# Tools to assess the impact of projects on climate change

Carbon management in Agriculture,
Adapted in 2025 from preceding presentation

the study identified the following 10 commonly used carbon accounting tools for further analysis:

1. Carbon Benefits Project Simple and Detailed Assessment tools developed by the GEF-funded ‘Carbon Benefits Project’ (**CBP SA** and DA)
2. Agence Française de Développement Carbon Footprint Tool (**AFD-CFT**)
3. Forest Carbon Calculator (U.S. Agency for International Development [USAID] Agriculture, Forestry, and Other Land Use [**AFOLU**] Carbon Calculator
4. Carbon Assessment Tool for Afforestation and Reforestation (**CAT-AR**)
5. Carbon Assessment Tool for Sustainable Forest Management (**CAT-SFM**)
6. Climate Change, Agriculture, and Food Security Mitigation Options Tool (**CCAFS MOT**)
7. Cool Farm Tool **(CFT**)
8. DeNitrification-DeComposition Model (**DNDC**)
9. Ex-Ante Carbon-Balance Tool (**EX-ACT**)
10. Tool for Afforestation and Reforestation Approved Methodologies (**TARAM**)

# Carbon Accounting Tools for Sustainable Land Management (World bank report 2016)

**Table E1: Activity scope of GHG tools**

| No. | Tool | Temperate crops | Tropical crops | Rice cultivation | Grassland | Livestock | Field trees, hedges, agroforestry | Perennial production (orchards, vineyards) | Forest | Wetlands | Settlements [2] | Other land [3] | Score (%) | Assessment Ratings |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | CBP | x | x | x | x | x | x | x | x | x | x | no | 91 | ++++ |
| 2 | AFD-CFT | x | x | no | x | x | no | no | x | no | x | x | 73 | +++ |
| 3 | AFOLU | x | x | x | x | x | x | x | x | no | no | no | 73 | +++ |
| 4 | CAT-AR | no | no | no | no | no | no | no | x | no | no | no | 9 | + |
| 5 | CAT-SFM | no | no | no | no | no | no | no | x | no | no | no | 9 | + |
| 6 | CCAFS | x | x | x | x | x | x | x | no | no | no | no | 64 | +++ |
| 7 | CFT | x | x | x | no | x | x | x | no | no | no | no | 55 | +++ |
| 8 | DNDC | x | x | x | x | x | no | x | no | no | no | no | 55 | +++ |
| 9 | EX-ACT | x | x | x | x | x | x | x | x | x | x | x | 100 | ++++ |
| 10 | TARAM | no | no | no | no | no | no | no | x | no | no | no | 9 | + |

x means the tool meets the criterion; no means the tool does not. Score is the number of activities out of 11 for which a tool is suitable, expressed in percent. Ratings are assigned as follows:

0 % <Tool score ≤ 25 % → +

25 % < Tool score ≤ 50% → ++

50 % < Tool score ≤ 75 % → +++

Tool score > 75 % → ++++

https://documents1.worldbank.org/curated/en/318251544164909341/pdf/132767-6-12-2018-14-1-54-SLMFullReportFINAL.pdf

There is close correlation between time and skill requirements for GHG analysis using the tools. Tools that are relatively highly skill-demanding, that is, require more than the basic skills, correspondingly require more time to perform GHG evaluations.

**Table E2: Data, Time and Skills requirements of the tools**

| No. | Tool | Data requirements | Time requirements | Skills requirements |
|---|---|---|---|---|
| 1 | CBP | +++ | + | ++ |
| 2 | AFD-CFT | +++ | ++ | + |
| 3 | AFOLU | +++ | +++ | +++ |
| 4 | CAT-AR | ++ | +++ | ++ |
| 5 | CAT-SFM | + | ++ | + |
| 6 | CCAFS | +++ | ++++ | ++++ |
| 7 | CFT | +++ | +++ | +++ |
| 8 | DNDC | + | + | + |
| 9 | EX-ACT | +++ | ++ | ++ |
| 10 | TARAM | +++ | + | + |
| Legend (modified from Colomb, 2013)[5] | | ++++ to +; from low data requirements to medium/ high/ very high data requirements | 0 min <Time necessary ≤ 10 min → ++++<br>10 min <Time necessary≤ 20 min → +++<br>20 min <Time necessary≤30 min → ++<br>Time necessary > 30 min → + | ++++ to +; from basic skills requirements to /medium/high/very high skills requirements |

