and the high growth curves, suggesting a possible total height between 22.0 and 27 m at rotation.

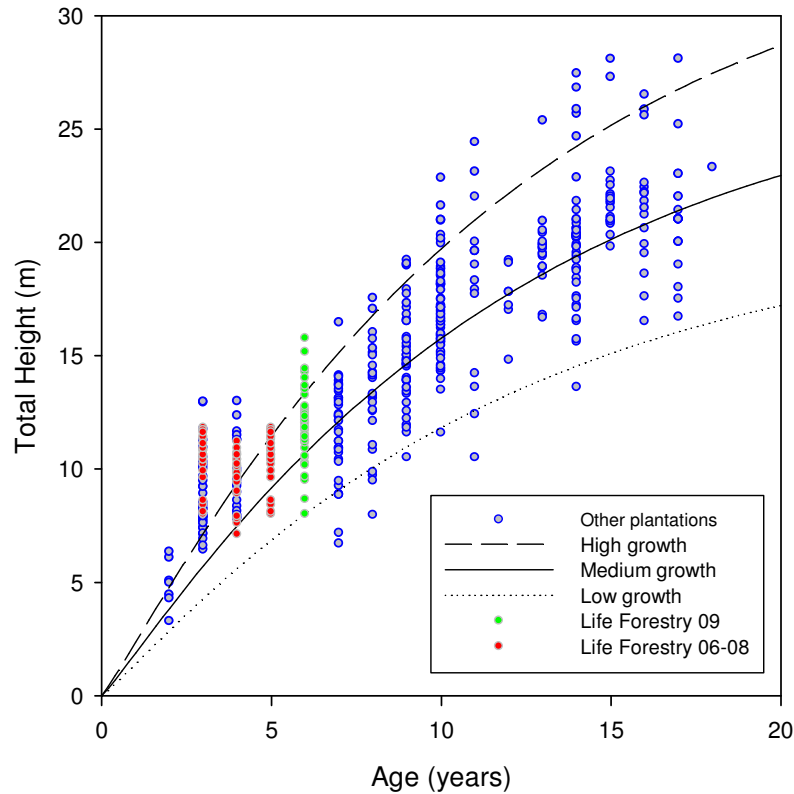



Figure 6. Total Height measurements carried out between 2006 and 2008 by the company (red dots), measurements carried during the present evaluation in 2009 (green dots), measurements carried out in different plantations within the San Carlos region (blue dots), and growth curves developed for teak in Costa Rica by Perez (2005) compared.

Additional observations

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 The project presents an optimum maintenance, with on-time thinning, pruning (up to 5-6 m of height) and grass cutting (Picture 1).



Picture 1. Panoramic view of the intensive management practices found in La Aldea Project.

- ✚ The terrain is soft undulated (less than 10% slope), ideal for the cultivation of teak. The soil is typical of that found in the region, i.e. with high contents of clay and a medium fertility potential (Picture 2).



Picture 2. Sample soil from La Aldea Project.

- ✚ The soil is deep enough (more than 60 cm) for teak roots to grow, which were found at depths of 45 cm already (Picture 3).



Picture 3. Soil depth evidenced in a drainage canal of Finca La Aldea.

- ✚ All measured trees presented their corresponding tag and numbering, as shown in Picture 4. The two points tracked in the field with a Garmin GPS were: tree # 99621 with coordinates 10.7906/-84.5051 and tree # 109092 with coordinates 10.7882/-84.5012.



Picture 4. Marking-tags in a teak tree of La Aldea Project.

- ✚ No evidence of pest and diseases where found in the plantation (Picture 5).



Picture 5. No pests and diseases where found in the plantation.

- ✚ The forest project “La Aldea” comprehends a monoculture (teak plantation) embedded in a natural forest ecosystem, which functions as a biological corridor for wild animals (Picture 6).



Picture 6. Group of spider monkeys crossing a sector of La Aldea Forest Project.



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