The Carbon Benefits Project (CBP)  
Tools to estimate the climate change mitigation co-benefits of land management projects

Eleanor Milne, Mark Easter and Keith Paustian

Plus many more!

NASA Carbon Monitoring System: Policy Speaker Series

30 November 2016
The CBP Modelling Component

Colorado State University
NREL at CSU are Component A Lead and responsible for Component A methodology

ISRIC—World Soils Information
Providing global soils information for carbon stock assessment

Overseas Development Group, UEA
Providing socio-economic expertise

The University of Leicester
The Department of Geography is providing advice on RS and supporting coordination

Centro de Energia Nuclear na Agricultura
Providing detailed data for parameterization and testing of CBP methods and models

The KAP SLM Project
This Kenyan project, involving KARI will help develop and implement a C benefits protocol

The Ningxia IEM Agricultural Dev. Project
This Chinese GEF project will help develop and implement a C benefits protocol

The Niger/Illigeria IEM Project
The NN IEM GEF Project will help develop and implement a C benefits protocol

The GEF Gansu Capacity Building Project
This Chinese GEF project will help develop and implement a C benefits protocol

Institut de Recherche pour le Développement
IRD are providing expertise on GHG assessment methods in SLM projects

International Livestock Research Institute
ILRI are working with the CBP on GHG emissions from livestock
Land Management

- Carbon stock changes (biomass and soils)
- GHG emissions (livestock, fertilisers, soils, biomass burning...)

From 2006 IPCC Guidelines
Sustainable Land Management

Sustainable land management projects such as those supported by the GEF have potential to:

- reduce GHG emissions
- sequester C from the atmosphere
Comprehensive Greenhouse Gas Inventory

- Agencies and NGOs, including the GEF wish to know the GHG consequences of projects they are supporting.
- Many tools focus almost exclusively on forest biomass (for REDD, etc.)
- Comprehensive GHG flux assessment is necessary to assess the Net GHG benefit of land use & management changes
Impact of the project over the baseline

Initial Land Use

Baseline Scenario

Business as usual

Project scenario

Carbon Benefit

Project Scenario

- Reduced grazing, protection of rangelands
- Reforestation/Afforestation

Project activities:

- Woody Carbon
- Enteric CH₄
- Manure N₂O, CH₄
- Biomass Burning (CO₂, N₂O, CH₄, CO, NOₓ)
- Synthetic Fertilizer N₂O
- Soil Carbon
The Carbon Benefits Project

To provides a system for the managers of GEF and other land management projects to:

- Estimate
- Track
- Report

C stock changes and GHG emissions (carbon benefits) which result from the project (in comparison to a baseline)
Features of the CBP System

A system that is-
- Online
- User friendly
- Can be used at any stage of a project
- Can be used for different types of projects with different amounts of data
- Gives spatially explicit output
- Gives a report in a standard format
Carbon Benefits Project: Modelling, Measurement and Monitoring

- **Project Information Module**
  - Toolkit advisor
  - Project Description Module
    - Guidance Module
      - Assessment Tools
        - Simple Assessment
        - Detailed Assessment
        - Dynamic Modelling
      - Socioeconomic Tools
    - Reporting Module

**Name of project, funding agency etc.**
**Where project activities are**
**Advice on measurements to take, which tools to use**
**Tools**
Name of project, funding agency etc.

Report: Module

Project Information Module

Toolkit advisor

Project Description Module

Guidance Module

Assessment Tools

Simple Assessment

Detailed Assessment

Dynamic Modelling

Socioeconomic Tools

Reporting Module
Enter, Manage, and Delete a Polygon
Enter, Manage, and Delete a Polygon

Controls the actions on the form

Controls the image view on the form
Enter, Manage, and Delete a Polygon

Click to create a polygon

Click to Change point or polygon name or group

Click to Delete a polygon or point

Click to show a short help video
Enter, Manage, and Delete a Point

Click to create a point

Click to delete a point

Click to Change point or polygon name or group
Establishing Points Using Latitude and Longitude

Upload from a File
Establishing Points Using Latitude and Longitude

Upload Points One at a Time
Uploading your own ESRI GIS Files

Upload from GIS files
Click Here to view standard (default) data on:

