



# **AsiaTeak Tropical Plantations**

## **Sri Lanka**

### **Annual Teak Tree Audit Report - 2018**

By



**Forest Works Holdings (Private) Limited**

**Agro Forestry Division**

**Sri Lanka.**

## Affirmation of Certifiers

Forest Works Holdings (Private) Limited; is always dedicated in accurate and precise auditing. This assignment is independently carried out by Forest Works Holdings (Private) Limited on the request of AsiaTeak Tropical Plantations Ltd.

The audit covers Teak plantations established by AsiaTeak Tropical Plantations Ltd., in three locations of Sri Lanka. All the plantations were inspected and evaluated under globally accepted methodologies explained in the report.

Herewith, we further substantiate that the inspected plantations are presently in reported conditions.



Eranda Priyankara Ratnamalala  
Director, Plantation Management  
Forest Works Holdings (Pvt) Ltd

Forest Works Holdings (Private) Limited  
No. 16/5, Power House Road,  
Polgahawela, Sri Lanka.

Tel: + 94 71 51 808 92/+94 3722 43471

Email: [erandapri@gmail.com](mailto:erandapri@gmail.com) / [info@fwh.lk](mailto:info@fwh.lk)

## Contents

1. INTRODUCTION .....	4
2. PRODUCTIVITY AND VOLUME ESTIMATES .....	4
3. ESTABLISHING SAMPLE PLOTS .....	4
3.1 DETERMINING THE NUMBER, SIZE AND SHAPE OF SAMPLE PLOTS.....	<b>Error!</b>
<b>Bookmark not defined.</b>	
3.2 SAMPLE PLOT ESTABLISHMENT IN ASIATEAK PLANTATIONS.....	5
4. DIMENSIONS TAKEN FROM SAMPLE PLOTS .....	5
4.1 TREE HEIGHT .....	5
4.2 TREE DIAMETER/GIRTH .....	5
5.1 CURRENT ANNUAL INCREMENT (CAI) AND MEAN ANNUAL INCREMENT (MAI)...	6
5.2 GROWTH PROJECTIONS OF ASIATEAK PLANTATIONS.....	6
5.4 GROWTH ANALYSIS OF EACH PLANTATION.....	7
5.4.1 PALUGAHAYAYA ESTATE - ANAMADUWA.....	7
5.4.2 GROWTH ANALYSIS OF SINNANAGAVILLU ESTATE-PUTTALAM .....	11
5.4.3 GROWTH ANALYSIS OF KUMBURUWELA ESTATE-BATTICALOA.....	14
6. DISCUSSION .....	24
7. REFERENCE.....	25

## List of Tables

Table 1: Tree Stock Comparison of 2016 with 2015.....	7
Table 2: Growth comparison of Palugahayaya estate.....	7
Table 3: Annual CAI and MAI Changes - Palugahayaya estate.....	9
Table 4: Tree growth comparison of Sinnanagavillu estate - Puttalam.....	11
Table 5: Annual CAI and MAI Changes - Sinnanagavillu estate.....	12
Table 6: Tree growth comparison of Kumburuwela Estate-Block number 01.....	14
Table 7: Annual MAI and CAI changes in Block number 01- Kumburuwela Estate.....	15
Table 8: Tree growth comparison of Kumburuwela Estate-Block number 02.....	17
Table 9: Tree growth comparison of Kumburuwela Estate-Block number 03.....	19
Table 10: Tree growth comparison of Kumburuwela Estate-Block number 04.....	19
Table 11: Tree growth comparison of Kumburuwela Estate-Block number 05.....	19

## List of Figures

Figure 1: Total Tree Height measuring by clinometer .....	<b>Error! Bookmark not defined.</b>
Figure 2: Diameter measurement at Anamaduwa plantation.....	<b>Error! Bookmark not defined.</b>
Figure 3: DBH achievement of Palugahayaya estate, Anamaduwa DBH Comparison with Projected growth level .....	8
Figure 4: Height achievement of Palugahayaya estate, Anamaduwa (Height Comparison with Projected growth level) .....	8
Figure 5: Mean annual increment of tree height at Palugahayaya estate .....	9
Figure 6: Mean annual increment of tree DBH at Palugahayaya estate .....	9
Figure 7: Current annual increment of tree Height in Palugahayaya estate .....	10
Figure 8: Current annual increment of tree DBH in Palugahayaya estate.....	10
Figure 9: Height achievement of Palugahayaya estate, Anamaduwa (Height Comparison with Projected growth level) .....	11
Figure 10: DBH achievement of Palugahayaya estate, Anamaduwa DBH Comparison with Projected growth level .....	12
Figure 11: Mean annual increment of tree height in Sinnanagavillu estate.....	12
Figure 12: Mean annual increment of tree DBH in Sinnanagavillu estate.....	13
Figure 13: Current annual increment of tree Height in Sinnanagavillu estate.....	13
Figure 14: Current annual increment of DBH in Sinnanagavillu estate.....	13
Figure 15: Height achievement of Block 01,Kumburuwela estate, Batticaloa (Height Comparison with Projected growth level).....	14
Figure 16: DBH achievement of Block 01,Kumburuwela estate, Batticaloa (DBH Comparison with Projected growth level).....	15
Figure 17: Mean Annual Increment of tree height in Block 01 in Kumburuwela estate.....	15
Figure 18: Mean Annual Increment of tree DBH in Block 01 in Kumburuwela estate.....	16
Figure 19: Current Annual Increment of tree height in Block 01 in Kumburuwela estate.....	16
Figure 20: Current Annual Increment of tree DBH in Block 01 in Kumburuwela estate.....	17
Figure 21: Height achievement of Block 02,Kumburuwela estate, Batticaloa (Height Comparison with Projected growth level).....	18
Figure 22: DBH achievement of Block 02,Kumburuwela estate, Batticaloa (DBH Comparison with Projected growth level).....	18
Figure 23: Mean Annual Increment of tree height in Block 02 in Kumburuwela estate .....	19
Figure 24: Mean Annual Increment of tree DBH in Block 02 in Kumburuwela estate .....	19
Figure 25: Current Annual Increment of tree height in Block 02 in Kumburuwela estate.....	20
Figure 26: Current Annual Increment of tree DBH in Block 01 in Kumburuwela estate.....	20
Figure 27: Height achievement of Block 03,Kumburuwela estate, Batticaloa (Height Comparison with Projected growth level) .....	21
Figure 28: DBH achievement of Block 03,Kumburuwela estate, Batticaloa (DBH Comparison with Projected growth level).....	21
Figure 29: Height achievement of Block 04,Kumburuwela estate, Batticaloa (Height Comparison with Projected growth level).....	22
Figure 30: DBH achievement of Block 04,Kumburuwela estate, Batticaloa (DBH Comparison with Projected growth level).....	22

## **1. INTRODUCTION.**

This report are presented with the analyzed Teak data of sample plots and with the annual tree stock of company plantations in Sri Lanka. There are main three plantations in Sri Lanka under the ownership of the Vision Forestry Company (PVT) LTD,. Forest Works Holdings are conducted the annual tree audit and evaluation for the Vision Forestry Company Ltd. as a independent tree auditor.

Forest Works Holdings (pvt) Ltd. is a registered forestry consultancy company in Sri Lanka. And it has strong capacity to conduct consultation operations in the field of forestry sector. Many experts on the field of Agro-forestry and the field of Carbon evaluation and carbon conscious are working with Forest Works Holdings (Pvt) Ltd. to enrich the company technical aspects according to the globally accepted methodologies.

## **2. PRODUCTIVITY AND VOLUME ESTIMATES**

The productivity of Teak plantations has been studied across a broad range of countries through permanent sample plots. The earliest yield table for teak was constructed by von Wulfing (1932) for plantations on Java, Indonesia. Laurie and Ram (1939) constructed a yield table for Teak plantations distributed over present-day India, Myanmar and Bangladesh. More recently, yield tables have been developed using data from permanent and temporary sample plots for plantations of teak established outside its natural range, including provisional yield tables for Trinidad and Tobago (Miller, 1969), Côte d'Ivoire (Maitre, 1983), Nigeria (Abayomi, 1984) and Sri Lanka (Phillips, 1995).

Timber corporation in Sri Lanka has developed yield tables for *Tectona grandis* (Teak) and some other timber trees in Sri Lanka. Yield tables have developed by considering the factors which effects to the growth of the timber trees that grown under the Sri Lankan conditions.

## **3. ESTABLISHING SAMPLE PLOTS**

It is not viable to conduct a total tree evaluation of all Teak plantations in Sri Lanka annually due to high cost of auditing. By carefully measuring trees within a representative sample of the area it is possible to greatly reduce the time and costs of measuring without losing accuracy. When measuring to assess the volume per hectare, sampling usually involves establishing a number of 'plots' within the forest. Only those trees located within the plots are measured.



### **3.2 SAMPLE PLOT ESTABLISHMENT IN ASIATEAK PLANTATIONS**

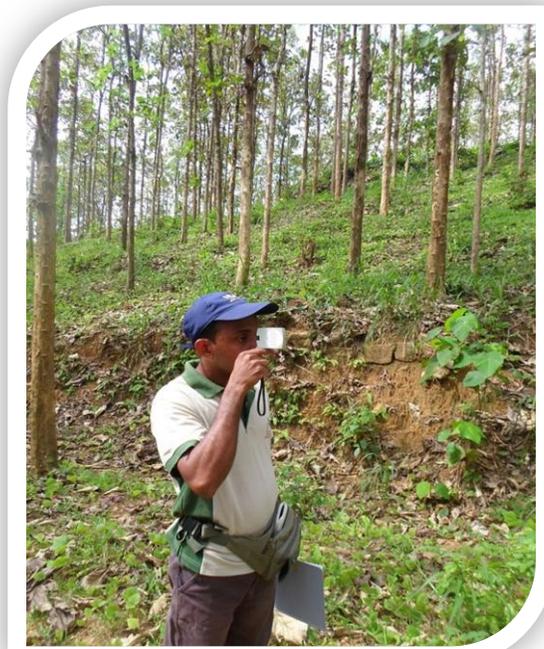
Three plantations are managed by AsiaTeak Plantations in Puttalam and Batticaloa region in Sri Lanka. There are 25 acres land in Puttalam named as Sinnanagavillu estate and 12 acres land in Anamaduwa named as Palugahayaya estate. Other Teak plantation is 120 acres land in Batticaloa named as Kumburuwela estate.

Sample plots have established in all plantations for measuring tree growth rates and volume increments to evaluate the real situation of the plantations for decision making purpose of the management.

## **4. DIMENSIONS TAKEN FROM SAMPLE PLOTS**

### **4.1 TREE HEIGHT**

Tree height is measured by bottom to top of the tree canopy by using a measuring pole that calibrated by standard measuring tapes. Tree height should be recorded to nearest 0.5 m scale.



