Developing an MRV System

To Support the Forest Investment Program

Developing a Carbon MRV System

This system will focus on carbon monitoring, reporting and verification to support two categories:

- Conservation of existing carbon stocks in forests
- Increasing carbon stocks in agroforestry

MRV Approach: Five Key Components

1. Merge ground data with satellite data to lower costs and cover large areas in MRV system

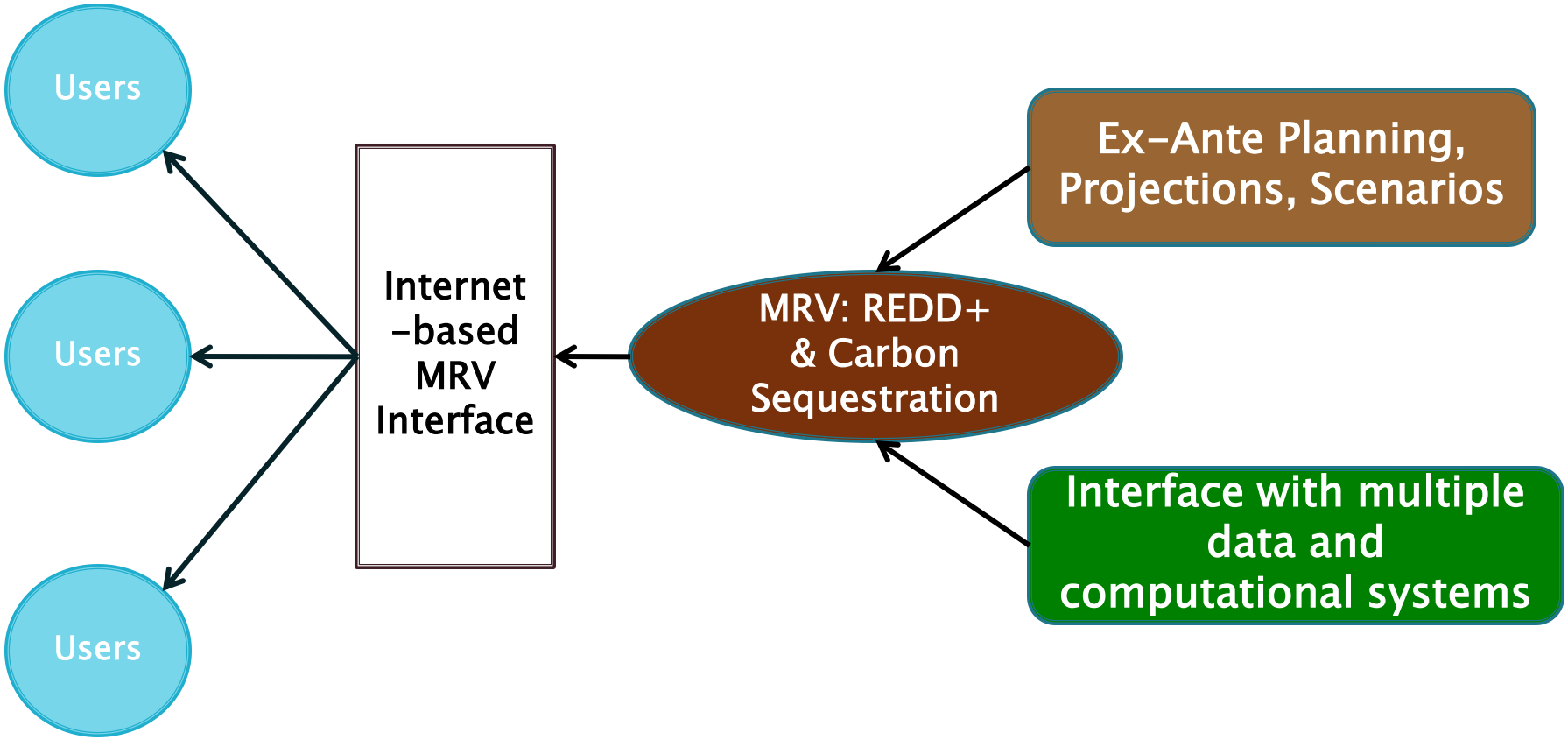
2. Develop and deploy advanced biomass measurements for large scale application carbon stocks and stock changes (fluxes)

3. Provide measurements of forest cover change:
- Include all REDD+
- Across all IPCC/FAO forest types (closed, open)

4. Deploy the MRV in a GIS-enabled Internet System for reporting and verification; and for project management

5. Use a suite of indicators and metrics for M&E: carbon + environment + biodiversity + social co-benefits

Basic Structure of the MRV



MRV Information Products

- Wall to wall mapping of forest cover and forest cover change
  - Deforestation, degradation, reforestation, fire, fragmentation, plantations
  - Closed forests to woodlands
- High resolution mapping for projects
- Integrates with and uses ground data from national forest inventories
- Integration of GIS layers on carbon, forest cover, and other forest management information
- On line “dashboard” for retrieval of indicators.

MRV Sample Data Products

- **Country Level**
  - Deforestation areas mapped over time
  - Degradation from logging mapped over time
  - Reforestation mapped over time
  - Carbon stocks mapped
  - Changes in carbon stocks (emissions and sequestration)
- **Project Level**
  - Reforestation areas mapped
  - Change in carbon stocks over time (sequestration)
  - Agroforestry areas mapped over time
  - Tree counts and basal areas mapped
  - Plantation areas mapped

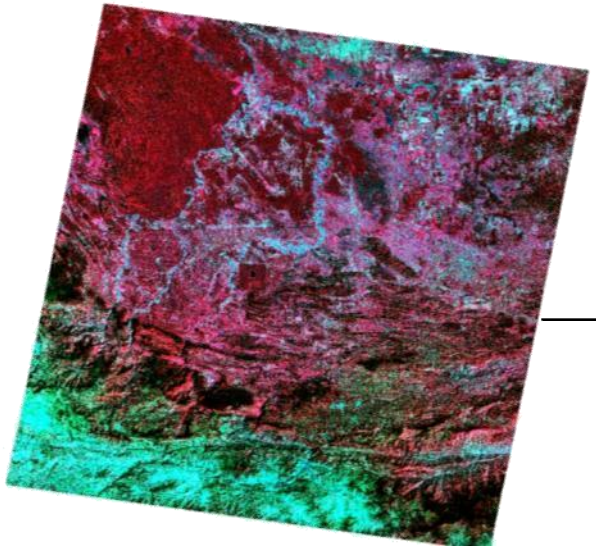
Deforestation and Degradation

- MRV for Forest Investment Program Countries

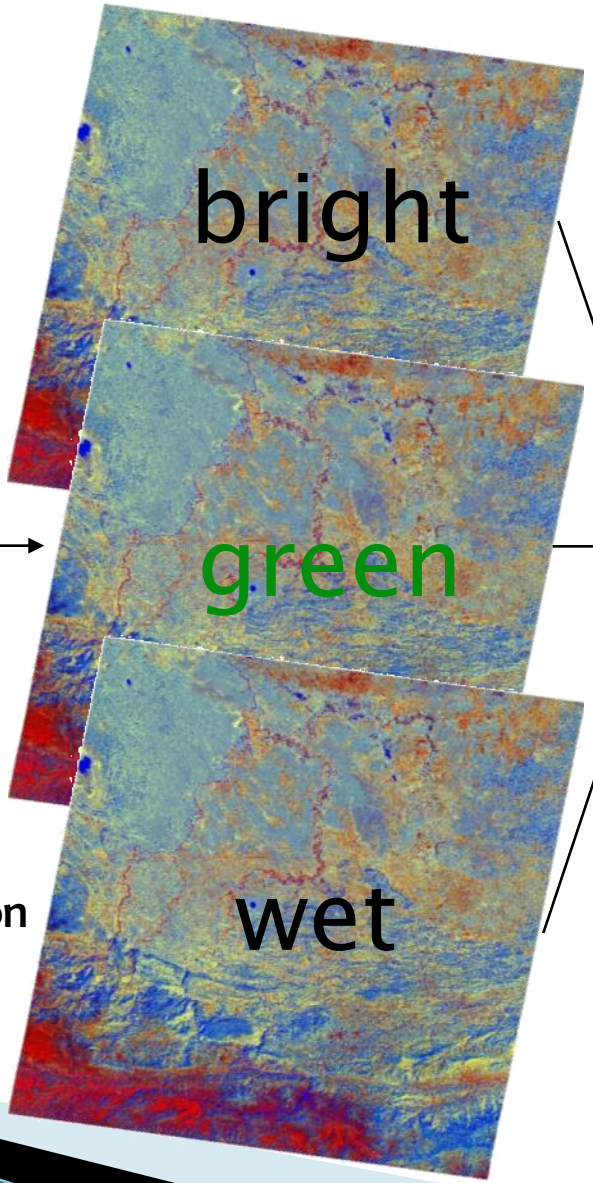
Uses a Remote Sensing Approach

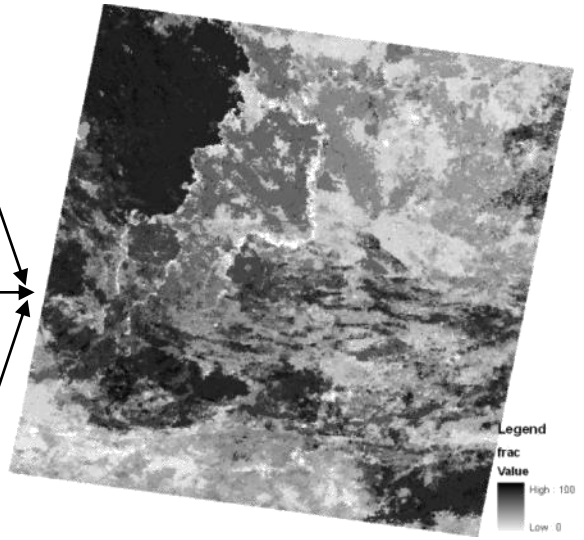
Reflectance

(bands 1,2,3,4,5,7)