- Climate Regions
- Soils
- Biomass Stocks
- Livestock & Manure Data
Enter your Project Activity Data

Click here to enter data on the area in each land use category
Carbon Benefits Project: Modelling, Measurement and Monitoring

- Project Information Module
- Toolkit advisor
- Project Description Module
- Guidance Module
- Assessment Tools
  - Simple Assessment
  - Detailed Assessment
  - Dynamic Modelling
- Socioeconomic Tools
- Reporting Module

Name of project, funding agency etc.
Where project activities are
Advice on measurements to take, which tools to use

Tools
The Tools

- Simple and Detailed Assessment based on the IPCC method

- Dynamic Modelling Option is an ecosystem model (Century) linked to a GIS
The Tools

Default data provided, choose from drop-down menus

What is needed to use it?
- A computer with an internet connection
- Information on land management activities and where they occur
- An idea of land use/management under a baseline and a project scenario

Who is it suitable for?
- Suitable for use in projects without many resources for C monitoring & reporting
- Also suitable for use by those developing project proposals
- Available in English, Chinese, Spanish, French and Russian (Portuguese soon)
### Simple Assessment Home

- **Forestland**
- **Grassland**
- **Settlements**
- **Wetlands**
- **Annual Crops**
- **Perennial Crops**
- **Agroforestry**
- **Livestock**

### Goal

The Simple Assessment provides a simple tool to assess the impact of a project on carbon stocks and greenhouse gas emissions. The tool will be most useful to Sustainable Land Management projects involving relatively few land use/management changes or on relatively small areas.

### Getting Started

Start by entering information for your Project Activity Areas for the ‘Initial Land Use’ (the situation at year 0 before your project started). Click on the land use categories in the left-hand menu and populate each section in the table below.

### Enter land use area in ha

<table>
<thead>
<tr>
<th>Land Use Category</th>
<th>Initial Land Use (ha)</th>
<th>Baseline Scenario (ha)</th>
<th>Project Scenario (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forestland</td>
<td>580</td>
<td>300</td>
<td>580</td>
</tr>
<tr>
<td>Grassland</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Settlements</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Wetlands</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Annual Crops</td>
<td>0</td>
<td>250</td>
<td>0</td>
</tr>
<tr>
<td>Perennial Crops</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Agroforestry</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Livestock</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*The total area includes all of the area in all of the first seven land use categories, but does not include the number of livestock.*
Simple Assessment - Forestland

Forestland Stage 1 of 2: Forest Types and Tree Age Ranges

1. Select Project Activity Area/Group
   - Reforestation [685 ha] X

2. Select a Forest Type and Tree Age Range
   - Forest Type: Eucalyptus camaldulensis
     - Add to table below

3. Enter area for each record
   - Delete
     - Forest Type: Eucalyptus camaldulensis
       - Tree Age Range: ~ 20 years
       - Area (ha): 685

Total Area Allocated (ha): 685/685
Simple Assessment – Forestland

Forestland Stage 2 of 2: Natural Losses and Wood Removal

1. Select Project Activity Area/Group
   - Reforestation [685 ha]

2. Enter percent of aboveground biomass affected by natural losses each year

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>Tree Age Range</th>
<th>Area (ha)</th>
<th>Fires (%/yr)</th>
<th>Wind (%/yr)</th>
<th>Pest/Disease (%/yr)</th>
<th>Other Losses (%/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eucalyptus camaldulensis</td>
<td>&lt;= 20 years</td>
<td>685</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
### Simple Assessment – Forestland

**3.** Enter volume of wood removed by timber harvest, fuel wood gathering, pruning or any other manmade process.

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>Tree Age Range</th>
<th>Area (ha)</th>
<th>Timber Harvest (m³/yr)</th>
<th>Fuelwood Gathering (m³/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eucalyptus camaldulensis</td>
<td>&lt;= 20 years</td>
<td>685</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**4.** Enter annual deforestation rate if applicable.

