

FOREST CARBON ACCOUNTING SOFTWARE DEVELOPMENT REPORT

CASE STUDY USING MERANG PEAT SWAMP FOREST DATA, SUMATERA SELATAN

Fandi Susanto

Palembang, July 2011



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Merang REDD Pilot Project



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Abstract

Forest carbon monitoring is one of the project components which deals with data collection, processing and analysis. To allow fast and accurate data processing, a data processing software had been developed. The software intended to provide forestry data input interfaces, processes the calculation and then output the calculation results into information. The software includes into the calculation additional data such as mass density and apply different carbon stock calculation formulas to different species. The software calculates tree distribution per DBH, tree distribution per plot, Importance Value Index, AGB Carbon Stock, DOM Carbon Stock, BGB Carbon Stock, Soil Carbon Stock and Total Carbon Stock.

1 INTRODUCTION

Forest carbon monitoring is one of the project components which deals with data collection, processing and analysis. A carbon inventory has been successfully conducted in the beginning of 2010. Huge amount of data about species, numbers and diameters have been collected on the field and have been digitized into Microsoft Access Database. However, mistakes occur very often when manual calculation is applied. Therefore, to allow fast and accurate data processing, a data processing software had been developed. The software processes collected forestry data into information. The information are AGB Carbon Stock, DOM Carbon Stock, Soil Carbon Stock and Importance Value Indices.

Although the software developed was able to provide fast and accurate calculation based on the raw data provided on Microsoft Access database, the software calculation accuracy could be improved by providing additional data such as wood mass density and by applying different carbon stock calculation formulas to different species

This software development project is intended to improve and revise the software developed on the previous project.

1.1 BRIEF EXPLANATION OF PREVIOUS PROJECT

Before the start of the previous project, the data was calculated using Microsoft Access and Microsoft Excel and therefore, to calculate the data, a person with a high level of understanding to the calculation is needed. Hence the software was developed to simplify, standarize and automate the calculation process.

Below is an image which represents the breadth of the software.





The first menu group is the data configuration which contains two sub menus to configure the data to be used. The Data View menu group contains the menus to view the data in Microsoft Access file and the combined tree findings data which was distributed among some tables. The Species Composition menu group provided some tree species related data. The Carbon Calculation menu group provided Carbon Stock calculation which consists of AGB Carbon Stock, DOM Carbon Stock, Soil Carbon Stock and their total.

Since the tree findings data in the Microsoft Access file are separated into a number of table, the software uses Microsoft Access file as the raw data and moves the data into a MySQL database with the purpose to simplify the grouping and calculation process. The database structure of the databases can be observed below.



Figure 1-2 Previous Project Microsoft Access Data Structure

🔲 plot 🔍	🔲 informasipohon 🔻	🔲 informasisubplota 🔻	
 id INT(11) NamaPlot VARCHAR(50) Strata 1 VARCHAR(50) Strata 2 VARCHAR(50) Indexes 	AnamaLokal VARCHAR(200) AnamaLatin VARCHAR(200) WoodDensity DOUBLE	 id INT(11) NamaPlot VARCHAR(50) Tanggal DATE TebalSerasah DOUBLE BeratSerasah DOUBLE TinggiSemak DOUBLE KerapatanSem ak DOUBLE KadarAir DOUBLE JanisDominan VARCHAR(100) Indexes 	
🔲 pohonhidup 🔹 🔻	🔲 palem 🔹 🔻	🔲 pohonmati 🛛 🔻	🔲 batangrebah 🛛 🔻
💡 id INT(11)	💡 id INT(11)	? id INT(11)	<pre>? id INT(11)</pre>
♦ NamaPlot VARCHAR(100)	NamaPlot VARCHAR(100)	♦ NamaPlot VARCHAR(100)	♦ NamaPlot VARCHAR(100)
SubPlot VARCHAR(50)	SubPlot VARCHAR(50)	♦ SubPlot VARCHAR(50)	SubPlot VARCHAR(50)
NoPohon VARCHAR(20)	NoPohon VARCHAR(20)	♦ NoPohon VARCHAR(20)	NoPohon VARCHAR(20)
♦ NamaLokal VARCHAR(100)	NamaLokal VARCHAR(100)	♦ NamaPohon VARCHAR(200)	♦ D1 FLOAT
Diameter FLOAT	Diameter FLOAT	♦ Keutuhan VARCHAR(20)	D2 FLOAT
Tinggi FLOAT	Tinggi FLOAT	♦ DBH FLOAT	Panjang RLOAT
♦ Keterangan VARCHAR(200)	Keterangan VARCHAR(200)		Pelapukan VARCHAR(50)
Indexes 🕨 🕨	Indexes 🕨 🕨	Tinggi FLOAT	DiameterGrowong FLOAT
		♦ Keterangan VARCHAR(100)	Indexes 🕨 🕨
		Indexes 🕨 🕨	

Figure 1-3 Previous Project MySQL Data Structure

The formulas used in the previous project were:

- AGB Carbon Stock: $C Kg/Tree = aD^b$
- DOM Carbon Stock:
 - Litter: $C \ Litter = \frac{Litter \ Weight}{1 + \frac{Water \ Content}{100}} x \ \% Carbon$
 - Dead Tree: $C Kg/Tree = aD^b x$ correction factor
 - Dead Wood: $C Kq/Tree = m x \ 15\%$, where:
 - m = V x Mass density factor
 - $V = \frac{1}{2}\pi r^2 p$

Soil Carbon Stock: C Soil / $Ha = \frac{Volume \ x \ Mass \ Density}{Area}$ _

Importance Value Index:

$$\circ \quad Density(D) = \frac{Species Tree Count}{Species rules rules}$$

- $Density(D) = \frac{1}{Entire \ plot \ area}$ $Relative \ Density(DR) = \frac{Species \ Density}{Density \ sum \ of \ all \ species} x100\%$
- Frequency $(F) = \frac{Number of subPlot where a species is found}{Sub plot count}$ Relative Frequency $(FR) = \frac{Species Frequency}{Frequency sum of all species} x100\%$
- $\circ \quad Dominance (Do) = \frac{Sum of species basal area}{Entire plot area}$
- Relative Dominance $(DoR) = \frac{Species \ dominance}{Total \ dominance \ of \ all \ species} x100\%$
- \circ Importance Value Index = DR + FR + DoR

2 OBJECTIVES

Based on meetings, several points to be developed or revised were concluded. Those are:

2.1 DATA INPUT

Previously, the data was inputted into Microsoft Access and then extracted into MySQL through the software. The new software was intended to do the data input and also output the calculation results.

2.2 REVISION OF THE CALCULATION METHODS.

Although previously the software developed was able to provide fast and accurate Carbon Stock calculation, the software calculation accuracy could be improved by including into the calculation additional data such as mass density and by applying different carbon stock calculation formulas to different species. This requirements triggered the needs for additional data table for the formulas and additional fields on related tables. The script for the carbon stock calculation also needs to be rewritten entirely which includes the calculation of AGB Carbon Stock, DOM Carbon Stock: Litter, Dead Wood, Dead Tree.

The formulas below will be used to calculate the trees' biomass carbon content. The trees' biomass is to be multiplied with a carbon fraction to find its carbon content. The SOM calculation also revised to include multiple layers to accommodate further possibilities.

- 1. AGB Carbon Stock: *f*(*DBH*, *WD*) x % Carbon
- 2. BGB = f(AGB) x % Carbon
- 3. DOM Carbon Stock:
 - a. Litter: $C \ Litter = \frac{Dry \ Weight \ Sample}{Fresh \ Weight \ Sample} x \ Fresh \ Weight \ Litter \ x \ \% Carbon$
 - *b.* Dead Tree: $C Kg/Tree = f(DBH, WD) \times \%$ Carbon
 - c. Dead Wood: $C \frac{Kg}{Tree} = m x \%$ *Carbon*, where:
 - i. m = V x Mass density
 - ii. $V = \frac{1}{2}\pi r_1^2 l_1 \frac{1}{2}\pi r_2^2 l_2$

Where r_1 and l_1 are wood radius and length, while r_2 and l_2 are hollow radius and length.

4. Total Soil Carbon Stock for each layer:

$$C Soil = \left(\left(Volume - \frac{BGB}{Wood \ Density} \right) x \ Bulk \ Density \ x \ \% \ Carbon \right)$$

- 5. Soil Carbon Stock per ha: $C Soil/Ha = \frac{C Soil}{Area (ha)}$
- 6. Total Carbon Stock: AGB + DOM + Soil
 % Carbon are variables which can be changed by user

2.3 Additional calculation.

The software also should include BGB Carbon Stock calculation (formula specified above), as it was also an important carbon pool. The software also added tree distribution per diameter range in the stand composition menu.

2.4 DATABASE STRUCTURE REDESIGN.

While the previous software were able to calculate carbon stocks, but since the tables in the database structures above are not yet related, there are known error which could be triggered when there are no tree findings in a plot area. Each tables stands on their own when they should be related to each other. Therefore there is a need to design a new relational database structure to alleviate the known error and to improve computing and storage efficiency. Based on the calculation methods revision, there is also the need to add additional tables and fields to certain tables on the database to accommodate more accurate calculation.

2.5 The Species Composition Adaption.

There are no changes in tree distribution, tree density and Importance Value Index calculation. But since the database need to be restructured, these calculations need to adapt to the new database structure.

2.6 BACKUP AND RESTORE FEATURE

To accommodate portability, this software needs to be able to backup its data and also restore its data to a previous state. This feature will also enable the software to store data from various carbon accounting projects and reload the data whenever required.

3 HARDWARE AND SOFTWARE REQUIREMENTS

3.1 HARDWARE REQUIREMENTS

This software was build on a system with Microsoft Windows 7, 2GB DDR3 Memory, Intel Core i5-460M Processor.

3.2 SOFTWARE REQUIREMENTS

This software needs Apache web server, MySQL database server and PHP scripting language which are bundled in Appserv 2.5.10. Optionally, users could use XAMPP which is quite similar to Appserv.

4 ANALYSIS AND DESIGN

4.1 **IDENTIFICATION OF NEEDS**

The Forest Carbon Accounting software need to be able to:

- Receive data input and provide data view the inputted data which consists of:
 - Plot Settings:
 - Stratification
 - Plots
 - Sub Plots
 - Species and Allometric Settings:
 - Equation Data
 - Species Data
 - Family Data
 - Conversion Factors

- Biomass Data Input:
 - Living Tree
 - Dead Tree
 - Dead Wood
 - Palms and Liana
 - Seedlings and Litter
- Calculate and provide view of the stand composition:
 - Tree Distribution per DBH range
 - Tree Distribution per Plot
 - Tree Density
 - Importance Value Index
- Calculate and provide view of the carbon stock per carbon pool:
 - Above Ground Biomass (AGB) Carbon Stock
 - Dead Organic Matter (DOM) Carbon Stock
 - Below Ground Biomass (BGB) Carbon Stock
 - Soil Organic Matter (SOM) Carbon Stock
 - o Total Carbon Stock

4.2 GRAPHICAL USER INTERFACE (GUI) DESIGN

Following are the wireframe GUI Designs.

4.2.1 MAIN FRAME AND MENUS

Fore	st Carl	oon Accou	unting
Configs	Data Input	Stand Composition	Carbon Calculation
Backup Database	Plot Settings	Tree Distribution-DBH	AGB Carbon Stock
Restore Database	Stratifications	Tree Distribution-Plot	DOM Carbon Stock
new Database	Plots	Tree Density	BGB Carbon Stock
	Sub Plots	Importance Value Index	Soil Carbon Stock
	Species and Allom	etric Settings	Total Carbon Stock
	Equations		
	Species		
	Families		
	Conversion Factor	ors	
	Biomass Data Inpu	t	
	Living Trees		
	Dead Trees		
	Dead Woods		
	Palms and Lianas	5	
	Seedlings and Lit	tter	
		Footer	

Figure 4-1 Main Menu wireframe design

4.2.2 STRATIFICATIONS

View	Input			View Input
Name	Туре	Area	Controls	Input New Strata
	Forest		edit delete	ID
	Non-Forest		edit delete	Name
			edit delete	Type v Forest/NonForest
			edit delete	Area
			edit delete	
			edit delete	Submit Reset
			edit delete	

Figure 4-2 Stratifications wireframe design

4.2.3 PLOTS

View	Input]										View Input		
Name	Strata	S.Type	Inventory Group	Date	Latitude	Longitude	Peat Depth (cm)	Water Level (cm)	Logging Year	Burnt Year	Controls	Input New Plot ID		
 	 	 	 	 	 	 	 		 	 	edit delete edit delete edit delete edit delete	Strata Plot Name Inv Group Date	T	<pre>vpe</pre>
			 		 			 			edit delete edit delete edit delete edit delete	Latitude Longitude Peat Depth	c	m
	•											Water Level Logging Year Burnt Year	c	m
													Submit Reset	t

Figure 4-3 Plots wireframe design

4.2.4 SUB PLOTS

Sub Plot	Area	Minimum Diameter	Maximum Diameter	Dead Wood Min D	Dead Wood Max D
Α					
В	<input/>	<input/>	<input/>		
С	<input/>	<input/>	<input/>	<input/>	<input/>
D	<input/>	<input/>	<input/>	<input/>	
E	<input/>	<input/>			
Change					

Figure 4-4 Sub Plots wireframe design

4.2.5 EQUATIONS





4.2.6 Species

<mark>/iew Inp</mark>	ut						View Input
ocal Name	Latin Name	Family	Mass Density	Equation	Formula	Controls	ID
						edit delete	Local Name
						edit delete	Latin Name
						edit delete	Mass Density
						edit delete	Allometric Equation
						edit delete	Family
						edit delete	
						edit delete	
						edit delete	

Figure 4-6 Species wireframe design

4.2.7 FAMILIES



Figure 4-7 Families wireframe design

4.2.8 CONVERSION FACTORS

Dead Wood BGB Carbon Fractions	Dead Wood BGB Carbon Fractions	Dead Wood BGB Carbon Fractions
Sound Moderate Rotten Save	BGB Equation	AGB BGB Dead Tree Dead Wood Litter
		Save