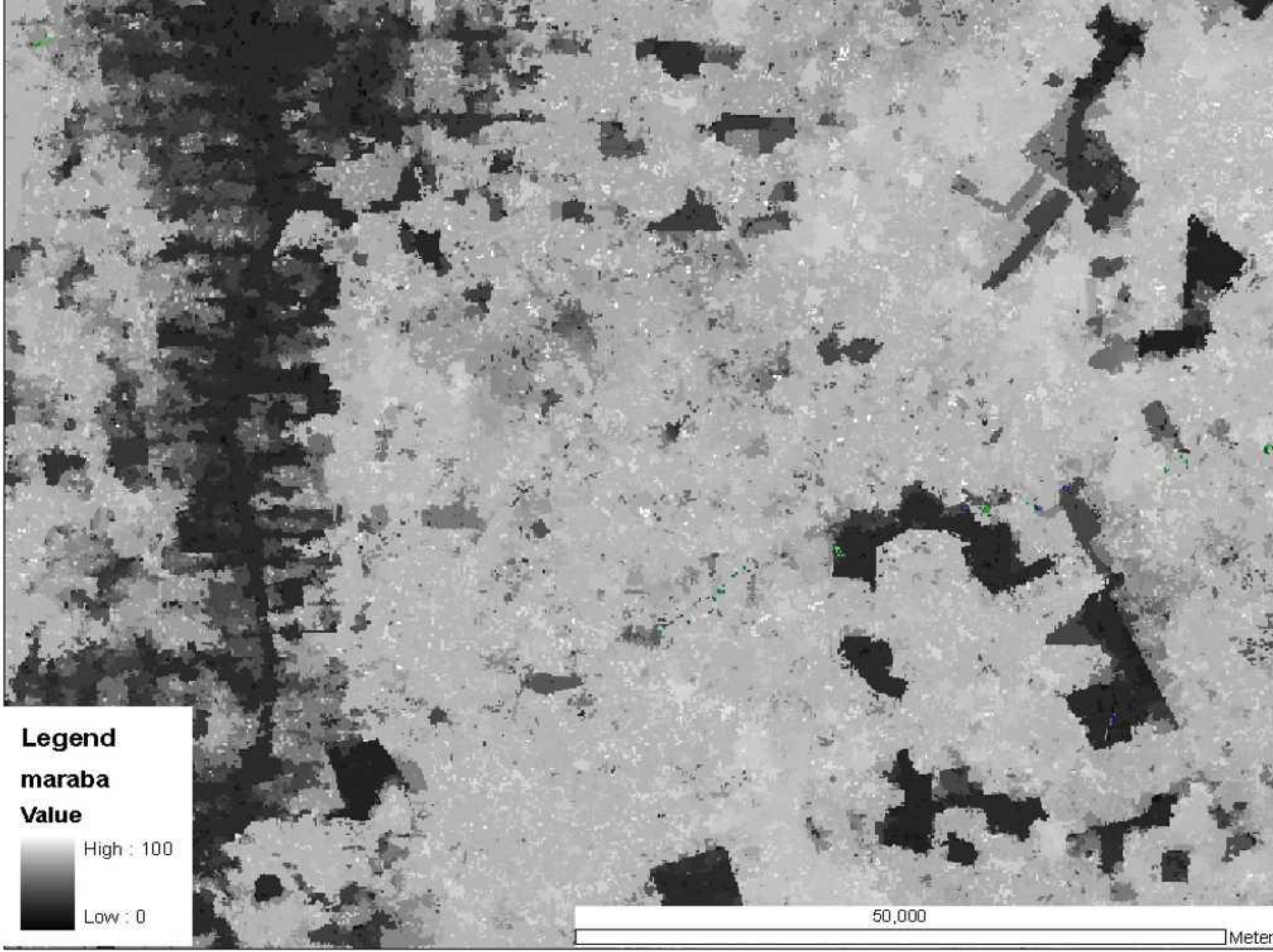
Tasseled cap transformation





Disturbance Index

50,000
Meter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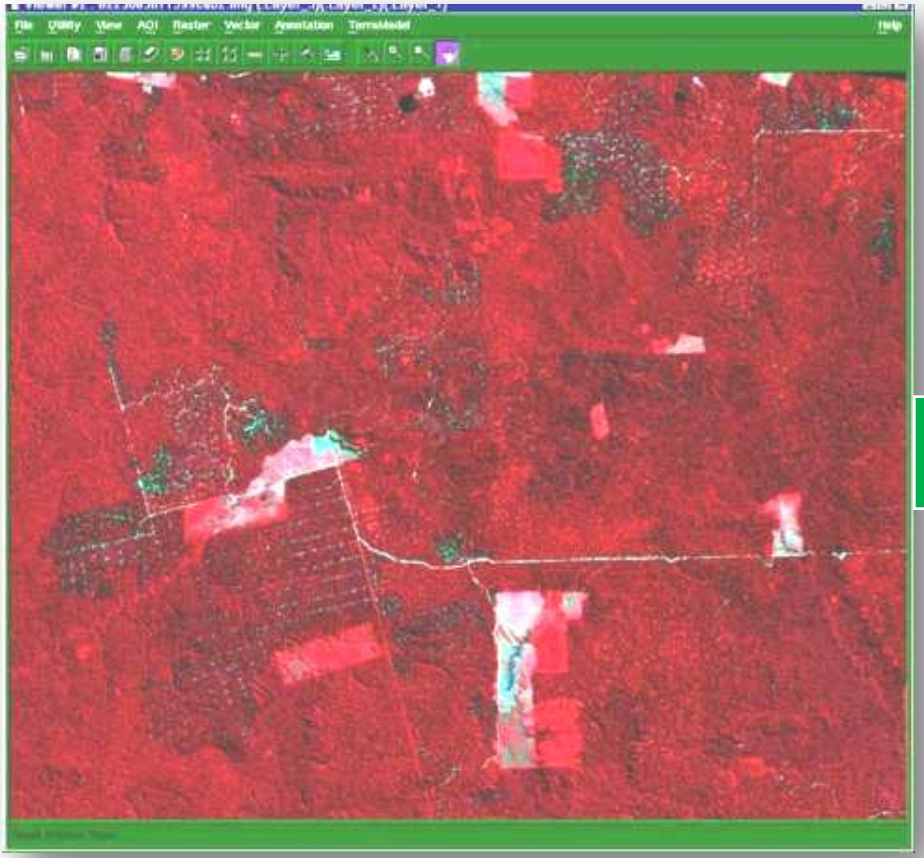
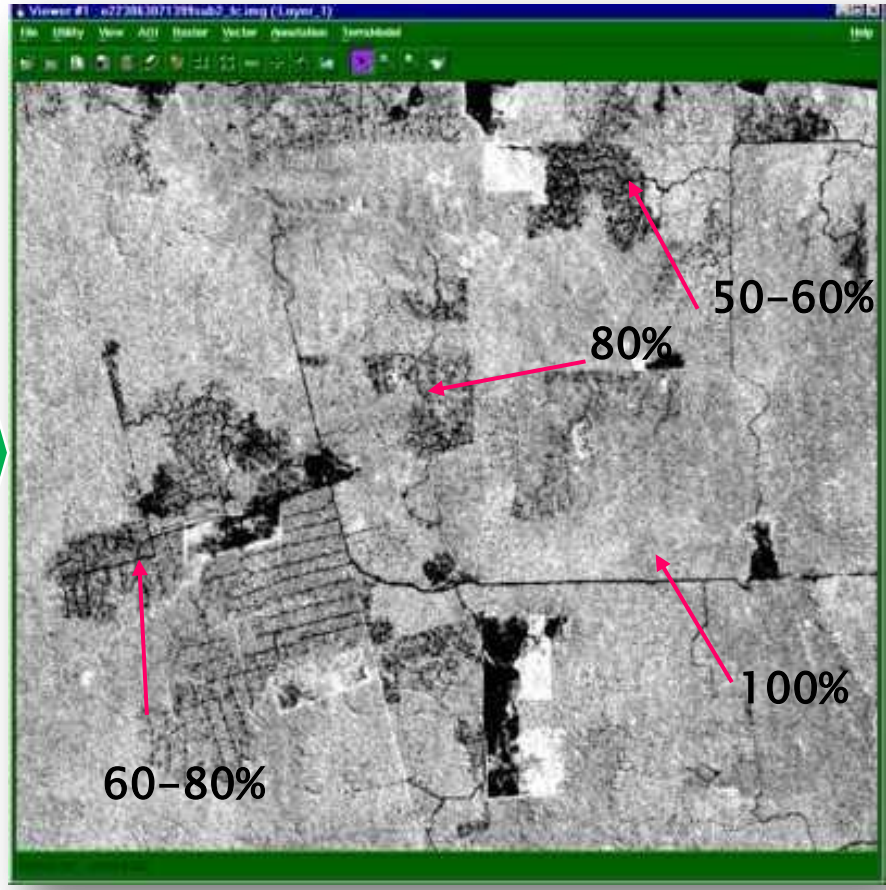
Continuous Fields Degradation

