

Landscape Carbon MRV Online Tool

CARPE Technical Toolkit Workshop
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What is the Landscape Carbon MRV Online Tool?

- An online toolkit to support monitoring, reporting and verification for REDD and AFOLU projects
- Supports landscape carbon project management and implementation
- Enables field data collection and calculates landscape carbon stocks
- Calculates GHG emissions from changes in landscape carbon stocks
- Initial development through the GEF-UNEP Carbon Benefits Project
 - tool available at <http://cbp.carbon2markets.org/>
- Ongoing development through the USAID Forest PLUS project in India
 - tool available at <http://fplus.carbon2markets.org/cas/login/>

MRV Online Tool – Capabilities and Purpose

- Plan and implement data collection at local, state or national level
 - Planning and implementing forest inventories of all five terrestrial carbon pools
 - Ingesting and storing inventory data from communities, project developers, forest departments, etc
 - Other types of non-carbon data required for REDD+
- Sharing data and results between project partners
 - User accounts with multiple levels of permission/access
- Transparent reporting and verification of GHG emissions and removals from REDD+ at project, state, or national level
- Facilitate local community participation
 - Tools and resources for local involvement that are accessible to anyone with the internet
- Training and capacity building tool
 - The online tools are readily incorporated into learning management systems for training

Carbon Benefits Project: Modelling, Measurement and Monitoring

version 1.6

You Are Here: Landscape Carbon MRV System → Menu

You are logged in as: dave | Logout | Help

Menu

Integrating Carbon Benefit
Estimates into GEF Projects

Create a project

Work on your projects

Report on your projects

Workspace Utilities



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OCTOBER 2005

INTEGRATING CARBON BENEFIT ESTIMATES INTO GEF PROJECTS



CAPACITY DEVELOPMENT AND ADAPTATION GROUP

GUIDELINES

Key Element #1: User and Project Information

Modify Information for Project: Demonstration Map Data > Inventory Data >>

Update Project Information:

Project Name: **Demonstration**

All fields are mandatory.

Upload Project Files Click Here
Click to See Uploaded Files

Location: Africa
Select a Country

Project Type: REDD+
REDD+, Biodiversity, National Forest Inventories, etc.

Abstract: This is a hypothetical REDD+ project in the Mau Forest of Western Kenya to demonstrate avoided emissions from reducing deforestation and degradation.

Documents uploaded

Type	Name	Options
Project Abstract	Demo Project Abstract.docx	
Budget	Demo Project Budget.xlsx	
Monitoring Report	Demo Project Monitoring Report.pdf	

Mail Address 2: **Project Documents** Apartment, suite, unit, building, floor, etc.

City: East Lansing

State/Province/Region: MI

ZIP Code: 48823

Country: United States

Project Duration (years): 30

Climate Zone: Tropical Montane

Moisture Zone: Moist

Project Description *The Project Description page is a resource for project managers to organize and distribute project documents in a content management system. The Project Description page also stores contact information for project personnel and basic information about the project type, location, and duration.*

[Help](#)

- An account is required for logging in to the system
- User contact information
- Project location information
- Abstract describing project activities
- Knowledge management system to store and share documents

Key Element #1: User and Project Information

Review Information for Project: Demonstration

Integrating Carbon Benefit Estimates into GEF Projects

Map Data >

Inventory Data >>

This is your project information:

Project Name	Demonstration
Documents	Click to Open List
Region	Africa
Country	Kenya
Project Type	REDD+
Abstract	This ... Expand
Contact Person	Mike Smalligan
Email Address	smallig2@msu.edu
Phone Number	517-355-4524
Address	1405 South Harrison
Address 2	Suite 101
City	East Lansing
State/Province/Region	MI
ZIP Code	48823
Country	United States
Project Duration (years)	30
Climate Zone	Tropical Montane
Moisture Zone	Moist

Edit Information

Review Information for Project: Demonstration

Integrating Carbon Benefit Estimates into GEF Projects

Map Data >

Inventory Data >>

This is your project information:

Project Name	Demonstration
Documents	Click to Open List
Region	Africa
Country	Kenya
Project Type	REDD+

Documents uploaded

Type	Name	Options
Project Abstract	Demo Project Abstract.docx	
Budget	Demo Project Budget.xlsx	
Monitoring Report	Demo Project Monitoring Report.pdf	