Figure 4-8 Conversion Factors wireframe design

4.2.9 LIVING TREE

Sort By 1st 2nd View Inp	v Filt v Plo v Sub	er t Plot		v v				Sort By 1st 2nd View Inpu	v v	Filter Plot Sub Plot	v v
Plot Name	Sub Plot	Local Name	Tree ID	DBH(cm)	Height (cm)	Description	Controls	ID			
							edit delete	Plot		v]
							edit delete	Sub Plot		v	1
							edit delete	Species		v	1
							edit delete	Tree ID			1
							edit delete	DBH			cm
							edit delete	Height			m
							edit delete	Description			1
									Submit	Reset]



4.2.10 DEAD TREE



Figure 4-10 Dead tree wireframe design

4.2.11 DEAD WOOD



Figure 4-11 Dead Wood wireframe design

4.2.12 PALMS AND LIANAS

Sort By 1st 2nd View Inp	v Plot v Sub	er t Plot		v v				Sort By 1st 2nd View Inpu	v v	Filter Plot Sub Plot		v v
Plot Name	Sub Plot	Local Name	Tree ID	DBH(cm)	Height (cm)	Description	Controls	ID				
							edit delete	Plot		v		
							edit delete	Sub Plot		v	1	
							edit delete	Species		v		
							edit delete	Tree ID			1	
							edit delete	DBH			cm	
							edit delete	Height			m	
							edit delete	Description			1	
									Submit	Reset		



4.2.13 SEEDLINGS AND LITTER

Select S	trata		v Vie	W						Select Strata
S. Type	Strata	Plot Name	Dominant	Litter	Litter	Seedlings	Seedlings	DW/FW	Controls	ID
			Species	Thickness	Weight	Height(cm)	Density	Ratio		Plot Name
									edit	Dominant Species
									edit	Litter Thickness
									edit	Litter Weight
									edit	Seedlings Height
									edit	Seedlings Density
									edit	DW/FW Ratio

v View v Submit Reset

m gr cm

Figure 4-13 Seedlings and litter wireframe design

4.2.14 AGB CARBON STOCK

View: Details per Plot v View										
Plot Name	Sub Plot	Tree ID	Local Name	Latin Name	DBH(cm)	AGB(Kg	C(Kg)	C(Kg/Ha)		
Total Sub Plot # at plot #### <total> <total></total></total>										
TOTAL PLOT <total> <total></total></total>										

Figure 4-14 AGB Carbon details per plot wireframe design

Filter View: Details per sub plot v SubPlot v View											
Sub Plot	Plot Name	Tree ID	Local Name	Latin Name	DBH(cm)	AGB (Kg	C(Kg)	C(Kg/Ha)			
	Total plot ### of sub plot # <total> <total></total></total>										
	TOTAL SUB PLOT <total></total>										

Figure 4-15 AGB Carbon details per sub plot wireframe design

Filter View: Sun	Filter View: Summary Per Plot v View										
Plot Name	C K	g/Ha	Sub	Plot	C Total Kg/Ha	C Total Ton/Ha					
	B C D E										
				TOTAL							

Figure 4-16 AGB summary per plot wireframe design

Filter					_
View:	Mean per st	rata	v	View	
Strata	C Ton/Ha	n Plot	s	t.se	CV(%)
Total					

Figure 4-17 AGB mean per strata wireframe design

Filter										
View:	Mea	Mean per forest/non-forest v View								
Strata		C Ton/Ha	n Plot	s	t.se	CV(%)				
Forest										
Non-Fo	rest									
Total										

Figure 4-18 AGB mean per forest/non-forest wireframe design

4.2.15 DOM CARBON STOCK 4.2.15.1 Dead Tree

Filter Group Dea View: Det	ad Tree ails per Plot	v v Plot	t:	v Vie	w				
Plot Name	Sub Plot	Tree ID	Local Name	Latin Name	Completeness	DBH(cm)	DOM(Kg	C(Kg)	C(Kg/Ha)
	Total Sub Plot # at plot ### <total> <total></total></total>								
TOTAL PLOT <total></total>									

Figure 4-19 Dead tree details per plot wireframe design

Filter Group De View: De	Filter Group Dead Tree v View: Details per sub plot v SubPlot v View										
Sub Plot	Plot Name	Tree ID	Local Name	Latin Name	Completeness	DBH(cm)	DOM(K	C(Kg)	C(Kg/Ha)		
	Total plot ### of sub plot #										
	TOTAL SUB PLOT <total> <total></total></total>										

Figure 4-20 Dead tree details per sub plot wireframe design

Filter								
Group	Dea	d Tr	ee		v			
View:	Sum	Summary Per Plo			ot	v	View	
Plot Name C Kg/Ha Sub Plot							C Total Kg/Ha	C Total Ton/Ha
		В	С	D	Е			
					то	TAL		

Figure 4-21 Dead tree summary per plot wireframe design

Filter Group View:	Dead Tree Mean per st	v rata	v	View]
Strata	C Ton/Ha	n Plot	s	t.se	CV(%)
Total					

Figure 4-22 Dead tree mean per strata wireframe design

Filter						
Group	Dea	ad Tree	v			
View:	Me	an per forest	/non-fo	rest v	Vie	w
Strata		C Ton/Ha	n Plot	s	t.se	CV(%)
Forest						
Non-Forest						
Total						

		C . /	C C	
$\mu_{10}\mu_{11} = \Delta_{12} + \Delta_{12} + \Delta_{12} = \Delta_{12} + \Delta_{1$	'ee mean ner	forest/non-	torect wirefram	e decion
	cc mean ber	101 CSU HOI	ioi cst wii ch am	L ULSIEII

4.2.15.2 Dead Wood

Filter Group Dea View: Det	Filter Group Dead Wood v View Details per Plot v Plot: v View										
Plot Name	Sub Plot	Tree ID	D1	D2	Length	Decomposition	Hollow D	Hollow	DOM	C (Kg)	C(Kg/Ha)
	Total Sub Plot # at plot ### <total> <total></total></total>										
								TOTAL P	PLOT	<total></total>	<total></total>

Figure 4-24 Dead wood details per plot wireframe design

Filter Group Dea View: Det	ad Wood ails per sub p	v plot v	SubPlot		v	View					
Sub Plot	Plot Name	Tree ID	D1	D2	Length	Decomposition	Hollow D	Hollow	DOM	C (Kg)	C(Kg/Ha)
							Total Sub Pl	ot # at pl	ot ###	<total></total>	<total></total>
								TOTAL P	PLOT	<total></total>	<total></total>

Figure 4-25 Dead wood details per sub plot wireframe design

Filter Group Dead Wood v View: Summary Per Plot v View											
Plot Name CKg/Ha Sub Plot C Total Kg/Ha C Total Ton/Ha											
	В	С	D	E							
				TOTAL							

Figure 4-26 Dead wood summary per plot wireframe design

Filter Group View:	Dead Wood Mean per st	v rata	v	View]
Strata	C Ton/Ha	n Plot	s	t.se	CV(%)
Total					

Figure 4-27 Dead wood mean per strata wireframe design

Filter								
Group	Dea	d Wood	v					
View:	w: Mean per forest/non-forest v View							
Strata		C Ton/Ha	n Plot	s	t.se	CV(%)		
Forest								
Non-Forest								
Total								

Figure 4-28 Dead wood mean per forest/non-forest wireframe design

4.2.15.3 Litter

Filter Group Litter v View: Summary Per Plot v View										
Plot Name	Dominant	Litter	Litter	Seedlings	Seedlings	DW/FW	C Litter			
	Species	Thickness	Weight	Height	Density	Ratio	Ton/Ha			
						Total				

Figure 4-29 Litter summary per plot wireframe design

Filter Group View:	Litter Mean per st	v rata	v	View]
Strata	C Ton/Ha	n Plot	S	t.se	CV(%)
Total					

Figure 4-30 Litter mean per strata wireframe design

Filter						
Group	Litte	er	v			
View:	Mea	an per forest	Vie	w		
Strata		C Ton/Ha	n Plot	s	t.se	CV(%)
Forest						
Non-Fo	rest					
Total						

Figure 4-31 Litter mean per forest/non-forest wireframe design

4.2.16 BGB CARBON STOCK

Filter View: De	Filter View: Details per Plot v View										
Plot Name	Sub Plot	Tree ID	Local Name	Latin Name	DBH(cm)	BGB(Kg)	V m3	V m3/Ha	C(Kg)	C(Kg/Ha)	
	Total Sub Plot # at plot ### <total> <total> <total> <total> <</total></total></total></total>										
					TOTAL P	LOT	<total></total>	<total></total>	<total></total>	<total></total>	

Figure 4-32 BGB Carbon details per plot wireframe design

Filter View: Det	ails per sub p	olot v	SubPlot	v	View					
Sub Plot	Plot Name	Tree ID	Local Name	Latin Name	DBH(cm)	BGB(Kg)	V m3	V m3/Ha	C(Kg)	C(Kg/Ha)
				Total Su	ıb Plot # at pl	ot ###	<total></total>	<total></total>	<total></total>	<total></total>
					TOTAL	PLOT	<total></total>	<total></total>	<total></total>	<total></total>

Figure 4-33 BGB Carbon details per sub plot wireframe design

Filter View: Sur	nma	ry Pe	er Plo	ot v	Vie	w	
Plot Name	C K	g/Ha	Sub	Plot	C Total	C Total	V Total
	В	С	D	E	Kg / Ha	Ton / Ha	m3/Ha
				TOTAL			

Figure 4-34 BGB Carbon summary per plot wireframe design

Filter View:	Mean per st	rata	v	View			
Strata	C Ton/Ha	n Plot	S	t.se	CV(%)	Average Vol (m3/Ha)	Vol (m3)
Total							

Figure 4-35 BGB Carbon mean per strata wireframe design

Filter View: Mea	an per forest	/non-for	est v	Vie	w	
Strata Type	C Ton/Ha	n Plot	s	t.se	CV(%)	Average Vol (m3/Ha)
Forest Non-Forest						
Total						

Figure 4-36 BGB mean per forest/non-forest wireframe design

4.2.17 Soil Carbon Stock

Total B Layer C	GB Volur Count	me :	Change						
Level	Area	Depth	Bulk	Carbon	C Tonnes	С	BGB Volume	BGB Volume	* C
			Density	Percent		Tonnes/Ha	Percent (%)	m3	Tonnes/Ha
####	#####	#####	####	####			#####		
#####	#####	#####	####	#####			#####		
####	#####	#####	####	####			#####		
#####	#####	####	####	####			######		
				Total					
Save C Tonn	es = Area	a(Ha) x de	epth (cm)	x bulk D	ensity (gr/cn	n³) x carbon p	percent(%)		
C Tonn	es / Ha =	C Tonnes	s / Area (I	Ha)					
BGB Vo	olume = E	BGB Volur	me Perce	nt/100 *	Total BGB Vo	olume			
*C Ton *C Ton	nes / Ha nes / Ha	= C Tonne is the soi	es/Ha - (B l carbon d	GB Volu	me(m³) * Bul d by root volu	lk Density(gr, ume.	/cm³) * carbo	n percent(%)	/100 / Area(H

Figure 4-37 Soil carbon stock wireframe design

4.2.18 TOTAL CARBON STOCK

ilter: /iew: Sum	nmary Pe	er Plot	v Vie	w		
Diat Nama	ACR	BCB		DOM		Total C
PIOLINAME	AGB	BGB	Dead Tree	Dead Wood	Litter	Ton/Ha
			Average	e (AGB+BGB+	DOM)	
					C Soil	
				Grand T	otal	
					*C Soil	
				*Grand	Total	

*The calculation is considering the root volume deducted from the soil volume.

Figure 4-38 Total carbon stock per plot wireframe design

Filter: View: Per	Strata		V	View			
	onata						
Strata	nDlot	ACR	PCP		DOM		Total C
Strata	IIPIOL	AGB	DOD	Dead Tree	Dead Wood	Litter	Ton/Ha
				Average	e (AGB+BGB+	DOM)	
						C Soil	
					Grand T	otal	
						*C Soil	
					*Grand	Total	

*The calculation is considering the root volume deducted from the soil volume.

Figure 4-39 Total carbon stock per strata wireframe design

Filter: View: Per	Forest/N	Non-Fore	est v	View]		
Strata	nDlot	ACR	D.C.D.		DOM		Total C
Strata	nPiot	AGB	BGB	Dead Tree	Dead Wood	Litter	Ton/Ha
Forest							
Non-Forest							
				Average	e (AGB+BGB+I	DOM)	
						C Soil	
					Grand T	otal	
						*C Soil	
					*Grand	Total	
*The calcula	tion is co	onsiderir	ng the ro	ot volume de	educted from	the soil	volume.

Figure 4-40 Total carbon stock per forest/non-forest wireframe design

4.2.19 BACKUP DATABASE

Back Up Database Press the "Back Up Database" button to backup your database The backup will be stored in the backup folder of the application.

Figure 4-41 Back up database wireframe design

4.2.20 Restore Database



Figure 4-42 Restore database wireframe design

4.2.21 NEW DATABASE

This functionality was designed for the purpose of the software first time use. Note that all data will be emptied or be filled with default values. If this is not the first time use and data has been inputted, You should back up your data first. Click <u>here</u> to reset database to the default state.

Figure 4-43 New database wireframe design

4.3 STRUCTURE OF TABLES



Figure 4-44 New database Structure of tables

5 RESULTS

Described below are the software developed on this project.

5.1 Номе

This is the starting point of the software. Users will see this page first when using the software. This page provides navigation and information about the software.

(Gambar dan penjelasan)

5.2 CONFIGS

This menu group contains software administration functionalities. Which includes database backup, database restoration and new database. These menu can used to save datas from different carbon inventory projects. Users can input trees data, back up the database, and then start a new carbon inventory projects by choosing new database and then back up the database. Users later can choose and restore the data they wish to view.

5.2.1 BACKUP DATABASE

This menu provides database backup functionality. Users can use this menu to back up their databases so that they could restore the database to previous state. The backup files will be saved in the backup folder of the application. The default name for the backup file will be: "backup <dd-MM-yyyy hh:mm:ss>.fsql". Users later can manually rename the file to a more fitting name, for example: south sumatra forest 2011.fsql.

(Configs	$\supset \subset$	Data Input	Sta	nd Compositio	n	Carbon Calculat	tion
Ba	ick up databa	ase:						
Back Up Databa	se							
Press the "Back U	p Database" button to	backup your o	latabase.					
The backup will be	e stored in the backup	folder of the ap	pplication.					