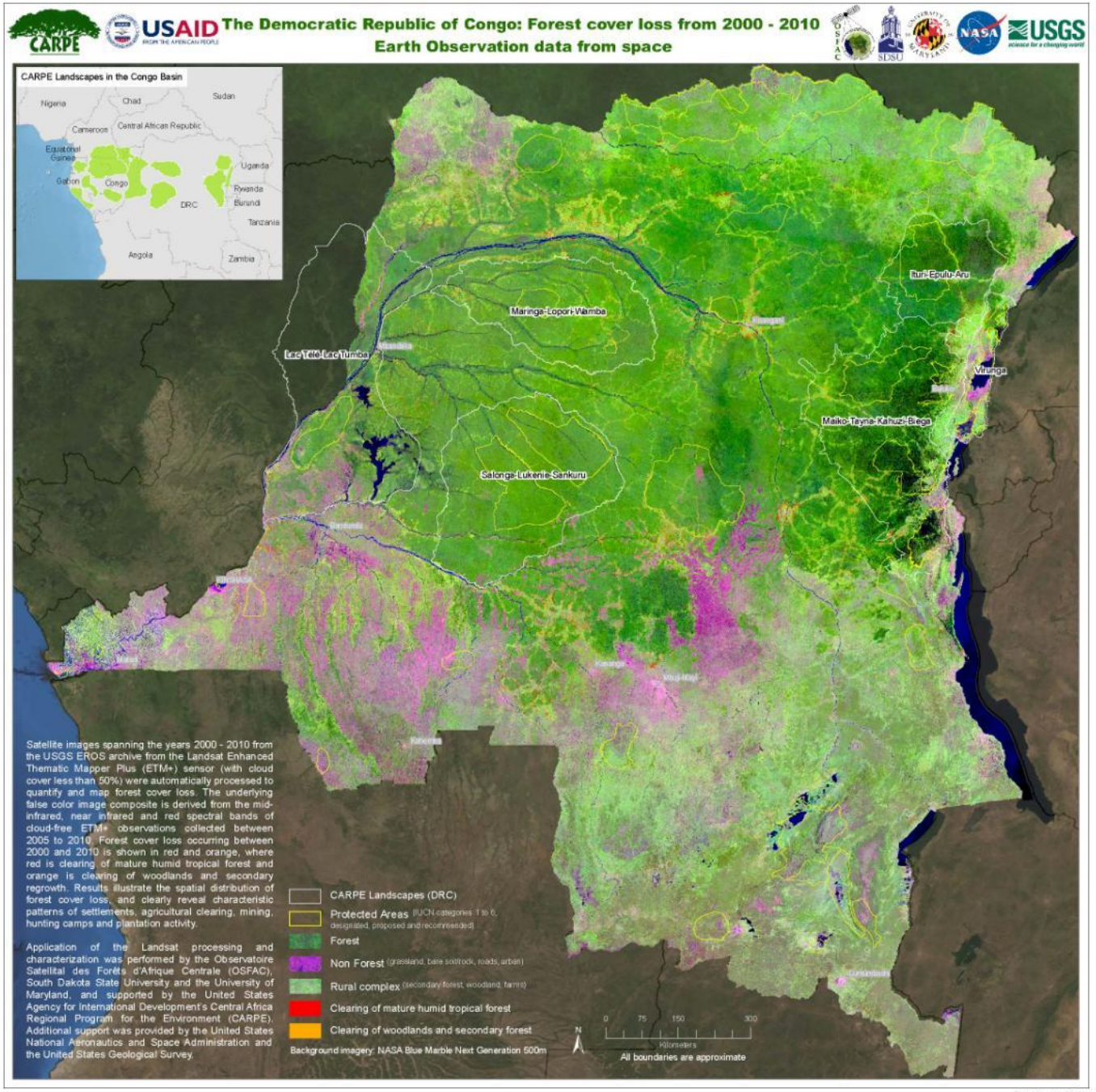
Satellite Image



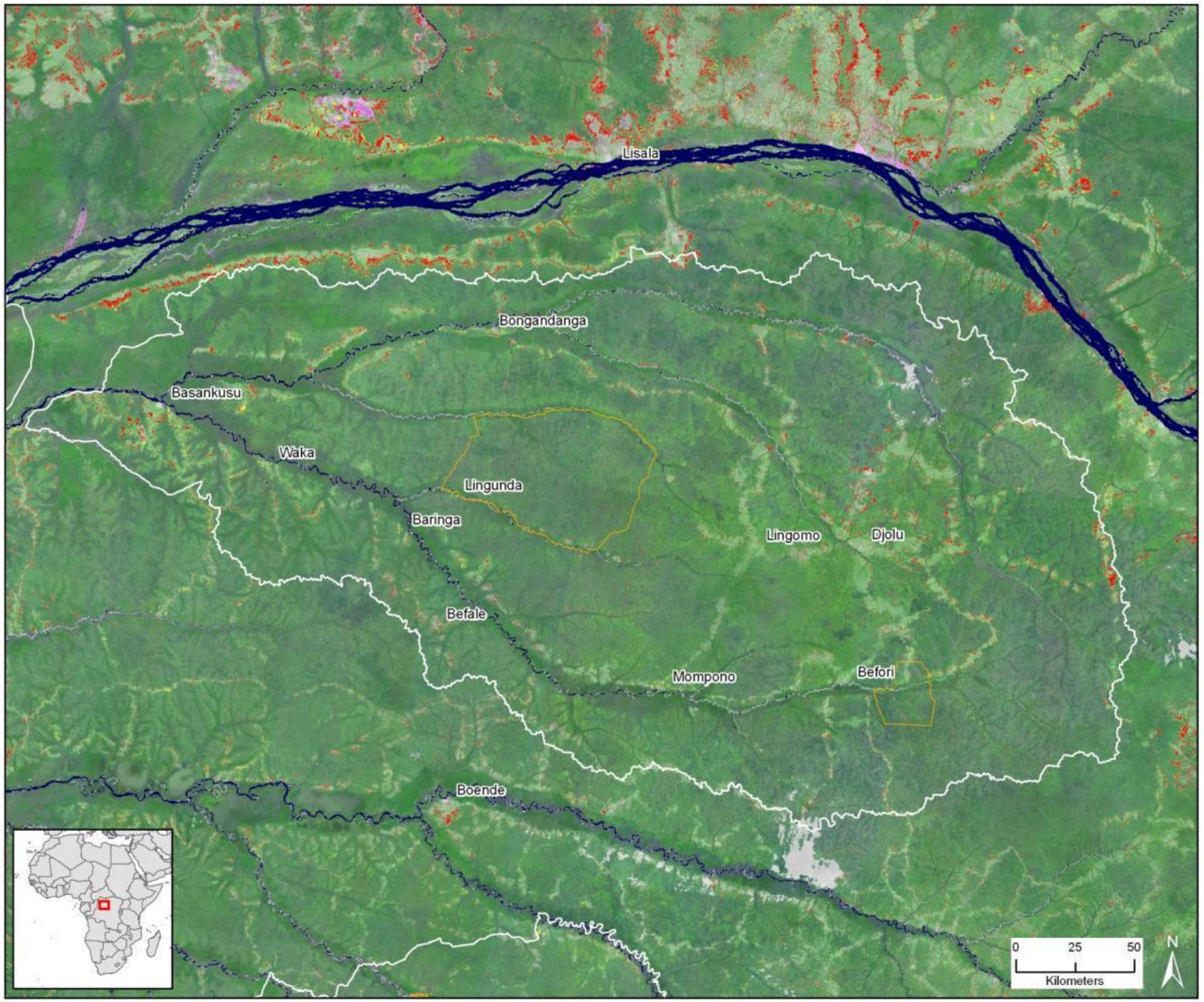
Biomass-Carbon Intrepretation



Forest Loss in the Democratic Republic of Congo 2000 - 2010



Forest change in the Maringa-Lopori-Wamba Landscape 1990-2000-2005



CARPE Landscapes
Boundaries in White

Protected Areas

Forest

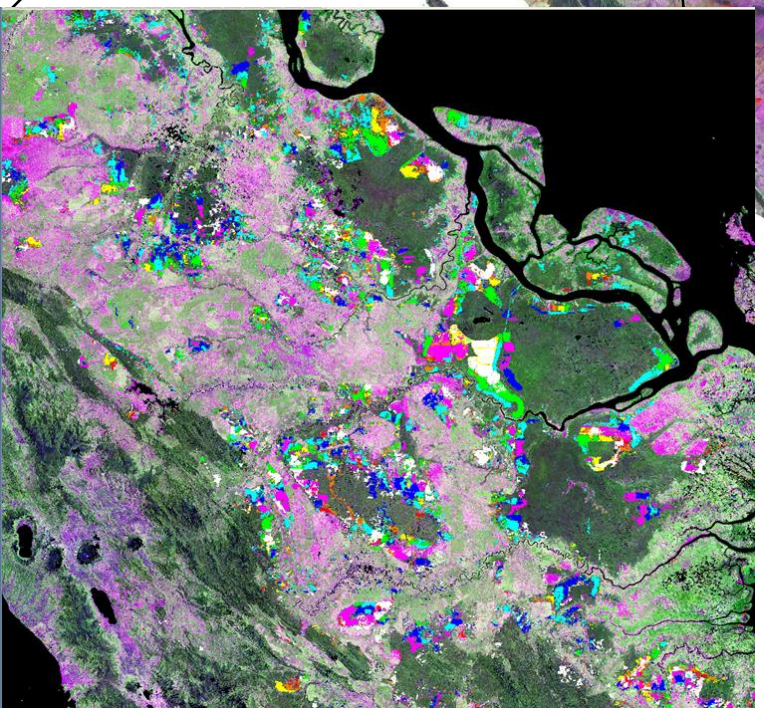
Non forest

Rural Complex
Secondary forest, farms

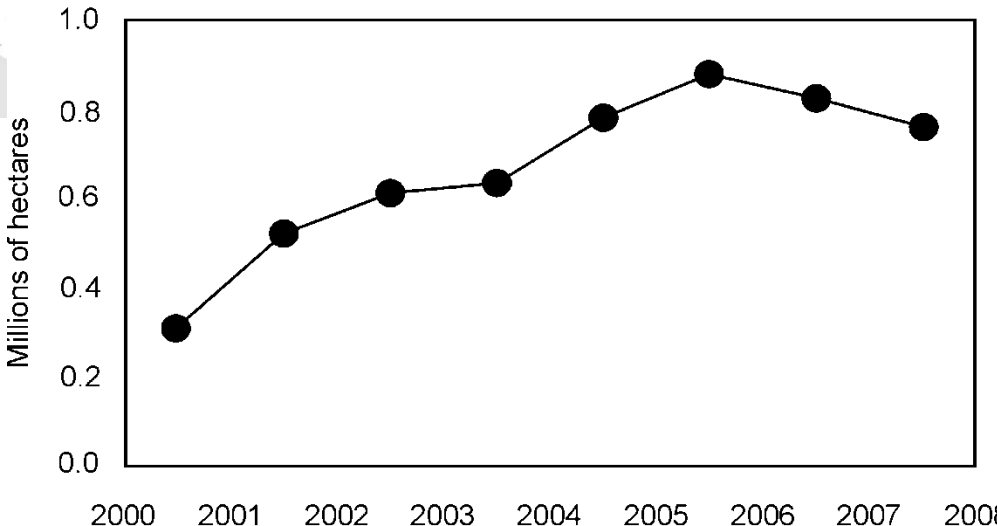
Forest Loss
Red c1990 – 2000
Yellow c 2000 - 2005