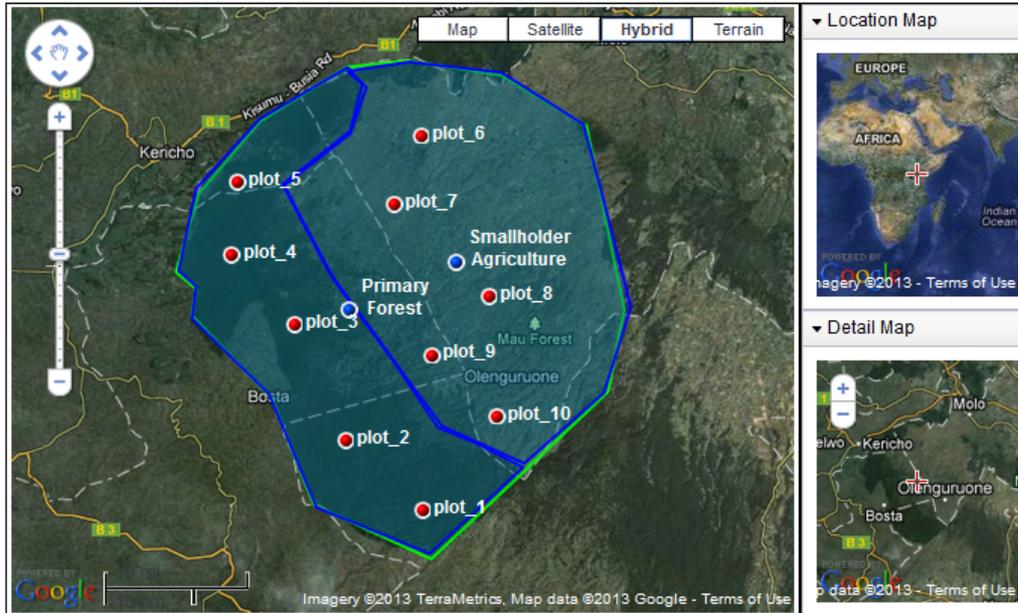
Address 2	Suite 101
City	East Lansing
State/Province/Region	MI
ZIP Code	48823
Country	United States
Project Duration (years)	30
Climate Zone	Tropical Montane
Moisture Zone	Moist

Edit Information

Key Element #2: Geographic Data

Mapping Data for Project: Demonstration

< Project Information | Inventory Data >



- Project Boundaries
- Parcels (strata)
- Inventory Plots
- Five methods to upload and store geographic information
 - Digitize on screen
 - Markers
 - Coordinates
 - .csv file
 - Shape files

File	Map Project	Map Parcels	Map Plots
Save	Draw Boundary	Draw Parcel	Draw Plot
Clear Map	Place Marker	Place Marker	Place Marker
Reload Map	Enter Coordinates	Enter Coordinates	Enter Coordinates
Show All	Upload Coordinates	Upload Coordinates	Upload Coordinates
Print	Upload Shape file	Upload Shape file	Upload Shape file
Fullscreen	Show All	Show All	Show All
Finish	Set View	Set View	Set View
	Cancel Operation	Cancel Operation	Cancel Operation

Map Data

The **Map Data** page is a resource for project managers to upload and store basic geographic information about their projects. The Map Data page is used to define the location of project boundaries, stratification within the project area, and the locations of sample plots in a forest inventory.

Help ►

Upload Shape file

All shapes contained in the Shape file will be uploaded.

Uploads **must** be a ZIP file containing at least these three files:
.SHP .DBF .SHX

Further, if using a coordinate system other than WGS 84 (lat/long), you must include a **.PRJ** file.

You may optionally specify a Shape record attribute name to be used for naming the new polygons.

An incorrect attribute field will result in all polygons being labeled as follows: **NULL [ID #123]**.

Any shape with a blank record will result in a polygon named as follows: **BLANK [ID #124]**.

Shapefile records (OPTIONAL)

Name field



Mapped



Reported

There is a 300 shape limit for uploaded shape files. Please contact GOES if you need to upload a larger shape file.