Figure 5-1 Database Backup Screenshot

5.2.2 RESTORE DATABASE

This menu provides database restoration functionality. Users can restore database to earlier condition. Users should use only the files generated by this software backup process. Users should not manually edit the contents of the backup files or use backup files generated by another software. Results are unpredictable for those actions. Note that the data prior to the restoration process will be lost. It is advised that users back up their database before using this menu.

Configs Data Input Stand Composition Carbon Calculation	
Restore database:	
Choose backup file to restore from: Browse. Restore Database	
Note that the existing data will be overwritten completely. You should first back up your data if you wish to keep current data.	

Figure 5-2 Database Restore Screenshot

5.2.3 NEW DATABASE

This menu provides new database functionality. If users need to clear the data and start a new carbon inventory project, user can use this menu to empty the database. The database will be emptied and some data such as equations and sub plots will be set into its default state. It is advised that users back up their database before using this menu except the first time use.

Configs	Data Input	Stand Composition	Carbon Calcu	llation
Reset database to default				
This functionality was designed for the purpose of the Note that all data will be emptied or be filled with d	ne software first time use. efault values.			
If this is not the first time use and data has been input Click \underline{here} to reset database to the default state.	utted, You should back up yo	our data first.		

Figure 5-3 New Database Screenshot

5.3 DATA INPUT

This menu group contains data management functionalities. Users can manage raw data in the menu provided in this menu group. The menus in this menu group includes: stratas, plots, sub

plots, equations, species, families, conversion factors, living trees, dead trees, dead woods, palms and lianas, seedlings and litters. When inputting the data, if an the software detected an error in the values inputted, the values previously inputted will be lost. It is advised for the user to press the browser's back button to continue editting the values.

5.3.1 PLOT SETTINGS

This menu is separated further into Stratifications, Plots and Sub Plots menus. Before inputting trees data, users should first fill these data since these data will influence the trees data input.

The stratifications menu provides the funcitonality to input, view, edit and delete stratas. Note that strata name, type and area are required when inputting new stratas. The strata area has to be an integer, and the stratas names should be unique.

	Stratification						
View		Ir	nput				
name	ţ	уре	area	Co	ntrols		
Rapat	Fore	st	399	<u>Edit</u>	<u>Delete</u>		
Sedang	Fore	st	300	<u>Edit</u>	<u>Delete</u>		
Belukar	Non	-Forest	300	<u>Edit</u>	<u>Delete</u>		
Mahang	Non	-Forest	300	<u>Edit</u>	<u>Delete</u>		
Rumput	Non	-Forest	300	<u>Edit</u>	<u>Delete</u>		
Semak	Non-Forest		300	<u>Edit</u>	<u>Delete</u>		
Tebangan	Non-Forest		300	<u>Edit</u>	<u>Delete</u>		
Terbuka	Non	-Forest	300	<u>Edit</u>	<u>Delete</u>		

Figure 5-4 View Strata Screenshot

Stra	tification
View Inp	<mark>it s</mark>
Input New Strata	
ID:	9
Name:	
Туре:	Select Type 💌
Area:	Ha
	Submit Reset

The plots menu provides functionality to input, view, edit and delete plots. Plot names are automatically filled with "<strata name>-<plot ID>" when users select stratas for example, if the plot ID is 27 and the strata is "medang", the plot name will be medang-27. The rest of the fields are not compulsory. If not filled, inventory group will be empty, date will be filled with "0000-00" value, latitude, longitude, peat depth, water level, logging year and burnt year will be filled with 0. The latitude, longitude, peat depth, water level, logging year and burnt year can not accept non numeric values.

Figure 5-5 Input Strata Screenshot

		Plot										
View	Inp	out										
Name	Strata	S.Type	Inventory Group	Date	Latitude	Longitude	Peat Depth (cm)	Water Level (cm)	Logging Year	Burnt Year	Со	atrols
Rapat-1	Rapat	Forest	Regu 2 / Pesrol	2009-12-03	-1.9789986	104.11883871	670	8	2009	0	<u>Edit</u>	<u>Delete</u>
Rapat-2		E-most	Regu 2 /	2010_02_01	93510	104.11250887	399	10		0	Edit	Delet
Tebangan-42	Tebangan	Non-Forest	Regu 17 Yanto	2009-12-04	-1.97946045	104.21141113	647	20	2007	2007	<u>Edit</u>	Delete
Tebangan-43	Tebangan	Non-Forest	Regu 1 / Yanto	2009-12-18	-2.03690825	104.16374761	700	14	2009	2007	<u>Edit</u>	<u>Delete</u>
Tebangan-44	Tebangan	Non-Forest	Regu 2 / Pesrol	2009-11-20	-2.00927102	104.13950345	650	0	2009	2007	<u>Edit</u>	<u>Delete</u>
Tebangan-45	Tebangan	Non-Forest	Regu 2 / Pesrol	2010-01-28	-2.00685963	104.07565959	362	2	2006	0	<u>Edit</u>	<u>Delete</u>

Figure 5-6 View Plot Screenshot

Ι	Plot
View Input	
Input new plot	
ID:	46
Strata:	Select Strata Type:
Plot Name:	
Inventory Group:	
Date :	
Latitude:	
Longitude:	
Peat Depth:	cm
Water Level:	cm
Logging Year:	
Burnt Year:	
	Submit Reset

Figure 5-7 Input Plot Screenshot

The sub plots menu provides functionality to change the sub plots settings. Which includes sub plot area, minimum diameter, maximum diameter, dead wood minimum diameter and dead wood maximum diameter. The sub plots areas will be used in calculating the biomass and carbon stock, while the diameter ranges will be used as input restriction when inputting trees data. While the sub plot area could be changed any time, the minimum diameter, maximum diameter, dead wood minimum diameter and dead wood maximum diameter should not be changed after inputting trees data. For example if the minimum diameter for sub plot B is initially 5 cm and the maximum diameter initally is 10 cm, users can input trees data as sub plot B and specify 6 cm for its diameter. If after the trees data input, users change the minimum diameter for sub plot B into 10 cm and its maximum into 20cm, the 6 cm tree data will still exists and will be identified by the software as a sub plot B tree data.

	Sub	Plot			
Sub Plot	Area	Minimum Diameter	Maximum Diameter	Dead Wood Min D	Dead Wood Max D
А	4 m ²				
В	25 m ²	5 cm	10 cm		
С	100 m ²	10 cm	20 cm	10 cm	30 cm
D	400 m ²	20 cm	35 cm	30 cm	
E	2500 m ²	35 cm			
Change	9				

Figure 5-8 Sub Plots Screenshot

5.3.2 Species and Allometric Settings

This menu is separated further into Equations, Species, Families, Conversion Factors.

The equations menu provides functionality to manage the formulas for calculating trees biomass and carbon stock. Note that the formula used for calculating the trees biomass is determined by the trees species and their respective equation. When using the software for the first time, every species will be using the default "Forest" equation. Especially for dead trees, the equations used will be equations "Dead Tree A", "Dead Tree B", and "Dead Tree C" each for dead trees with completeness level "A", "B", and "C" respectively. Users can not delete or change the name of the "Dead Tree A", "Dead Tree B", "Forest" and "Non-Forest" equations.

Users could use PHP mathematical functions for the equations. Those are pow for exponent, log for natural logarithm, log10 for base 10 logarithm, and exp to find the exponent of natural number e. Users should input the equation following common mathematical rules. Equation names should be unique.

When editting the equation, the software will check whether the equation contains WD variable. If it contains WD and some species with zero mass density (mass density is not specified) are using the equation, the software will reject the changes.

А	llometric E	quations		
View	Input			
name		equation	Co	ntrols
Dead Tree A	0.206284*pow(D	BH,2.4511)*0.9	<u>Edit</u>	<u>Delete</u>
Dead Tree B	0.206284*pow(D	BH,2.4511)*0.8	<u>Edit</u>	<u>Delete</u>
Dead Tree C	0.206284*pow(D	BH,2.4511)*0.7	<u>Edit</u>	<u>Delete</u>
Forest	0.206284*pow(D	BH,2.4511)	<u>Edit</u>	<u>Delete</u>
Non-Forest	0.153108*pow(D	BH,2.4)	<u>Edit</u>	<u>Delete</u>
Kettering	0.11*WD*pow(D	BH,2.62)	<u>Edit</u>	<u>Delete</u>
Murdiyarso	0.19*WD*pow(D	BH,2.37)	<u>Edit</u>	<u>Delete</u>
Brown	0.118*pow(DBH,	2.53)	<u>Edit</u>	<u>Delete</u>
Chave	WD*exp(-1.239+	1.980*log(DBH)+0.207*pow(log(DBH),2)-0.0281*pow(log(DBH),3)	<u>Edit</u>	<u>Delete</u>
Samalca	0.2902*pow(DBH	I,2.313)	<u>Edit</u>	<u>Delete</u>
Basuki et al	exp(0.01)*pow(D	BH,0.02)	<u>Edit</u>	<u>Delete</u>

Figure 5-9 View Equations Screenshot

Allometric Equations
View Input
-Input New Equation-
ID: 6
Name: Kettering
Equation: 0.11*WD*pow(DBH,2.62)
Please type-in the allometric equation at the text field above. Use DBH, WD, and H each for Diameter at Breast Height, Wood Density, and Height. Note that DBH, WD and H represents variable values taken from tree findings data. Use pow to calculate exponent, for example: 0.03*pow(DBH,2.475) Use log to calculate natural logarithm, for example: 2.3*log(DBH) Use log to calculate base 10 logarithm, for example: log10(DBH)-0.22 Use exp to calculate exponent of natural number, for example: exp(3.54)*pow(DBH,0.23) Examples: WD*(a*pow(DBH,3)+b*pow(DBH,2)+(c+d)*DBH+e) pow(DBH,a)+pow(DBH,b)+exp(c) a*WD*pow(DBH,b) Save

Figure 5-10 Input Equations Screenshot

The Species menu provides functionality to manage the trees species data. Users can view, input, edit and delete species data here. When inputting species, the species local name and its equation are compulsory. While its latin name, mass density and family are not. If the species equation contains WD variable, the species mass density must be specified and not zero. The species local name should be unique and its mass density also has to be a number.

	Speci	es						
View	Input							
Local Name	L	atin Name	Family	Mass Density (Kg/m ³)	Equation	Formula	Co	ntrols
Akar Kekait				0	Forest	0.206284*pow(DBH,2.4511)	<u>Edit</u>	<u>Delete</u>
Angat-angat				0	Forest	0.206284*pow(DBH,2.4511)	<u>Edit</u>	<u>Delete</u>
Antui				0	Forest	0.206284*pow(DBH,2.4511)	<u>Edit</u>	<u>Delete</u>
Arang	Diospyro	s sp.		A	Forest	0.206284*pow(DPH 2.4511)	Edit	Delete
				v l	\sim	1-0 (LOL1, 2. TO 1-)		
Trentang	Camnosp	erma coriaceum		0	Forest	0.206284*pow(DBH,2.4511)	<u>Edit</u>	<u>Delete</u>
Tukulan	Blumeod	endron tokbrai		660	Forest	0.206284*pow(DBH,2.4511)	Edit	Delete
Uyah-uyah	Stemonur	us secundiflorus		630	Forest	0.206284*pow(DBH,2.4511)	Edit	<u>Delete</u>

Figure 5-11 View Species Screenshot

View Input	ies
ID: 62 Local Name: Maha Latin Name: Maca Mass Density: 390 Allometric Equation: Fore Family P	hang Putih caranga pruniosa

Figure 5-12 Input Species Screenshot

The families menu provides functionality to manage the families data. Users can view, input, edit and delete families here. Families name should be unique.

		Fa	amili	ies	
View		Inpu	ut		
name	Co	ntrols			
Cyperaceae	<u>Edit</u>	<u>Delete</u>			

Figure 5-13 View Families Screenshot

	Families	
View	Input	
-Input new spe	ecies family	
_	ID: 2	
Fam	nily Name:	
	Submit	Reset

Figure 5-14 Input Families Screenshot

In the conversion factors menu, users can manage various constants which will be used when calculating biomass and carbon stocks. The dead wood constants group is used to deterimine the dead wood mass density based on its decomposition level.

A	llometri	c Settings
Dead Wood	BGB	Carbon Fractions
Dead Wood 1	Mass Density b	ased on Decomposition
	Sound: 0.	6
1	Moderate: 0.	4
	Rotten: 0.	2
		Save

Figure 5-15 Dead Wood Conversion Factors Screenshot

The BGB group is used to deterimine the equation used for calculating BGB biomass. The BGB biomass equation is a function of AGB biomass and therefore must contain AGB variable.

Al	lometric	Settings
Dead Wood	BGB quation	Carbon Fractions
BGB E	quation: 0.25	*AGB
		Save

Figure 5-16 BGB Converstion Factors Screenshot

The Carbon Fractions Group contains the multiplication factor for calculating the trees carbon stock. Where the trees carbon stock is the trees biomass multiplied by the carbon fractions. The carbon fractions are divided into AGB, BGB, Dead Tree, Dead Wood, and Litter.

Alle	ometric	Settings
Dead Wood	BGB	Carbon Fractions
Carbon Fractions-		
	AGB: 0.5	
	BGB: 0.48	
Dead	Tree: 0.47	
Dead \	Nood: 0.45	
	Litter: 0.5	
		Save
Carbon Fractions	should be in f	fraction. Where 50% m

Figure 5-17 Carbon Fractions Conversion Factors Screenshot

5.3.3 BIOMASS DATA INPUT

The biomass data input is further separated into living trees, dead trees, dead woods, palms and lianas, and seedlings and litters. The menus provide the functionality to view, input, edit and delete trees data. Users can sort and filter the data view to fit the users needs. The users can also delete multiple trees data at once by ticking the desired trees data and clicking "delete selected" button.

The Living Trees menu is used to manage living trees data. When inputting living trees data, the plot, sub plot, species, treeID and DBH are compulsory. The tree ID should be unique in each plot. Users cannot input identical names for a tree in the same plot. While inputting the trees species, users can add new species by clicking the "new species" button. The trees DBH should be a number and between the range determined in the sub plots menu. The trees height should be a number.