Cloud

Indonesia

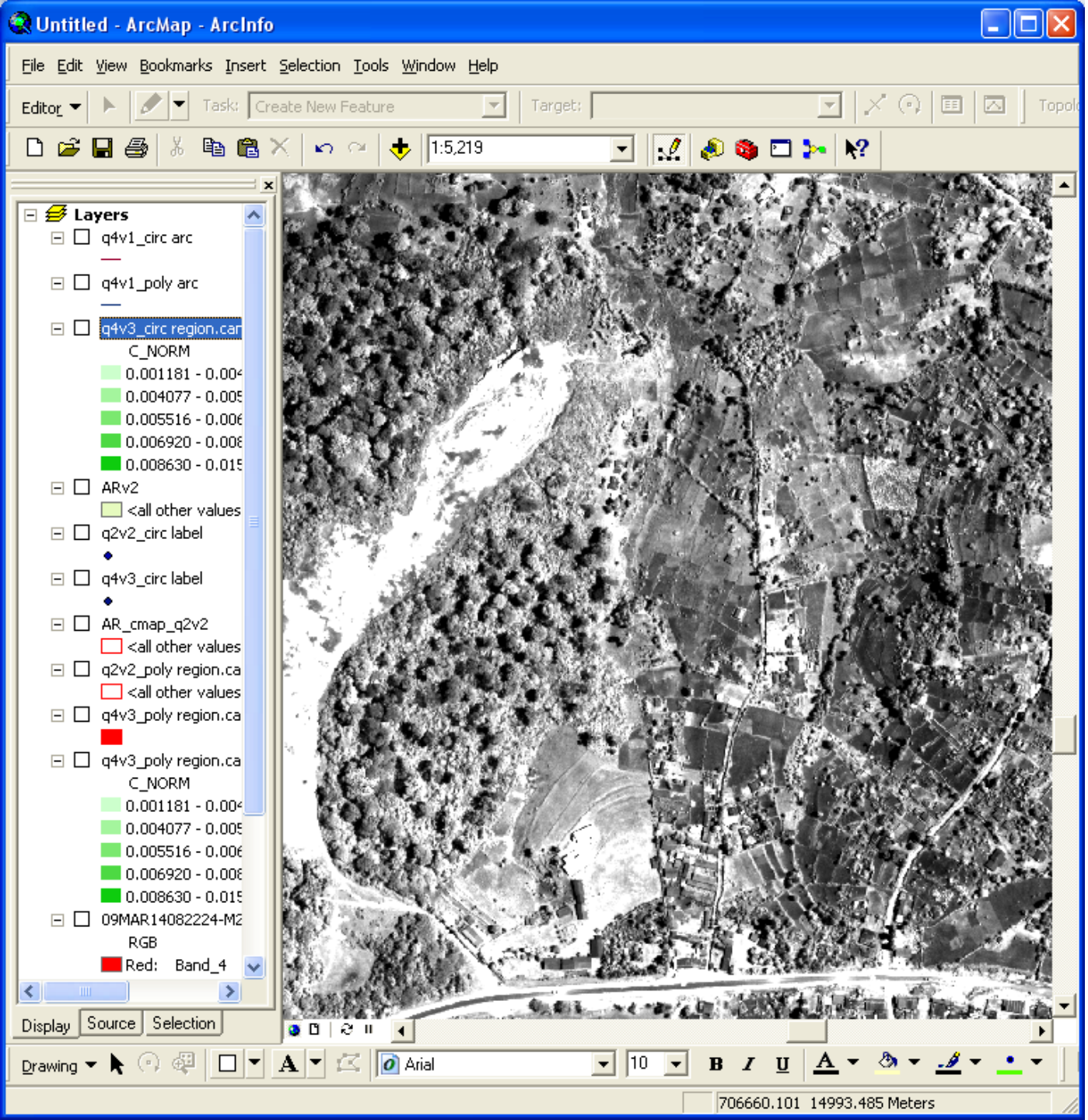


Forest cover loss in Sumatra and Kalimantan



Agroforestry

- MRV for Forest Investment Program Countries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q4v3_circ region.car
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q4v3_poly region.ca
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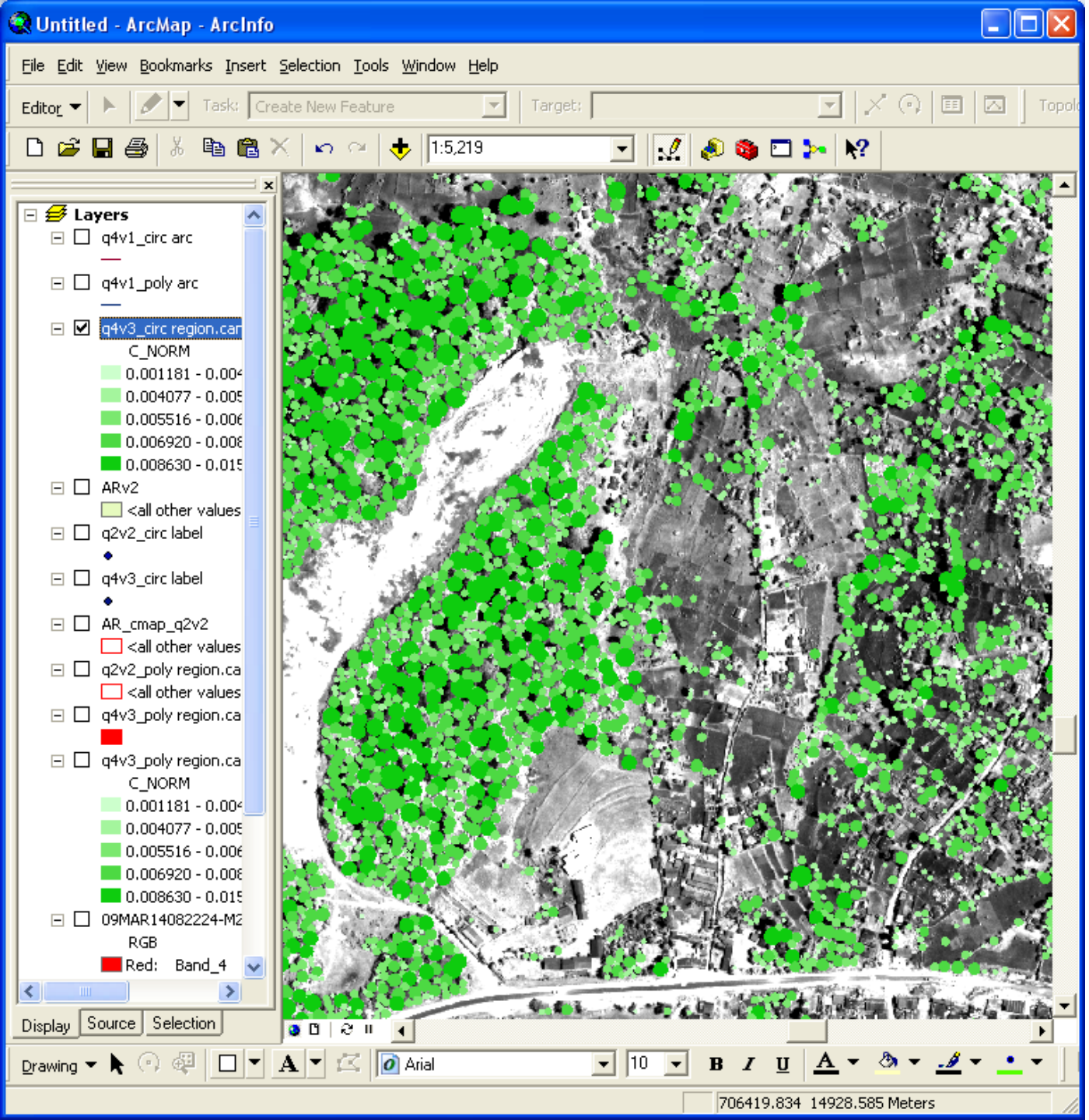
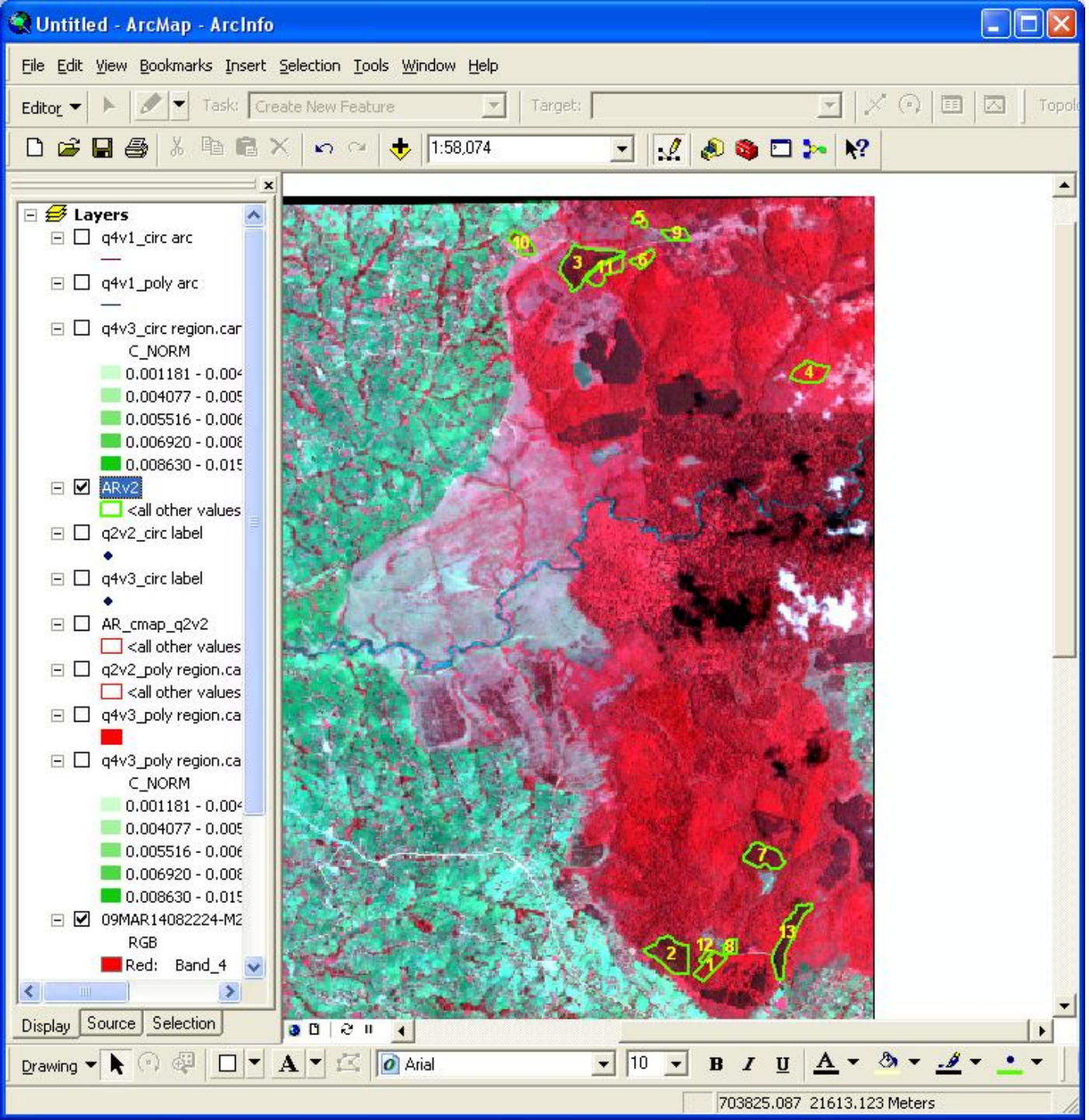