*Figure 01, Measuring Tree Height by using Clinometers*

### **4.2 TREE DIAMETER/GIRTH**

Tree diameter is the important parameter to evaluate the growth rate of Teak plants. Measuring Diameter at breast height is the standard way to measure the diameter.

Diameter at breast height (DBH) were measured in all sample plots in all plantations. According to the standard way to measure the tree diameter it should be taken at the 1.3 m above from the ground level.



*Figure 02, Measuring Diameter at Vision Forestry Plantation Anamaduwa, Sri Lanka*

## **5. DATA ANALYSIS**

### **5.1 CURRENT ANNUAL INCREMENT (CAI) AND MEAN ANNUAL INCREMENT (MAI)**

CAI and MAI gives us important information about the growth behaviors of plantation. According to this evaluation management plan can be tailor made to achieve the growth targets in each year for

CAI Calculation can be done by reducing the last year average growth by this year average growth. It is the growth performance of current year with the effect of climate conditions, impact of agricultural practices.

MAI is the mean of the growth from first year of the plantation up to now. MAI can be calculated by dividing the current growth by age of trees.

### **5.2 GROWTH PROJECTIONS OF ASIATEAK PLANTATIONS**

Tissue cultured Teak stumps are cultivated by the AsiaTeak plantations for obtaining the best growth rate in the Teak plantations with comparing other general Teak plantations in the world. According to the Thai Orchid Lab company Pvt. Ltd. the proven records are

shown that Tissue cultured Teak plants are growing well with short rotation period to achieve the sufficient timber volume in managed Teak plantations.

### 5.3 TREE STOCK OF ASIATEAK PLANTATIONS IN SRI LANKA IN 2018

Estate	2017				2018					
	No of good trees	No of Small/poor trees	No of total trees	Difference 2016 VS 2017	No of good trees	No of Small/poor trees	No. of Reserved trees	No. of trees for thinning	No of total trees	Difference 2017 VS 2018
Palugahayaya	4411	51	4462	-52	3914	-	110	240	4264	-198
Sinnanagavillu	5514	38	5552	-35	5033	262	193	-	5488	-64
Kumburuwela Block - 01	2039	253	2292	-88	1733	297	241	34	2305	13
Kumburuwela Block - 02	3252	862	4114	-99	3076	1083	-	-	4159	45
Kumburuwela Block - 03	3564	605	4169	-186	2604	1368	-	-	3972	-197
Kumburuwela Block - 04	2693	547	3240	-82	1977	1185	-	-	3162	-78
Kumburuwela Block - 05	3927	2134	6061	-699	3212	3108	-	-	6320	259
Total Kumburuwela	15475	4401	19876	-1154	12602	7041	241	34	19918	42
<b>Grand Total</b>	<b>25,400</b>	<b>4,490</b>	<b>29,890</b>	<b>(1,241)</b>	<b>21,549</b>	<b>7,413</b>	<b>434</b>	<b>274</b>	<b>29,670</b>	<b>(220)</b>

Table 1: Tree Stock Comparison of 2018 with 2017

- ❖ Trees that shown some abnormal negative growth when comparing with the average growth level in the age are categorized as small/poor trees. It has represented some poor grown and replanted trees in the Batticaloa estate as small/poor trees. Trees in Sinnanagavillu estate and Kumburuwela has retained as reserved trees to compensate any damaged trees of client's trees

### 5.4 GROWTH ANALYSIS OF EACH PLANTATION

#### 5.4.1 PALUGAHAYAYA ESTATE - ANAMADUWA

Year	Tree Height (m)						Tree DBH (cm)					
	2013	2014	2015	2016	2017	2018	2013	2014	2015	2016	2017	2018
Plot 01	5.5	6.2	6.8	8.7	10.1	10.5	6.1	7.5	9.0	10.2	11.7	11.8
Plot 02	5.5	6.3	6.7	9.0	9.7	10.0	6.1	7.5	9.3	10.2	10.9	11.3
Plot 03	5.9	6.9	7.4	11.2	11.7	12.0	6.6	8.0	9.8	11.1	12.0	12.2
Plot 04	7.0	9.1	8.9	12.3	13.8	14.5	7.6	9.7	12.0	13.1	13.7	14.1
<b>Average</b>	<b>6.0</b>	<b>7.1</b>	<b>7.5</b>	<b>10.3</b>	<b>11.3</b>	<b>11.8</b>	<b>6.6</b>	<b>8.2</b>	<b>10.0</b>	<b>11.2</b>	<b>12.1</b>	<b>12.4</b>

Table 2: Growth comparison of Palugahayaya estate

**Total Average timber volume = 269.6 m<sup>3</sup>**

## DBH Analysis of Palugahayaya estate-Anamaduwa

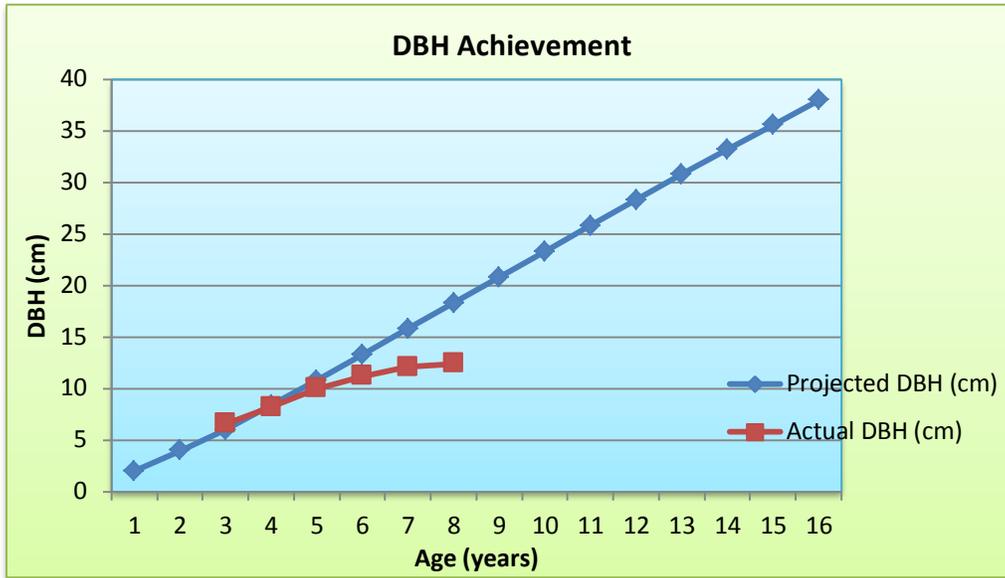


Figure 1: DBH achievement of Palugahayaya estate, Anamaduwa DBH Comparison with Projected growth level

## Height Analysis of Palugahayaya estate-Anamaduwa

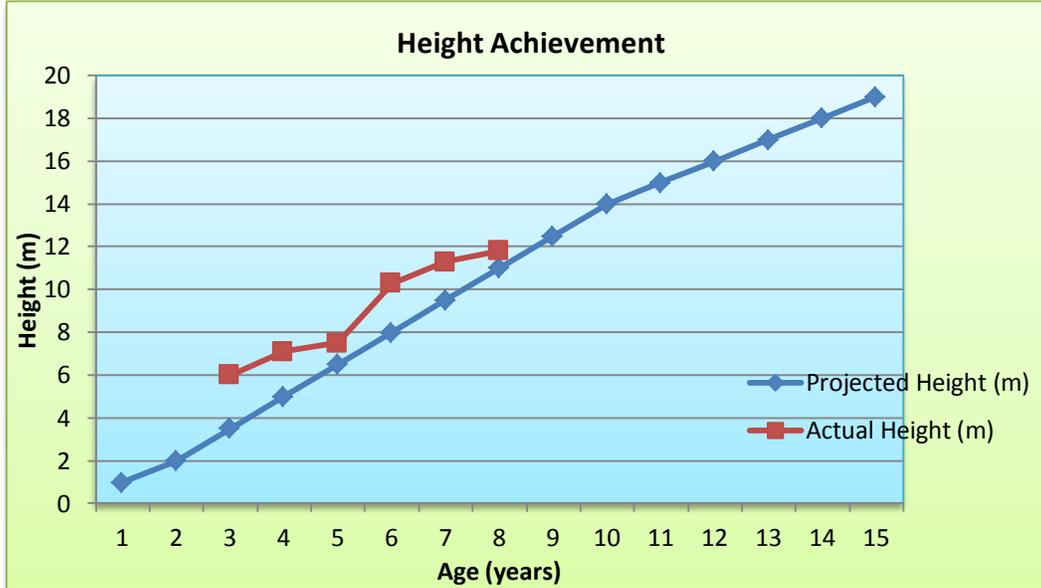


Figure 2: Height achievement of Palugahayaya estate, Anamaduwa (Height Comparison with Projected growth level)

## MAI & CAI Analysis

Year	Tree Ht (m)						Tree DBH (cm)					
	Year 2013	Year 2014	Year 2015	Year 2016	Year 2017	Year 2018	Year 2013	Year 2014	Year 2015	Year 2016	Year 2017	Year 2018
MAI	2.0	1.8	1.5	1.7	1.6	1.7	2.2	2.0	2.0	1.9	1.7	1.8
CAI	-	1.1	0.3	2.9	1.0	0.4	-	1.6	1.9	1.1	0.9	0.3