# Tools under UNFCCC/KP

Toward Carbon market…

→ CDM : Only Afforestation and Reforestation project

JI : respect of KP Articles 3.3 and 3.4 (but still no registered project)

→ **Voluntary markets**

Kyoto eligible activities not always mandatory
(but approach is the similar)0

- Voluntary Carbon Standard – VCS
- Climate, Community & Biodiversity Standard – CCBS
- VER+ Carbon Standard
- CarbonFix Standard
- Plan Vivo Standards
- California Climate Action Registry Forest Protocol – CCAR
- WinRock
- Chicago Climate Exchange protocols
- BioCarbon Fund

# Tools under UNFCCC/KP

## A/R tools

UNFCCC Google Search

- CDM Home
- About CDM
- Executive Board (EB)
- Panels / Working Groups / Teams
- Programme of Activities
- Project Activities
- Issuance of CERs
- CDM Registry
- Methodologies
  - Methodologies for CDM project activities
  - Afforestation / Reforestation Methodologies
    - Approved A/R Methodologies
    - A/R Methodology Progress Table
    - Requests for revision of approved methodologies
    - Requests for clarifications approved methodologies
  - Small Scale CDM Methodologies
  - Small Scale Afforestation/ Reforestation CDM Methodologies
- Specific Call for Public

### Approved A/R Methodologies

This section provides access to approved methodologies and the methodological tools agreed by the Executive Board.

Afforestation and reforestation Tools

- Tool for the demonstration and assessment of additionality in A/R CDM project activities (347 KB)
- Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities (245 KB)
- Calculation of the number of sample plots for measurements within A/R CDM project activities (195 KB)
- Tool for testing significance of GHG emissions in A/R CDM project activities (64 KB)
- Estimation of GHG emissions related to fossil fuel combustion in A/R CDM project activities (230 KB)
- Procedure to determine when accounting of the soil organic carbon pool may be conservatively neglected in CDM A/R project activities (78 KB)
- Estimation of direct nitrous oxide emission from nitrogen fertilization (141 KB)
- Tool for estimation of GHG emissions from clearing, burning and decay of existing vegetation due to implementation of a CDM A/R project activity (875 KB)
- Tool for estimation of GHG emissions related to displacement of grazing activities in A/R CDM project activity (645 KB)
- Procedures to demonstrate the eligibility of lands for A/R CDM project activities (38 KB)
- Tool for calculation of GHG emissions due to leakage from increased use of non-renewable woody biomass attributable to an A/R CDM project activity (145 KB)
- Tool for estimation of Carbon Stocks, Removals and Emissions for the Dead Organic Matter Pools due to Implementation of a CDM A/R Project Activity (324 KB)
- Tool for the identification of degraded or degrading lands for consideration in implementing CDM A/R project activities (364 KB)
- Estimation of changes in the carbon stocks of existing trees and shrubs within the boundary of an A/R CDM project activity (301 KB)

http://cdm.unfccc.int/Reference/tools/index.html

# Tools under UNFCCC/KP

**Tool = Flowchart + Equations + default values**

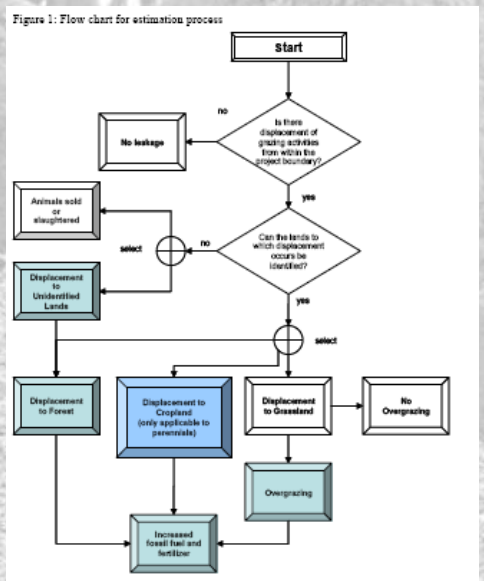
UNFCCC/CCNUCC

CDM – Executive Board | A/R methodological tool | EB 39 Report Annex 12 Page 1

"Estimation of GHG emissions related to displacement of grazing activities in A/R CDM project activity"

$$LK_{Perennial,t} = \sum_{k} Area_{Perennial,k,t} * B_{Perennial,k} * (1 + R_{Perennial,k}) * 0.5 * \frac{44}{12}$$