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>Tree Age Range</th>
<th>Area (ha)</th>
<th>Area Cleared without Burning (ha/yr)</th>
<th>Area Cleared with Burning (ha/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eucalyptus camaldulensis</td>
<td>&lt;= 20 years</td>
<td>685</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Simple Assessment - Grasslands

Grassland Stage 1 of 3: Grassland Systems

1. Select Project Activity Area/Group
   - Project Activity Area Group 1 [3964 ha]

2. Select a Grassland System
   - Rangeland

3. Describe Grassland System
   - Rangeland: Severe Degraded Grassland, Improvements: Multiple, Amount of N Fertilizer (kg/ha): 0, % N in Fertilizer: 0, Burn Frequency: once every four years, Area: 600

Improvements -
Fertilization, irrigation, introducing legumes, improved grass varieties
Simple Assessment Annual Crops

Improvements -
Fertilization, irrigation, cover crops, legumes in rotation, use of high-yielding varieties
Simple Assessment - Agroforestry

Agroforestry Stage 1 of 4: Agroforestry Systems

1. Select Project Activity Area/Group

   Project Activity Area Group 1 [3964 ha]

2. Create an Agroforestry System

   Name: Peach/vegetable

   Add to table below

3. Enter an Area for each Record

<table>
<thead>
<tr>
<th>Agroforestry System</th>
<th>Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peach/vegetable</td>
<td>60</td>
</tr>
</tbody>
</table>

Total Area Allocated (ha): 60/
The Tools

Can create own crop/ grass/ forest/ agroforestry types and systems
Can use project specific emission factors

**What is needed to use it?**
Same as Simple Assessment plus:
- Specific information on crop/grass/forest species and systems
- Optional measurements to improve emission factors
- Resources and facilities for field sampling and lab analysis (to varying extents)

**Who is it suitable for?**
- Projects wanting to reduce uncertainties in emissions estimations
- Suitable for use in projects with more emphasis on C benefits
Detailed Assessment Home

Goal

The Detailed Assessment provides a tool to assess the impact of projects on carbon stocks and greenhouse gas emissions. Suitable for detailed reporting where there is a reasonable focus on climate change mitigation and/or a multiple, land management changes on areas with several combinations of soil type and climate. Users will have the option to improve carbon and greenhouse gas balance estimates by inputting project specific information (from field measurements or local data sets).

Getting Started

Start by entering information for your Project Activity Areas for the 'Initial Land Use' (the situation at year 0 before your project started). Click on the land use categories in the left hand menu and complete each section in turn. Then do the same for the 'Baseline Scenario' (what would have happened in your project area over the project period without any project activities) and finally the 'Project Scenario'. The project period can be any length of time defined by the user. Information for the baseline and project scenarios should represent the change over the entire period. For further explanation of the scenarios and help with the Detailed Assessment click on the 'Help' button, top right.
Annual Cropland in DA

Cropping System Planting Sequences

Add | Delete

Crop 1: Legumes and pulses, dried
Crop 2: Beans
Crop 3: Cassava

Create New Crop

Name: [Blank]


Crop Table:

<table>
<thead>
<tr>
<th>Year</th>
<th>Planting Sequence</th>
<th>Crop Name</th>
<th>Residue Management</th>
<th>Tillage System</th>
<th>Fort</th>
<th>Amount of N Fertilizer (kg/ha)</th>
<th>% of nitrogen (N) in fertilizer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Maize, dry</td>
<td>Collected</td>
<td>Full</td>
<td></td>
<td>60</td>
<td>46</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>Legumes and pulses, dried</td>
<td>Retained</td>
<td>Reduced</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>Napier Grass</td>
<td>Collected</td>
<td>None</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Factors in **green text** are good candidates for improvement through a measurement and monitoring program. They can be edited.

Factors in **black text** are more complex and/or expensive to measure though they can be improved through a measurement and monitoring program. They can be edited.

Factors in **red text** are either very difficult and/or expensive to measure, or they are well understood and cannot be improved upon, or they are physical constants. They cannot be edited.