Table 3: Annual CAI and MAI Changes - Palugahayaya estate

### Mean Annual Increment (MAI)

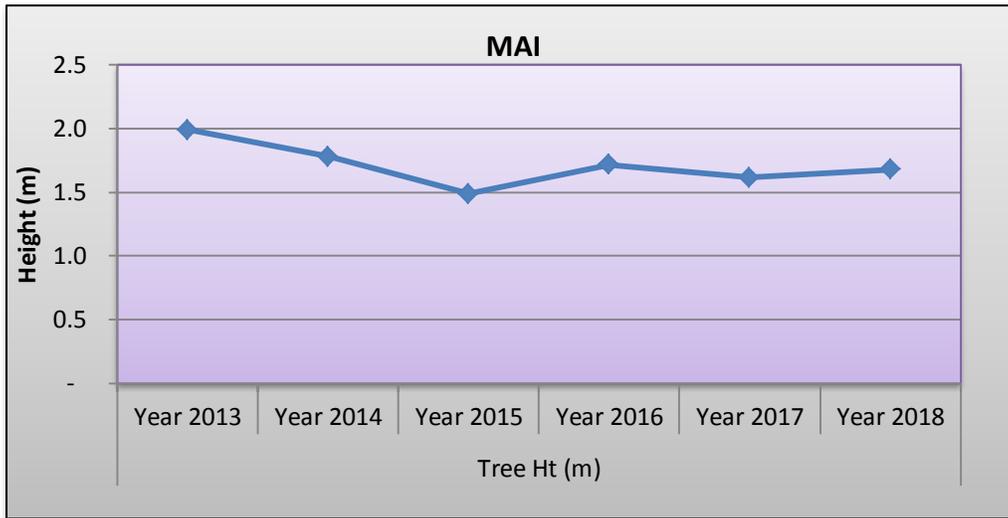


Figure 3: Mean annual increment of tree height at Palugahayaya estate

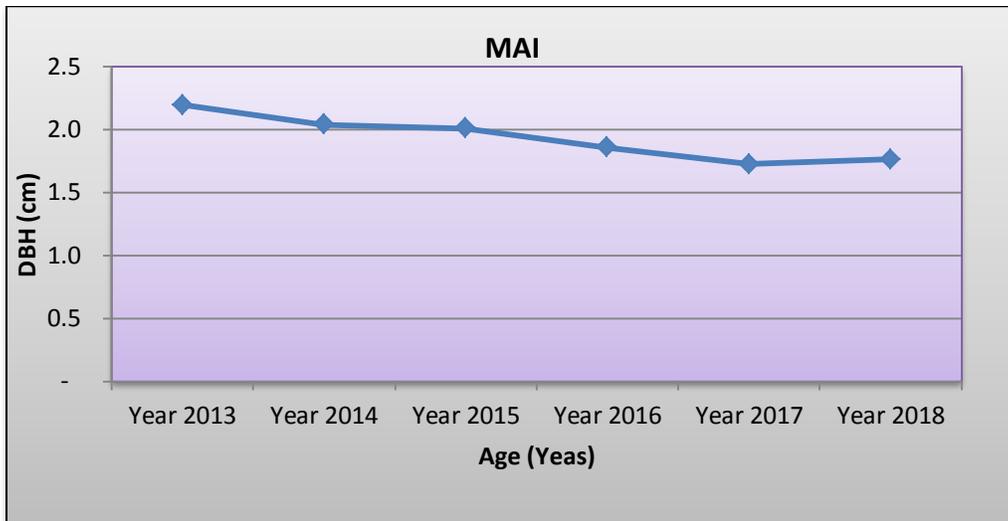


Figure 4: Mean annual increment of tree DBH at Palugahayaya estate

### Current Annual Increment (CAI)

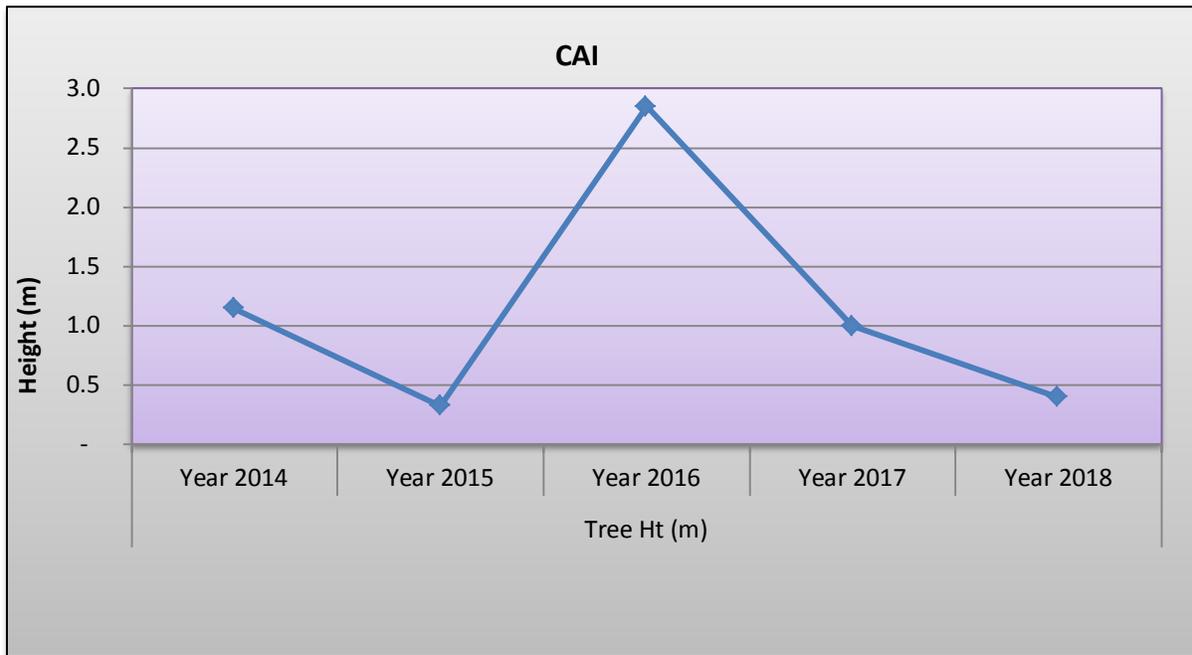


Figure 5: Current annual increment of tree Height in Palugahayaya estate

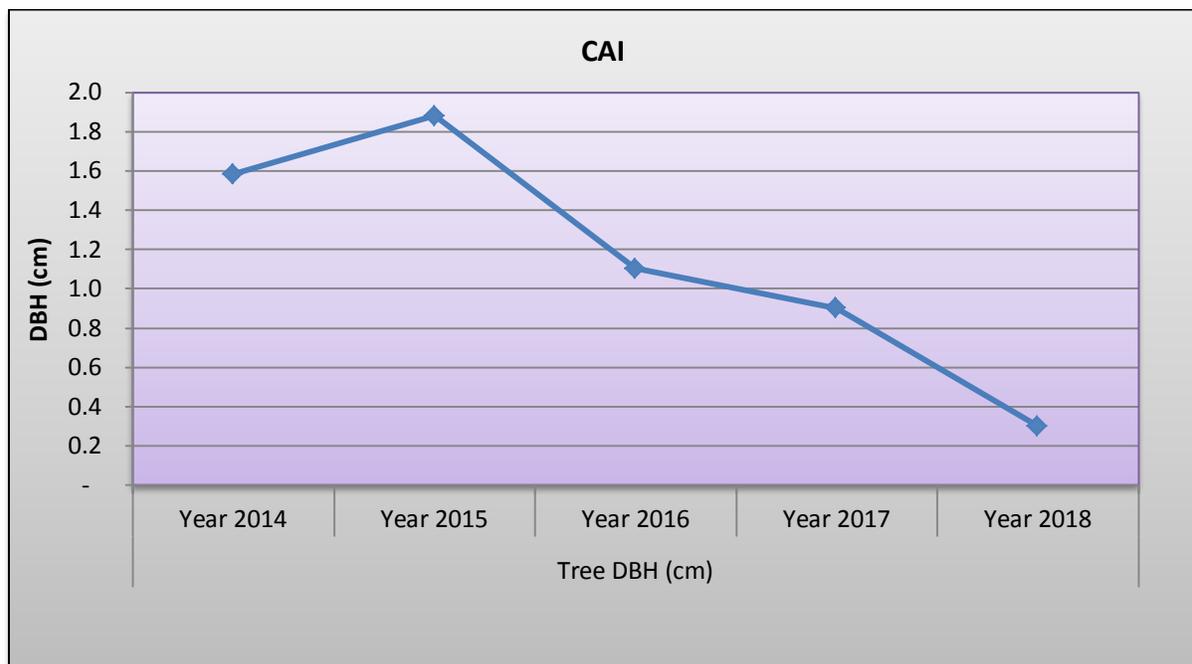


Figure 6: Current annual increment of tree DBH in Palugahayaya estate

#### 5.4.2 GROWTH ANALYSIS OF SINNANAGAVILLU ESTATE-PUTTALAM

Year	Tree Ht (m)					Tree DBH (cm)				
	2014	2015	2016	2017	2018	2014	2015	2016	2017	2018
Plot No. 01	4.7	5.3	7.6	8.5	9.9	5.3	7.1	9.6	11.3	12.5
Plot No. 02	5.7	6.2	7.4	8	8.7	4.1	8.9	10.5	12	12.6
Plot No. 03	5.1	6.1	8.1	9.2	10.6	4.4	7.5	10	11.9	12.5
Plot No. 04	5.4	6.4	8.2	9.3	10.7	4.1	8.7	10.9	12.8	13.5
Plot No. 05	4.8	6.4	8.7	10	11.9	3.9	8.4	11.4	13.3	13.6
<b>Average</b>	<b>5.1</b>	<b>6.1</b>	<b>8.0</b>	<b>9.0</b>	<b>10.4</b>	<b>4.4</b>	<b>8.1</b>	<b>10.5</b>	<b>12.3</b>	<b>12.9</b>

Table 4: Tree growth comparison of Sinnanagavillu estate - Puttalam

**Total Average timber volume = 373.2 m<sup>3</sup>**

#### Height Analysis of Sinnanagavillu estate - Puttalam

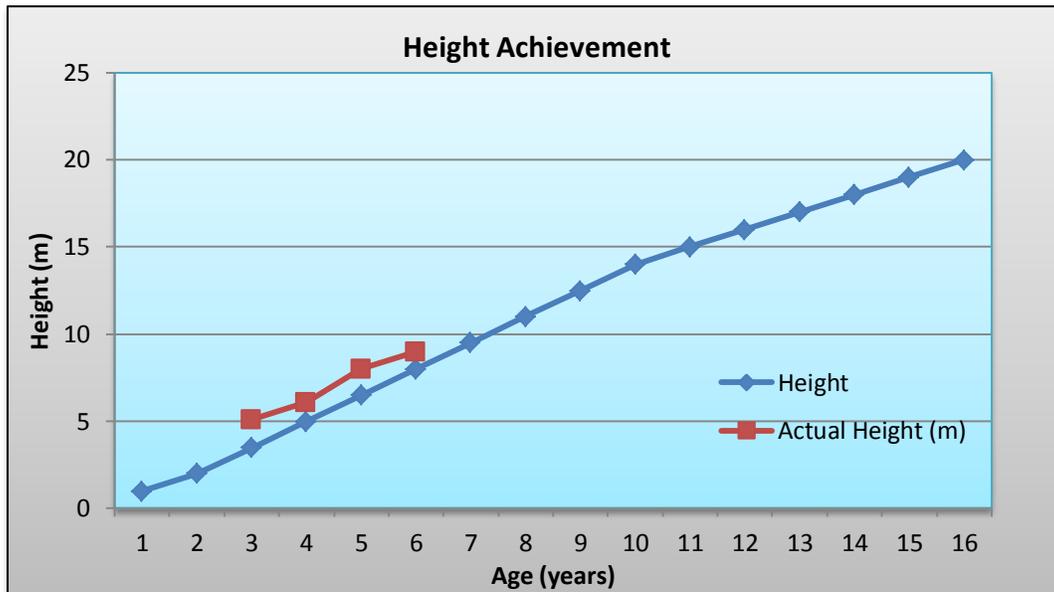


Figure 7: Height achievement of Palugahayaya estate, Anamaduwa (Height Comparison with Projected growth level)

