

Forest Management Review January 2020

Report on visit at Anamaduwa, Puttalam and Batticaloa Teak Plantations

Executive Summary

I visited the AsiaTeak Group teak plantations at Anamaduwa, Puttalam and Batticaloa with Mr. Jayalath, and Mr. Eranda to conduct this Forest Management Review on 1st, 2nd & 3rd Jan. In this study I have used the 2019 inventory data for my analysis and recommendations to be made.

In this visit, 21 plots, each having 500m² area were used to cover total area of 10,500 m² on the plantations. 764 trees were measured for DBH (Diameter at Breast Height), however a lesser number of trees were measured for height parameter. It is understood that the present study results almost complied with previous inventory data. Even though we established our plots on different locations not to coincide (close) with permanent plots, which were permanently established.

The extent of Anamaduwa plantation is 4.8 ha in which 4036 trees are found with average of 15.2 cm DBH and 12.3 m height and 980 trees per ha basis. That means around 4.1 ha (85% of land area) has been used or covered by trees.

The extent of Puttalama plantation is 10 ha in which 5447 trees are found with average of 16.6 cm DBH and 12.3 m height and 695 trees per ha basis. That means around 7.8 ha (78% of land area) has been used or covered by trees.

The extent of Batticaloa plantation is 48 ha in which 20145 trees are found with average of 11.3 cm DBH and 7.9 m height and 682.8 trees per ha basis. That means around 29.5 ha (65% of land area) has been used or covered by trees. Considering these facts, demarcation of forest cover area with actual land area is vital for each and every plantation and block because we manage the plantation based on number of trees per ha. (see more details in tables 1,2,3.1, 3.2,3.3, 3.4, 3.5 ,4 and 5).

The extent of land area with trees (excluding area where trees are not available) must be demarcated and included into map. Due to unavailability of this data, ? mark is shown at appropriate places.

Diameter at breast height has increased 13.6 to 15.2, 15.4 to 16.6 and 9.06 to 11.3 from March in 2019 up to present in Anamaduwa, Puttalam and Batticaloa plantation respectively. Growth of height in same plantations show in above said tables.

Recommendations for each block and each plantation are given separately in this report and more precise estimation can be made after the 2020 audit. Set targets and objectives for management of these three plantations should be clearly defined in order to focus the silvicultural treatment for individual trees, blocks and each plantation because there are significant growth difference within the plantation or within the same block. It is found that the area where debris on the site was burned exhibited excellent tree growth. This gives good clue for soil enrichment.

Healing of the pruning scars on the main stems were studied which reveals that some plantation took one year to heal the scar of 5cm diameter and 3-4 years for 10-15 cm scar. If a longer time period is taken to heal the main stem it badly affects for wood quality due to fungus infection. In future we need to give more attention to this aspect. At least 60% of live crown needs to be retained on trees after pruning for photosynthesis. Instructions are given for workers in this regard.

After clearly defining the major objectives for each plantation such as felling age, tree volume, timber yield per ha, log size and number of stems per ha, the most precise thinning regime can be designed and applied to achieve the set targets.

Wood density we determined for this study shows that it complies with teak wood density of same age of this plantation.





Samples cut for determination of wood density in three sites.

Table 1. Summary of Tree inventory data collected from Anamaduwa, Puttalam and Batticaloa Teak Plantations on 2020.1.04-05

Plantation name	No.of trees in 500m ²	Mean DBH(cm)	Mean Height(m)	No.of trees in ha	Total no.of trees found in Block by 2019 study .	Estimated planted area (ha) based on 2019 audit
Anamaduwa	49	15.2	12.3	980	4036	4.1 ha (85% of land area)
Puttalam	34.7	16.6	12.8	695	5447	7.8 ha (78% of land area)
Batticaloa	34.1	11.3	7.9	682.8	20145	29.5 ha (65% of land area)
Average of three estates (total)		14.4	11			
Average of three estates for 2019 study		11.22	11.6		Total = 29,628	