]	Living	Trees						
	Solution Solution	ort By:	Input	Filter: Plot All Sub Plot Al	.					
	Del	ete Selected								
		Plot Name	Sub Plot	Local Name	Tree ID	DBH (cm)	Height (m)	Description	Co	itrols
		Belukar-22	В	Balam Cabe	B1	6	0		<u>Edit</u>	Delete
		Belukar-22	В	Gerinang Lalat	B2	6.9	0		Edit	Delete
Ľ		B 30	D	Lalat	P					
П		Terbuka-36	D	Simpur	D2	31.8	0		Edit	Delete
		Terbuka-36	E	Punak	E1	50	0		<u>Edit</u>	Delete
		Terbuka-37	D	Meranti Kelungkung	D1	23.5	0		<u>Edit</u>	Delete
	Del	ete Selected								

Figure 5-18 View Living Trees Screenshot

Living	Trees
Sort By: 1 st 2 nd	Filter: Plot All Sub Plot All
View Input	
-Input New Tree	
ID: 4	74
Plot :	Please Select One
Sub Plot :	Please Select One 💌
Species :	Please Select One New Species
Tree ID :	
DBH :	cm
Height :	m
Description :	
	Submit Reset

Figure 5-19 Input Living Trees Screenshot

The Dead Trees menu is used to manage dead trees data. Dead trees input follow rules similar to the rules when inputting living trees data, except the dead tree species data is not compulsory.

		Dead '	Trees						
1 ¹ 2 ¹	ort By: st nd		Filter: Plot All Sub Plot 4	VII 💌]	14.4			
	View	Input					k		
De	lete Selected								
	Plot Name	Sub Plot	Local Name	Tree ID	DBH (cm)	Height (m)	Completeness Level	Description	Controls
	Belukar-26	E	Punak	1E2	80	0	В		Edit Delete
	Belukar-26	E	Simpur	2E2	50	0	С		Edit Delete
	Belukar-26	E	Punak	3E2	47	0	С		Edit Delete
	Terbuka-37	E	Balam Seminai	IE2	40.3	15	С		Edit Delete
	Terbuka-37	E	Balam Seminai	2E2	53	15	A		Edit Delete
	Terbuka-37	E	Kempas	3E2	36	15	A		Edit Delete
De	lete Selected								

Figure 5-20 View Dead Trees Screenshot

Dead	l Trees
Sort By: 1 st • 2 nd • View Input	Filter: Plot All Sub Plot All
Input New Dead Tree	
ID:	34
Plot :	Please Select One
Sub Plot :	Please Select One 💌
Species :	Please Select One Rew Species
Tree ID :	
DBH :	cm
Height :	m
Completeness Level : Description :	<u>○A</u>
	Submit Reset

Figure 5-21 Input Dead Trees Screenshot

The Dead Woods menu is used to manage dead woods data. Every fields in dead wood data is compulsory. The tree ID must be unique in each plot. The dead wood's 1st diameter, 2nd diameter, length, Hollow diameter and hollow length should be a number. The 2nd diameter and hollow diameter should be less than the 1st diameter, and the hollow length must be less than the dead wood's length.

		-	Dead V	Voods								
Sort By: 1 st ··· · 2 nd ··· · View Input					ilter: lot All ub Plot Al	v I v		14		V an		
	Del	ete Selected										
		Plot Name	Sub Plot	Tree ID	Dl (cm)	D2 (cm)	Length (m)	Decomposition Level	Hollow Diameter (cm)	Hollow Length (m)	Cont	rols
		Belukar-24	С	1/C3	16.6	15.5	5.5	Sound	0	0	<u>Edit</u> D)elete
		Belukar-24	D	3D3	55	40	12	Rotten	0	0	Edit D)elete
		Belule	C	102	14	10		a-itan	0		D	alate
		Terbuka-37	C C	203	15	13.8	7	Rotten	0	0	Edit D)elete
1		Terbuka-37	D	1D3	35	30	5	Sound	0	0	Edit D)elete
		Terbuka-37	D	2D3	41	35	1.5	Moderate	0	0	Edit D	Delete
	Del	ete Selected							-			

Figure 5-22 View Dead Wood Screenshot

Dead V	Woods	
Sort By: 1 st ···· · 2 nd ··· · View Input	Filter: Plot All Sub Plot All	
Input New Dead Wood		
ID: 43	3	
Plot : -	Please Select One 💌	
Sub Plot : -	Please Select One 💌	
Tree ID :		
1 st diameter:	cm	
2 nd diameter:	cm	
Length :	m	
Decomposition C: Level:	Sound OModerate ORotten	
Hollow Diameter:	cm	
Hollow Length:	m	
	Submit Reset	

Figure 5-23 Input Dead Wood Screenshot

The Palms and Lianas menu is used to manage palms and lianas data. Palms and lianas input follow rules identical to the rules when inputting living trees data.

	Pa	lms an	d Lianas						
Sc 1 ^s 2 ⁿ	ort By: t t View	▼ ▼ Input	Filter: Plot A Sub Pl	All Lot All 💌	-				
	Plot Name	Sub Plot	Local Name	Tree ID	DBH	Height	Description	Cor	atrols
	Rapat-1	С	Bengkuang	C2	16.2	0		Edit	Delete
	Rapat-1	С	Bengkuang	C3	16.3	0		<u>Edit</u>	<u>Delete</u>
		с	Bengkuang	C4	1000	<u> </u>		<u>Edit</u>	Delete
	Tebangan-44	С	Dengreuang	C4	15.4	0	\sim	Edit	Delete
	Tebangan-44	С	Bengkuang	C5	19.7	0		<u>Edit</u>	<u>Delete</u>
	Tebangan-44	С	Bengkuang	C6	16.2	0		Edit	Delete

Figure 5-24 View Palms and Lianas Screenshot

Palms and	l Lianas	
Sort By: 1 st ···· · 2 nd ··· · View Input	Filter. Plot All • Sub Plot All •	
Input New Palm		
ID: 39		
Plot : -	Please Select One 💌	
Sub Plot : 🗧	Please Select One 💌	
Species : -	Please Select One	New Species
Tree ID :		
DBH :	cm	
Height :	m	
Description :	.:i Submit Reset	

Figure 5-25 Input Palms and Lianas Screenshot

The seedlings and litters menu is used to manage the seedlings and litters data. The seedlings and litters data is specified per plot. There is exactly one seedlings and litters data for each plots. The seedlings and litters data can not be deleted. Users can only edit the data.

	Seedli	ngs and l	Litters						
Select Str	ata: All	▼ V	iew						
Strata Type	Strata	Plot Name	Dominant Species	Litter Thickness (cm)	Litter Weight (gr)	Seedlings Height (cm)	Seedlings Density (%)	DW/FW Ratio	Controls
Non Hutan	Belukar	Belukar-22	Rumbai	13	7200	30	7	0.65	<u>Edit</u>
Non Hutan	Belukar	Belukar-23		2	2600	0	0	0.61	<u>Edit</u>
Non Huter	Belukar	Belukar-24	Asem Payo	10	12500	12.5	40	0.61	<u>Edit</u>
Non Hutan	Tebangan	Tebangan-45		3	5600	0	0	0.61	Ean
Non Hutan	Terbuka	Terbuka-36	Pakis	50	2000	40	60	0.61	<u>Edit</u>
Non Hutan	Terbuka	Terbuka-37	Pakis Paku	10	27000	130	75	0.61	Edit

Figure 5-26 View Seedlings and Litters Screenshot

Seedlings	and Litters
Select Strata: All	View
-Sub Plot A Info	
ID:	23
Plot Name:	Belukar-23
Dominant Species:	Please Select One
Litter Thickness :	2 cm
Litter Weight :	2600 gr
Seedlings Height :	0 cm
Seedlings Density :	0 %
DW/FW Ratio* :	0.61
	Save Reset
*Dead Weight / Fresh Weig	ht Ratio

Figure 5-27 Edit Seedlings and Litters Screenshot

5.4 STAND COMPOSITION

The Stand Composition menu group consists of Tree distribution per DBH, tree distribution per plot, tree density and importance value index. These data represents the composition of tree species inside the plots specified. The composition calculation is done automatically by the software.

5.4.1 TREE DISTRIBUTION PER DBH

The Tree Distribution per DBH provides the view of tree count based on its species and DBH. Users can observe the trees DBH distribution aided by color ranges. The pink color represents trees count less than 3. The orange color represents trees count between 3 to 5. Yellow represents 6 to 8 trees count. Green represents 9 to 11 tree count. While blue represents 12 or more trees.



Figure 5-28 Tree Distribution per DBH Screenshot

5.4.2 TREE DISTRIBUTION PER PLOT

The tree distribution per plot provides the view of tree count based on its plot and species. The view also provides color aid as in trees distribution per DBH.



Figure 5-29 Tree Distribution per Plot Screenshot

5.4.3 TREE DENSITY

The tree density provides the view of tree densities per plot. The trees densities is calculated by the tree count per the subplot area (in Ha).

Tree Density											
Strata 1: All Strata View											
Diet Name	Sub	plot T	iree (Count	Subple	ot Tre	e Den	sity	Total Density		
Plot Name	В	С	D	E	В	С	D	E	(Tree/Ha)		
Rapat-1	0	2	2	9	0	200	50	36	286		
Rapat-2	1	0	0	0	400	0	0	0	400		
Rapat-3	1	3	1	8	400	300	25	32	757		
Rapat-4	0	0	0	0	0	0	0	0	0		
rebangan-42	0	1					U	16	110		
Tebangan-43	0	0	0	3	0	0	0	12	12		
Tebangan-44	1	0	0	4	400	0	0	16	416		
Tebangan-45	3	0	2	4	1200	0	50	16	1266		
Total	48	79	88	221	19200	7900	2200	884	30184		

Figure 5-30 Tree Density Screenshot

5.4.4 IMPORTANCE VALUE INDEX

The importance value index provides the view of the importance value indices. Users can choose to view the IVI of all sub plots or only for saplings, poles, trees or large trees. Users can also choose to show the IVI for all species or just a limited number.

]	Importance Value Indices										
Saplings	Saplings 👻 Show: 20 💌										
Local 1	Name	Scienti	fic Name	D	DR	F	FR	Do	DoR	IVI	
Gerinan	g Lalat			62.222	14.583	0.089	9.091	0.281	14.257	12.644	
Malasiro)			17.778	4.167	0.044	4.545	0.131	6.672	5.128	
Medang	Putih			17.778	4.167	0.044	4.545	0.078	3.958	4.224	
					$\langle \rangle$	- 044	4 545	0 077	3.016		
Balam S	untik			8.889	2.083	0.022	2.275	0.049	2.501	2.286	
Kayu A	ra Pulut			8.889	2.083	0.022	2.273	0.046	2.325	2.227	
Nangoi		Calophyllum	sclerophyllum	8.889	2.083	0.022	2.273	0.045	2.268	2.208	
Kayu Ar	ra Itam			8.889	2.083	0.022	2.273	0.040	2.047	2.134	

Figure 5-31 Importance Value Index Screenshot

5.5 CARBON CALCULATION

The carbon calculation menu group consists of AGB Carbon Stock, DOM Carbon Stock, BGB Carbon Stock, Soil Carbon Stock and Total Carbon Stock. The menus provide carbon stock calculation for each carbon pool.

5.5.1 AGB CARBON STOCK

AGB carbon stock provides the calculation of Above Ground Biomass and its carbon stock. The AGB Carbon Stock is calculated using living trees data and their respective species and equations. There are 5 views for the carbon calculations: Details Per Plot, Details Per Sub Plot, Summary Per Plot, Mean Per Strata and Mean Per Forest/Non-Forest.