## DBH Analysis of Sinnanagavillu estate - Puttalam

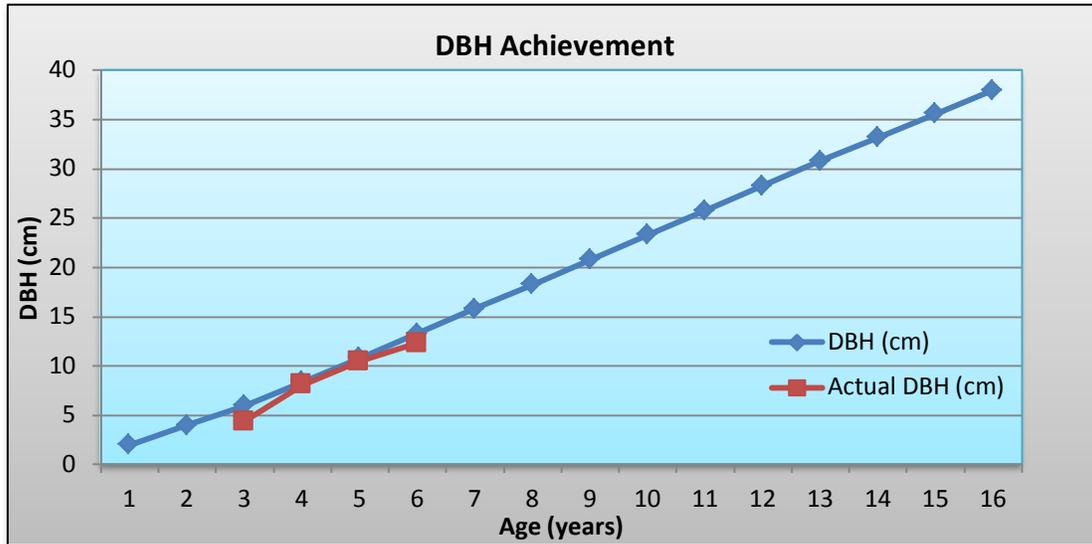


Figure 8: DBH achievement of Palugahayaya estate, Anamaduwa DBH Comparison with Projected growth level

## MAI & CAI Analysis

Year	Tree Ht (m)					Tree DBH (cm)				
	year 2014	Year 2015	Year 2016	Year 2017	Year 2018	year 2014	Year 2015	Year 2016	Year 2017	Year 2018
MAI	1.7	1.5	1.6	1.5	1.7	1.5	2.0	2.1	2.0	2.2
CAI	-	0.9	1.9	1.0	1.4	-	3.8	2.4	1.8	0.7

Table 5: Annual CAI and MAI Changes - Sinnanagavillu estate

## Mean Annual Increment (MAI)

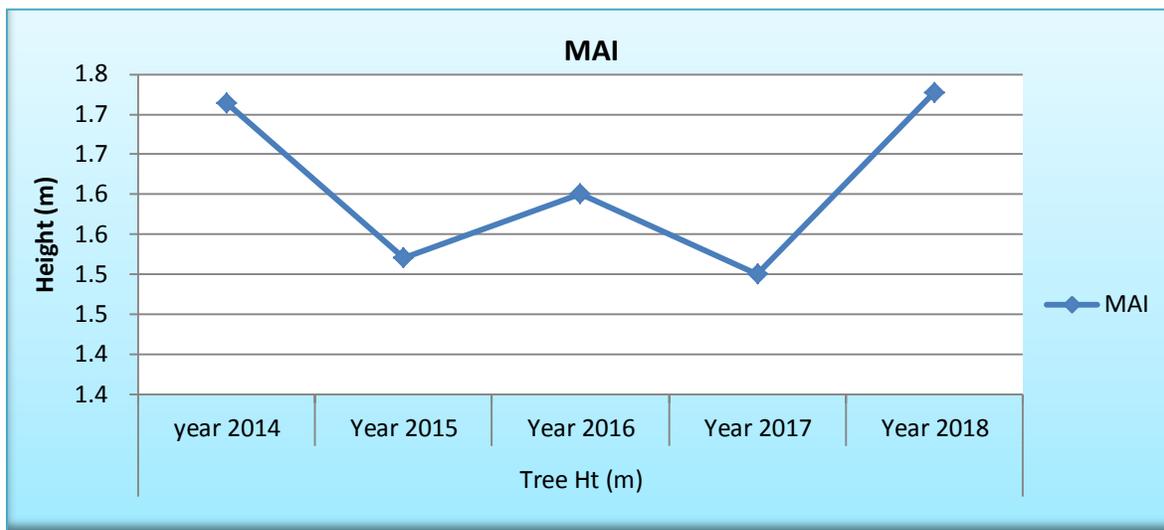


Figure 9: Mean annual increment of tree height in Sinnanagavillu estate

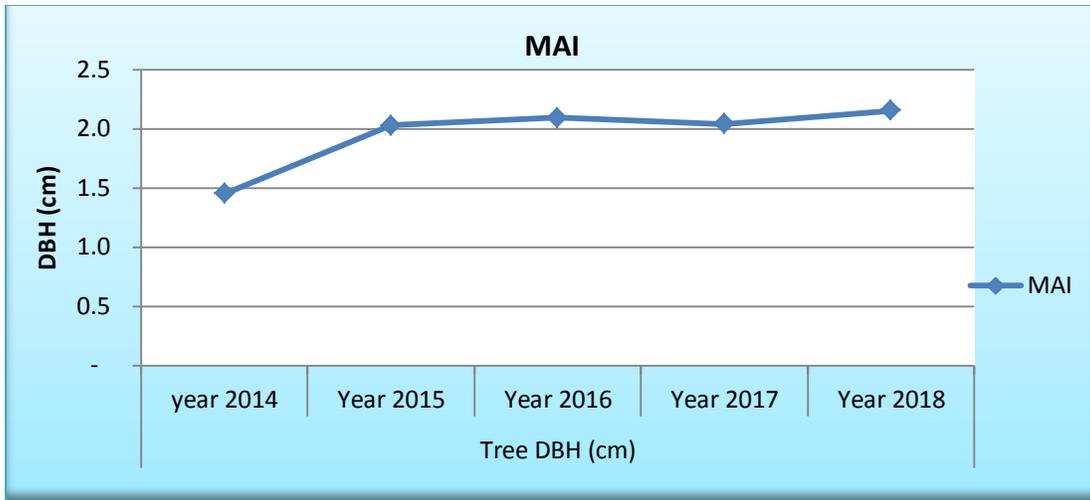


Figure 10: Mean annual increment of tree DBH in Sinnanagavillu estate

### Current Annual Increment (CAI)

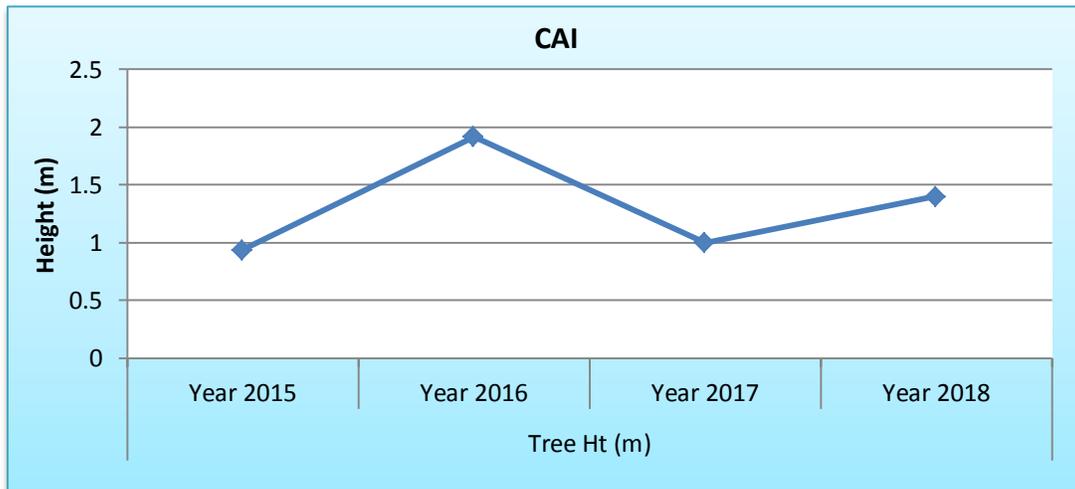


Figure 13: Current annual increment of tree Height in Sinnanagavillu estate.

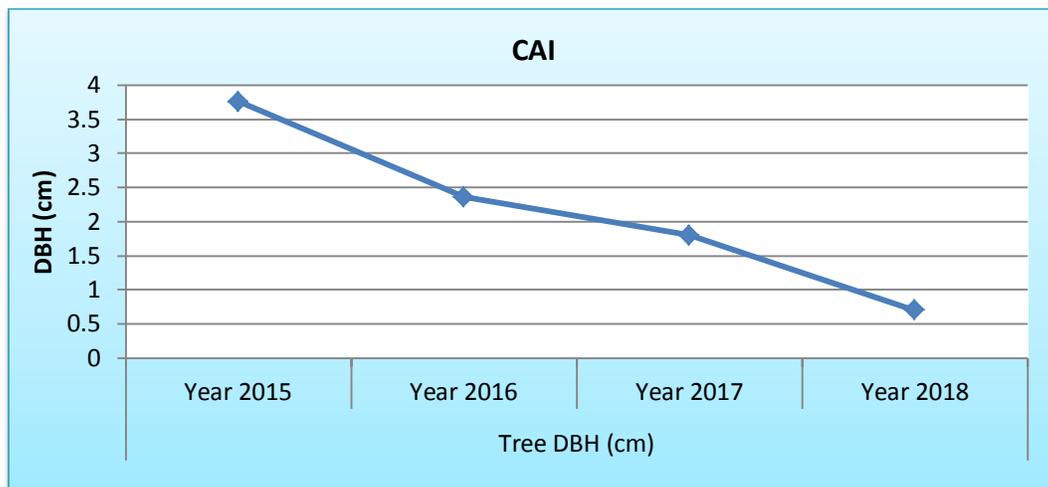


Figure 14: Current annual increment of DBH in Sinnanagavillu estate.