1. Palugahayaya Teak Plantation, Anamaduwa, Sri Lanka

Extent of the land (plantation): 4.8 ha

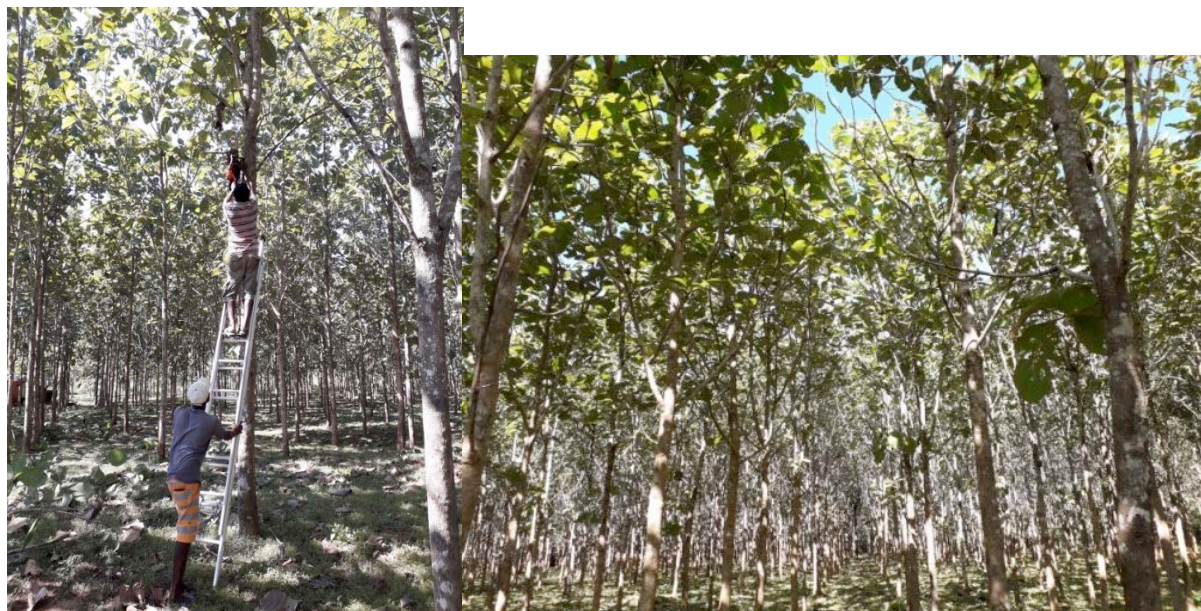
Planting year and present age (Years): 2009 / 2010 and 10 years old



Out side view of Anamaduwa teak plantation managed by Vision Forestry (PVT) limited.



Staff office and part of teak plantation.



High pruning with small chain saw.

Branches incline to main stem due to shortage of sunlight

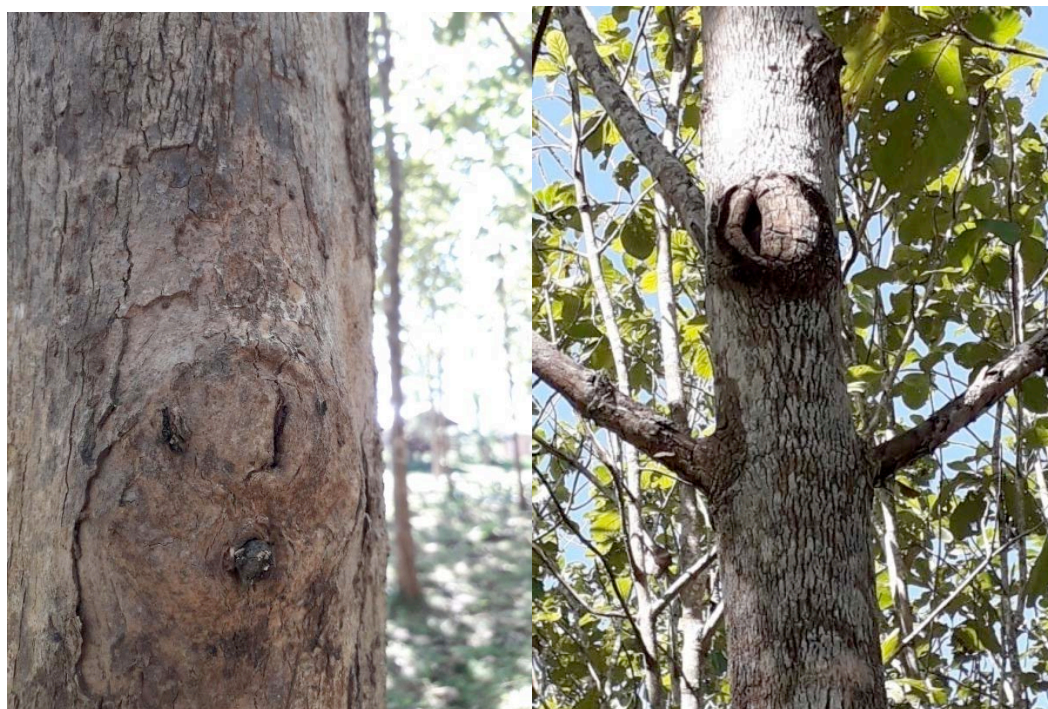


Tree with bad-formed trunk has to be removed by thinning.