Figure 1: Flow chart for estimation process



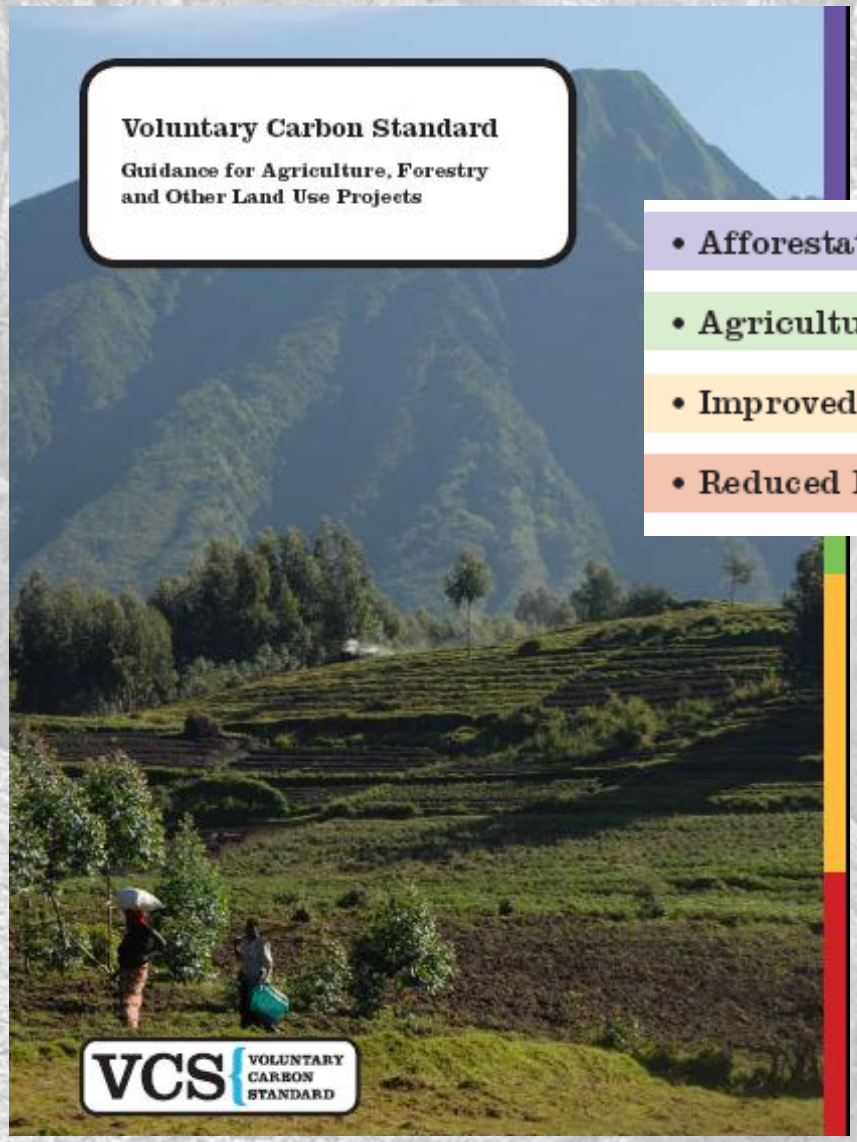

$$DMI_{TOTAL,k,t} = \frac{\sum_{g} DMI_{g} * (H_{existing,g,k,t} + H_{g,k,t})}{1000} * 365$$