Key Element #3: Inventory Data

Inventory Data for Project: Demonstration

<< Project Information < Map Data Emissions Calculator >

- Plot Biomass Data Template [Download](#)
- Field Measurement Guides [Click Here](#)
- Project Information

Project Name:

Mapped Area: 200375.9812 ha Reported Area: 200375.0 ha
- Parcel Information

Add a Parcel

Select a Parcel
- Plot Information

You must Select a Parcel in step 4 before you can view Plot Information.
- Review Allometric Equations

Carbon Stocks by Parcel

Parcel Descriptors <small>Values below in ha</small>	Carbon Density <small>Values below in tC/ha</small>				Carbon Stocks <small>Values below in tC</small>				
	Area	AGB	BGB	SOCLitterDeadwood	AGB	BGB	Soil	LitterDeadwood	Total
Primary Forest	81,483.00	576.0	155.72	451.0 2.1	5,046,934,668	12,684,257	199,714,833	171,114 407,415	259,912,287
Smallholder Agriculture	117,660.00	104.5	28.92	166.0 0.8	1,412,294,707	3,405,463	254,851,560	100,011 170,607	270,822,347
Project Totals	199,143.00				59,229,374	16,089,719	454,566,393	271,125 578,022	530,734,634

Close

You must Select a Parcel in step 4 before you can view Plot Information.

- Carbon Stocks by Parcel [Click Here](#)
- Carbon Calculator Summary [Click Here](#)

Inventory Data *The **Inventory Data** page is a resource to manage inventory data collected for the project. The **Inventory Data** page provides measurement guidelines, spreadsheets for data collection and upload into an online database, and reporting functions to see the results of carbon stock calculations for the project.* [Help](#)

- Inventory Protocols
- Data sheets
- Modify geographic information
- Allometric equations to calculate AGB
- Data upload into the online database
- Data processing
- Carbon stock calculations & reports
- All 5 carbon pools

<< Project Information < Map Data Emissions Calculator >

1. Plot Biomass Data Template [Download](#)
2. Field Measurement Guides [§ 7.1](#) [Click Here](#)
3. Project Information
Project Name:
Mapped Area: 194993.8452 ha Reported Area: ha
4. Parcel Information
Add a Parcel
 ▼
5. Plot Information
You must Select a Parcel in step 4 before you can view Plot Information.
6. Review Allometric Equations [§ D](#) [Open in New Window](#)
7. Upload Plot Biomass Data [Upload](#)
8. Manage Parcels & Plots & Allometry [Click Here](#)
9. Project Soil Data [Download](#) [Upload](#)
This Excel workbook is pre-populated with data already entered into the MRV.
10. Plot Summary
You must Select a Parcel in step 4 to activate this link.
11. Carbon Stocks by Plot [§ 8](#)
You must Select a Parcel in step 4 to activate this link.
12. Carbon Stocks by Parcel [Click Here](#)
13. Carbon Calculator Summary [Click Here](#)
14. Carbon Calculator Uncertainty [Click Here](#)

Inventory Data

The **Inventory Data** page is a resource to manage inventory data collected for the project. The **Inventory Data** page provides measurement guidelines, spreadsheets for data

[Help](#) ►

The following text are excerpts from [Integrating Carbon Benefit Estimates into GEF Projects](#) (October 2005).

1. GEF Projects and their Carbon Impact
2. The Scope of these Guidelines
- ▶ 3. The Types of Projects
- ▶ 4. The Problem of Leakage
- ▶ 5. The Baseline Scenario
- ▶ 6. Developing a Measurement and Monitoring Plan
- ▼ 7. Field Measurements

▼ 7.1 Preparation for Fieldwork

Efficient planning is essential to reduce unnecessary labour costs, avoid safety risks and ensure reliable carbon estimates. The equipment used in fieldwork should be accurate and durable enough to withstand the rigours of use under adverse conditions. The type of equipment required will depend on the type of measurements, but the following list covers most of what is typically used in the field.

See [Resources #1, 2, and 9](#) for tools within the MRV that help to prepare for fieldwork and data collection.

[Continued on page 18](#)

- ▶ 8. Data Analyses
9. Guidance for Specific Project Types
10. Mitigation and Adaptation
- References
- Appendix A: Glossary

Key Element #4: GHG Emissions Calculator

Project REDD Demonstration

Continent	Africa
Climate	Tropical Montane
Moisture	Moist
Soil Type	LAC
Duration	25
Carbon/DryMatter	0.47