### 5.4.3 GROWTH ANALYSIS OF KUMBURUWELA ESTATE-BATTICALOA

#### Block Number 01

Year	Tree Ht (m)					Tree DBH (cm)				
	2015	2016	2017	2018	Variance	2015	2016	2017	2018	Variance
Plot No. 01	8.3	9.3	10.1	14.0	3.9	10.6	13.0	14.7	16.4	1.7
Plot No. 02	3.3	4.1	4.6	5.0	0.4	4.2	5.4	5.9	7.0	1.1
Plot No. 03	3.5	4.5	5.1	5.6	0.5	4.3	6.0	6.6	8.5	1.9
<b>Average</b>	<b>5.0</b>	<b>6.0</b>	<b>6.6</b>	<b>8.2</b>	1.6	<b>6.3</b>	<b>8.1</b>	<b>9.0</b>	<b>10.6</b>	1.6

Table 6: Tree growth comparison 2017 with 2018 of Kumburuwela Estate-Block number 01

**Total Average timber volume = 94.5 m<sup>3</sup>**

#### Height Analysis of Block 01, Kumburuwela estate - Batticaloa

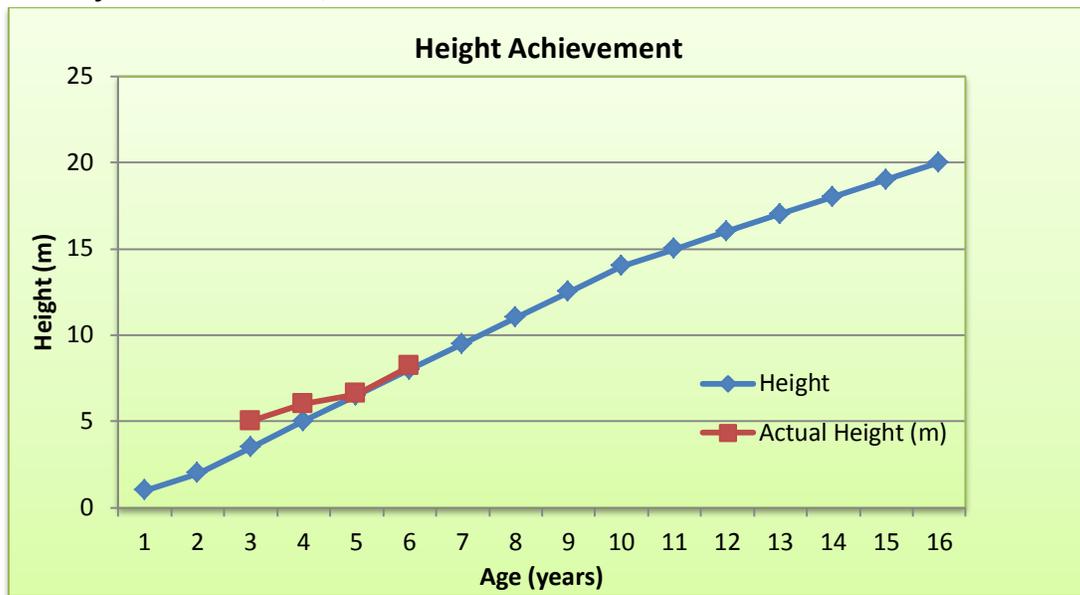


Figure 15: Height achievement of Block 01, Kumburuwela estate, Batticaloa (Height Comparison with Projected growth level)

### DBH Analysis of Block 01, Kumburuwela estate - Batticaloa

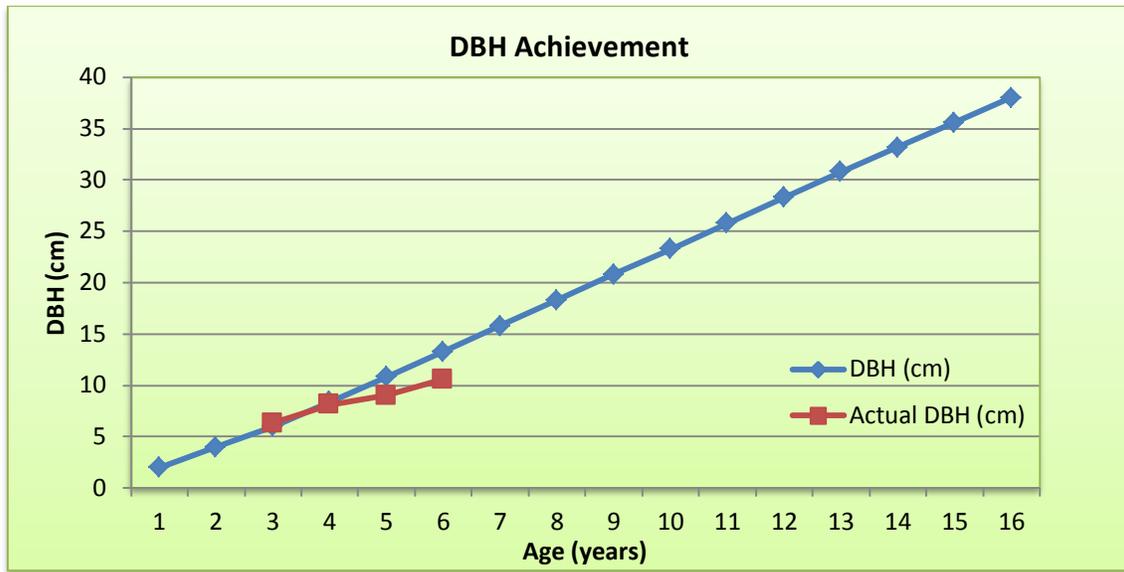


Figure 16: DBH achievement of Block 01, Kumburuwela estate, Batticaloa (DBH Comparison with Projected growth level)

### MAI & CAI Analysis

Year	Tree Ht (m)				Tree DBH (cm)			
	Year 2015	Year 2016	Year 2017	Year 2018	Year 2015	Year 2016	Year 2017	Year 2018
MAI	1.7	1.5	1.3	1.4	2.1	2.0	1.8	1.8
CAI	-	0.9	0.7	1.6	-	1.8	0.9	1.6

Table 7: Annual MAI and CAI changes in Block number 01- Kumburuwela Estate.

### Mean Annual Increment (MAI) Analysis

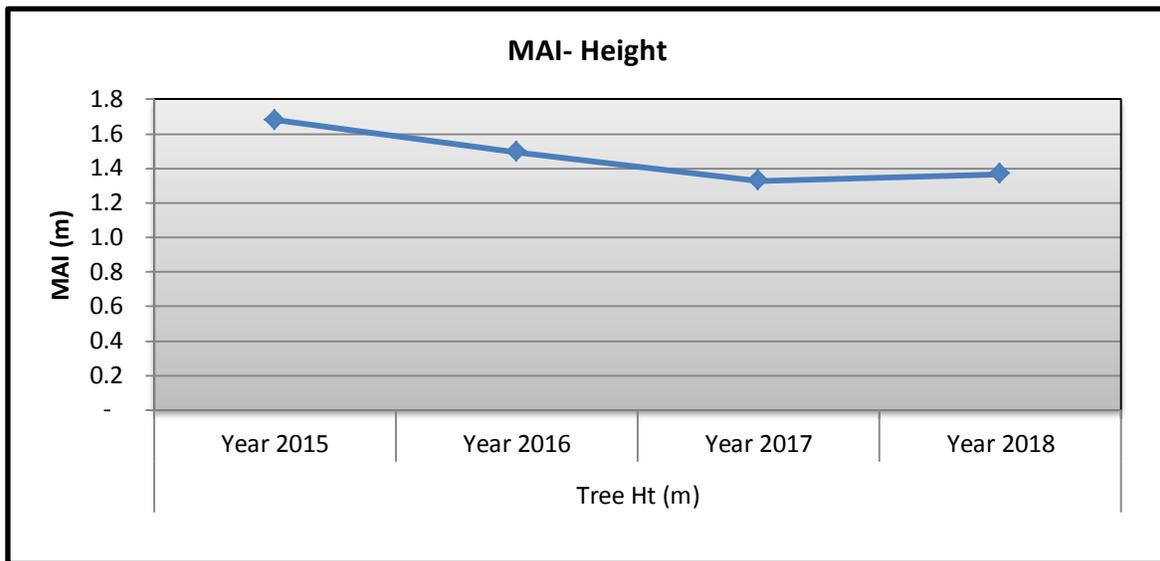


Figure 17: Mean Annual Increment of tree height in Block 01 in Kumburuwela estate

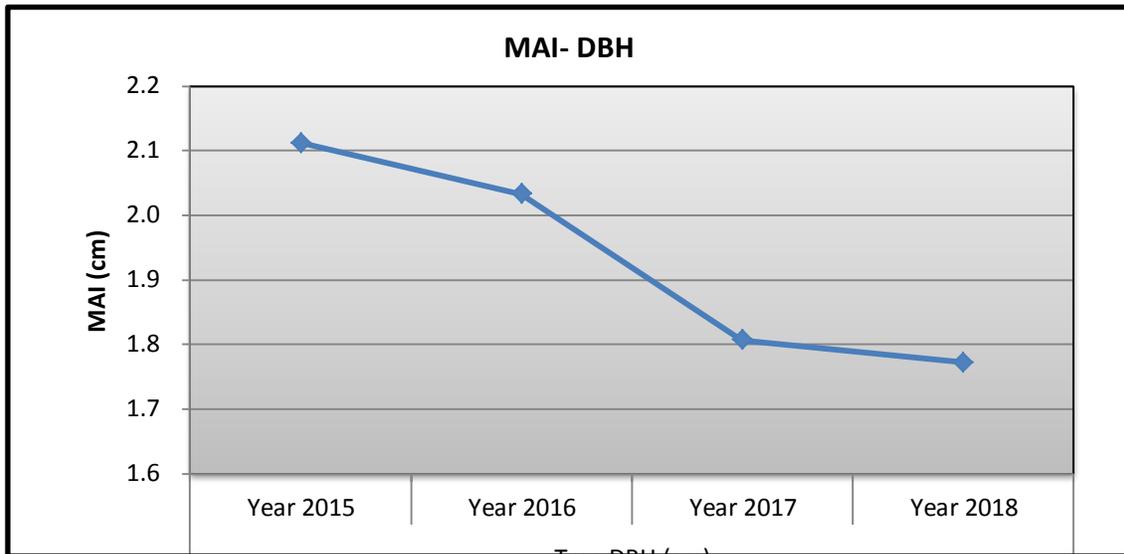


Figure 18: Mean Annual Increment of tree DBH in Block 01 in Kumburuwela estate.