DEFAULT ESTIMATES FOR STANDING BIOMASS GRASSLAND (AS DRY MATTER) AND ABOVEGROUND NET PRIMARY PRODUCTION, CLASSIFIED BY IPCC CLIMATE ZONES.

| IPCC Climate Zone | Peak above- ground live biomass Tonnes d.m. ha$^{-1}$ | | | Above-ground net primary production (ANPP) Tonnes d.m. ha$^{-1}$ | | |
|---|---|---|---|---|---|---|
| | Average | No. of studies | Error# | Average | No. of studies | Error[1] |
| Boreal-Dry & Wet[2] | 1.7 | 3 | ±75% | 1.8 | 5 | ±75% |
| Cold Temperate-Dry | 1.7 | 10 | ±75% | 2.2 | 18 | ±75% |

Table 2: Data for typical cattle herds for the calculation of daily gross energy requirement

| Cattle - Africa | Weight (kg) | Weight Gain (kg/day) | Milk (kg/day) | Work (hrs/day) | Pregnant | DE | Co |
|---|---|---|---|---|---|---|---|
| Mature Females | 200 | 0.00 | 0.30 | 0 | 33% | 55% | |
| Mature Males | 275 | 0.00 | 0.00 | 0 | 0% | 55% | |
| Young | 75 | 0.10 | 0.00 | 0 | 0% | 60% | |
| Weighted Average | 152 | 0.06 | 0.02 | 0 | 3% | 58% | |
| Cattle - Asia | | | | | | | |