Home ▶

Project List ▶

Delete Project ▶

Add User ▶

Logout ▶

Project Scenarios

Scenario	Reference Scenario	Emissions (t CO ₂)	Reference difference
Avoid Forest Conversion	Deforest to Agriculture	4,771	-35,103

add new

Reference Scenarios

Scenario	Parcel	Emissions (t CO ₂)
Deforest to Agriculture	Mau Forest	39,874

add new

Parcels

Parcel	Location	Area (ha)	Land Cover
Mau Forest	Western Kenya	100.0	Mau Forest

add new

Practices

Practice	Category	Harvest	Burn
Default Practices		0.0	0.0

add new

Land Covers

Land Cover	Category	Total	Dead	Soil
		Biomass (tDM/ha)	Carbon (tC/ha)	Carbon (tC/ha)
Africa Tropical mountain systems	F	146.05	3.65	47.0
Africa Tropical mountain systems (plantation)	F	114.3	3.65	47.0
Annual Crop	A	8.7	0.0	30.08
Grassland	G	8.7	0.0	47.0
Mau Forest	F	353.5	7.1	44.9
Paddy Rice	R	8.7	0.0	51.7
Perennial/Tree Crop	P	8.7	0.0	47.0
Western Kenya Ag	A	100.3	2.2	30.3

add new

- Estimates annual GHG emissions and removals from A/R, REDD, RIL, and TOF
- Calculates Tier 1-3 GHG emissions from changes in terrestrial carbon stocks
- Users enter Tier 2 or Tier 3 data to define the carbon stocks in a land cover
- Users define Reference and Project Scenarios
- Provides Tier 1 IPCC default values if project data are not available

Key Element #5: Utilities

Carbon Benefits Project:
Modelling, Measurement and Monitoring

version 1.6

You Are Here: Landscape Carbon MRV System → Menu → Workspace Utilities

You are logged in as: dave | Logout | Help

Workspace Utilities

Utilities can be accessed from the menu at right.

- Integrating Carbon Benefit Estimates into GEF Projects
- Allometric Equations ▶
- Copy Project ▶
- Add User ▶
- Workspace Utilities ▶

UNEP GEF Colorado State University WWF ISRIC MICHIGAN STATE UNIVERSITY UEA World Agroforestry Centre CI-OR cena

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Carbon2Markets MRV Hide

GEF Guidebook MRV User Guide

The following text are excerpts from [Integrating Carbon Benefit Estimates into GEF Projects](#) (October 2005).

1. GEF Projects and their Carbon Impact
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- ▶ 6. Developing a Measurement and Monitoring Plan
- ▶ 7. Field Measurements
- ▶ 8. Data Analyses
9. Guidance for Specific Project Types
10. Mitigation and Adaptation

References

Appendix A: Glossary

Appendix B: Illustration of Carbon Inventory Methods fo...

Appendix C: Creating Biomass Regression Equations

- ▶ Appendix D: Published Biomass Regression Equations

Appendix E: Indications of Magnitude of Change in Carb...

Allometric Equations

Name	Expression (AGB in kg DM)	Actions
Temperate Hardwoods - IPCC 2003	$0.5 + ((25000 * dbh^{2.5}) / ((dbh^{2.5}) + 246872))$	<i>shared</i>
Tropical and Temperate Pines - IPCC 2003	$0.887 + ((10486 * dbh^{2.84}) / ((dbh^{2.84}) + 376907))$	<i>shared</i>
Tropical Dry Forests - Brown 1997	$\exp(-1.996 + 2.23 * \ln(dbh))$	<i>shared</i>
Tropical moist forests (Brown 1997)	$42.69 - 12.8(dbh) + 1.242(dbh^2)$	<i>shared</i>
Tropical Moist Forests - IPCC 2003	$\exp(-2.289 + 2.649 * \ln(dbh) - 0.021 * (\ln(dbh))^2)$	<i>shared</i>
Tropical Wet Forests - IPCC 2003	$21.297 - 6.953 * (dbh) + 0.740 * dbh^2$	<i>shared</i>

Publicly-shared equations are highlighted in yellow-green color.

Integrating Carbon Benefit Estimates into GEF Projects

List AEQs ▶

Add AEQ ▶

Workspace Utilities ▶

Allometric Equations

You can define a custom allometric equation below.

Tree parameters are case-sensitive and include: **dbh**, **total_height**, **crown_d_max**, **crown_d_90**, **wood_gravity**.

Please note that triple exponentiation (w^x^y) and large constants ($c > 999$), among other subexpressions, are prohibited. Please contact admin@carbon2markets.org if this is problematic for you.

Name:

e.g. Tropical moist forests (Brown 1997)

AGB Equation in kg DM:

e.g. $42.69 - 12.8(\text{dbh}) + 1.242(\text{dbh}^2)$

Public:

Do you want to share this allometric equation with everyone?