Above Ground Biomass Filter. View Plot Name Sub Plot Tree ID Local Name Latin Name DBH (cm) AGB (Kg) C (Kg) C Kg/Ha Rapat-1 C C1 Medang Putih 15.5 170.64 85.32 Rapat-1 C C5 Balam Suntik 15.2 162.66 81.33 Image: C C5 Balam Suntik 15.2 561.61 280.81 Rapat-1 D D1 Gasing Lithocarpus sundaicus 25.2 561.61 280.81 Rapat-1 E E8 Rengas Burung 28 727.10 362.57 Rapat-1 E E9 Rengas Burung 87.2 17.77.2.41 5.86.21 Rapat-1 E E9 Rengas Burung 78 8.957.33 4.478.67 Total Sub Plot E Rapat-1 Z3.095.56 93.582.25 104 124.206.57 126.356.35 recoangan-45 E E3 Rengas Lempuing 65.7 5.881.66									
Filter: View: Details Per Plot Plot All View Plot Name Sub Plot Tree ID Local Name Latin Name DBH (cm) AGB (Kg) C (Kg) C Kg/Ha Rapat-1 C C1 Medang Putih 15.5 170.64 85.32 Rapat-1 C C5 Balam Suntik 15.2 162.66 81.33 Total Sub Plot C Rapat-1 166.65 16,665.16 Rapat-1 D D1 Gasing Lithocarpus sundaicus 25.2 561.61 280.81 Rapat-1 E E8 Rengas Burung Duera 1000000000000000000000000000000000000	Ab	ove Gi	round	Biomass					
View: Details Per Plot Plot All View Plot Name Sub Plot Tree ID Local Name Latin Name DBH (cm) AGB (Kg) C (Kg) C Kg/Ha Rapat-1 C C1 Medang Putih 15.5 170.64 85.32 Rapat-1 C C5 Balam Suntik 15.2 162.66 81.33 Total Sub Plot C Rapat-1 166.65 16,665.16 Rapat-1 D D1 Gasing Lithocarpus sundaicus 25.2 561.61 280.81 Rapat-1 E E8 Rengas Burung Duera Lucccccccccccccccccccccccccccccccccccc	Filter:								
Plot Name Sub Plot Tree ID Local Name Latin Name DBH (cm) AGB (Kg) C (Kg) C Kg/Ha Rapat-1 C C1 Medang Putih 15.5 170.64 85.32 Rapat-1 C C5 Balam Suntik 15.2 162.66 81.33 Image: C C5 Balam Suntik Image: C C Rapat-1 166.65 16,665.16 Rapat-1 D D1 Gasing Lithocarpus sundaicus 25.2 561.61 280.81 Rapat-1 D D1 Gasing Lithocarpus sundaicus 25.2 561.61 280.81 Rapat-1 E E8 Rengas Burung Nuera Lew" 28 72.7.10 362 cr Rapat-1 E E9 Rengas Burung 87.2 17.772.41 5.886.21 Rapat-1 E E9 Rengas Burung 78 8.957.33 4.478.67 Total Sub Plot E Rapat-1 Z S0.2 5.93,582.25 126,356.35 Tecoangan-45 <th< td=""><td>View: Details</td><td>s Per Plot</td><td></td><td>▼ Plot: All</td><td>▼ View</td><td></td><td></td><td></td><td></td></th<>	View: Details	s Per Plot		▼ Plot: All	▼ View				
Rapat-1 C C1 Medang Putih 15.5 170.64 85.32 Rapat-1 C C5 Balam Suntik 15.2 162.66 81.33 Total Sub Plot C Rapat-1 166.65 16,665.16 Rapat-1 D D1 Gasing Lithocarpus sundaicus 25.2 561.61 280.81 Rapat-1 D D1 Gasing Lithocarpus sundaicus 25.2 561.61 280.81 Rapat-1 E E8 Rengas Burung 87.2 727.10 362.67 Rapat-1 E E9 Rengas Burung 78 8.957.33 4,478.67 Rapat-1 E E9 Rengas Burung 78 8.957.33 4,478.67 Total Sub Plot E Rapat-1 23,395.56 93,582.25 Total Sub Plot E Rapat-1 24,206.57 126.356.35 Total Sub Plot E Rapat-1 24,206.57 126.356.35 Total Sub Plot E Tebangan-45 8,022.36 32,089.43 Total Sub Plot E Teban	Plot Name	Sub Plot	Tree ID	Local Name	Latin Name	DBH (cm)	AGB (Kg)	C (Kg)	C Kg/Ha
Rapat-1 C C5 Balam Suntik 15.2 162.66 81.33 Total Sub Plot C Rapat-1 166.65 16,665.16 Rapat-1 D D1 Gasing Lithocarpus sundaicus 25.2 561.61 280.81 Rapat-1 D D1 Gasing Lithocarpus sundaicus 25.2 561.61 280.81 Rapat-1 E E8 Rengas Burung Duera 1=0 28 727.10 362.55 rapat-1 E E9 Rengas Burung 87.2 11,7772.41 5,886.21 Rapat-1 E E9 Rengas Burung 78 8,957.33 4,478.67 Total Sub Plot E Rapat-1 23,395.56 93,582.25 93,582.25 126,356.35 Icoangan-45 E E2 Rengas Burung 50.2 -10,571 1,520.65 Tebangan-45 E E3 Rengas Lempuing 65.7 5,881.66 2,940.83 Tebangan-45 E E4 Kempas Koompassia malaccensis 42.3 1,998.89 999.44 Total Sub Plot E Tebangan-45 8,022.36	Rapat-1	С	C1	Medang Putih		15.5	170.64	85.32	
Total Sub Plot C Rapat-1 166.65 16,665.16 Rapat-1 D D1 Gasing Lithocarpus sundaicus 25.2 561.61 280.81 Rapat-1 D Lithoua Rawa Duero Louin 28 727.10 362.67 Rapat-1 E E8 Rengas Burung 87.2 11,772.41 5,886.21 Rapat-1 E E9 Rengas Burung 78 8,957.33 4,478.67 Rapat-1 E E9 Rengas Burung 78 8,957.33 4,478.67 Total Sub Plot E Rapat-1 Z3,395.56 93,582.25 93,582.25 93,582.25 Total Sub Plot E Rapat-1 24,206.57 126,356.35 recoangan-45 E E3 Rengas Lempuing 65.7 5,881.66 2,940.83 Tebangan-45 E E4 Kempas Koompassia malaccensis 42.3 1,998.89 999.44 Total Sub Plot E Tebangan-45 8,022.36 32,089.43 Total Sub Plot Tebangan-45 8,388.25 54,459,11	Rapat-1	С	C5	Balam Suntik		15.2	162.66	81.33	
Rapat-1 D D1 Gasing Lithocarpus sundaicus 25.2 561.61 280.81 Rapat-1 D Lithocarpus Rawa Duera Levino 28 727.10 362.55 Rapat-1 E E8 Rengas Burung 87.2 11,772.41 5,886.21 Rapat-1 E E9 Rengas Burung 78 8,957.33 4,478.67 Total Sub Plot E Rapat-1 E. E9 Rengas Burung 78 8,957.33 4,478.67 Total Sub Plot E Rapat-1 23,395.56 93,582.25 126,356.35 126,356.35 Teoangan-45 E E3 Rengas Burung 50.2 1,520.65 Tebangan-45 E E3 Rengas Lempuing 65.7 5,881.66 2,940.83 Tebangan-45 E E4 Kempas Koompassia malaccensis 42.3 1,998.89 999.44 Total Sub Plot E Tebangan-45 8,022.36 32,089.43 32,089.43 32,089.43 32,089.43						Total Sub Plo	ot C Rapat-1	166.65	16,665.16
Rapat-1 r t-tutung Rawa Duera Levino 28 727.10 362.55 Rapat-1 E E8 Rengas Burung 87.2 11,772.41 5,886.21 Rapat-1 E E9 Rengas Burung 78 8,957.33 4,478.67 Total Sub Plot E Rapat-1 23,395.56 93,582.25 Total Sub Plot Rapat-1 24,206.57 126,356.35 Total Plot Rapat-1 24,206.57 126,356.35 Total Plot Rapat-1 24,206.57 126,356.35 Tebangan-45 E E3 Rengas Lempuing 65.7 5,881.66 2,940.83 Tebangan-45 E E4 Kempas Koompassia malaccensis 42.3 1,998.89 999.44 Total Plot Tebangan-45 8,022.36 32,089.43 Total Plot Tebangan-45 8,388.25 54,459.11	Rapat-1	D	D1	Gasing	Lithocarpus sundaicus	25.2	561.61	280.81	
Rapat-1 E E8 Rengas Burung 87.2 11,772.41 5,886.21 Rapat-1 E E9 Rengas Burung 78 8,957.33 4,478.67 Total Sub Plot E Rapat-1 23,395.56 93,582.25 Total Sub Plot E Rapat-1 24,206.57 126,356.35 recoangan-45 E E3 Rengas Lempuing 65.7 5,881.66 2,940.83 Tebangan-45 E E4 Kempas Koompassia malaccensis 42.3 1,998.89 999.44 Total Plot Tebangan-45 8,022.36 32,089.43 Total Plot Tebangan-45 8,388.25 54,459.11	Rapat-1	P		L-hitung Rawa	Dvera law"	28	727.10	362.55	
Rapat-1 E E9 Rengas Burung 78 8,957.33 4,478.67 Total Sub Plot E Rapat-1 23,395.56 93,582.25 Total Plot Rapat-1 24,206.57 126,356.35 Tebangan-45 E E3 Rengas Lempuing 65.7 5,881.66 2,940.83 Tebangan-45 E E4 Kempas Koompassia malaccensis 42.3 1,998.89 999.44 Total Plot Tebangan-45 8,022.36 32,089.43	Rapat-1	E	E8	Rengas Burung		87.2	11,772.41	5,886.21	
Total Sub Plot E Rapat-1 23,395.56 93,582.25 Total Plot Rapat-1 24,206.57 126,356.35 Tebangan-45 E E3 Rengas Lempuing 65.7 5,881.66 2,940.83 Total Plot Tebangan-45 E E4 Kempas Koompassia malaccensis 42.3 1,998.89 999.44 Total Plot Tebangan-45 8,022.36 32,089.43 Total Plot Tebangan-45 8,388.25 54,459,11	Rapat-1	E	E9	Rengas Burung		78	8,957.33	4,478.67	
Total Plot Rapat-1 24,206.57 126,356.35 recoangan-45 E E2 Rengas Burung 50.2 5,671.31 1,520.65 Tebangan-45 E E3 Rengas Lempuing 65.7 5,881.66 2,940.83 Tebangan-45 E E4 Kempas Koompassia malaccensis 42.3 1,998.89 999.44 Total Sub Plot E Tebangan-45 8,022.36 32,089.43 Total Plot Tebangan-45 8,388.25 54,459,11						Total Sub Pl	ot E Rapat-1	23,395.56	93,582.25
Icoangan-45 E E2 Rengas Burung 50.2 5.0.1 1,520.65 Tebangan-45 E E3 Rengas Lempuing 65.7 5,881.66 2,940.83 Tebangan-45 E E4 Kempas Koompassia malaccensis 42.3 1,998.89 999.44 Total Sub Plot E Tebangan-45 8,022.36 32,089.43 Total Plot Tebangan-45 8,388.25 54.459.11						Total P	lot Rapat-1	24,206.57	126,356.35
Tebangan-45 E E3 Rengas Lempuing 65.7 5,881.66 2,940.83 Tebangan-45 E E4 Kempas Koompassia malaccensis 42.3 1,998.89 999.44 Total Sub Plot E Tebangan-45 8,022.36 32,089.43	rebangan-45	E	E2	Rengas Burung		50.2	5,011.31	1,520.65	
Tebangan-45 E E4 Kempas Koompassia malaccensis 42.3 1,998.89 999.44 Total Sub Plot E Tebangan-45 8,022.36 32,089.43 Total Plot Tebangan-45 8,388.25 54.459.11	Tebangan-45	E	E3	Rengas Lempuing		65.7	5,881.66	2,940.83	
Total Sub Plot E Tebangan-45 8,022.36 32,089.43 Total Plot Tebangan-45 8.388.25 54.459.11	Tebangan-45	E	E4	Kempas	Koompassia malaccensis	42.3	1,998.89	999.44	
Total Plot Tebangan-45 8.388.25 54.459.11					Tota	al Sub Plot E	Tebangan-45	8,022.36	32,089.43
						Total Plot T	ebangan-45	8,388.25	54,459.11
Total C 3,056,505.03								Total C	3,056,505.03

Figure 5-32 AGB Details per Plot Screenshot

	Above G	round	Biomass					
Filter: View: De	etails Per Sub P	Plot	▼ Sub Plot: All ▼	View				
Sub Plot	Plot Name	Tree ID	Local Name	Latin Name	DBH (cm)	AGB (Kg)	C (Kg)	C Kg/Ha
В	Rapat-2	B1	Durian Payo		9.7	54.09	27.05	
				Tota	al Plot Rapat-	2 Sub Plot B	27.05	10,818.62
В	Rapat-3	B1	Pepahit	Quasia borneensis	6	16.66	8.33	
				Tota	al Plot Rapat-	3 Sub Plot B	8.33	3,332.90
В	Rapat-5	B1	Nangoi	Calophyllum sclerophyllum	8	33.73	16.87	
P	Ct mo	D2				21.05		
В	Tebangan-45	B3	Kayu Kapas		8.1	34.77	17.39	
				Total Plo	t Tebangan-4	5 Sub Plot B	35.26	14,103.89
					Tota	l Sub Plot B	742.34	296,935.31
С	Rom		- Jong Putih		15.5	170.64	85.22	
	Tebangan-45	E3	Rengas Lempung		65.7		2,940.83	
E	Tebangan-45	E4	Kempas	Koompassia malaccensis	42.3	1,998.89	999.44	
				Total Plo	t Tebangan-4	5 Sub Plot E	8,022.36	32,089.43
					Tota	l Sub Plot E	374,812.44	1,499,249.74
							Total C	3,056,505.03

Figure 5-33 AGB Details per Sub Plot Screenshot

	Ab	ovo Cr	ound B	iomoss								
Fi	ilter:	ove GI	ouna D	10111455			_					
V	View: Summary Per Plot View											
р	C Kg/Ha Sub Plot											
ſ	Plot Name SP-B SP-C SP-D SP-E C Total Kg/Ha C											
Ra	apat-1	0.00	16,665.16	16,108.94	93,582.25	126,356.35	126.356					
Ra	apat-2	10,818.62	0.00	0.00	0.00	10,818.62	10.819					
Ra	apat-3	3 222-00	12 310.82	14,003.30	37,469.62	67 116 64	67.117					
16	ebangan-43	0.00	0.00	0.00	9,515.45	9,515.45	9.515					
Te	ebangan-44	5,572.75	0.00	0.00	18,866.13	24,438.88	24.439					
Te	ebangan-45	14,103.89	0.00	8,265.78	32,089.43	54,459.11	54.459					
					Total	3,056,505.03	3,056.505					

Figure 5-34 AGB Summary per Plot Screenshot

Abov	Above Ground Biomass										
Filter: View: Mean Per Strata											
Strata C Ton/Ha n plot s t.se CV (%)											
Belukar	55.186	9	33.143	22.095	60.06						
Mahang	Mahang 84.332 1 0.000 0.000 0.										
Rapat	100.187	9	73.859	49.239	73.72						
Rumput	0.000	1	0.000	0.000	0.00						
Sedang	105.669	12	48.624	28.073	46.02						
Semak	7.830	3	10.519	12.147	134.34						
Tebangan	30.952	8	24.217	17.124	78.24						
Terbuka	17.342	2	16.159	22.853	93.18						
Total	67.922	45	56.952	16.980	83.85						

Figure 5-35 AGB Mean per Strata Screenshot

Abov	Above Ground Biomass										
Filter: View: Mean Per	Hilter:										
view. Meant er	r oresentoir r or										
Strata Type	C Ton/Ha	n plot	S	t.se	CV (%)						
Forest	103.319	21	59.078	25.784	57.18						
Non-Forest	Non-Forest 36.950 24 32.019 13.072 86.65										
Total	Total 67.922 45 56.952 16.980 83.85										

Figure 5-36 AGB Forest/Non-Forest Screenshot

5.5.2 DOM CARBON STOCK

DOM Carbon Stock provides calculation of Death Organic Matter Biomass and its carbon stock. The DOM Carbon Stock uses three groups of data, which is Dead Trees, Dead Woods and Litter. Each group has five views for the carbon calculations: Details Per Plot, Details Per Sub Plot, Summary Per Plot, Mean Per Strata and Mean Per Forest/Non-Forest, except for Litter which has only three last views.