Forest-Ag landscape

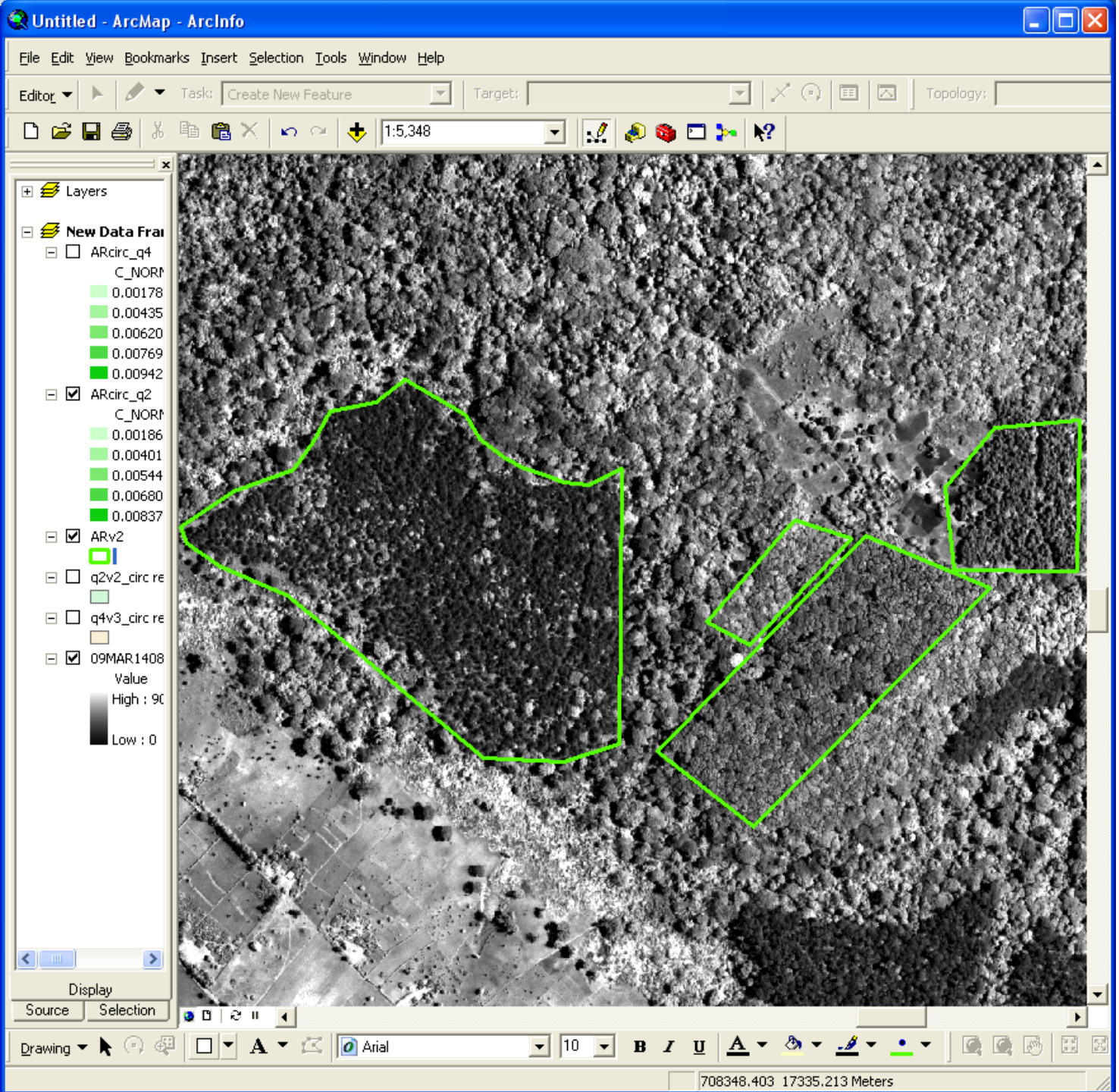
Carbon Map -circle regions (with Pan Image)