<table>
<thead>
<tr>
<th>Factor Name</th>
<th>Factor Type</th>
<th>Units</th>
<th>Source Category</th>
<th>SubSource Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>CF: Carbon Fraction</td>
<td>Complex Measurement</td>
<td>tonnes C/tonnes d m</td>
<td>Soil Nitus Oxide</td>
<td>Cropland Residue</td>
</tr>
<tr>
<td>dCg: Change in Herbaceous Biomass C from Growth</td>
<td>Field Measurement</td>
<td>tonnes CO2/ha</td>
<td>Biomass C Stocks</td>
<td>Herbaceous Biomass (Land Use Change)</td>
</tr>
<tr>
<td>EF: Direct Emission Factor for Crop Residues</td>
<td>Recommend Default Only</td>
<td>Kg N2O-N/Kg N</td>
<td>Soil Nitus Oxide</td>
<td>Cropland Residue</td>
</tr>
<tr>
<td>EF: Direct Emission Factor for Cultivated Organic Soil</td>
<td>Recommend Default Only</td>
<td>Kg N2O-N/ha/yr</td>
<td>Soil Nitus Oxide</td>
<td>Mineralization of Cultivated Organic Soils</td>
</tr>
<tr>
<td>EF: Direct Emission Factor for N Fertilizers</td>
<td>Recommend Default Only</td>
<td>Kg N2O-N/Kg N</td>
<td>Soil Nitus Oxide</td>
<td>Synthetic N Fertilizer</td>
</tr>
<tr>
<td>DMF: Dry Matter Fraction of Residue</td>
<td>Laboratory Measurement</td>
<td>tonnes dmt/tonnes residue</td>
<td>Soil Nitus Oxide</td>
<td>Cropland Residue</td>
</tr>
</tbody>
</table>
### 2. View/Update Factor Values and Confidence Intervals

<table>
<thead>
<tr>
<th>Annual Crop Type</th>
<th>Project/Country</th>
<th>Factor Value</th>
<th>Factor Type</th>
<th>Uncertainty (± %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legumes and pulses, dried</td>
<td>Ethiopia</td>
<td>0.5600</td>
<td>Field Measurement</td>
<td>50.0000</td>
</tr>
<tr>
<td>Maize, dry</td>
<td>Ethiopia</td>
<td>1.6500</td>
<td>Field Measurement</td>
<td>50.0000</td>
</tr>
<tr>
<td>Napier Grass</td>
<td>Ethiopia</td>
<td>0.7332</td>
<td>Field Measurement</td>
<td>90.0000</td>
</tr>
</tbody>
</table>

### Notes for this factor record:


### 3. Recommended Measurement and Monitoring Protocols

```
FAOSTAT database → http://faostat3.fao.org/faostat-gateway/go/to/home/E
```
Forestland in DA

Forestland Stage 1 of 2: Forest Types and Tree Age Ranges

- Subtropical mountain systems natural vegetation
- Subtropical mountain systems plantation - broadleaved
- Subtropical mountain systems plantation - eucalyptus
- Subtropical mountain systems plantation - other
- Tropical mountain systems natural vegetation
- Tropical mountain systems plantation - broadleaved
- Tropical mountain systems plantation - eucalyptus
- Tropical mountain systems plantation - other
- Tropical mountain systems plantation - other
- Tropical mountain systems plantation - other

<table>
<thead>
<tr>
<th>Subtropical mountain systems plantation - Eu...</th>
<th>Tree Age Range</th>
<th>Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt; 20 years</td>
<td>1010</td>
</tr>
</tbody>
</table>

Total Area Allocated (ha): 1010/1010
Forestland in DA

Carbon Benefits Project: Modelling, Measurement and Monitoring

Welcome Eleanor Mine (Sign out)
Language: en-GB  Wednesday 08 May 2013
Project Name (Id): Detailed Assessment Tutorial (183)  View/Update Profile

Start Here → Project Description → Guidance → Analysis Tools → Reports → Provide Feedback

1. Initial Land Use ✓
2. Baseline Scenario ✓
3. Project Scenario x

Forestland Stage 2 of 2: Natural Losses and Wood Removal

1. Select Project Activity Area/Group
   - Demonstration Group [8540 ha] ✓

2. Enter percent of aboveground biomass affected by natural losses each year

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>Tree Age Range</th>
<th>Area (ha)</th>
<th>Fires (%/yr)</th>
<th>Wind (%/yr)</th>
<th>Pest/Disease (%/yr)</th>
<th>Other Losses (%/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yela Watershed Forest</td>
<td>&gt; 20 years</td>
<td>1010</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
### 3. Enter volume of wood removed by timber harvest, fuel wood gathering, pruning or any other manmade process.