### Current Annual Increment (CAI) Analysis

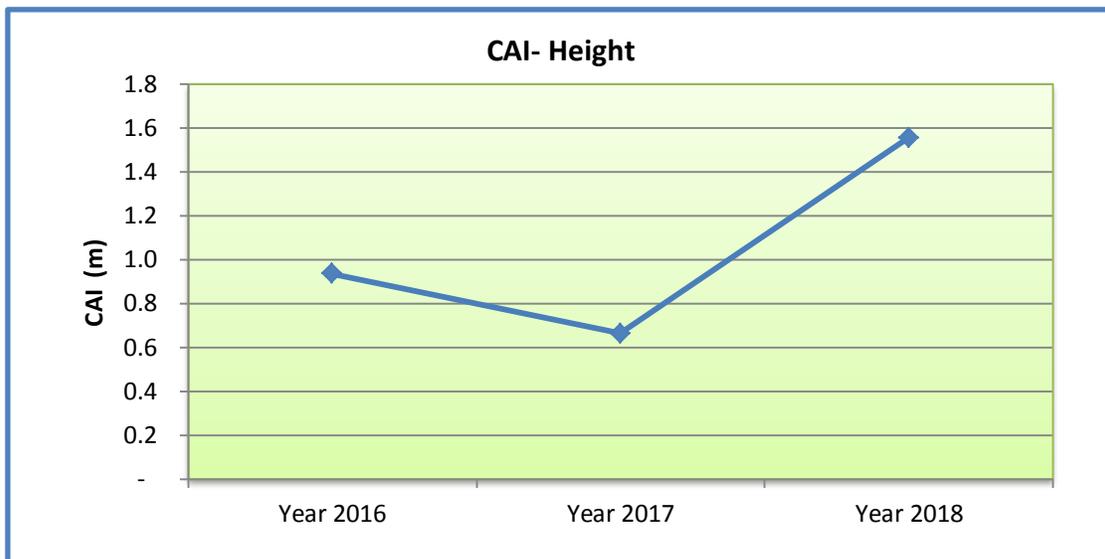


Figure 19: Current Annual Increment of tree height in Block 01 in Kumburuwela estate.

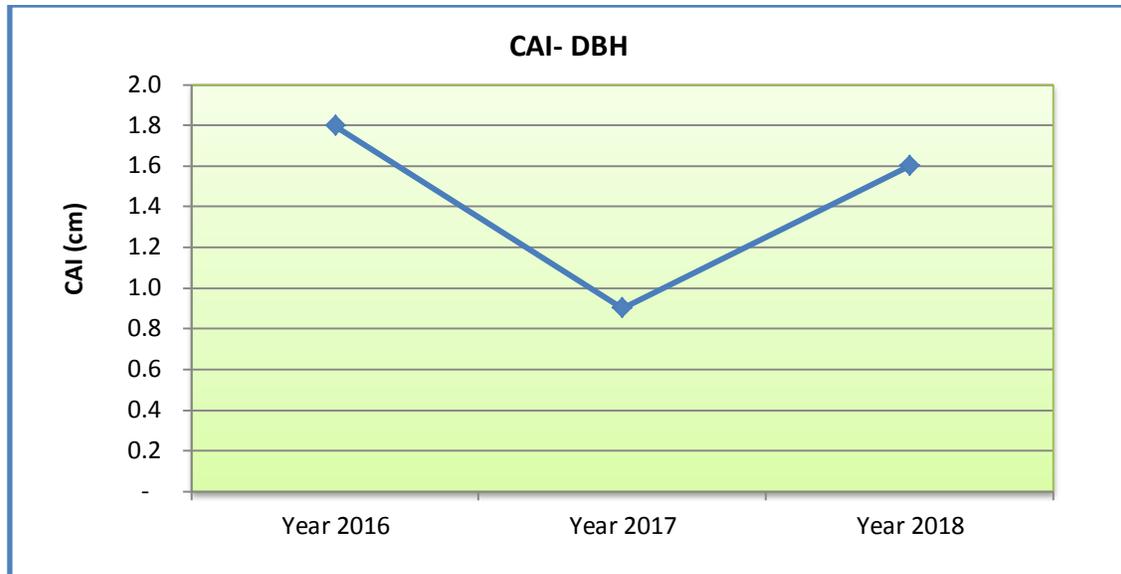


Figure 20: Current Annual Increment of tree DBH in Block 01 in Kumburuwela estate.

### Block Number 02

Year	Tree Ht (m)					Tree DBH (cm)				
	2015	2016	2017	2018	Variance	2015	2016	2017	2018	Variance
Plot No. 01	2.1	3.9	4.6	5.3	0.7	2.5	5.3	6.3	9.5	3.2
Plot No. 02	3.0	5.6	6.4	7.7	1.3	3.6	6.5	7.8	8.8	1.0
Plot No. 03	1.8	2.6	3.2	5.3	2.1	1.9	3.2	4.1	6.8	2.7
Plot No. 04	3.7	3.0	3.6	4.6	1.0	3.7	3.0	3.6	6.9	3.3
<b>Average</b>	<b>2.3</b>	<b>4.0</b>	<b>4.7</b>	<b>6.1</b>	<b>1.4</b>	<b>2.7</b>	<b>5.0</b>	<b>6.1</b>	<b>8.4</b>	<b>2.3</b>
<b>MAI</b>	<b>0.8</b>	<b>1.0</b>	<b>0.9</b>	<b>1.2</b>	<b>0.3</b>	<b>0.9</b>	<b>1.3</b>	<b>1.2</b>	<b>1.7</b>	<b>0.5</b>
<b>CAI</b>		<b>1.7</b>	<b>0.7</b>	<b>1.4</b>	<b>0.6</b>		<b>2.4</b>	<b>1.0</b>	<b>2.3</b>	<b>1.3</b>

Table 8: Tree growth comparison of Kumburuwela Estate-Block number 02

**Total Average timber volume = 74.9 m<sup>3</sup>**

### Height Analysis of Block 02, Kumburuwela estate - Batticaloa

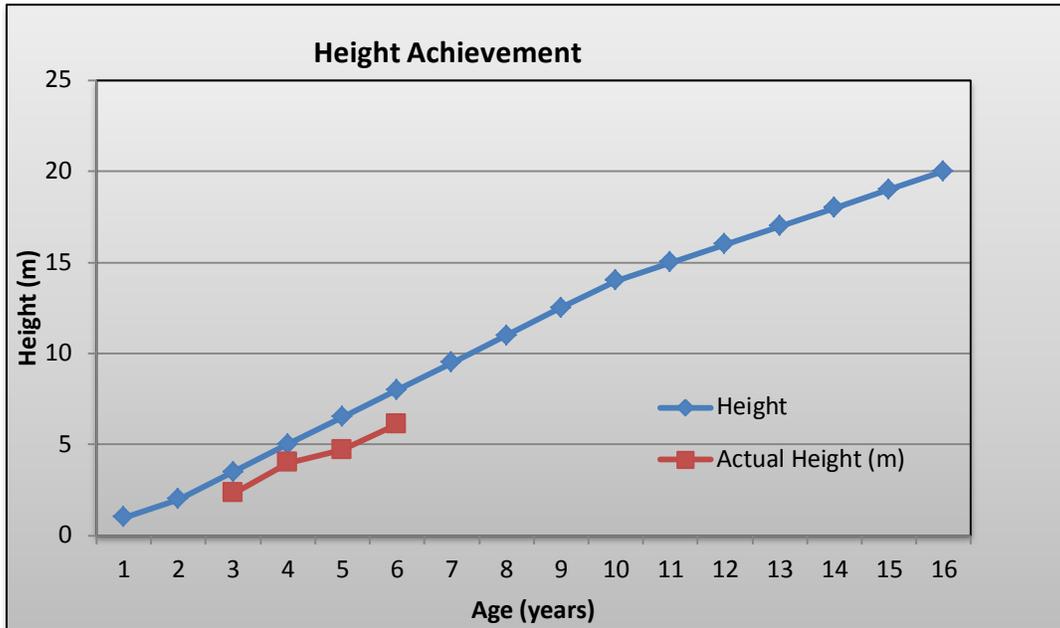


Figure 21: Height achievement of Block 02, Kumburuwela estate, Batticaloa (Height Comparison with Projected growth level)

### DBH Analysis of Block 02, Kumburuwela estate - Batticaloa

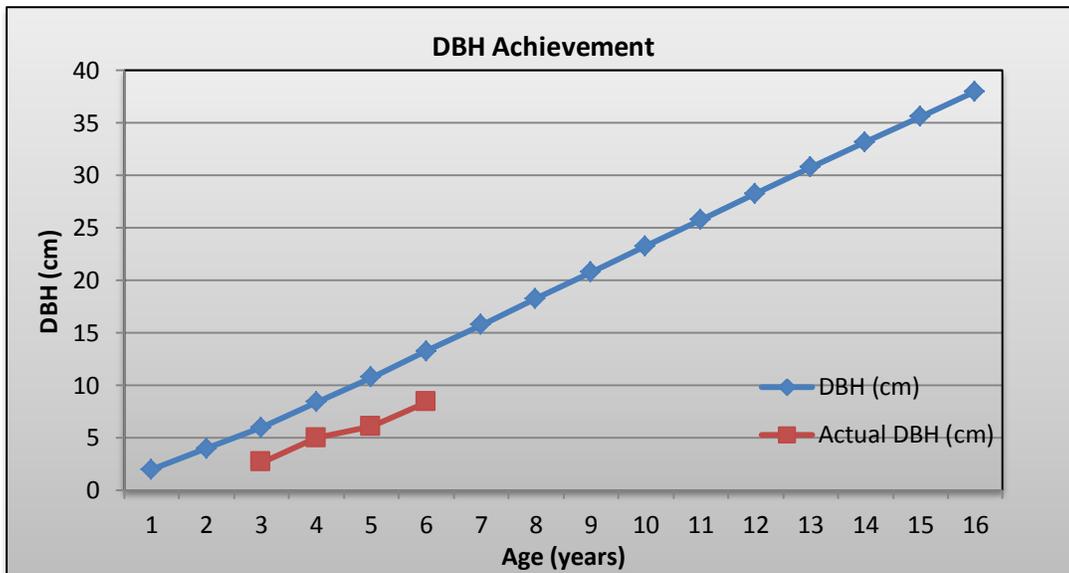


Figure 22: DBH achievement of Block 02, Kumburuwela estate, Batticaloa (DBH Comparison with Projected growth level)

### MAI & CAI Analysis

Year	Tree Ht (m)	Tree DBH (cm)
------	-------------	---------------

	2015	2016	2017	2018	2015	2016	2017	2018
<b>Average</b>	2.3	4.0	4.7	6.1	2.7	5.0	6.1	8.4
<b>MAI</b>	0.8	1.0	0.9	1.2	0.9	1.3	1.2	1.7
<b>CAI</b>	-	1.7	0.7	1.4	-	2.4	1.0	2.3

Table 7: Annual MAI and CAI changes in Block number 02- Kumburuwela Estate.