Agricultural Landscapes

- MRV for Forest Investment Program Countries



AR_ID	Species	Area (HA)
1	Prunus	4.88
2	Pinus	12.29
3	Pinus/Cupressus	14.99
4	Margaritaria	6.47
5	Margaritaria	1.47
6	Margaritaria	2.46
7	Cupressus	7.87
8	Cupressus	2.17
9	Cupressus	3.17
10	Cupressus	4.06
11	Cupressus	5.48
12	Bischovia	0.89
13	Pinus	10.43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0.00401
0.00544
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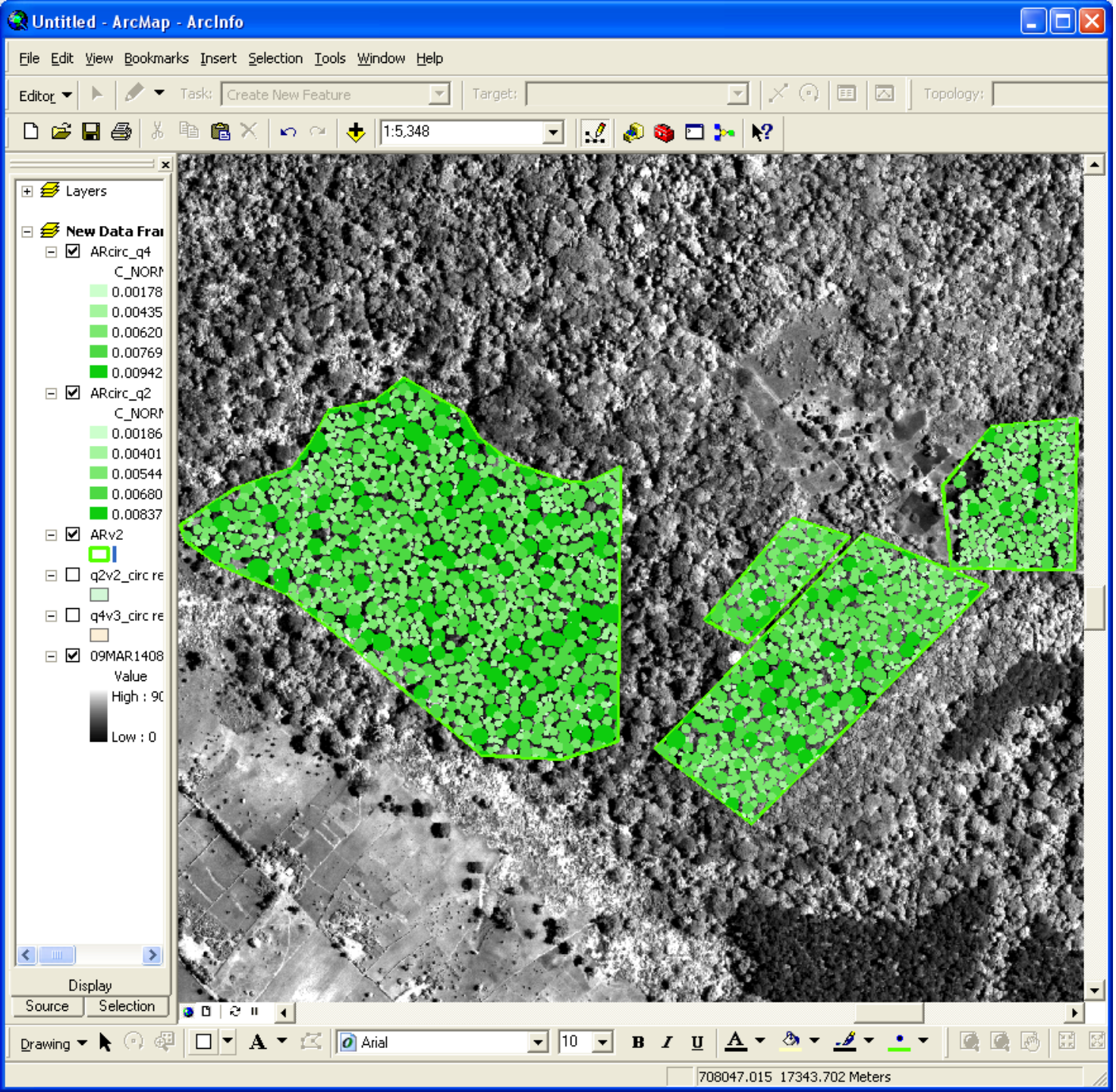
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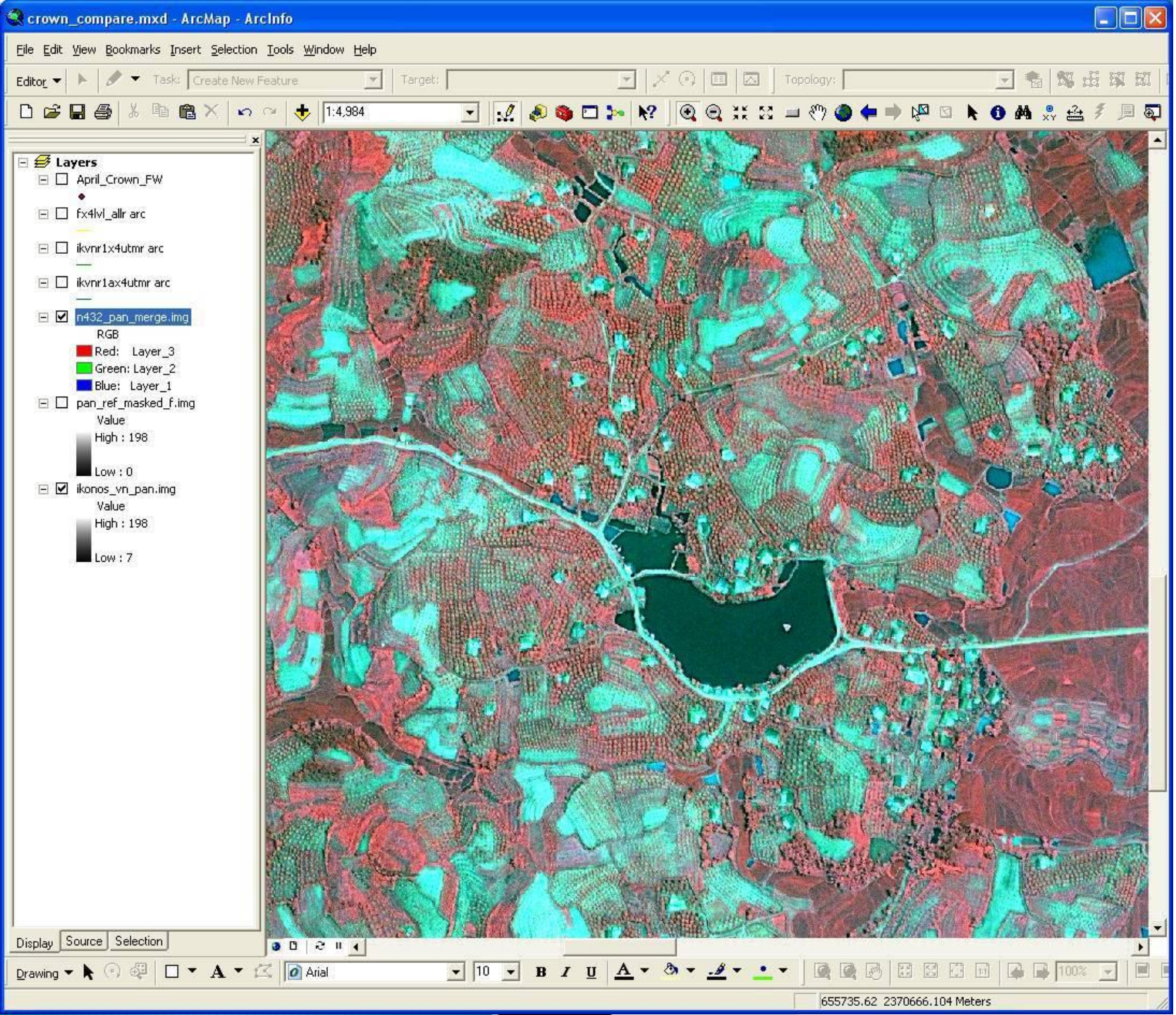
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Green: Layer_2
Blue: Layer_1
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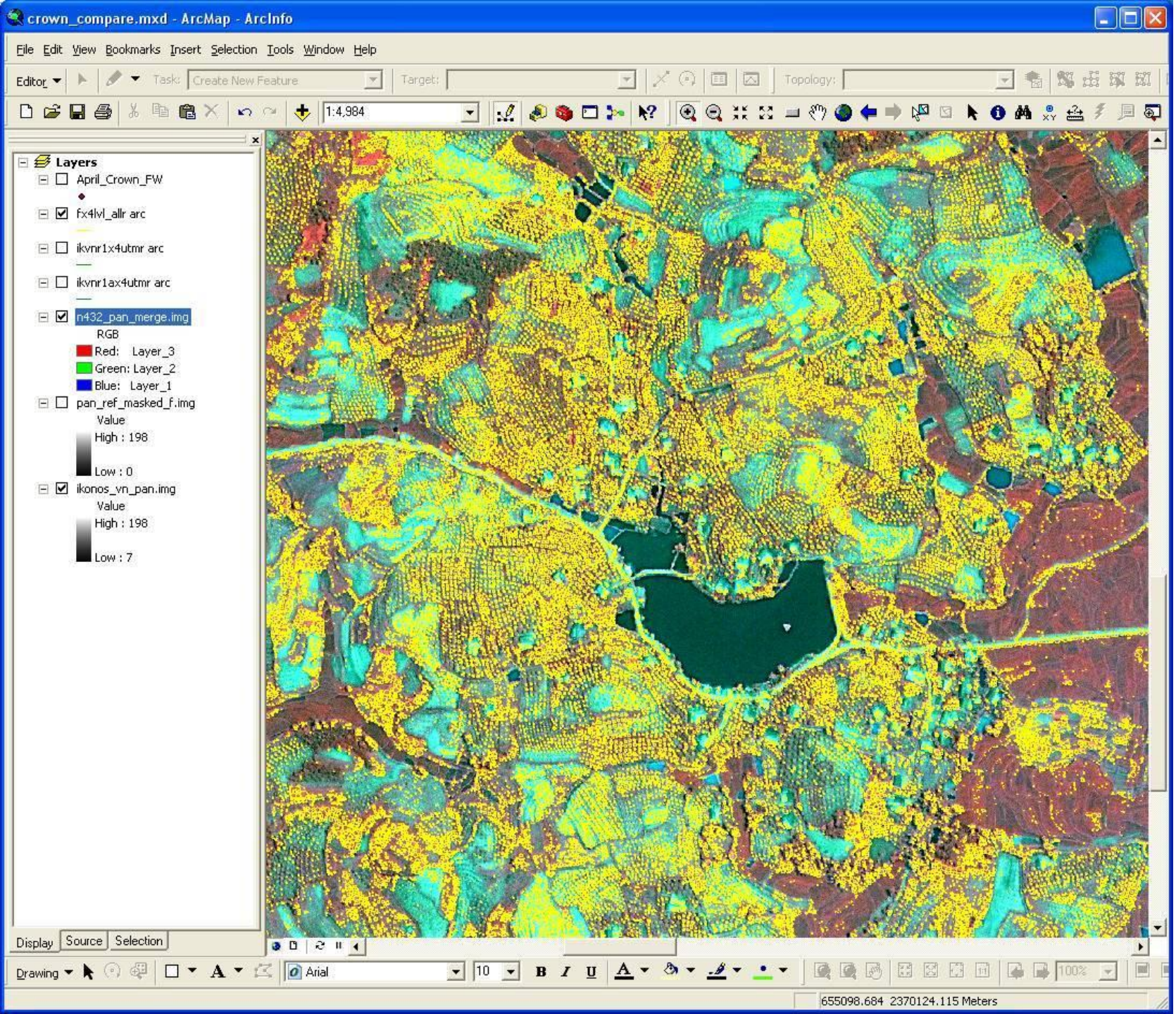
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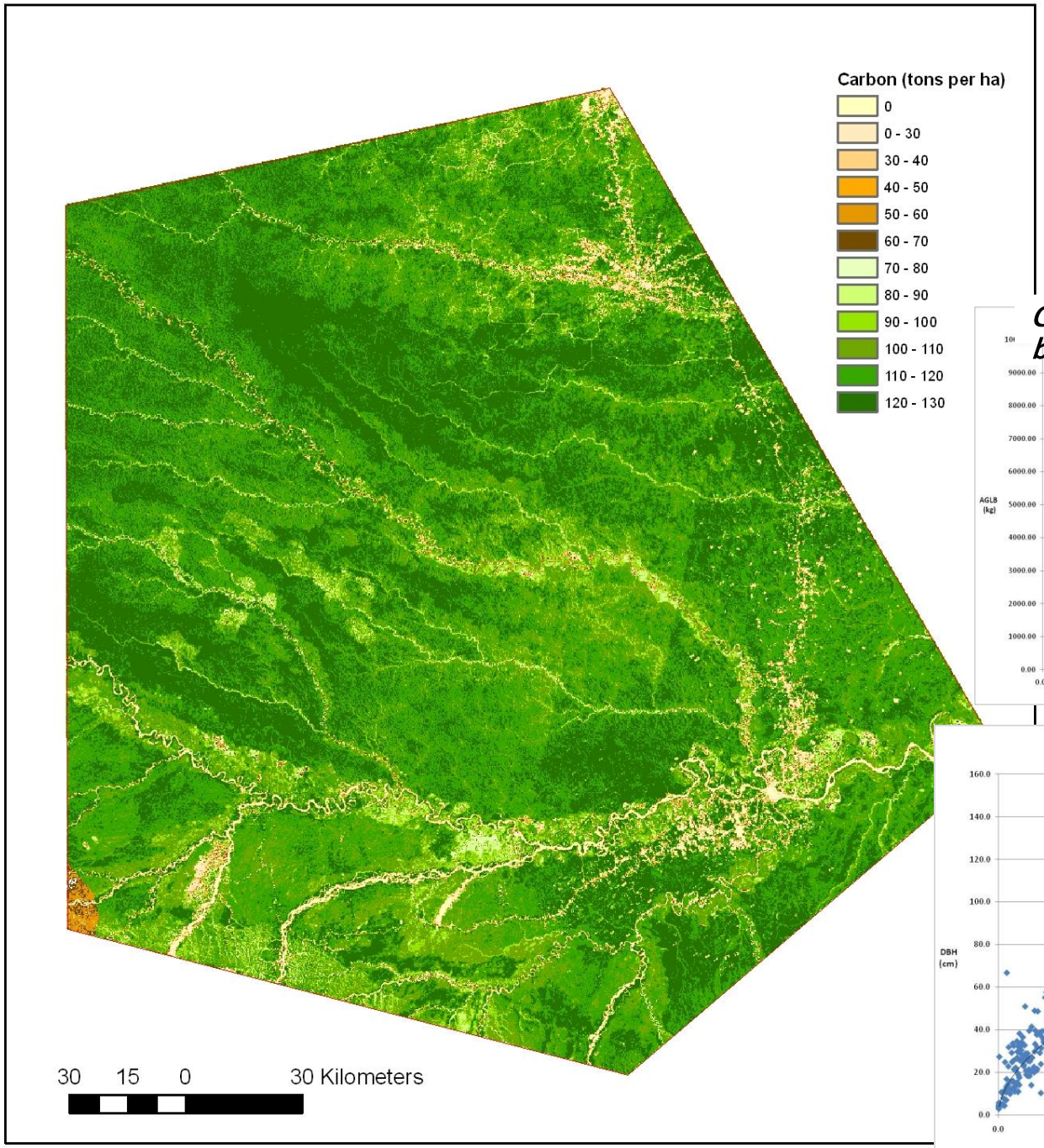
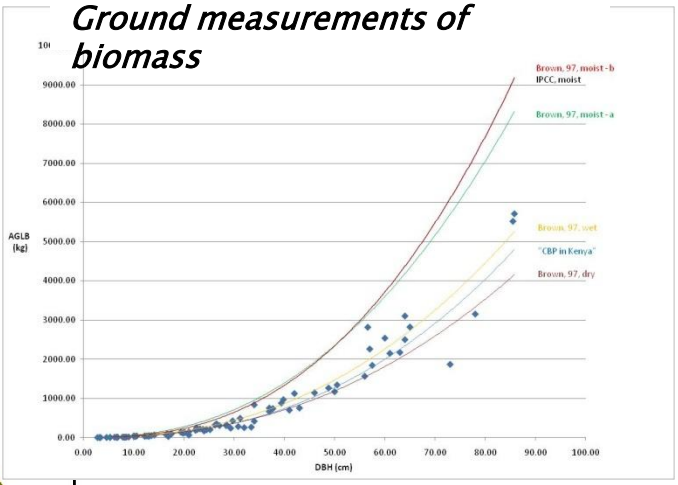
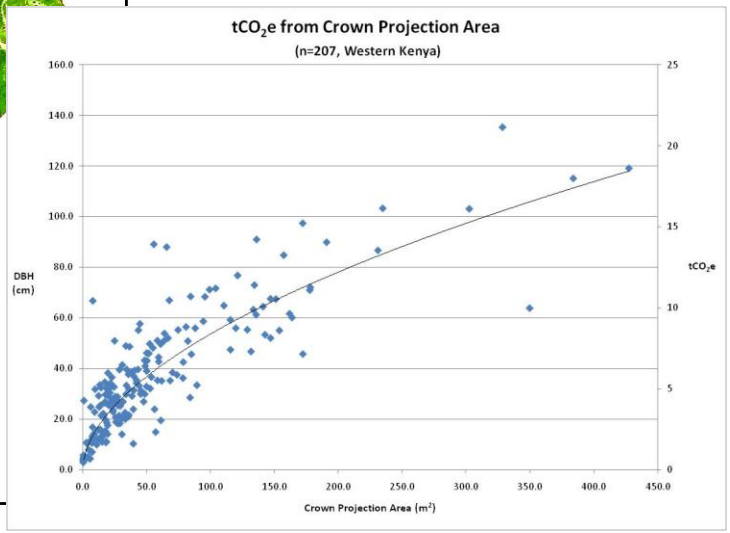
Carbon Stocks