D	ead O1	rganic	Matter						
Filter:									
Group: Dea	d Tree								
View: Detail	s Per Plot		▼ Plot: All	✓ View					
		_	_	-	_				
Plot Name	Sub Plot	Tree ID	Local Name	Latin Name	Completeness	DBH (cm)	TB (Kg)	C (Kg)	C Kg/Ha
Rapat-1	D	1D2	Kempas	Koompassia malaccensis	С	23.5	331.27	155.70	
					T	otal Sub Plot	D Rapat-1	155.70	3,892.48
Rapat-1	E	1E2	Pepahit	Quasia borneensis	С	38.1	1,082.85	508.94	
					1	Fotal Sub Plot	E Rapat-1	508.94	2,035.76
						Total Plo	ot Rapat-1	664.64	5,928.24
Rapat-2	F	1E2	Maryawoh		С	39.8	1,205 14	566.42	
-coungan-45	Е	1E2	WICIANA	snorea teysmanniana	C		8,928.73	4,196.50	
Tebangan-45	Е	2E2	Punak	Tetramerista glabra	С	42.7	1,431.88	672.98	
					Total	Sub Plot E Te	bangan-45	4,869.48	19,477.93
					1	Total Plot Te	bangan-45	5,011.52	25,816.58
								Total C	232,546.22

Figure 5-37 DOM Dead Tree Details per Plot Screenshot

	Dead Or	ganic	Matter						
Filter:									
Group: D	ead Tree	•							
View: De	tails Per Sub P	lot	Sub Plot: All	View					
Sub Plot	Plot Name	Tree ID	Local Name	Latin Name	Completeness	DBH (cm)	TB (Kg)	C (Kg)	C Kg/Ha
С	Semak-32	1C2	Meranti Payau	Shorea teysmanniana	С	19.9	220.39	103.58	
С	Semak-32	2C2	Punak	Tetramerista glabra	С	18.5	184.30	86.62	
					Total Pl	ot Semak-32	Sub Plot C	190.20	19,020.26
С	Terbuka-36	1C2	Darah-darah	Horsfieldia sp.	С	19.2	201.87	94.88	
					Total Plot	Terbuka-36	Sub Plot C	94.88	9,487.70
С	Terbuka-37	1C2	Pabung		А	16	166.01	78.02	
					Total Plot	Terbuka-37	Sub Plot C	78.02	7,802.33
С	Tebangan-45	2C2	Kelat	Syzygium racemosum	С	13.1	79.09	37.17	
					Total Plot	Febangan-45	Sub Plot C	37.17	3,717.11
						Total	Sub Plot C	400.27	40,027.40
D	Rapet 1	100	Kempas	Koompassia mel-soonsis	С	23.5	331.27	155 70	
	rebangan-45	1E2	IVICIAL	and teysmanniana	0		0,720.73	4,190.50	
E	Tebangan-45	2E2	Punak	Tetramerista glabra	С	42.7	1,431.88	672.98	
					Total Plot	Tebangan-45	Sub Plot E	4,869.48	19,477.93
						Total	Sub Plot E	34,634.75	138,538.99
								Total C	232,546.22

Figure 5-38 DOM Dead Tree Details per Sub Plot Screenshot

D	Dead Organic Matter											
Filter: Group: Dead Tree View: Summary Per Plot View												
Plot Name C Kg/Ha Sub Plot C Total Kg/Ha C Total Ton/Ha												
SP-B SP-C SP-D SP-E												
Rapat-1	0.00	0.00	3,892.48	2,035.76	5,928.24	5.928						
Rapat-2	0.00	0.00	0.00	2,265.66	2,265.66	2.266						
Rapat-3			0.00	0.00		0.000						
Tebangan-43	0.00	0.00	0.00	0.00	0.00	0.000						
Tebangan-44 0.00 0.00 0.00 0.00 0.00												
Tebangan-45	Tebangan-45 0.00 3,717.11 2,621.54 19,477.93 25,816.58											
				Total	232,546.22	232.546						

Figure 5-39 DOM Dead Tree Summary per Plot Screenshot

Dea	Dead Organic Matter										
Group: Dead Tree View: Mean Per Strata View											
Strata	C Ton/Ha	n plot	s	t.se	CV (%)						
Belukar	3.416	9	7.481	4.988	219.00						
Mahang	0.000	1	0.000	0.000	0.00						
Rapat	6.186	9	10.251	6.834	165.71						
Rumput	0.000	1	0.000	0.000	0.00						
Sedang	2.862	12	4.869	2.811	170.11						
Semak	11.392	3	15.685	18.112	137.69						
Tebangan	5.306	8	9.169	6.484	172.82						
Terbuka	17.579	2	11.442	16.182	65.09						
Total	5.168	45	8.712	2.597	168.58						

Figure 5-40 DOM Dead Tree Mean per Strata Screenshot

Dea	d Organi	c Mat	ter								
Filter: Group: Dead Tree View: Mean Per Forest/Non-Forest View											
Strata Type	C Ton/Ha	n plot	s	t.se	CV (%)						
Forest	4.287	21	7.610	3.321	177.53						
Non-Forest	5.938	24	9.669	3.948	162.83						
Total	5.168	45	8.712	2.597	168.58						

Figure 5-41 DOM Dead Tree Mean Per Forest/Non Forest Screenshot

										D	ead Wood mas
D	ead Or	rganic	Mat	ter					/	Sound: 0.6	Moderate: 0
Filter: Group: Dea	d Wood								1	Go to Data Settings>c	Input>Species onvertion factor
View: Details	s Per Plot		▼ Pl	ot: All		▼ View					
Plot Name	Sub Plot	Tree ID	D1 (cm)	D2 (cm)	Length (m)	Decomposition Level	Hollo Diame	w Hollow ter Length	TB (Kg)	C (Kg)	C Kg/Ha
Rapat-1	С	1C3	30	21	9.5	Moderate	0	0	194.0	/ 87.33	
							Т	otal Sub Plot	C Rapat-	87.33	8,733.06
Rapat-1	D	1D3	31	10.5	7	Rotten	0	0	47.34	4 21.30	
							T	otal Sub Plot	D Rapat-1	21.30	532.61
								Total Ple	ot Rapat-J	108.63	9,265.66
Rapat-3	С		121	14.9	4	Moderate		0	32.78	3 14.75	
rcoangan-45	D	1D3	41.2	34.1	8.2	Sound	0	0	D47.7.	246.49	
							Total S	s <mark>ub Plot D T</mark> e	bangan-4:	3 246.49	6,162.22
							Т	otal Plot Te	bangan-4:	5 246.49	6,162.22
										Total C	195,974.44

Figure 5-42 DOM Dead Wood Details Per Plot Screenshot

_			_								I	Dea	d Wood mass]
D	ead Org	anic N	latte	er						5	Sound: 0.6	;	Moderate: 0.4
Filter: Group: Dead	d Wood		_	_						C S	Go to Dat Settings>	a Ir con	put>Species a vertion factor t
View: Details	s Per Sub Plot		Sub	Plot:		ïew							
Sub Plot	Plot Name	Tree ID	D1 (cm)	D2 (cm)	Length (m)	Decomposition Level	H Dia	ollow meter	Hollow Length	TB (K	g) C (K	g)	C Kg/Ha
Rapat-1	С	1C3	30	21	9.5	Moderate	0		0	194.	07 87	.33	
								Tota	Sub Plot	1 Rapat	-1 87	.33	8,733.06
Rapat-3	С	1/C3	17.4	14.9	4	Moderate	0		0	32.	78 14	.75	
								Tota	l Sub Plot	3 Rapat	-3 14	.75	1,474.92
Rapat-7	C	1C3	21.1	19.4	2.1	Rotten	0		0	13.	53 6	09	
Tebangan-45	D	1D3	41.2	24.1	8.2	Sound	0		•	J47.	75 246	.49	
							Tot	al Sub I	Plot 45 Te	bangan-	45 246	.49	6,162.22
								Tota	l Plot Tek	angan-	45 3,558	.68	88,966.93
											Total	C	195,974.44

Figure 5-43 DOM Dead Wood Details per Sub Plot Screenshot

	D	ead (Organio	c Matte	r							
	Filter:	- Wood		r								
	View: Summ	ary Per	Plot	▼ Vie	w							
	Plot Name C Kg/Ha Sub Plot C Total Kg/Ha C Total Ton/Ha											
	SP-B SP-C SP-D SP-E											
	Rapat-1	0.00	8,733.06	532.61	0.00	9,265.66	9.266					
	Rapat-2	0.00	0.00	0.00	0.00	0.00	0.000					
	Rapat-3		1 474 92	0.00	0.00	1 474 02	1.475					
Π	Tebangan-43	0.00	0.00	0.00	0.00	0.00	0.000					
	Tebangan-44	0.00	3,740.69	3,723.38	0.00	7,464.07	7.464					
	Tebangan-45	0.00	0.00	6,162.22	0.00	6,162.22	6.162					
					Total	195,974.44	195.974					

Figure 5-44 DOM Dead Wood Summary per Plot Screenshot

Dea Filter: Group: Dead W View: Mean Per	d Organi ood – Strata	c Mat	ter ^r iew										
Strata	Strata C Ton/Ha n plot s t.se CV (%)												
Belukar	6.377	9	12.146	8.098	190.48								
Mahang	0.000	1	0.000	0.000	0.00								
Rapat	2.596	9	4.555	3.036	175.44								
Rumput	0.818	1	0.000	0.000	0.00								
Sedang	2.943	12	5.642	3.257	191.71								
Semak	4.751	3	6.098	7.042	128.35								
Tebangan	6.834	8	8.378	5.924	122.58								
Terbuka	5.080	2	3.404	4.814	67.01								
Total	4.355	45	7.453	2.222	171.15								

Figure 5-45 DOM Dead Wood Mean per Strata Screenshot

Dea	d Organi	c Mat	ter								
Filter: Group: Dead Wood View: Mean Per Forest/Non-Forest View											
Strata Type	C Ton/Ha	n plot	s	t.se	CV (%)						
Forest	2.794	21	5.083	2.218	181.91						
Non-Forest	5.721	24	8.924	3.643	156.00						
Total	4 355	45	7 452	2 222	171 15						

Figure 5-46 DOM Dead Wood Mean per Forest/Non Forest Screenshot

D Filter: Group: Litter View: Summ	ead Organic	• Matter			Go to Data I Settings>co	Carbon Fraction Input>Species : nvertion factor	n: 0.5 and Allometric to change.
Plot Name	Dominant Species	Litter Thickness (cm)	Litter Weight (gr)	Seedlings Height (cm)	Seedlings Density (%)	DW/FW Ratio	C Litter (ton/Ha)
Rapat-1		2	0	0	0	0.61	0.000
Rapat-2		2.2	6300	0	0	0.61	4.804
Rapat-3		2	1900	20	10	0.61	1.449
Tebangan-43	Pakis	9	7000	60	10	0.61	
Tebangan-44	Pakis Paku	2	3800	300	90	0.61	2.898
Tebangan-45		3	5600	0	0	0.61	4.270
						Total	242.644

Figure 5-47 DOM Litter Summary per Plot Screenshot

Dea Filter: Group: Litter View: Mean Per	d Organi • •	c Matt	ter /iew									
Strata C Ton/Ha n plot s t.se CV (%)												
Belukar	Behukar 5.165 9 3.975 2.650 76.95											
Mahang	12.987	1	0.000	0.000	0.00							
Rapat	5.543	9	3.328	2.218	60.03							
Rumput	4.657	1	0.000	0.000	0.00							
Sedang	7.990	12	7.463	4.309	93.40							
Semak	3.613	3	3.927	4.535	108.71							
Tebangan	4.736	8	2.224	1.573	46.97							
Terbuka	12.987	2	15.833	22.392	121.91							
Total	6.324	45	5.586	1.665	88.32							

Figure 5-48 DOM Litter Mean per Strata Screenshot

Dea	d Organi	c Mat	ter									
Filter: Group: Litter View: Mean Per	Group: Litter Image: Second											
Strata Type	C Ton/Ha	n plot	s	t.se	CV (%)							
Forest	6.941	21	6.050	2.640	87.16							
Non-Forest	5.785	24	5.216	2.130	90.18							
Total	6.324	45	5.586	1.665	88.32							

Figure 5-49 DOM Litter Mean per Forest/Non Forest Screenshot

5.5.3 BGB CARBON STOCK

BGB Carbon Stock provides calculation of Below Ground Biomass, its carbon stock and its volume. The BGB Carbon Stock uses living trees data, calculate their AGB, and convert them into BGB using the equation set in the Conversion Factors menu. The BGB Volume is the tree's BGB divided by its mass density. If the tree's mass density is not specified, the volume is displayed as NA in the view. Even though the volume is not displayed, when calculating Volume / Ha, the software used default mass density which is 700Kg/M³.