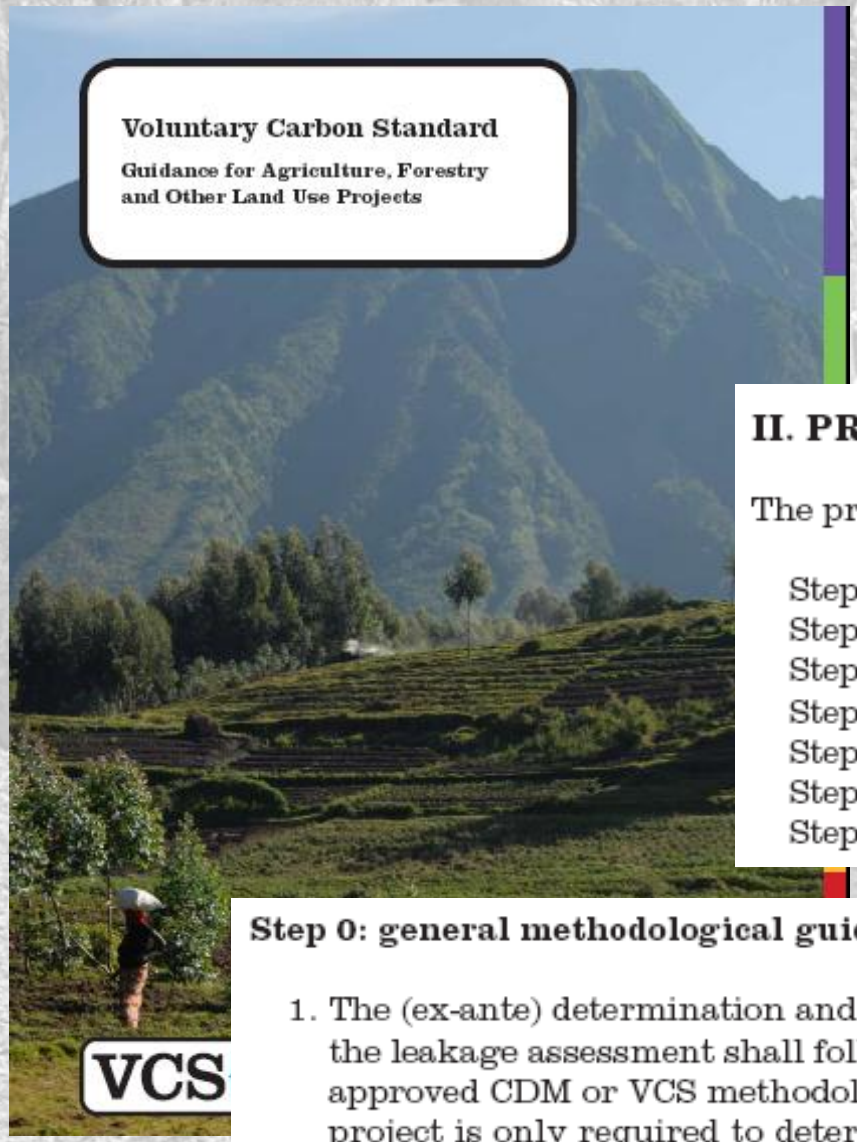



## How Voluntary Standards works?

**Example**

- Afforestation, Reforestation and Revegetation (ARR)
- Agricultural Land Management (ALM)
- Improved Forest Management (IFM)
- Reduced Emissions from Deforestation and Degradation (REDD)

# Tools under UNFCCC/KP





## II. PROCEDURE

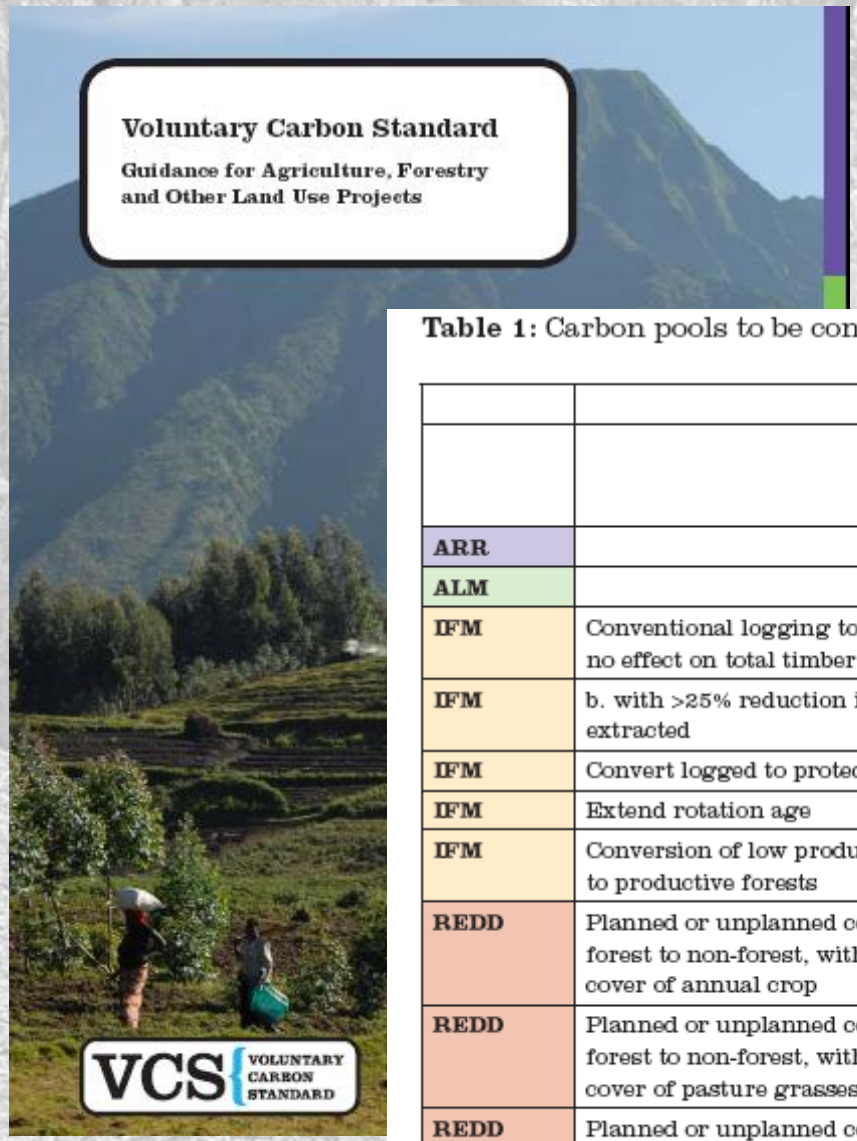
The project proponents shall take the following steps:

Step 0: follow the general methodological guidance
Step 1: determine the land eligibility
Step 2: determine the project boundary
Step 3: determine the carbon pools
Step 4: establish a project baseline
Step 5: assess and manage leakage
Step 6: estimate and monitor net project greenhouse gas benefits

**Step 0: general methodological guidance**

1. The (ex-ante) determination and quantification of the baseline and project scenario, including the leakage assessment shall follow either relevant IPCC 2006 Guidelines (GL) for AFOLU[4], or approved CDM or VCS methodologies. An ex-ante calculation of the net carbon benefits of the project is only required to determine whether decreases in carbon pools or increases in GHG emissions are insignificant and need not be measured and monitored.