- MRV for Forest Investment Program Countries



Ground measurements of biomass





MRV Information system

- MRV for Forest Investment Program Countries

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FIP MRV data manager

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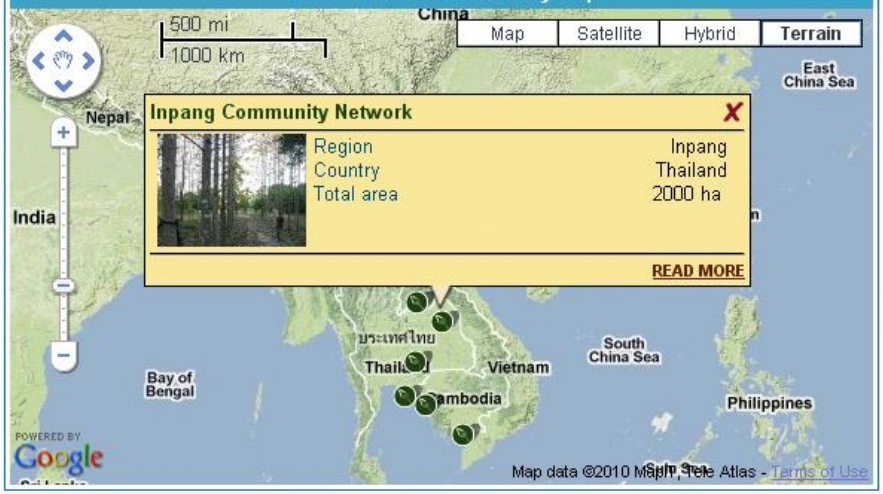
Carbon2Markets™

Carbon2Markets™ Inventory Map



Publications

Carbon2Markets™ Prospectus
Greening the Globe through Carbon Sequestration
Released August 2007

Amazon Deforestation
A photo essay by Ricardo Funari
Released 2000

Other publications from Carbon2Markets™
Carbon2Markets™ has several publications available on the web through the Global Observatory for Ecosystem Services.

Downloads

Carbon2Markets™ project inventory KMZ file
To review more details on some of the more advanced Carbon2Markets™ projects download this KMZ file for your Google Earth thick client.

Featured Projects

Carbon2Markets™ is currently developing and registering several projects in Africa, Southeast Asia and Latin America. Below is a brief listing of a few featured projects. These projects and others can be explored in greater depth using the map above or by downloading this KMZ file. To see an example of a detailed project management and measurement system for one site click here.

Viet Nam

Kien Lao and Cam Son Communes, Luc Ngan District, Bac Giang Province

The project area is located approximately 90 kilometers northeast of the capital city, Hanoi. The landscape Luc Ngan District is a mosaic of paddy rice in the lowlands, Litchi orchards, cassava, soybean and pineapple, and afforestation/reforestation in the upland areas. This Carbon2Markets™ project is centered on community-based agroforestry with Litchi and

Carbon Offsets Project Thailand(Teak)

Access the MRV system for the small-scale agroforestry carbon offset project in Thailand.

- *283 ha small-holder tectona grandis*
- *Average size 2.9 ha*
- *114 stands in five provinces*
- *98 households*

Find: Next Previous Highlight all Match case

Done

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http://www.carbon2markets.org/thaiteak/thai_teak_site.asp?ID=IN-TH_013

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Small Scale Agroforestry Development in Thailand

Site: IN-TH_013

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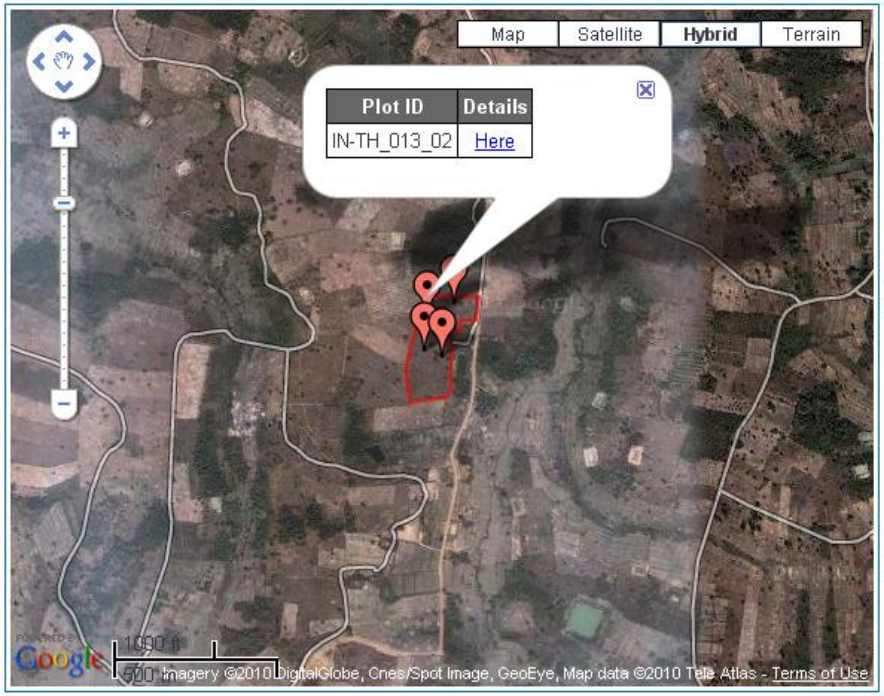


How to:

- Navigate with the map controls (zoom in/out, pan) or select map type at the top right.
- Click once on the Sample Plot balloon to access plot level information and tree data.
- Detail information about this agroforestry site is listed in the tabs below the map.