Slow growth part of site



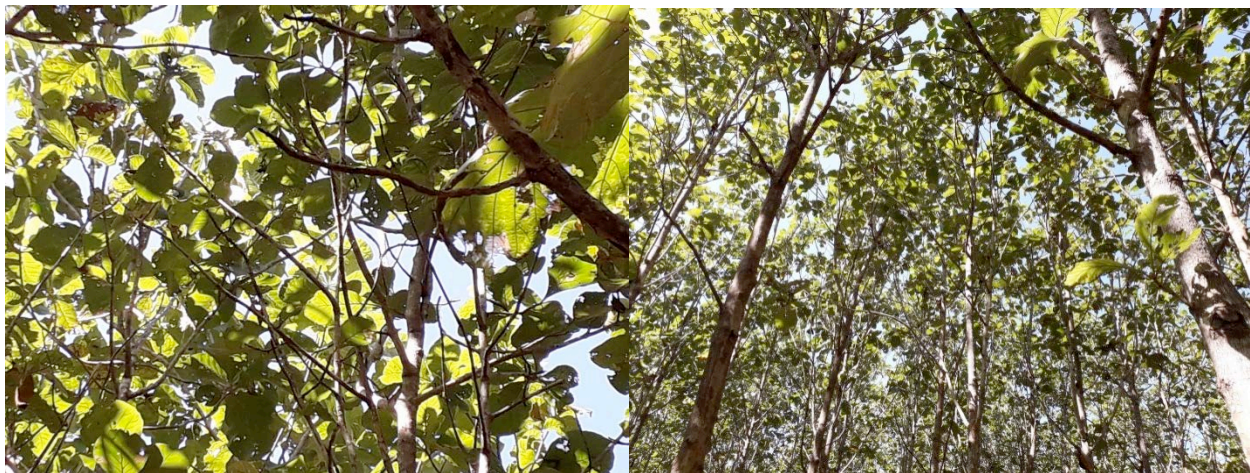
Comparison of slow growth tree and fast growth tree



Scar on main stem formed due to cutting of bigger branches. Attempt must be made to cut the branches as early stages when it is possible



Candarsan waterproof wound dressing is applied on stem wound. We recommend to add suitable fungicide into the solution. 60% live crown should be remained with tree. A top branch had to be kept with crown.



Canopy competition needs to be assessed and remedial action can be applied after finalizing the management objectives.



Attention must be paid to mitigate termite infestation. Application of soaked creosote preservatives band was proposed. Weeding is not an issue. Healthy surrounding, ground is helpful to minimize the fire hazard.



Experimental pruning work.



Branches developed almost perpendicular to the stem when abundant sunlight and spacing available



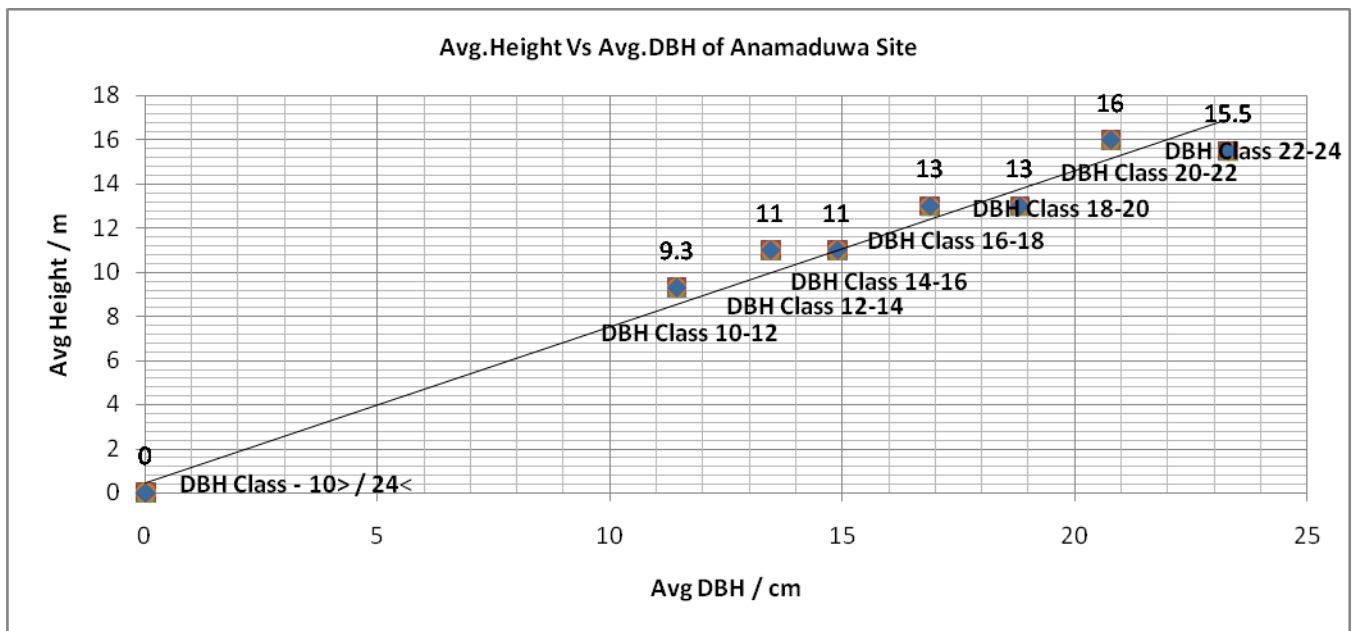
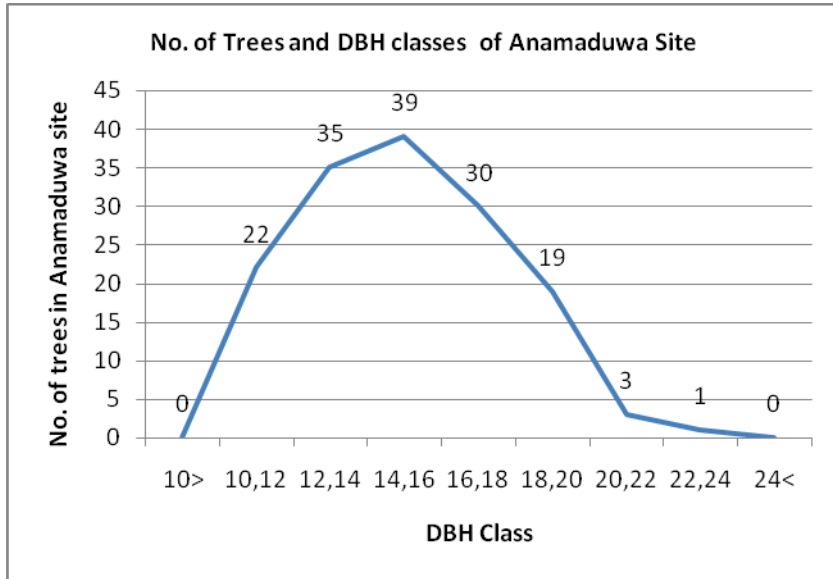
Proper healing take place