# Tools under UNFCCC/KP



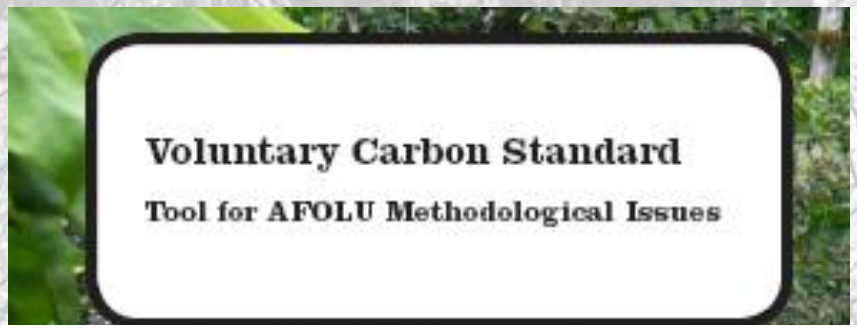
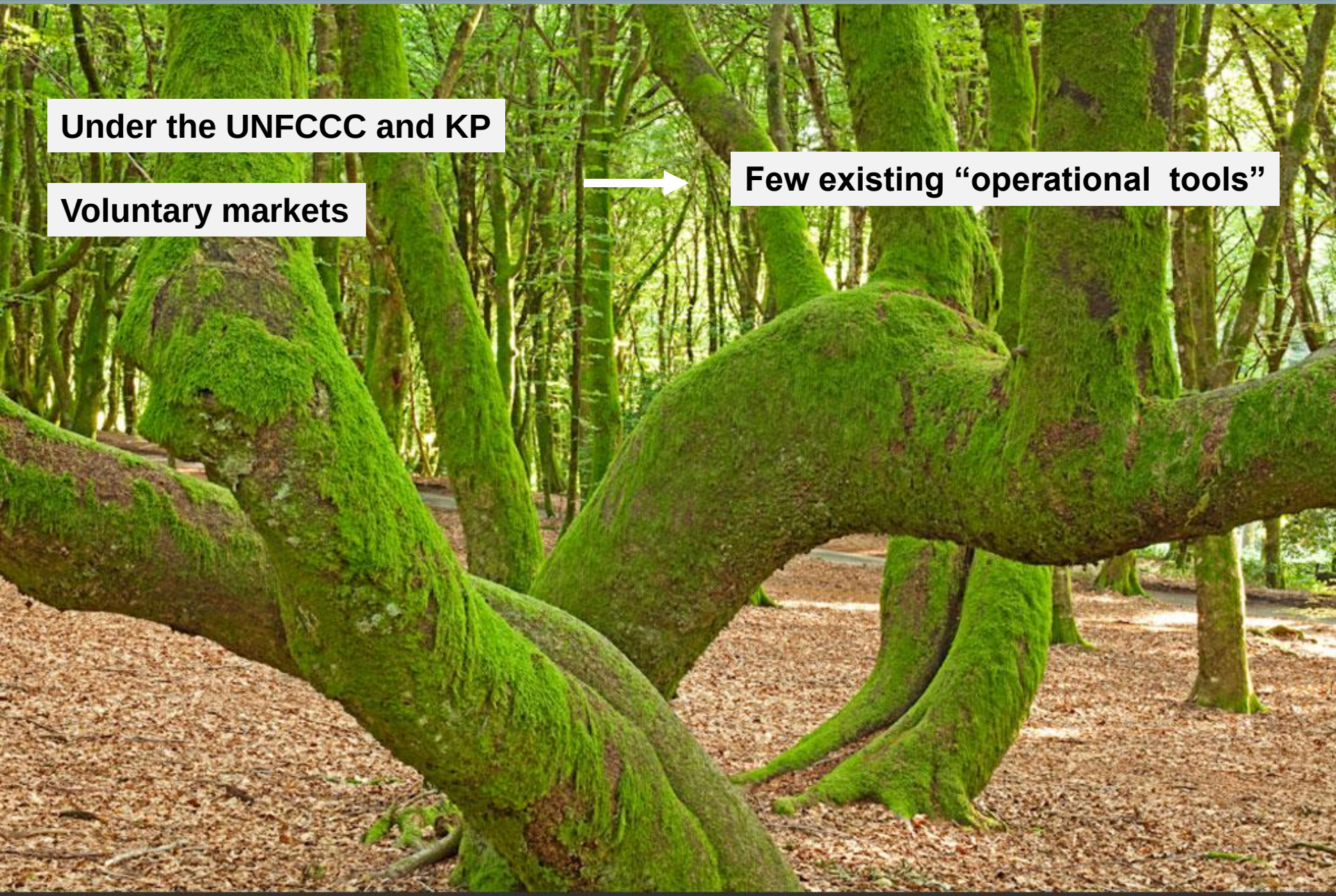