Legend Symbols

Corner Point of Sample Plot

Agroforestry Site

Site Information | Plot Details | Baseline Carbon Stock | Carbon Sequestration

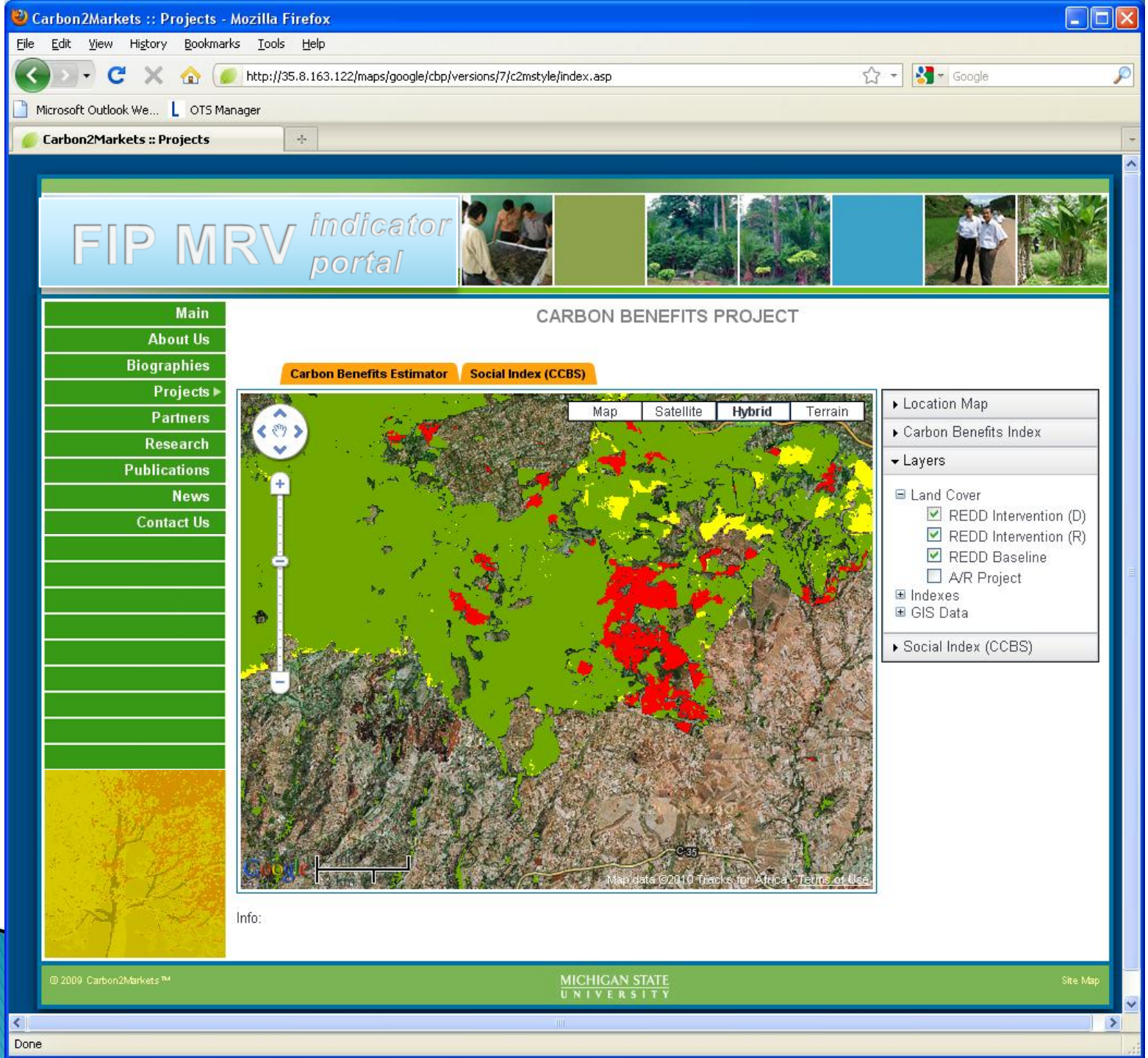
Baseline Year	2009
Baseline Carbon Stock (tCO2e)	357.52
Sequestration Rate (tCO2e/ha/year)	10.62
Year 5 - 2014 (tCO2e)	231.52
Year 10 - 2019 (tCO2e)	463.03
Year 15 - 2024 (tCO2e)	694.55

Ex-Ante Carbon Sequestration

Generate a report with the most updated information for this site.

Find: Next Previous Highlight all Match case

Done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Carbon Benefits Estimator
Social Index (CCBS)
Map
Satellite
Hybrid
Terrain
Location Map
Carbon Benefits Index
Layers
Land Cover
REDD Intervention (D)
REDD Intervention (R)
REDD Baseline
A/R Project
Indexes
GIS Data
Social Index (CCBS)
Info:
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MICHIGAN STATE UNIVERSITY
Site Map
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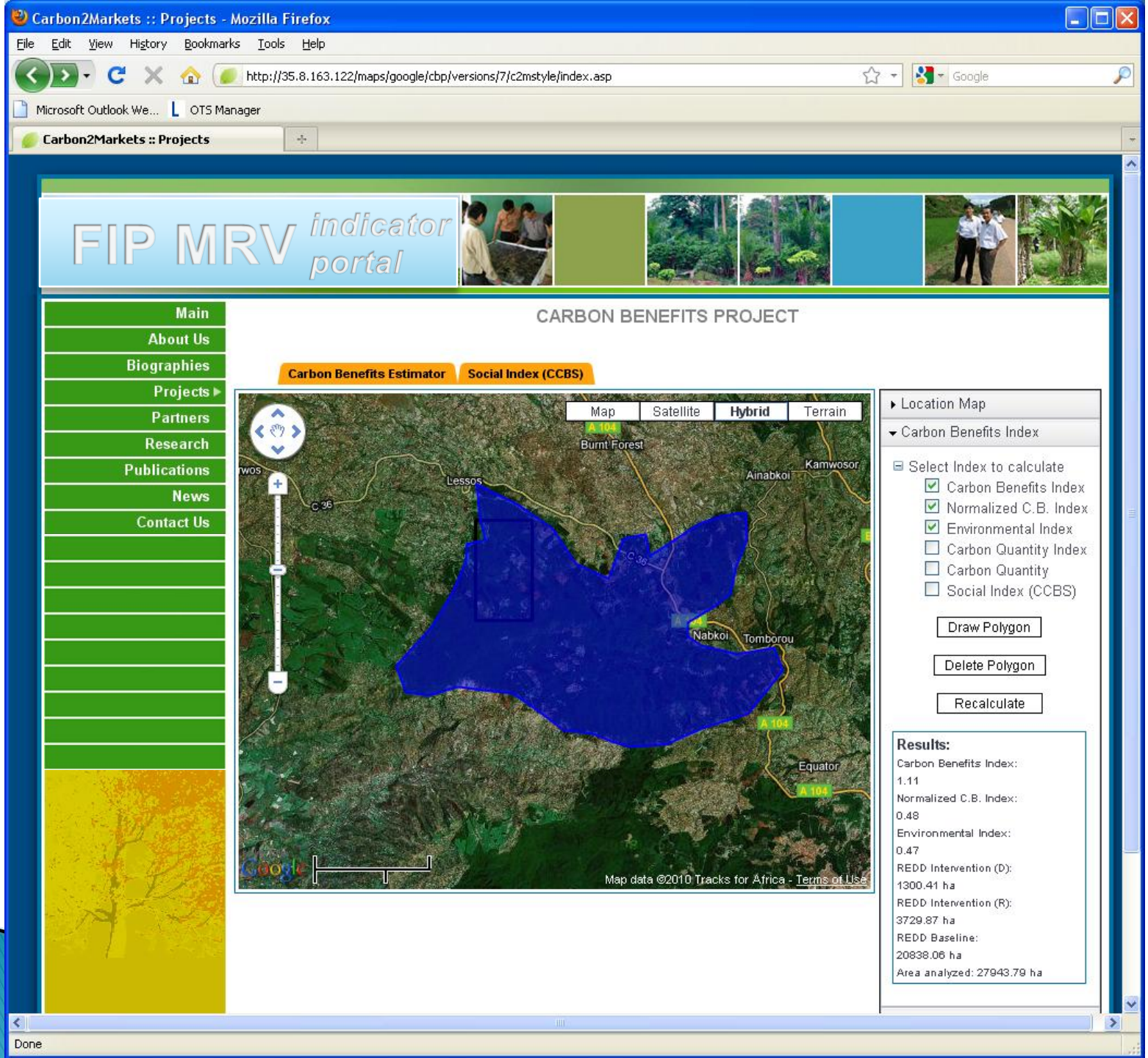
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Satellite
Hybrid
Terrain
Burnt Forest
Lessos
Ainabkoi
Kamwosor
Nabkoi
Tomborou
Equator
Map data ©2010 Tracks for Africa - Terms of Use
Location Map
Carbon Benefits Index
Select Index to calculate
Carbon Benefits Index
Normalized C.B. Index
Environmental Index
Carbon Quantity Index
Carbon Quantity
Social Index (CCBS)
Draw Polygon
Delete Polygon
Recalculate
Results:
Carbon Benefits Index:
1.11
Normalized C.B. Index:
0.48
Environmental Index:
0.47
REDD Intervention (D):
1300.41 ha
REDD Intervention (R):
3729.87 ha
REDD Baseline:
20838.06 ha
Area analyzed: 27943.79 ha
Done

Country Needs/Capabilities

Sources: MSU, GOFC-GOLD 2009, An assessment of national forest monitoring capabilities in tropical non-Annex I countries

	For. Cov. Chg. Monitoring Capacity	Forest Inventory Capacity	Remote Sensing Tech. Challenges	MRV Comments
Brazil	Very Good	Limited	Low	No cloud issues; Flat; Drivers well understood; Relatively easy to map.
Mexico	Very Good	Very Good	Medium	Complex: temperate to tropical.
Peru	Very Good	Good	Low	No cloud issues; flat; drivers well understand; relatively easy to map.
DRC	Some	Some	Medium	Cloud issues; Complex forest type (dry deciduous forest); fire common.
B. Faso	Very Low	Good	Low	Woodland savannah.
Ghana	Good	Limited	Medium	Fire common.
Laos	Good	Good	Low	Complex topography; Diverse forest types; Rapid change from shifting cultivation.
Indonesia	Very Good	Good	Medium	Cloud issues; Complex and diverse forest ecosystems; Complex use classes.

Delivery to Pilot Countries

- Step 1
  - Products to be applied in all 8 FIP countries
  - Ground calibration, data and validation is done in country
  - Web interface delivers results interactively, stores data in a secure content management system, provides tools for country indicators reports
  - Training and capacity building, technical infrastructure development in-country
- Step 2
  - Country-based system is delivered and deployed, integrated with national spatial data infrastructure and forestry sector/agency national inventory
  - FIP maintains a connection to country systems

Illustrative Country Budget

	USD
Computer Equipment	110,500
Field Measurement Equipment	56,000
Field Logistics	155,000
Software	25,000
Geospatial Data	107,500
Training and Capacity Building	450,000
TOTAL	**904,000**

Advantages of the System to Countries

- Plug and play system
- Cost effective
- Includes local stakeholders from civil society, communities, and the private sector
- Compatible with FCPF
- Equal opportunity MRV system