### Mean Annual Increment (MAI) Analysis

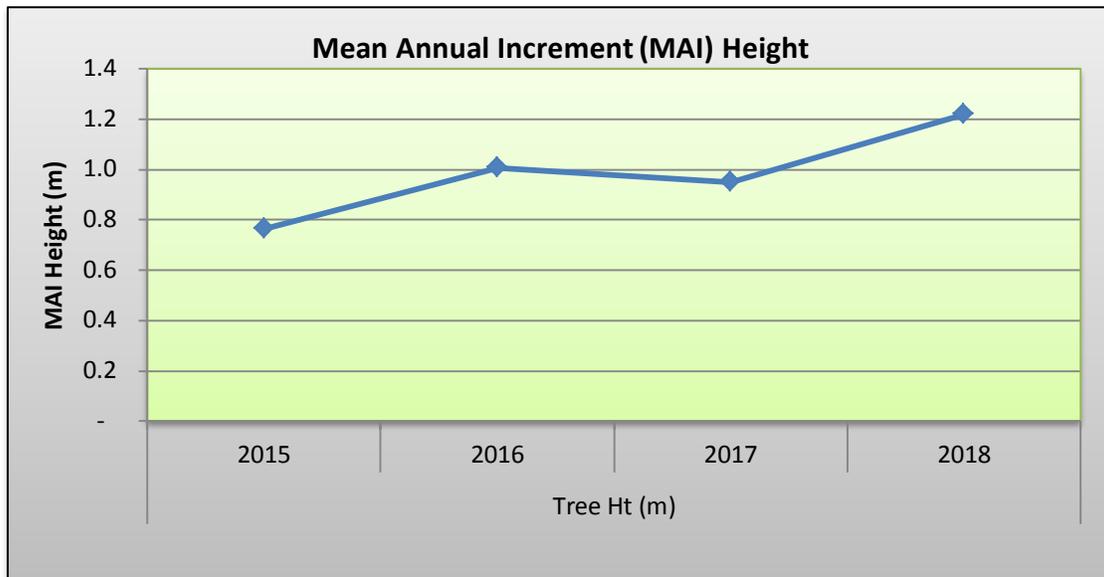


Figure 23: Mean Annual Increment of tree height in Block 02 in Kumburuwela estate

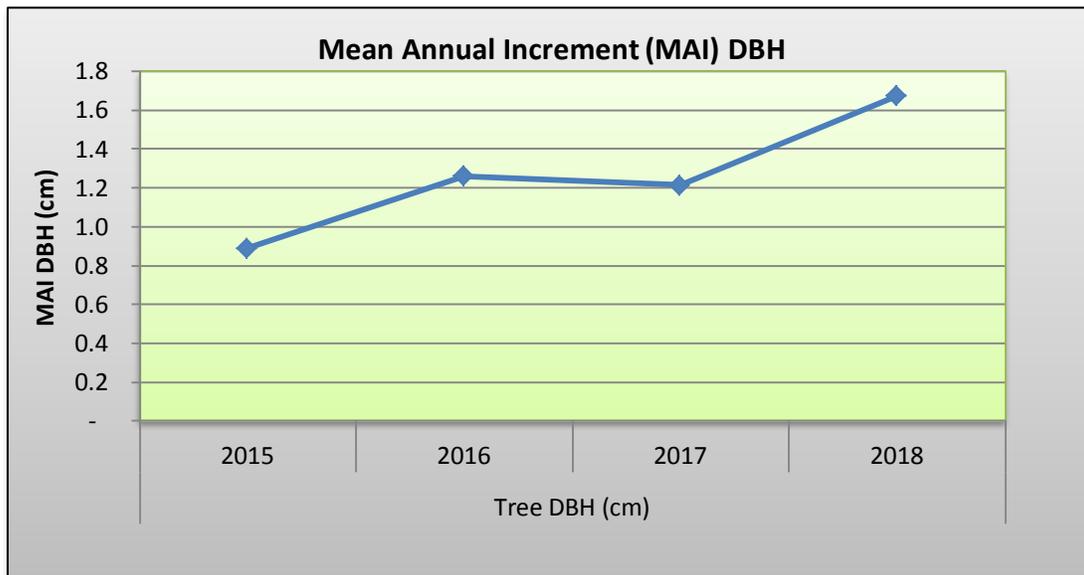


Figure 24: Mean Annual Increment of tree DBH in Block 02 in Kumburuwela estate.

## Current Annual Increment (CAI) Analysis

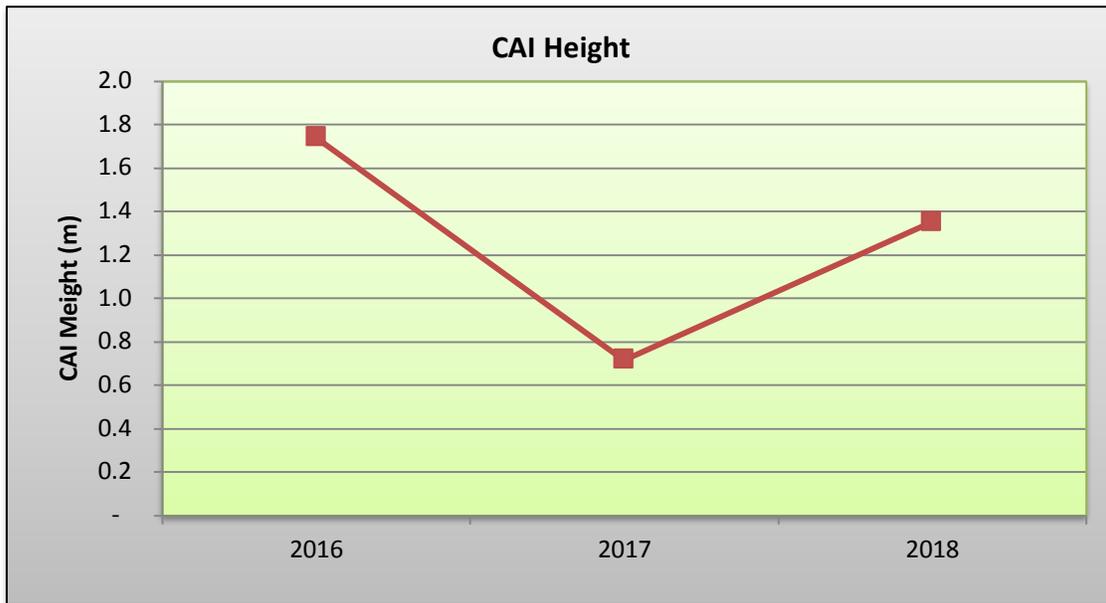


Figure 25: Current Annual Increment of tree height in Block 02 in Kumburuwela estate.

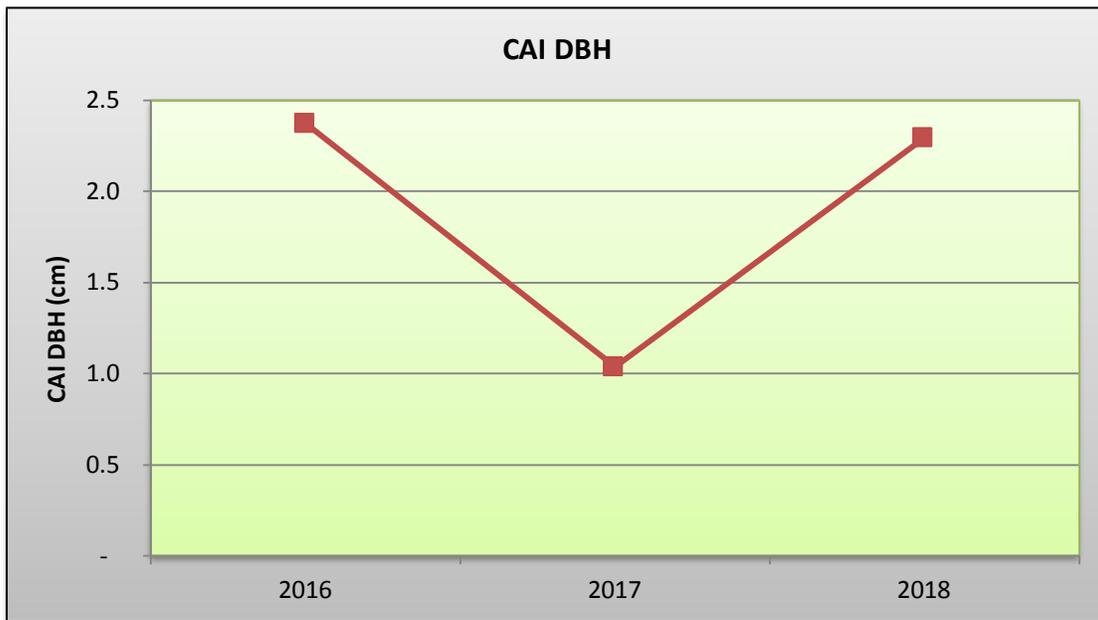


Figure 26: Current Annual Increment of tree DBH in Block 02 in Kumburuwela estate.

### Block Number 03

Year	Tree Ht (m)				Tree DBH (cm)			
	2016	2017	2018	Variance	2016	2017	2018	Variance
Plot No. 01	1.8	4.7	5.5	0.8	2.2	5.6	6.9	1.3
Plot No. 02	3.7	5.3	6.1	0.8	4.8	6.7	8.8	2.1
Plot No. 03	3.9	4.6	5.7	1.1	5.0	5.9	8.4	2.5
Plot No. 04	3.9	2.3	3.7	1.4	3.9	2.3	5.1	2.8
<b>Average</b>	<b>3.2</b>	<b>4.9</b>	<b>5.8</b>	<b>0.9</b>	<b>4.0</b>	<b>6.1</b>	<b>8.0</b>	<b>1.9</b>

Table9: Tree growth comparison of Kumburuwela Estate-Block number 03

**Total Average timber volume = 67.5 m<sup>3</sup>**

### Height Analysis of Block 03, Kumburuwela estate - Batticaloa

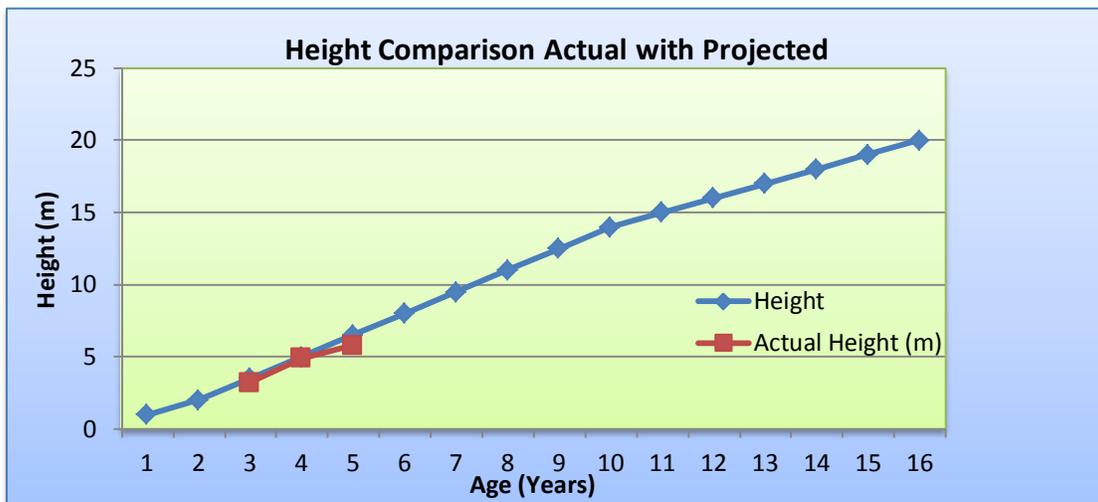


Figure 27: Height achievement of Block 03, Kumburuwela estate, Batticaloa (Height Comparison with Projected growth level)