**Table 1:** Carbon pools to be considered for different AFOLU project activities

| | | Living Biomass | | | Dead Organic Matter | | | |
|---|---|---|---|---|---|---|---|---|
| | | Above ground trees* | Above ground non-tree* | Below-ground | Litter | Dead wood | Soil[7] | Wood products[8] |
| ARR | | Y | O/S | Y | O/S | O/S | O/S | O |
| ALM | | Y | N | O | N | N | Y | O |
| IFM | Conventional logging to RIL: a. with no effect on total timber extracted | Y | N | O | N | Y | N/O | N |
| IFM | b. with >25% reduction in timber extracted | Y | N | O | N | Y | N/O | Y |
| IFM | Convert logged to protected forests | Y | N | O | N | Y | N/O | Y |
| IFM | Extend rotation age | Y | N | O | N | O | N | O |
| IFM | Conversion of low productive forests to productive forests | Y | N | O | O | O | N | O |
| REDD | Planned or unplanned conversion of forest to non-forest, with final land cover of annual crop | Y | O | O | O | O | O | Y |
| REDD | Planned or unplanned conversion of forest to non-forest, with final land cover of pasture grasses | Y | O | O | O | O | N | Y |
| REDD | Planned or unplanned conversion of forest to non-forest, with final land cover of perennial crop[9] | Y | Y | O | O | O | N | Y |