[Integrating Carbon Benefit Estimates into GEF Projects](#)[List AEQs ▶](#)[Add AEQ ▶](#)[Workspace Utilities ▶](#)

Project Name:

Mapped Area: 194993.8452 ha Reported Area: 184844.0 ha

4. Parcel Information

Add a Parcel

Select a Parcel

Carbon Calculator Uncertainty

Per [2006 IPCC Guidelines for National Greenhouse Gas Inventories](#), "quantitative uncertainty analysis is performed by estimating the 95 percent confidence interval of the emissions and removals estimates for individual categories and for the total inventory."

Parcels		Mean Carbon Densities & Uncertainty					Total
ID	# Plots (n)	AGB tC/ha	BGB tC/ha	SOC tC/ha	Litter tC/ha	Deadwood tC/ha	Total tC/ha
Primary Forest	5	161.90 ± 41.59 ¹	43.71 ± 11.23 ¹	54.00 ± 7.12 ¹	2.10 ± 0.65 ¹	5.00 ± 1.77 ¹	266.72 ± 43.70 ¹
		$110.27 - 213.54$ ² [n = 5] ³	$29.77 - 57.66$ ² [n = 5] ³	$45.17 - 62.83$ ² [n = 5] ³	$1.29 - 2.91$ ² [n = 5] ³	$2.81 - 7.19$ ² [n = 5] ³	$212.46 - 320.98$ ² [n = 5] ³
Smallholder Agriculture	5	36.46 ± 17.41 ¹	9.84 ± 4.70 ¹	27.45 ± 4.33 ¹	0.65 ± 0.38 ¹	1.45 ± 0.57 ¹	75.85 ± 18.56 ¹
		$14.84 - 58.08$ ² [n = 5] ³	$4.01 - 15.68$ ² [n = 5] ³	$22.08 - 32.82$ ² [n = 5] ³	$0.18 - 1.12$ ² [n = 5] ³	$0.74 - 2.16$ ² [n = 5] ³	$52.80 - 98.90$ ² [n = 5] ³

¹ Mean ± Standard Deviation

² 95% Confidence Interval (t-distribution) using the [standard error of the mean](#)