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>Tree Age Range</th>
<th>Area (ha)</th>
<th>Timber Harvest (m³/3yr)</th>
<th>Fuelwood Gathering (m³/3yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yala Watershed Forest</td>
<td>&gt; 20 years</td>
<td>1010</td>
<td>3600</td>
<td>3600</td>
</tr>
</tbody>
</table>

### 4. Enter annual deforestation rate if applicable.

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>Tree Age Range</th>
<th>Area (ha)</th>
<th>Area Cleared without Burning (ha/yr)</th>
<th>Area Cleared with Burning (ha/yr)</th>
<th>Reforestation / Afforestation Area (ha/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yala Watershed Forest</td>
<td>&gt; 20 years</td>
<td>1010</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Factors in **green text** are good candidates for improvement through a measurement and monitoring program. They can be edited. Factors in **black text** are more complex and/or expensive to measure, though they can be improved through a measurement and monitoring program. They can be edited. Factors in **red text** are either very difficult and/or expensive to measure, or they are well understood and cannot be improved upon, or they are physical constants. They cannot be edited.

<table>
<thead>
<tr>
<th>Factor Name</th>
<th>Factor Type</th>
<th>Units</th>
<th>Source Category</th>
<th>SubSource Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aboveground Biomass Stock</td>
<td>Field Measurement</td>
<td>tonnes dm/ha</td>
<td>Biomass C Stocks</td>
<td>Forestland</td>
</tr>
<tr>
<td>CF: Carbon Fraction</td>
<td>Complex Measurement</td>
<td>tonnes Ctonne dm</td>
<td>Biomass C Stocks</td>
<td>Forestland</td>
</tr>
<tr>
<td>MF: Mass of Fuel</td>
<td>Laboratory Measurement</td>
<td>tonnes dm/ha</td>
<td>Biomass C Stocks</td>
<td>Forestland</td>
</tr>
<tr>
<td>ER(NOx): NOx Emission Ratio</td>
<td>Recommend Default Only</td>
<td>tonnes NOx-Nton... N</td>
<td>Biomass Burning</td>
<td>Forestland</td>
</tr>
<tr>
<td>R: Root: Shoot Ratio</td>
<td>Complex Measurement</td>
<td>unitless</td>
<td>Biomass C Stocks</td>
<td>Forestland</td>
</tr>
<tr>
<td>Gef(CO): CO Emission Factor for Burning</td>
<td>Complex Measurement</td>
<td>g kg-1 dry matter burnt</td>
<td>Biomass Burning</td>
<td>Forestland</td>
</tr>
<tr>
<td>Gef(CH4): CH4 Emission Factor for Burning</td>
<td>Complex Measurement</td>
<td>g kg-1 dry matter burnt</td>
<td>Biomass Burning</td>
<td>Forestland</td>
</tr>
<tr>
<td>Gef(N2O): N2O Emission Factor for Burning</td>
<td>Complex Measurement</td>
<td>g kg-1 dry matter burnt</td>
<td>Biomass Burning</td>
<td>Forestland</td>
</tr>
<tr>
<td>Gef(NOx): NOx Emission Factor for Burning</td>
<td>Complex Measurement</td>
<td>g kg-1 dry matter burnt</td>
<td>Biomass Burning</td>
<td>Forestland</td>
</tr>
<tr>
<td>CF: Combustion Factor</td>
<td>Laboratory Measurement</td>
<td>g burned o-1</td>
<td>Biomass Burning</td>
<td>Forestland</td>
</tr>
</tbody>
</table>
Forestland in DA

2. View/Update Factor Values and Confidence Intervals

<table>
<thead>
<tr>
<th>Land Use Climate Region</th>
<th>Tree Type</th>
<th>Age Range</th>
<th>Factor Value</th>
<th>Factor Type</th>
<th>Uncertainty (+/- %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tropical Montane</td>
<td>Yale Watershed Forest</td>
<td>&lt;= 20 years</td>
<td>13.0000</td>
<td>Field Measurement</td>
<td>52.0000</td>
</tr>
</tbody>
</table>

Notes for this factor record:

3. Recommended Measurement and Monitoring Protocols

- 2003 IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry, Table 3.3.2, p. 3.71
Tools

- **Simple Assessment** allows rapid assessment of total carbon / greenhouse gas balance for a project, using generalized cropping system descriptions and standard / default equation factors.