Bad formed tree trunk is rarely found.

Table 1. Tree inventory data collected from 500m² circular plot in Anamaduwa plantation on 2020.1.04

Plot no.	No.of trees in 500m ²	Mean DBH (cm)	Mean Height (m)	No.of trees in ha	Total no. of trees in plantation If trees planted in 4.8 ha	Estimated planted area (ha) based on 2019 audit
Plot 1	55	14.2	9.5	1100	980X4.8=4704 (4036 trees found in 2019 study)	4.1 ha (85% of land area)
Plot 2	49	14.5	12	980		
Plot 3	43	16.9	15.5	860		
Average(total)	49 (147)	15.2	12.3	980		
Average in 2019 study		13.6	12.5			

DBH Classes	Range	No. of Trees	Avg. DBH	Avg. Height	Percentage of No. of trees %
0	10>	0	0	0	0.00
1	10,12	22	11.43	9.3	14.77
2	12,14	35	13.45	11	23.49
3	14,16	39	14.89	11	26.17
4	16,18	30	16.88	13	20.13
5	18,20	19	18.81	13	12.75
6	20,22	3	20.77	16	2.01
7	22,24	1	23.30	15.5	0.67
8	24<	0	0	0	0
		149			



2. Singhanagavillu Teak plantation, Puttalam, Sri Lanka

Extent of the land (plantation): 10 ha

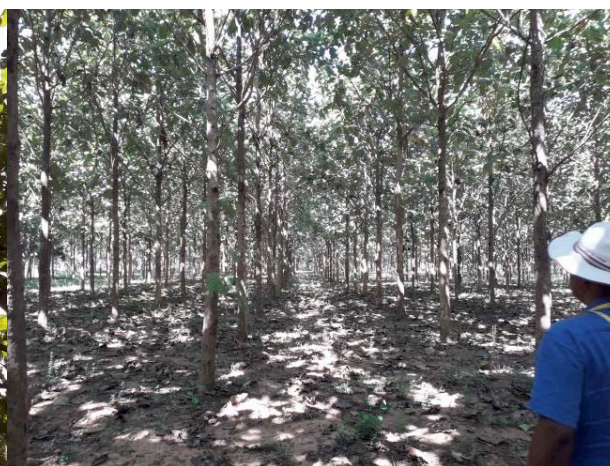
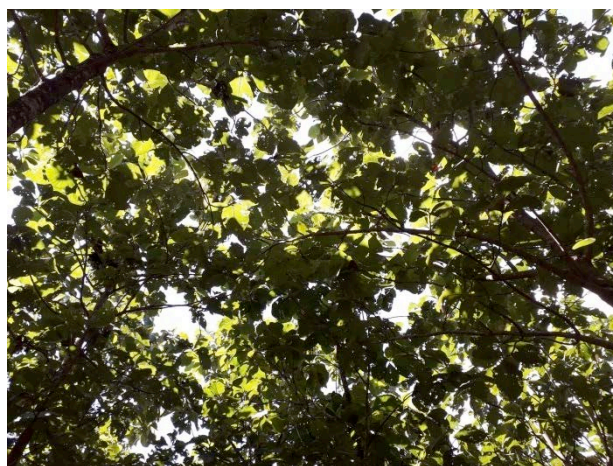
Planting year and present age (Years): 2011 and 9 years old



Entrance of the plantation



Inside view of the plantation



Canopy is almost closed in some parts of the plantation. Selective thinning can be applied.