³ Number of sampling plots for the particular carbon pool

Close

14. Carbon Calculator Uncertainty

Click Here

Carbon Calculator Uncertainty

Inventory Data

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Help

38°40'0"E

38°45'0"E

38°50'0"E

38°55'0"E

3°35'0"S

3°35'0"S

3°40'0"S

3°40'0"S

3°45'0"S

3°45'0"S

3°50'0"S

3°50'0"S

38°40'0"E

38°45'0"E

38°50'0"E

38°55'0"E

Legend

 Wildlife Works Project Area

Carbon Map

tC per hectare

 High : 7.45

 Low : 1.28

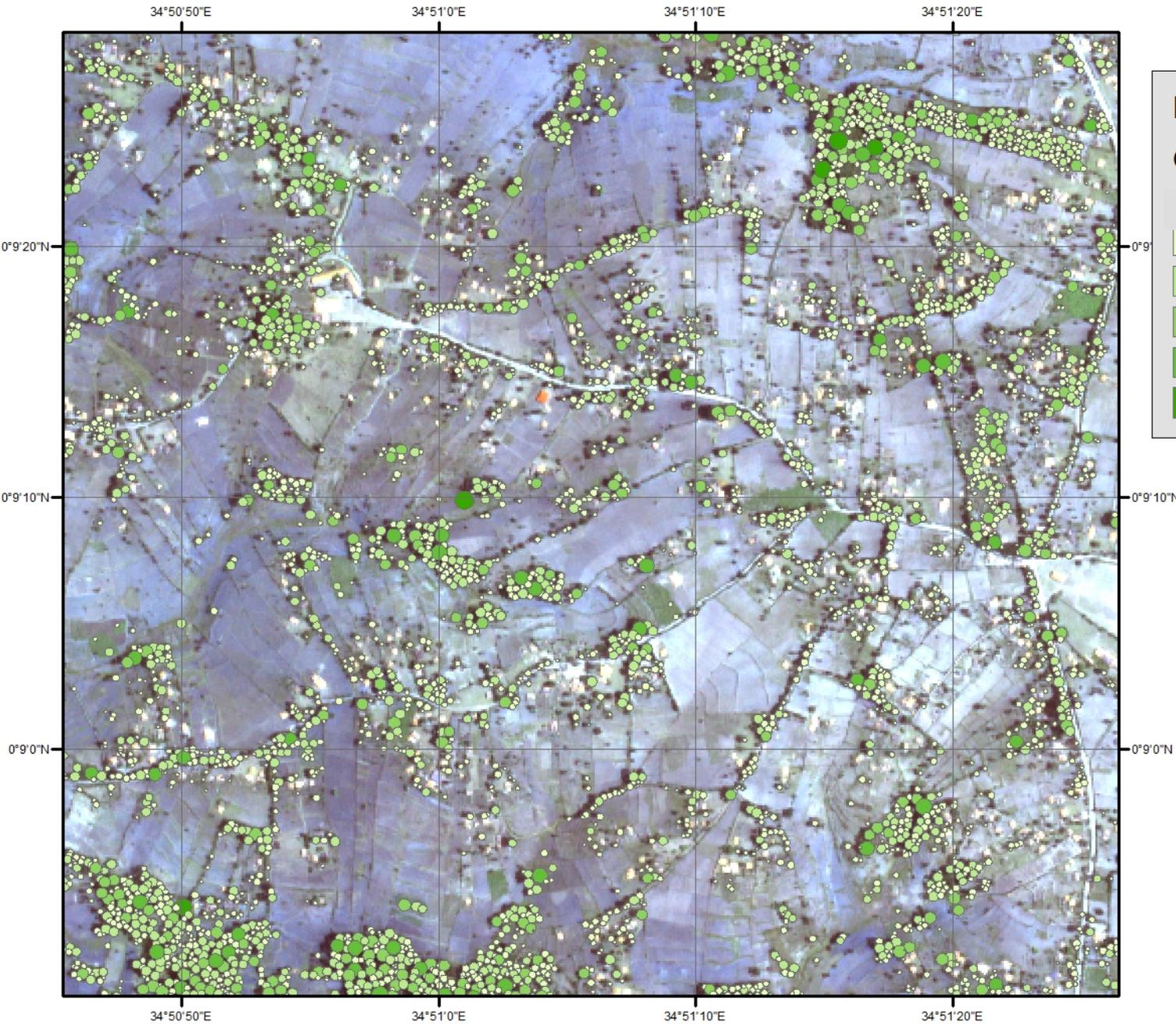
Fractional Cover Map

 High : 100 %

 Low : 0 %

3 1.5 0 3 Kilometers





Legend

Crown Area Carbon

Tons of Carbon

	0.10 - 0.41
	0.41 - 0.96
	0.96 - 1.82
	1.82 - 3.35
	3.35 - 12.85

155 ha
1418.83 tC
9.15 tC/ha



Global Observatory for Ecosystem Service: Carbon2Markets

Introduction

This is a knowledge management application designed to facilitate training and capacity building for community-based forest carbon measurement and monitoring. The application includes:

- A forum where the community of users can share ideas and experiences and ask questions
- Workbooks for engaging communities and using the on-line forest carbon tools at Carbon2Markets
- Movies that demonstrate community carbon measurements and the use of the on-line forest carbon tools
- Sample data sets for data and field collection data sheets
- Additional resource guides to support community capacity building and project development

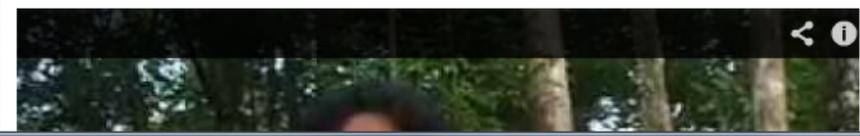
Workbooks

Links here to workbooks in PDF and PPT formats.

- Community capacity building
- On-line forest carbon tool

Demonstration Movies

Links to on-line training movies.



Forum

[Forum](#)

On-line forest carbon tool

Log in

[On-line forest carbon tool](#)

Username: *demo_training1*
Password: *community1*

Log in to the on-line forest carbon tool. Access demonstration projects pre-loaded to the demo training account registry. Practice using the system using your own data or the sample data provided below. The demo training log in is a temporary workspace used solely for training in this LMS. For a permanent account please contact Carbon2Markets at samekjay@msu.edu

Sample data

Links to download:

- GIS data shapefile and csv file
- Inventory data sheets

Key Elements Under Development

- Accommodate a larger amount of inventory parameters and data related to REDD+
- Modify the Emissions Calculator to better handle enhanced forest carbon stocks (the +)
- Add social and environmental indicators and score cards (for REDD+)
- Fully incorporate remote sensing data and data products
 - Coarse, moderate, and fine resolution optical satellite data
 - Forest fractional cover, TOF, carbon density maps, calibration / validation
- Incorporate into Learning Management Systems for Training & Capacity Building
- User accounts with levels of permission and access
 - “enterprise system” to allow multiple users throughout India access to the project information
- Expanded reporting as specified by the users