- **Detailed Assessment** allows more specific descriptions of cropping systems, crop yields, grassland management, and allows use of project-specific equation factors.

- **Dynamic Modelling** allows highly specific cropping systems, detailed climate and soil datasets, uses dynamic models, produces highly accurate and precise results.
## Mineral Soils C Stocks

<table>
<thead>
<tr>
<th>Project Activity Area Group Name</th>
<th>Climate</th>
<th>Soil</th>
<th>Category</th>
<th>SubCategory</th>
<th>MgmtSoilCls</th>
<th>InputSoilCls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reforestation Area 1</td>
<td>Tropical Montane</td>
<td>Low Activity Clay Mineral</td>
<td>Agroforestry</td>
<td></td>
<td>Reduced Tillage</td>
<td>N/A</td>
</tr>
<tr>
<td>Reforestation Area 1</td>
<td>Tropical Montane</td>
<td>Low Activity Clay Mineral</td>
<td>Forestland</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reforestation Area 1</td>
<td>Tropical Montane</td>
<td>Low Activity Clay Mineral</td>
<td>Forestland</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
</tbody>
</table>

*GWP are 100-year time horizon based on estimates from the IPCC 4th Assessment Report*
What carbon science information do you need/want to support your work/project?

*Forestland:* Better estimates of above ground biomass in tropical and sub-tropical forests, especially secondary forests in reforested areas.

*Grasslands:* Estimates of tree/shrub cover, woody AGB (and BGB) in different types and ages of savannahs in Sub Saharan Africa.

*Settlements:* Better estimates of ‘typical’ tree cover (and associated AGB) in rural villages and settlements particularly in Africa.

*Cropland:* Crop management info in developing countries, who is growing what where and how! (outside of CMS activities)
Estimates of woody biomass in croplands (hedge rows, shade trees, erosion bunds) in small holder landscapes.

*Wetlands:* Show presence and timing of flooding – to ID rice area and also observe drainage and re-flooding management.
-When and how should the carbon science information be delivered?
-Online resource with free access and easy searching function which can be linked to other non-NASA tools.

-Are you interested in any particular CMS projects or products?
-Carbon Monitoring of Agricultural Lands: Developing a Globally Consistent Estimate of Carbon Stocks and Fluxes

-Total Carbon Estimation in African Mangroves and Coastal Wetlands in Preparation for REDD and Blue Carbon Credits

-Reducing Uncertainties in Satellite-Derived Forest Aboveground Biomass Estimates Using a High Resolution Forest Cover Map

-Long-Term Carbon Consequences of Amazon Forest Degradation
- Are you interested in any particular CMS projects or products?

- Indonesian peat swamp inventory

- Time Series Fusion of Optical and Radar Imagery for Improved Monitoring of Activity Data, and Uncertainty Analysis of Emission Factors for Estimation of Forest Carbon Flux

- Developing Statistically Rigorous Sampling Design and Analysis Methods to Reduce and Quantify Uncertainties Associated with Carbon Monitoring Systems

-- Provide global country-level estimates of mean aboveground forest biomass per hectare in support of the 2015 UN Food and Agriculture Association Forest Resources Assessment.

- Spatially Explicit Sources and Sinks of Carbon from Deforestation, Reforestation, Growth and Degradation in the Tropics: Development of a Method and a 10 Year Data Set 2000-2010

- Estimating Global Inventory-Based Net Carbon Exchange from Agricultural Lands for Use in the NASA Flux Pilot Study
Thank-you!

www.unep.org/cbp_pim

Tools currently undergoing an overhaul