Branching habit of teak needs to be considered when doing pruning. Removing large branches may cause to break down the main stem. Hence sometime it is better not to remove the large branches.



This photo self explain what happen when the large branch is removed.

It will take 3-4 years to heal the scar.



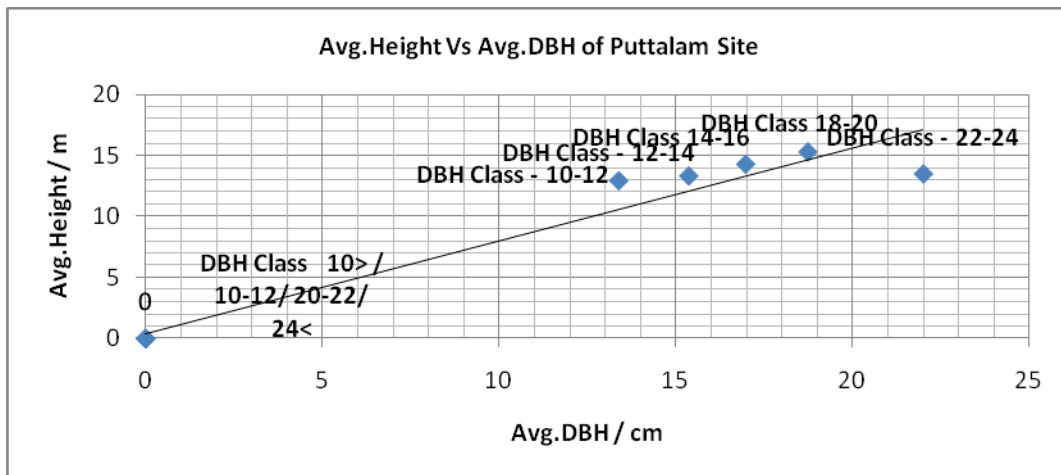
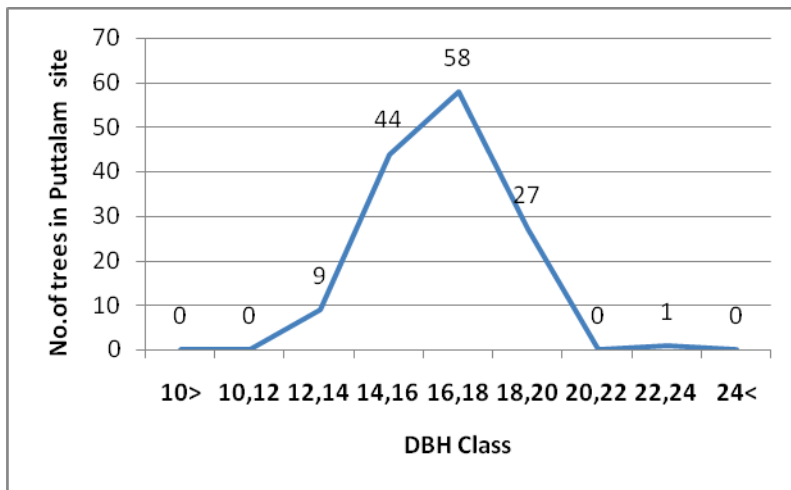
No issue on weeding. Healing with dead branch and healing for knot free timber in same stem



Table 2. Tree inventory data collected from 500m² circular plot on 2020.1.04

Plot no.	No. of trees in 500m ²	Mean DBH (cm)	Mean Height (m)	No. of trees in ha	Total trees in plantation If trees planted in 10 ha	Estimated planted area (ha) based on 2019 audit
Plot 1	33	16.9	13.5	660	6950 (5447 trees found in 2019 study)	7.8 ha (78% of land area)
Plot 2	33	16.4	12.5	660		
Plot 3	36	15.9	13	720		
Plot 4	37	17.1	12.5	740		
Average (total)	34.7 (139)	16.6	12.8	695		
Average in 2019 study		15.4	11			

DBH Classes	Range	No. of Trees	Avg. DBH	Avg. Height	Percentage of No. of trees %
0	10>	0	0	0	0
1	10,12	0	0.00	0	0
2	12,14	9	13.38	12.94	6.47
3	14,16	44	15.36	13.33	31.65
4	16,18	58	16.97	14.3	41.72
5	18,20	27	18.73	15.3	19.42
6	20,22	0	0.00	0	0
7	22,24	1	22.00	13.5	0.71
8	24<	0	0	0	0
		139			



3. Kumburuwela Teak plantation, Batticaloa, Sri Lanka

Extent of the land (plantation): 48 ha

Planting year and present age (Years): 2012 and 8 years old

Planting spacing : 4m x 4m (zigzag / spacing between two rows is 3.5m but 4 m between in two trees)



Part of site office in teak plantation.