### DBH Analysis of Block 03, Kumburuwela estate - Batticaloa

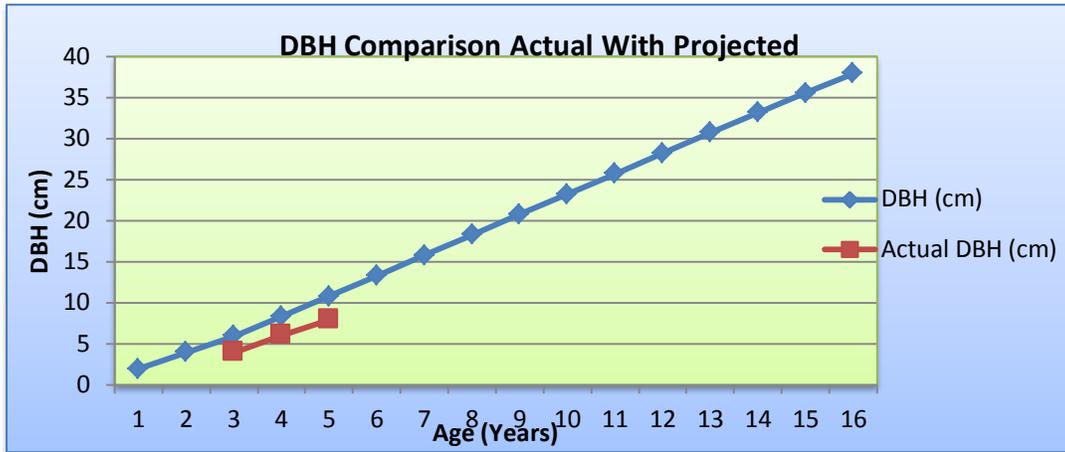


Figure 28: DBH achievement of Block 03, Kumburuwela estate, Batticaloa (DBH Comparison with Projected growth level)

### Block Number 04

Year	Tree Ht (m)				Tree DBH (cm)			
	2016	2017	2018	Variance	2016	2017	2018	Variance
Plot No. 01	1.6	1.9	4.1	2.2	1.8	2.5	5.4	2.9
Plot No. 02	4.3	5.1	6.9	1.8	5.0	6.4	8.2	1.8
Plot No. 03	4.6	5.4	5.9	0.5	5.6	7.1	9.0	1.9
<b>Average</b>	<b>3.5</b>	<b>4.1</b>	<b>5.6</b>	<b>1.5</b>	<b>4.2</b>	<b>5.3</b>	<b>7.5</b>	<b>2.2</b>

Table 10: Tree growth comparison of Kumburuwela Estate-Block number 04

**Total Average timber volume = 41.1 m<sup>3</sup>**

### Height Analysis of Block 04, Kumburuwela estate - Batticaloa

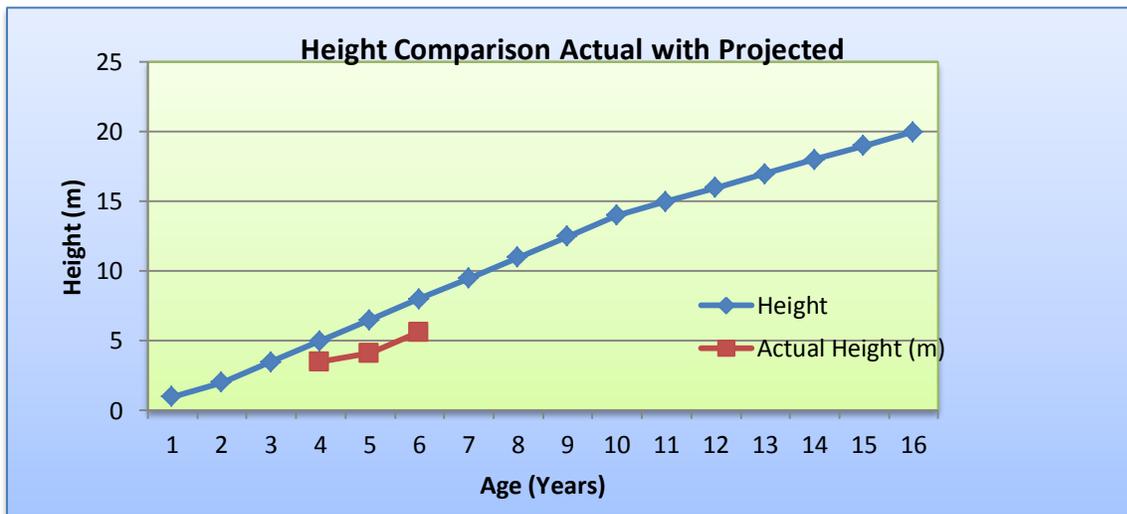


Figure 29: Height achievement of Block 04, Kumburuwela estate, Batticaloa (Height Comparison with Projected growth level)

## DBH Analysis of Block 04, Kumburuwela estate - Batticaloa

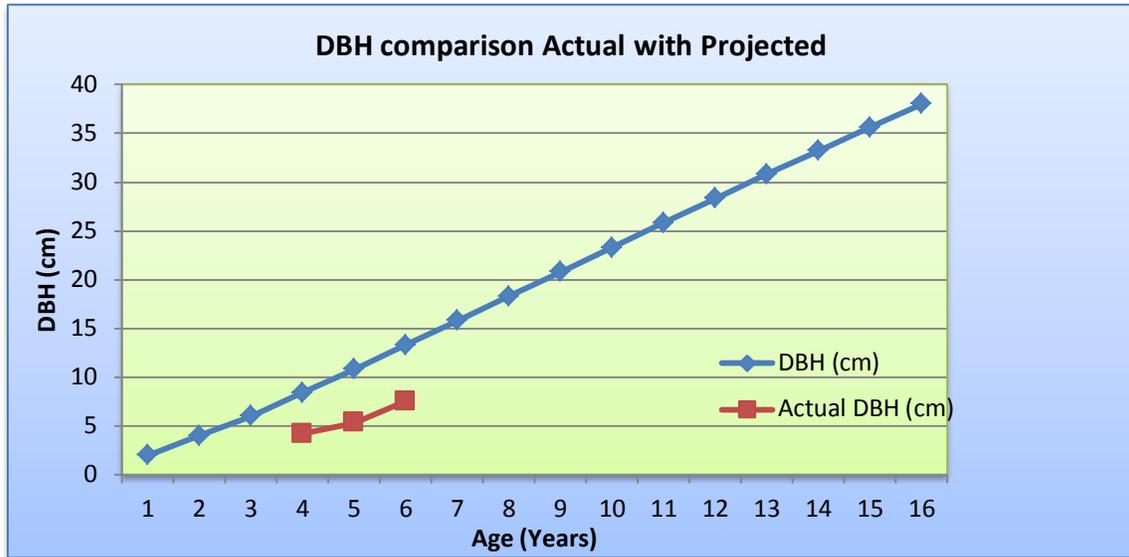


Figure 30: DBH achievement of Block 04, Kumburuwela estate, Batticaloa (DBH Comparison with Projected growth level)

## Block Number 05

Year	Tree Ht (m)			Tree DBH (cm)		
	2017	2018	Variance	2017	2018	Variance
Plot No. 01	2.8	4.3	1.5	3.0	5.0	2.0
Plot No. 02	3.0	6.0	3.0	3.8	7.6	3.8
Plot No. 03	3.8	5.7	1.9	4.9	7.7	2.8
Plot No. 04	2.2	4.8	2.6	3.0	6.2	3.2
Plot No. 05	4.6	5.8	1.2	5.5	7.4	1.9
Plot No. 06	3.1	4.3	1.2	3.6	5.8	2.2
<b>Average</b>	<b>3.3</b>	<b>5.2</b>	<b>1.9</b>	<b>4.0</b>	<b>6.6</b>	<b>2.7</b>

Table 11: Tree growth comparison of Kumburuwela Estate-Block number 05

## 6. DISCUSSION AND RECOMMENDATIONS

According to the analyzed data, it is important to raise few of conclusions with general information collected in the period of plantation evaluation in Sri Lanka. Generally, all the plantations are affecting with bad weather and climatic conditions in plantation regions for last couple of years.

**Palugahayaya estate** - Generally plantation condition of Palugahayaya estate in Anamaduwa is in satisfactory level with the actual growth achievements. But drought conditions prevailing in last few years are still badly effecting to the growth of Teak in Palugahayaya estate. And also according to the mean annual increment (MAI) and current annual increment (CAI), the growth rates are shown some draw back in last year.

Some poorly formed and deformity trees have been removed from the estate and it is a good plan to rectify the growth condition of trees. more trees should be removed to increase the growth rate within short period of time to reduce more competition among Teak trees.

**Sinnanagavillu estate** - Trees in Sinnanagavillu estate show satisfactory growth rate of both height and DBH. The actual diameter and height of trees are still in line with projected growth level. Hence, it is important to implement proper silvicultural methodologies to maintained further of this growth conditions to meet the ultimate harvest.

Teak trees in Sinnanagavillu estate is growing well with adequate space between plants and has been implemented a proper pruning programme to increase the quality of tree stems and volume of timber.

**Kumburuwela estate** - Teak trees in block 01 in Kumburuwela estate is still in the satisfactory level of growth and still in line with the projected growth level. But the growth rate in last year is not up to the level and it is illustrated by current annual increment (CAI) and mean annual increment (MAI). As in the CAI and MAI graphs growth achievement is not up to the projected level. Sometimes it could be resulted by the irregular weather pattern which faced last year.

Most of poorly grown plants are applied organic manure to increase the growth rate of teak trees in slow grown areas in the plantation. Application of organic matter into the poor lands of the plantation.

Irregular pattern of weather has effected to the growth of Teak trees in the plantation. But it will help to increase the quality of timber of teak. Quality of timber of Teak trees depends on the conditions faced trees in their life cycle.

## 7. REFERENCE

International Tropical Timber Organization report Volume 16 - 2011 (for Teak market trends and growth rates)

Sustainable Forest cultivation Management (handbook) - Dr. Nimal Ruwanpathirana, Research, Development and Training Division, State Timber Corporation (Sri Lanka).

Olivier Monteuis and Henri-Félix Maître - New developments in teak cloning lead to better plantation.

Thai Orchid Lab Company LTD. TOL Super Teak from Tissue culture.

The Growth and Yield of Teak (*Tectonagrandis L*) In Northern Ghana by Thompson K. Nunifu (for permanent Sample plot establishment)

Site, Technology and Productivity of Teak Plantations - Regional Seminar - Conclusion and Recommendations TeakNet Asia Pacific Region.

Micro-propagation: An effective tool for mass production of quality planting stock of teak by Shuchishweta V. Kendurkar.