File: View: Details Per Plot I Plot All View Plot Name Sub Plot Tee ID Local Name Latin Name DBH (cm) TB (kg) C (kg) C Kg/Ha Vm ³ Vm ³ /Ha Rapat-1 C C1 Medaag Puth 15.5 42.66 20.48 NA 6.09 Rapat-1 C C5 Balam Suntik 15.2 40.67 19.52 NA 5.81 TETE Sub Plot C Rapat 1 40.00 3,999.64 0.00 11.90 Rapat-1 D D1 Gasing Lithocarpus sundaicus 25.2 140.40 67.39 NA 5.01 Rapat-1 D D2 Jehtnag Rawa Dyera lowii 28 181.78 87.25 0.50 12.62 Rapat-1 E E1 Rengas Burung 71.4 1,803.04 865.64 NA 10.30 84.61.5 NA 2.57 Rapat-1 E E3 Jehtnag Rawa Dyera lowii 44.4 502.74 2701.1 1.56 6.25	Be	low Gı	round]	Biom ass											
View: Details Par Plot Plot Rail View Plot Name Sub Plot Tee ID Local Name Latin Name DBH (cm) TB (kg) C (kg) C Kg/Ha Vm ³ Vm ³ /Ha Rapat-1 C C1 Medang Putih 15.5 42.66 20.48 NA 6.09 Rapat-1 C C5 Balam Suntik 15.2 40.67 19.52 NA 5.81 Rapat-1 D D1 Gasing Lithocarpus sundaicus 25.2 140.40 67.39 NA 5.01 Rapat-1 D D2 Jehtnug Rawa Dyera lowii 28 181.78 87.25 0.50 12.62 Rapat-1 E E Rengas Burung 71.4 1.803.04 86.615 0.50 17.64 Rapat-1 E E Pabung 40.5 49.20 215.62 NA 2.57 Rapat-1 E E Gasing Lithocarpus sundaicus 41 46.291 222.00 NA 2.64 Rapat-1 E E Rengas Burung 78.1<	Filter:	D DI .													
Piot NameSub PiotTree IDLocal NameLatin NameDBH (nn)TB (Kg)C (Kg)C Kg/HV n³V n³/HaRapat-1CC1Medang Putih15.542.6620.48NA6.00Rapat-1CC5Balan Suntik15.240.6719.52NA5.81Rapat-1DD1GasingLithocarpus sundaicus25.2140.4067.39NA5.01Rapat-1DD2Jehtung RawaDyera lowii28181.7887.250.0511.62Rapat-1EE1Rengas BurungQuera lowii14.4180.3086.56NA10.30Rapat-1EE2PabungQuera lowii44.456.2727.011.566.25Rapat-1EE3Jehtung RawaDyera lowii44.456.2727.011.566.25Rapat-1EE3Jehtung RawaDyera lowii44.456.2727.011.566.25Rapat-1EE3BeinginaEicus benjamina42.7511.324.56NA2.25Rapat-1EE3Rengas BurungFicus benjamina42.7511.324.56NA2.24Rapat-1EERengas BurungFicus benjamina42.7511.32.45.8NA2.24Rapat-1EERengas BurungFicus benjamina42.7511.32.45.8NA2.24Rapat-1EE <th>View: Details</th> <th>s Per Plot</th> <th></th> <th></th> <th>▼ View</th> <th></th> <th></th> <th></th> <th></th> <th>_</th> <th></th>	View: Details	s Per Plot			▼ View					_					
Rapat-1CC1Medang Puth15.542.6620.48NA6.09Rapat-1CC5Balam Suntik15.240.6719.52NA5.81Rapat-1DD1GasingLithocarpus sundaicus25.2140.4067.39NA5.01Rapat-1DD2Jehtung RawaDyera lowii28181.7887.250.5012.62USE VIET VET VET VET VET VET VET VET VET VET V	Plot Name	Sub Plot	Tree ID	Local Name	Latin Name	DBH (cm)	TB (Kg)	C (Kg)	C Kg/Ha	V m ³	V m ³ /Ha				
Rapat-1 C C5 Balam Suntik 15.2 40.67 19.52 NA 5.81 Repat-1 D D1 Gasing Lithocarpus sundaicus 25.2 140.40 67.39 NA 5.01 Rapat-1 D D2 Jehtung Rawa Dyera lowii 28 181.78 87.25 0.50 12.62 Rapat-1 E E1 Rengas Burung Quera lowii 48.05 449.20 215.62 NA 0.50 Rapat-1 E E2 Pabung Quera lowii 44.4 562.74 27.01 1.56 6.25 Rapat-1 E E3 Jehtung Rawa Dyera lowii 44.4 562.74 27.01 1.56 6.25 Rapat-1 E E3 Jehtung Rawa Dyera lowii 41.4 462.91 22.20 NA 2.164 Rapat-1 E E Rengas Burung Ficus benjarinia 42.7 511.38 245.64 0.98 3.93	Rapat-1	С	C1	Medang Putih		15.5	42.66	20.48		NA	6.09				
Rapat-1 D D1 Gasing Lithocarpus sundaicus 25.2 140.40 67.39 NA 5.01 Rapat-1 D D2 Jehtung Rawa Dyera lowii 28 181.78 87.25 .050 12.62 Rapat-1 E D2 Jehtung Rawa Dyera lowii 28 181.78 87.25 .050 12.62 Rapat-1 E E1 Rengas Burung .01 1.64.65 3.866.15 0.50 17.64 Rapat-1 E E2 Pabung .01.64 .05.62.74 270.11 .01.030 Rapat-1 E E3 Jehtung Rawa Dyera lowii 44.4 562.74 270.11 .156 6.25 Rapat-1 E E4 Gasing Lithocarpus sundaicus 41 462.91 222.20 NA 2.66 Rapat-1 E E5 Rengas Burung Ficus benjamina 42.7 511.38 245.46 .09.8 3.93 Rapat-1 E E6 Beringin Ficus benjamina 87.2 2.943.10 1.41.26 NA	Rapat-1	С	C5	Balam Suntik		15.2	40.67	19.52		NA	5.81				
Rapat-1 D D1 Gasing Lithocarpus sundaicus 25.2 140.40 67.39 MA 5.01 Rapat-1 D D2 Jehtung Rawa Dyera lowii 28 181.78 87.25 0.50 12.62 Rapat-1 E E1 Rengas Burung 71.4 1,803.04 865.46 NA 10.30 Rapat-1 E E2 Pabung 0.50 17.44 1,803.04 865.46 NA 10.30 Rapat-1 E E3 Jehtung Rawa Dyera lowii 44.4 562.74 270.11 1.56 6.25 Rapat-1 E E4 Gasing Lithocarpus sundaicus 41 462.91 222.40 NA 2.65 Rapat-1 E E6 Beringin Ficus benjamina 42.7 511.38 245.46 0.98 3.93 Rapat-1 E E8 Rengas Burung 87.2 2.943.10 1,412.69 NA 1.68 Rapat-1 E <td></td> <td></td> <td></td> <td></td> <td>Te</td> <td>otal Sub Plot</td> <td>C Rapat-1</td> <td>40.00</td> <td>3,999.64</td> <td>0.00</td> <td>11.90</td>					Te	otal Sub Plot	C Rapat-1	40.00	3,999.64	0.00	11.90				
Rapar-1 D D2 Jehtung Rawa Dyera lowii 28 181.78 87.25 0.50 12.62 Image: Sub Picture Image: Sub Pictur	Rapat-1	D	D1	Gasing	Lithocarpus sundaicus	25.2	140.40	67.39		NA	5.01				
Total Sub Ploy Trans154.653,866.150.5017.46Rapat-1EE1Rengas Burung71.41,803.04865.46NA10.30Rapat-1EE2PabungOyera lowii44.5449.20215.62NA2.57Rapat-1EE3Jehutung RawaDyera lowii44.4562.74270.111.566.25Rapat-1EE4GasingLithocarpus sundaicus41462.91222.20NA2.66Rapat-1EE5Rengas Burung78.12.246.381.078.26NA2.67Rapat-1EE6BeringinFicus benjamina42.7511.38245.460.983.93Rapat-1EE7Darah-darahHorsfieldia sp.41.6479.70230.25NA2.66Rapat-1EE8Rengas Burung87.22.943.101.412.69NA1.682Rapat-1EE9Rengas Burung782.239.331.074.88NA1.280Rapat-1EE9Rengas Burung0.57705.90705.90705.90705.90Total Pict First Brane5.01.913.0325.253.0510.04Rapat-1EEEKempasKoompassia malaccensis42.3499.7223.933.0325.253.0510.04Total Pict First First First Brane5.01.915.05.955.05.955.05.955.05.955.	Rapat-1	D	D2	Jelutung Rawa	Dyera lowii	28	181.78	87.25		0.50	12.62				
Rapat-1 E E1 Rengas Burung 71.4 1,803.04 865.46 NA 10.30 Rapat-1 E E2 Pabung 40.5 449.0 215.62 NA 2.57 Rapat-1 E E3 Jehtung Rawa Dyera lowii 44.4 562.74 270.11 NA 2.55 Rapat-1 E E4 Gasing Lithocarpus sundaicus 41 462.91 222.20 NA 2.65 Rapat-1 E E5 Rengas Burung Ficus benjamina 42.7 511.38 245.46 0.98 3.93 Rapat-1 E E6 Beringin Ficus benjamina 42.7 511.38 245.46 0.98 3.93 Rapat-1 E E7 Darah-darah Horsfieldia sp. 41.6 479.70 230.25 NA 16.82 Rapat-1 E E9 Rengas Burung S7.2 2.943.10 1,412.69 NA 16.82 Rapat-1 E E9 Rengas Burung S7.2 2.943.10 1,71.48 30.325.52 30.5 10.83<					Te	otal Sub Plot	D Rapat-1	154.65	3,866.15	0.50	17.64				
Rapat-1 E E2 Pabung 40.5 449.20 215.62 NA 2.57 Rapat-1 E E3 Jelutung Rawa Dyera lowii 44.4 562.74 270.11 1.56 6.25 Rapat-1 E E4 Gasing Lithocarpus sundaicus 41 462.91 222.20 NA 2.65 Rapat-1 E E5 Rengas Burung 78.1 2.246.38 1.078.26 NA 2.65 Rapat-1 E E6 Beringin Ficus benjamina 42.7 511.38 245.46 0.98 3.93 Rapat-1 E E7 Darah-darah Horsfieldia sp. 41.6 479.70 230.25 NA 2.74 Rapat-1 E E9 Rengas Burung 87.2 2.943.10 1.412.69 NA 12.84 Rapat-1 E E9 Rengas Burung 78 2.39.33 1.074.88 NA 12.80 recordgan-45 E E4 Kempas Koompasia malaccensis 42.3 499.72 239.87 0.53 2.10 <t< td=""><td>Rapat-1</td><td>E</td><td>E1</td><td>Rengas Burung</td><td></td><td>71.4</td><td>1,803.04</td><td>865.46</td><td></td><td>NA</td><td>10.30</td></t<>	Rapat-1	E	E1	Rengas Burung		71.4	1,803.04	865.46		NA	10.30				
Rapat-1EE3Jehtung RawaDyera lowii44.4562.74270.111.566.25Rapat-1EE4GasingLithocarpus sundaicus41462.91222.20NA2.65Rapat-1EE5Rengas Burung78.12,246.381,078.26NA2.65Rapat-1EE6BeringinFicus benjamina42.7511.38245.460.983.93Rapat-1EE7Darah-darahHorsfieldia sp.41.6479.70230.25NA2.74Rapat-1EE8Rengas Burung87.22,943.101,412.69NA16.82Rapat-1EE9Rengas Burung782,39.331,074.88NA12.80Total Plot Te La Sub Plot E Teagan-155,614.9322,459.742.5570.89Total Plot Te La Sub Plot E Teagan-451,925.377,701.460.532.217Total Plot Te La Sub Plot E Teagan-451,925.613,070.190.6638.68	Rapat-1	E	E2	Pabung		40.5	449.20	215.62		NA	2.57				
Rapat-1EE4GasingLithocarpus sundaicus41462.91222.20NA2.65Rapat-1EE5Rengas Burung78.12,246.381,078.26NA12.84Rapat-1EE6BeringinFicus benjamina42.7511.38245.460.983.93Rapat-1EE7Darah-darahHorsfieldia sp.41.6479.70230.25NA2.74Rapat-1EE8Rengas Burung87.22,943.101,412.69NA16.82Rapat-1EE9Rengas Burung782,239.331,074.88NA12.80Rapat-1EE9Rengas Burung0.777822,39.331,074.88NA12.80Total Plot E Verture Total Sub Plot E Tebus5,614.9322,459.742.5570.89Total Plot Tebus Plot E Tebus1,925.377,701.460.532.217Total Plot Tebus Plot E Tebus5,013.1813,070.190.6638.68	Rapat-1	E	E3	Jelutung Rawa	Dyera lowii	44.4	562.74	270.11		1.56	6.25				
Rapat-1EE5Rengas Burung78.12,246.381,078.26NA12.84Rapat-1EE6BeringinFicus benjamina42.7511.38245.460.983.93Rapat-1EE7Darah-darahHorsfieldia sp.41.6479.70230.25NA2.74Rapat-1EE8Rengas Burung87.22,943.101,412.69NA16.82Rapat-1EE9Rengas Burung782,239.331,074.88NA12.84Rapat-1EE9Rengas Burung782,239.331,074.88NA12.80Rapat-1EE9Rengas Burung782,239.331,074.88NA12.80Total Plot Te Rapat-15,614.9322,459.742.5570.89Total Plot Te washing to the rapat-15,614.9330,325.523.05100.43Total Plot Te washing to the rapat-15,614.9322,459.742.5570.89Total Plot Te washing to the rapat-15,614.9322,459.742.5570.89Total Plot Te washing to the rapat-15,614.9323,9553.052.01Total Plot Te washing to the rapat-15,614.932,913.160.532.10Total Plot Te washing to the rapat-11,925.777,701.460.532.217Total Plot Te washing to the rapat-15,013.1813,070.190.6638.68	Rapat-1	E	E4	Gasing	Lithocarpus sundaicus	41	462.91	222.20		NA	2.65				
Rapat-1EE6BeringinFicus benjamina42.7511.38245.460.983.93Rapat-1EE7Darah-darahHorsfieldia sp.41.6479.70230.25NA2.74Rapat-1EE8Rengas Burung87.22,943.011,412.69NA16.82Rapat-1EE9Rengas Burung782,239.331,074.88NA12.80Total Plot Ferson5614.9322,459.742.5570.89Total Plot E apat-15.809.5830,325.523.05100.43Total Plot E apat-15.909.5823.932.10Total Plot Te-tor Total Plot Te-t	Rapat-1	E	E5	Rengas Burung		78.1	2,246.38	1,078.26		NA	12.84				
Rapat-1EE7Darah-darahHorsfieldia sp.41.6479.70230.25NA2.74Rapat-1EE8Rengas Burung 87.2 $2,943.10$ $1,412.69$ NA 16.82 Rapat-1EE9Rengas Burung 78 $2,239.33$ $1,074.88$ NA 12.80 Total Plot E Rapat-1 $5,614.93$ $22,459.74$ 2.55 70.89 Total Plot E Rapat-1 $5,614.93$ $22,459.74$ 2.55 70.89 Total Plot E Rapat-1 $5,614.93$ $22,459.74$ 2.55 70.89 Total Plot E Tebus Plot	Rapat-1	E	E6	Beringin	Ficus benjamina	42.7	511.38	245.46		0.98	3.93				
Rapat-1 E E8 Rengas Burung 87.2 $2,943.10$ $1,412.69$ NA 16.82 Rapat-1 E E9 Rengas Burung 78 $2,239.33$ $1,074.88$ NA 12.80 Total Plot E daman 5614.93 $22,459.74$ 2.55 70.89 Total Plot Teleman 78 705.80 705.80 705.80 Total Plot E Teleman 705.80 <th colspa="</td"><td>Rapat-1</td><td>E</td><td>E7</td><td>Darah-darah</td><td>Horsfieldia sp.</td><td>41.6</td><td>479.70</td><td>230.25</td><td></td><td>NA</td><td>2.74</td></th>	<td>Rapat-1</td> <td>E</td> <td>E7</td> <td>Darah-darah</td> <td>Horsfieldia sp.</td> <td>41.6</td> <td>479.70</td> <td>230.25</td> <td></td> <td>NA</td> <td>2.74</td>	Rapat-1	E	E7	Darah-darah	Horsfieldia sp.	41.6	479.70	230.25		NA	2.74			
Rapat-1 E E9 Rengas Burung 78 2,239.33 1,074.88 NA 12.80 Total Sub Plot E Rapat-1 5,614.93 22,459.74 2.55 70.89 Total Plot Rapat-1 5,614.93 22,459.74 2.55 70.89 Total Plot Rapat-1 5,614.93 30,325.52 3.05 100.43 Total Plot Rapat-1 5,809.58 30,325.52 3.05 100.43 Total Plot Rapat-1 705.80 100 <th 1"<="" colspan="4" td=""><td>Rapat-1</td><td>E</td><td>E8</td><td>Rengas Burung</td><td></td><td>87.2</td><td>2,943.10</td><td>1,412.69</td><td></td><td>NA</td><td>16.82</td></th>	<td>Rapat-1</td> <td>E</td> <td>E8</td> <td>Rengas Burung</td> <td></td> <td>87.2</td> <td>2,943.10</td> <td>1,412.69</td> <td></td> <td>NA</td> <td>16.82</td>				Rapat-1	E	E8	Rengas Burung		87.2	2,943.10	1,412.69		NA	16.82
Total Sub Plot E Rapat-1 5,614.93 22,459.74 2.55 70.89 Total Plot E Rapat-1 5,809.58 30,325.52 3.05 100.43 Tebangan-45 E E3 Refigas Deservation 705.70 705.80 705.80 100.43 Tebangan-45 E E4 Kempas Koompassia malaccensis 42.3 499.72 239.87 0.53 2.10 Total Plot Te bangan-45 1,925.37 7,701.46 0.53 22.17 Total Plot Tebangan-45 2,013.18 13,070.19 0.66 38.68	Rapat-1	E	E9	Rengas Burung		78	2,239.33	1,074.88		NA	12.80				
Total Plot Rapat-1 5,809.58 30,325.52 3.05 100.43 rebangan-45 E E3 Rengas roompany 00.7 705.80 107 Tebangan-45 E E4 Kempas Koompassia malaccensis 42.3 499.72 239.87 0.53 2.10 Total Sub Plot E Tebangan-45 1,925.37 7,701.46 0.53 22.17 Total Plot Tebangan-45 2,013.18 13,070.19 0.66 38.68					Т	otal Sub Plot	E Rapat-1	5,614.93	22,459.74	2.55	70.89				
Incoangan-45 E E3 Reingas Econgraming D5.7 705.80 10.7 Tebangan-45 E E4 Kempas Koompassia malaccensis 42.3 499.72 239.87 0.53 2.10 Total Sub Plot E Tebangan-45 1,925.37 7,701.46 0.53 22.17 Total Plot Tebangan-45 2,013.18 13,070.19 0.66 38.68						Total Plo	t Rapat-1	5,809.58	30,325.52	3.05	100.43				
Tebangan-45 E E4 Kempas Koompassia malaccensis 42.3 499.72 239.87 0.53 2.10 Total Sub Plot E Tebangan-45 1,925.37 7,701.46 0.53 22.17 Total Plot Tebangan-45 2,013.18 13,070.19 0.66 38.68	reoangan-45	E	E3	Kengas Demptang		05.7		705.80		1111					
Total Sub Plot E Tebangan-45 1,925.37 7,701.46 0.53 22.17 Total Plot Tebangan-45 2,013.18 13,070.19 0.66 38.68	Tebangan-45	E	E4	Kempas	Koompassia malaccensis	42.3	499.72	239.87		0.53	2.10				
Total Plot Tebangan-45 2,013.18 13,070.19 0.66 38.68 Total C 723 551 21 Total C 723 551 21					Total S	Sub Plot E Te	bangan-45	1,925.37	7,701.46	0.53	22.17				
T-4-1 C 722 561 21					Т	otal Plot Teb	angan-45	2,013.18	13,070.19	0.66	38.68				
10tar C /55,501.21								Total C	733,561.21						