Inventory team

Block 1

Best site (Block 1) can be used to compensate the shortage of trees or timber volume from other site some time without thinning.



Block 1



Block 2



Block 3



Block 4



Block 4- comparison of slow and fast growth trees in same Block

Block 5

Table 3.1. Tree inventory data collected from 500m² circular plot on 2020.1.05

Block and Plot no.		Trees in 500m ²	Mean DBH (cm)	Mean Height (m)	No. of trees in ha	Total trees in Block 1
Block 1	Plot 1	34	18.3	13.5	680	2230 trees found in 2019 study
	Plot 2	35	10.7	8.1	700	
Average (total)		34.5 (69)	14.5	10.8	690	
Average in 2019 study			11.4	9.1		

Table 3.2. Tree inventory data collected from 500m² circular plot on 2020.1.05

Block and Plot no.		Trees in 500m ²	Mean DBH (cm)	Mean Height (m)	No. of trees in ha	Total trees in Block 2
Block 2	Plot 1	33	11.6	7.8	660	4308 trees found in 2019 study
	Plot 2	33	9.9	6.8	660	
Average (total)		33 (66)	12	8.5	660	
Average in 2019 study			9.7	6.9		

Table 3.3. Tree inventory data collected from 500m² circular plot on 2020.1.05

Block no. and Plot no.		No. of trees in 500m ²	Mean DBH (cm)	Mean Height (m)	No. of trees in ha	Total trees in Block 3
Block 3	Plot 1	34	9.5	5.5	680	3982 trees found in 2019 study
	Plot 2	34	11.5	8.1	680	
	Plot 3	36	8.4	6	720	
Average (total)		34.7 (104)	9.8	6.5	693	
Average in 2019 study			8.7	6.4		

Table 3.4. Tree inventory data collected from 500m² circular plot on 2020.1.05

Block and Plot no.		No. of trees in 500m ²	Mean DBH	Mean Height (m)	No. of trees in ha	Total trees in Block 4
Block 4	Plot 1	36	13.2	7.5	720	(3282 trees found in 2019 study)
	Plot 2	35	11	7.1	700	
	Plot 3	35	7.2	4.7	700	
Average (total)		35.3 (106)	10.5	6.4	706	
Average in 2019 study			8.3	6.3		

Table 3.5. Tree inventory data collected from 500m² circular plot on 2020.1.05

Block and Plot no.		No. of trees in 500m ²	Mean DBH	Mean Height (m)	No. of trees in ha	Total trees in Block 5
Block 5	Plot 1	32	8.4	6.3	640	6343 trees found in 2019 study
	Plot 2	33	11.9	9.1	660	
	Plot 3	36	11.3	7.9	720	
	Plot 4	32	7.9	6.4	640	
Average (total)		33 (133)	9.9	7.4	665	
Average in 2019 study			6.0	7.2		

Table 3. Summary of Tree inventory data collected from Block 1,2,3,4, and 5 in Kumburuwela Teak Plantation situated in Batticaloa on 2020.1.05

Block no.	Trees in 500m ²	Mean DBH (cm)	Mean Height	No. of trees in ha	Total no. of trees found in Block by 2019 study .
Block 1	34.5	14.5	10.8	690	2230
Block 2	33	12	8.5	660	4308
Block 3	34.7	9.8	6.5	693	3982
Block 4	35.3	10.5	6.4	706	3282
Block 5	33	9.9	7.4	665	6343
Average	34.1	11.3	7.9	682.8	682.8 x 45ha = 30,726 trees expected
Average in 2019 study		9.06	6.94		

Range	No. of Trees	Avg. DBH	Avg. Height	% of number of trees
10>	211	7.99	5.71	45
10,12	116	10.97	7.65	25
12,14	65	13.02	8.96	14
14,16	32	15.03	9.42	7
16,18	22	16.85	7	5
18,20	25	18.80	13.5	5
20,22	2	20.15	0	
22,24	0	0.00	0	
	473			

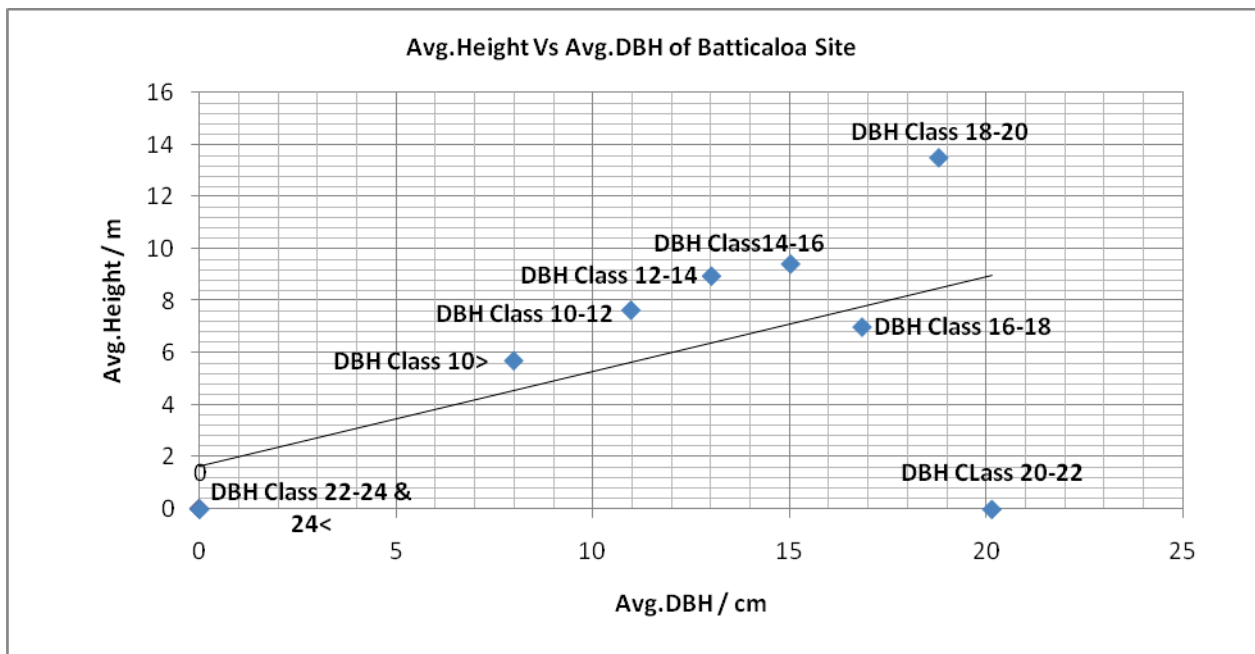
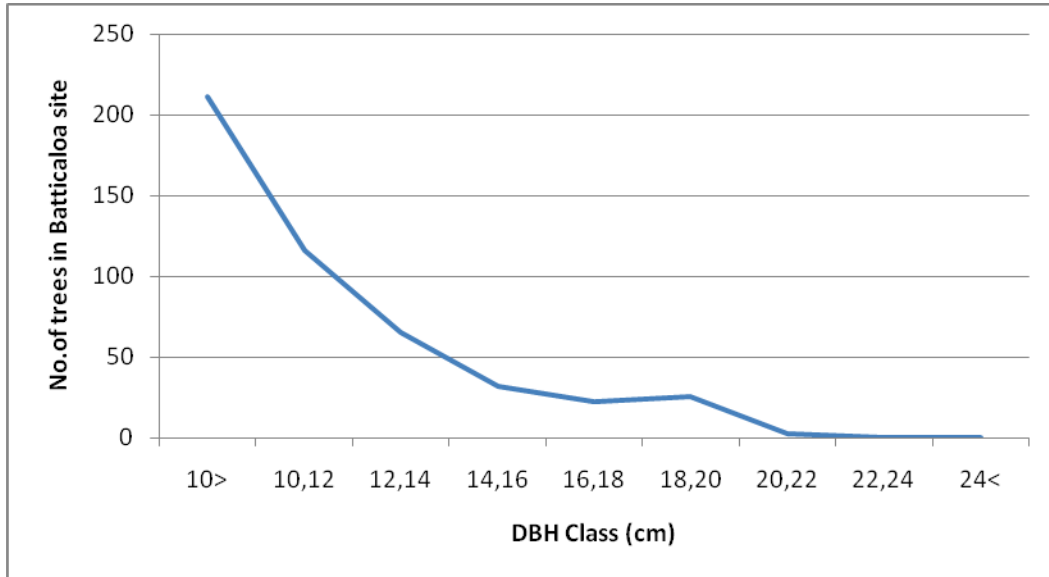
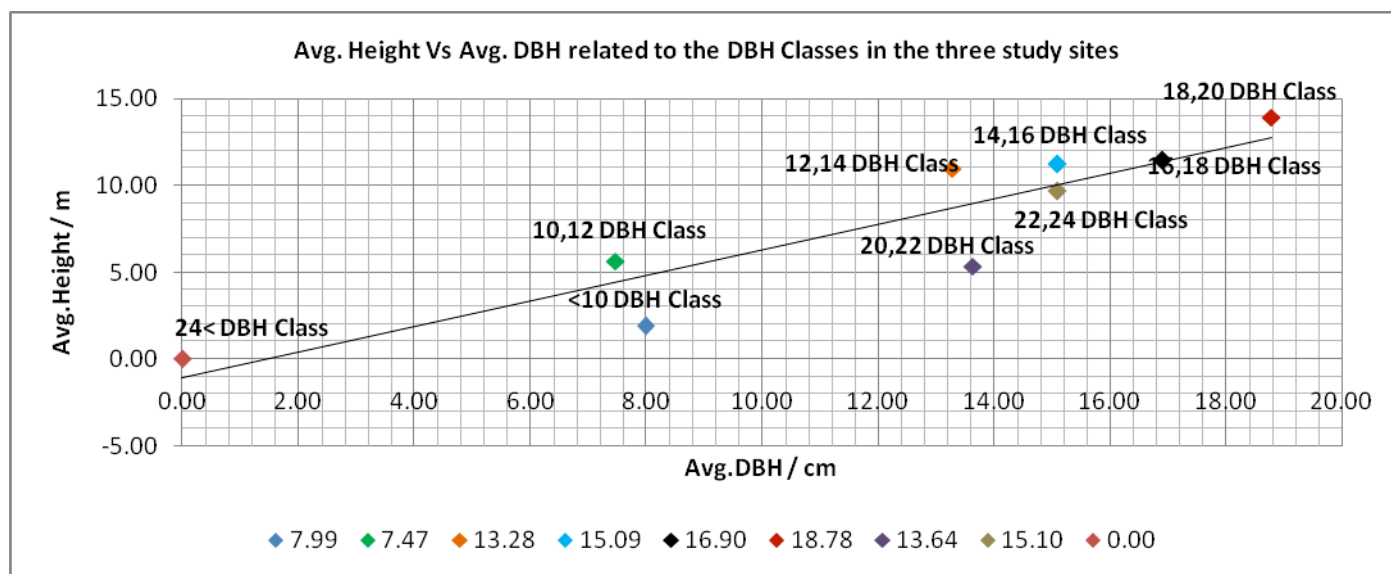