Figure 5-50 BGB Details per Plot Screenshot

J	Below Gi	round 2	Biomass									
Filter:												
View: De	atails Per Sub P	lot	✓ Sub Plot: All ▼	View								
Sub Plot	Plot Name	Tree ID	Local Name	Latin Name	DBH (cm)	TB (Kg)	C (Kg)	C Kg/Ha	V m ³	V m ³ /Ha		
В	Rapat-2	B1	Durian Payo		9.7	13.52	6.49		NA	7.73		
				Total	Plot Rapat-2	Sub Plot B	6.49	2,596.47	0.00	7.73		
В	Rapat-3	B1	Pepahit	Quasia borneensis	6	4.17	2.00		NA	2.38		
	Total Plot Rapat-3 Sub Plot B 2.00 799.90 0.00 2.38											
В	Rapat-5	B1	Nangoi	Calophyllum sclerophyllum	8	8.43	4.05		0.01	5.44		
В	Rapat-5	B2	Medang Cabe		6	4.17	2.00		NA	2.38		
				Total	Plot Rapat-5	Sub Plot B	6.05	2,418.98	0.01	7.82		
В	D		- Ing Bujuk		0.5	9.78	4 70		NIA	5.59		
Б	Tebangan-45	B2	Pepahit	Quasia borneensis	6.6	5.20	2.53		NA	3.01		
В	Tebangan-45	B3	Kayu Kapas		8.1	8.69	4.17		NA	4.97		
				Total Plot	Febangan-45	Sub Plot B	8.46	3,384.93	0.00	10.07		
					Total S	ub Plot B	178.16	71,264.47	0.10	214.81		
С	Rapat-1	C1	Medang Putih		15.5	42.66	20.48		NA	6.09		
С	Rapet 1		Palam Suntik		15.2	40.67	19 52		NA	5.81		
E	Tebangan-45	E3	Rengas Lempuing		65.7	1,470.42	705.80		NA	0.10		
E	Tebangan-45	E4	Kempas	Koompassia malaccensis	42.3	499.72	239.87		0.53	2.10		
				Total Plot	Febangan-45	Sub Plot E	1,925.37	7,701.46	0.53	22.17		
					Total §	Sub Plot E	89,954.98	359,819.94	82.16	1,080.65		
							Total C	733,561.21				

Figure 5-51 BGB Details per Sub Plot Screenshot

Be	low Gi	round F	3iomass	5								
Filter:												
View: Summ	ary Per Plo											
Die N	C Kg/Ha Sub Plot											
Plot Name	SP-B	SP-C	SP-D	SP-E	C Total Kg/Ha	C 10	tal Ion/Ha	Vol Total m [°] /Ha				
Rapat-1	0.00	3,999.64	3,866.15	22,459.74	30,325.52		30.326	100.43				
Rapat-2	2,596.47	0.00	0.00	0.00	2,596.47		2.596	7.73				
Rapat-3	200.00	2 954.60	3,360.79	8,992.71	16 107 99		16.108	50.23				
Tebangan-43	0.00	0.00	0.00	2,283.71	2,283.71		2.201	7.29				
Tebangan-44	1,337.46	0.00	0.00	4,527.87	5,865.33		5.865	17.46				
Tebangan-45	3,384.93	0.00	1,983.79	7,701.46	13,070.19		13.070	38.68				
				Total	733,561.21		733.561					

Figure 5-52 BGB Summary per Plot Screenshot

Belov	w Ground	l Bion	lass				
Filter:							
View: Mean Per	Strata						
Strata	C Ton/Ha	n plot	s	t.se	CV (%)	Avg Vol (m ³ /Ha)	Vol (m ³)
Belukar	13.245	9	7.954	5.303	60.06	42.12	12,635.11
Mahang	20.240	1	0.000	0.000	0.00	81.76	24,527.86
Rapat	24.045	9	17.726	11.817	73.72	74.12	29,574.22
Rumput	0.000	1	0.000	0.000	0.00	0.00	0.00
Sedang	25.361	12	11.670	6.738	46.02	77.42	23,225.94
Semak	1.879	3	2.525	2.915	134.34	5.52	1,657.03
Tebangan	7.428	8	5.812	4.110	78.24	23.20	6,960.41
Terbuka	4.162	2	3.878	5.485	93.18	12.68	3,802.55
Total	16.301	45	13.669	4.075	83.85		102,383.11

Figure 5-53 BGB Mean per Strata Screenshot

Belov	w Ground	l Biom	iass							
Filter: View: Mean Per Forest/Non-Forest 💌 View										
Strata Type	C Ton/Ha	n plot	s	t.se	CV (%)	Avg Vol (m ³ /Ha)				
Forest	24.797	21	14.179	6.188	57.18	3 76.01				
Non-Forest	8.868	24	7.684	3.137	86.6	5 28.68				
Total	16.301	45	13.669	4.075	83.85	5				

Figure 5-54 BGB Mean per Forest/Non Forest Screenshot

5.5.4 SOIL CARBON STOCK

The Soil Carbon menu provides the interface to calculate Soil Carbon Stock. Users can change the layer count for the soil and set the variables for each soil layer.

		Soil C	arbon								
1	otal BGB	Volume: 10	2,383.11	m ³	ensity m ³) Carbon Percent(%) C tonnes C tonnes/Ha BGB Volume percent(%) BGB Volume (m ³) *C tonnes/Ha 42 1,512,000.00 63.00 50 51,191.56 62.91 5 42 924,000.00 42.00 30 30,714.93 41.97 2 42 453,600.00 25.20 20 20,476.62 25.19 Total: 2,889,600.00 130.20 102,383.11 130.07 (gr/cm ³) x carbon percent(%) 3GB Volume 3GB Volume 3GB Volume						
L	Layer count: Change										
	Level Area(Ha) Depth Bulk Density (cm) (gr/cm ³) P		Carbon Percent(%)	C tonnes	C tonnes/Ha	BGB Volume percent(%)	BGB Volume (m ³)	*C tonnes/Ha			
ſ	1	24000	15	0.1	42	1,512,000.00	63.00	50	51,191.56	62.91	
ſ	2	22000	20	0.05	42	924,000.00	42.00	30	30,714.93	41.97	
ſ	3	18000	30	0.02	42	453,600.00	25.20	20	20,476.62	25.19	
					Total:	2,889,600.00	130.20		102,383.11	130.07	
C C B *	Total: 2,889,600.00 130.20 102,383.11 130.07 Save C Tonnes - Area(Ha) x depth (cm) x bulk Density (gr/cm ³) x carbon percent(%) C Tonnes / Ha = C Tonnes / Area (Ha) BGB Volume = BGB Volume Percent/100 * Total BGB Volume *C Tonnes / Ha = C Tonnes/Ha - (BGB Volume(m ³) * Bulk Density(gr/cm ³) * carbon percent(%)/100 / Area(Ha)) *C Tonnes / Ha is the soil carbon deducted by root volume.										

Figure 5-55 Soil Carbon Stock Screenshot

5.5.5 TOTAL CARBON STOCK

The The Total Carbon Stock Menu provides the calculation summary of all the other carbon stock calculation. The Total Carbon Stock summarizes the AGB, DOM, BGB and Soil carbon stock altogether. There are three view choices: Summar Per Plot, Per Strata and Per Forest/Non-Forest.

Total Carbon											
Filter: View: Summ	rilter. View: Summary Per Plot 💌 View										
DI (N	AGB	BGB		та ста							
Plot Name			Dead Tree	Dead Wood	Litter	Total C Ton/H					
Rapat-1	126.356	30.326	5.928	9.266	0.000	171.87					
Rapat-2	10.819	2.596	2.266	0.000	5.643	21.323					
	67 117	16.108	0.000	1-475	1.702	86.40					
Tebangan-43	9.515	2.204	0.000	0.000	6.270						
Tebangan-44	24.439	5.865	0.000	7.464	3.404	41.172					
Tebangan-45	54.459	13.070	25.817	6.162	5.016	104.524					
	100.07										
					C Soil	130.200					
				Grand	l Total	230.271					
	*C Soil	130.072									
				*Grand	l Total	230.142					
*The calculation is considering the root volume deducted from the soil volume.											

Figure 5-56 Total Carbon Stock per Plot Screenshot

Filter: View: Per Strata View										
Strate	- Dist	AGB	BGB		Т-4-1 С Т Л					
Strata	n Plot			Dead Tree	Dead Wood	Litter	lotal C lon/Ha			
Belukar	9	55.186	13.245	3.416	6.377	5.165	83.389			
Mahang	1	84.332	20.240	0.000	0.000	12.987	117.559			
Rapat	9	100.187	24.045	6.186	2.596	5.543	138.557			
Rumput	1	0.000	0.000	0.000	0.818	4.657	5.475			
Sedang	12	105.669	25.361	2.862	2.943	7.990	144.825			
Semak	3	7.830	1.879	11.392	4.751	3.613	29.465			
Tebangan	8	30.952	7.428	5.306	6.834	4.736	55.256			
Terbuka	2	17.342	4.162	17.579	5.080	12.987	57.149			
				Average A	AGB + BGB -	DOM	78.959			
	130.200									
	209.159									
	130.072									
	209.031									
*The calculation is considering the root volume deducted from the soil volume.										

Figure 5-57 Total Carbon Stock per Strata Screenshot

Filter: View: Per Fo	Total Carbon									
		AGB	BGB	DOM						
Strata Type	n Plot			Dead Tree	Dead Wood	Litter	Tota	I C Ton/Ha		
Non-Forest	24	36.950	8.868	5.938	5.721	5.785		63.262		
Forest	21	103.319	24.797	4.287	2.794	6.941		142.139		
Average AGB + BGB + DOM								102.700		
C Soil								130.200		
Grand Total								232.900		
		130.072								
		232.772								
The calculation is considering the root volume deducted from the soil volume.										

Figure 5-58 Total Carbon Stock per Forest/Non Forest Screenshot