Table 4.summary of Tree inventory data collected from Anamaduwa, Puttalam and Batticaloa Teak Plantation on 2020.1.4-05

Plantation name	No.of trees in 500m ²	Mean DBH(cm)	Mean Height(m)	No.of trees in ha	Total no.of trees found in Block by 2019 study .	Estimated planted area (ha) based on 2019 audit
Anamaduwa	49	15.2	12.3	980	4036	4.1 ha (85% of land area)
Puttalam	34.7	16.6	12.8	695	5447	7.8 ha (78% of land area)
Batticolo	34.1	11.3	7.9	682.8	20145	29.5 ha (65% of land area) 20145 trees were found in 2019 study
Average of three states (total)		14.4	11			
Average of three states for 2019 study		11.22	11.6		Total =29628	



Main recommendations.

1. Some recommendations are given at appropriate places in this document where photos are shown with captions.
2. Targets and objectives for the management of these three plantations should be clearly defined in order to focus the silvicultural treatment for individual tree, blocks and each plantation because there are significant growth differences within the plantation or within the same block.
3. 85% of land area of Anamaduwa, 78% of land area in Puttalam and 65% of land area of Batticaloa occupy the tree cover. Therefore, for proper forest management it is recommended that the extent of land area with trees (excluding area where trees are not available) is demarcated and included into maps.
4. After clearly defining the major objectives for each plantation, such as felling age, tree volume, timber yield per ha, log size and number of stems per ha, the precise thinning regime can be designed and applied to achieve the set targets.
5. Analysis of the growth parameters found that 26% of trees have 14.8 cm diameter (DBH) range in Anamaduwa Plantation, 41% of trees have 16.9 cm diameter (DBH) range in Puttalam Plantation and 45% of trees have less than 10 cm (7.9 cm) diameter (DBH) range in Batticaloa Plantation. This clearly shows that the majority (70%) of Batticaloa trees are less than 12 cm of tree DBH. This plantation is 1-2 year younger than Anamaduwa and Batticaloa plantations however growth parameters given in this report must be studied further.
6. In land preparations where the debris was burned shows good tree growth contrasting the adjoining area, therefore soil treatment after soil testing will improve the tree growth. Fertilizing is the one option.
7. Regular site inspections and observations should be noted down in the field book by the workers (supervisors), which will be helpful to control termite damage and prevent other hazardous situations.
8. Removing of larger branches such as more than 7cm diameter by pruning should be done very carefully and try to limit such operations as much as possible.
9. Experimental trial for damaged trees (select trees that are expected to be removed by thinning) can be done using very low concentration of creosote to repel the termites.
10. A graph is prepared based on tree growth parameter such as height vs DBH for these three sites, which can be used for prediction of height when DBH is available.

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