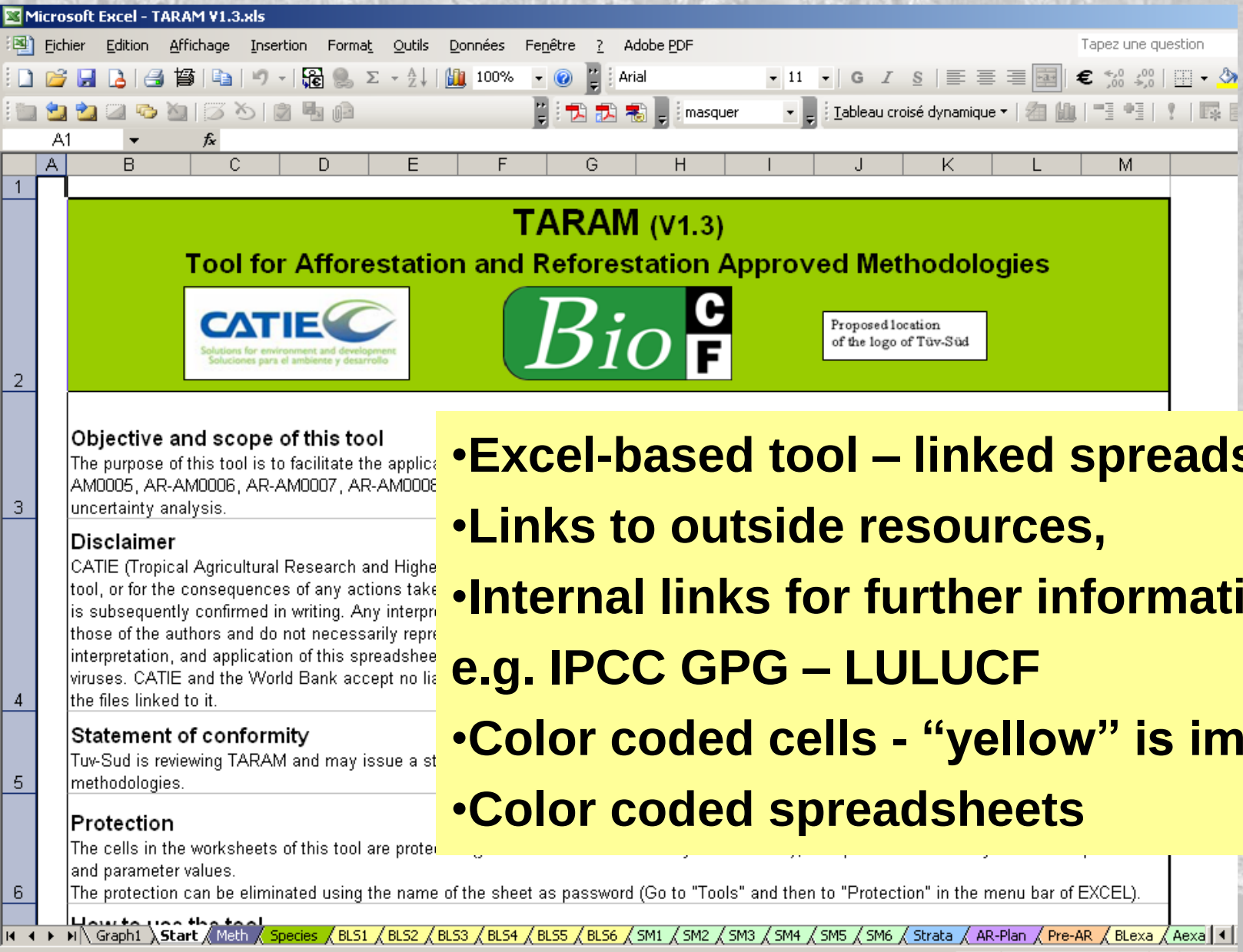
**Y=Yes, O = Optional, S =if significant, N = No**

# Tools under UNFCCC/KP



# Existing operational tools

## Tool for ex-ante estimation of forestry CERs – "TARAM"




- **Excel-based tool – linked spreadsheets**
- **Links to outside resources,**
- **Internal links for further information**

**e.g. IPCC GPG – LULUCF**

- **Color coded cells - "yellow" is important**
- **Color coded spreadsheets**

## Adapted “Bilan Carbone®” from ADEME

# Calcul des émissions du projet

Déforestation
Construction des infrastructures d'exploitation
Matériaux utilisés pour la construction
Energie consommée par les engins de chantier pour la construction

Emissions liées à la décomposition de la matière organique dans le réservoir (barrages)
Consommation de combustibles fossiles
Emissions dues au relargage des gaz géothermiques dans l'atmosphère
Electricité consommée
Electricité consommée dans les logements
Transport de personnes et fret
Intrants et matériaux utilisés
Emissions de procédé
Cheptel
Déchets
Emissions des eaux usées

## Emissions liées à la mise en place du projet :

> déforestation

**Etablissement, déforestation**

terrain 1
terrain 2
terrain 3
terrain 4

| superficie déforestée (hectares) | t de C à l'hectare de la forêt coupée | t C à l'hectare de la culture | t équ. carbone | t équ. CO2 |
|---|---|---|---|---|
| | | | 0 | 0 |
| | | | 0 | 0 |
| | | | 0 | 0 |
| | | | 0 | 0 |
| | | Total | 0 | 0 |

**Adapted "Bilan Carbone®" from ADEME**

## GHG Emissions for the Project Scenario

## GHG Emissions for the Baseline

## Results

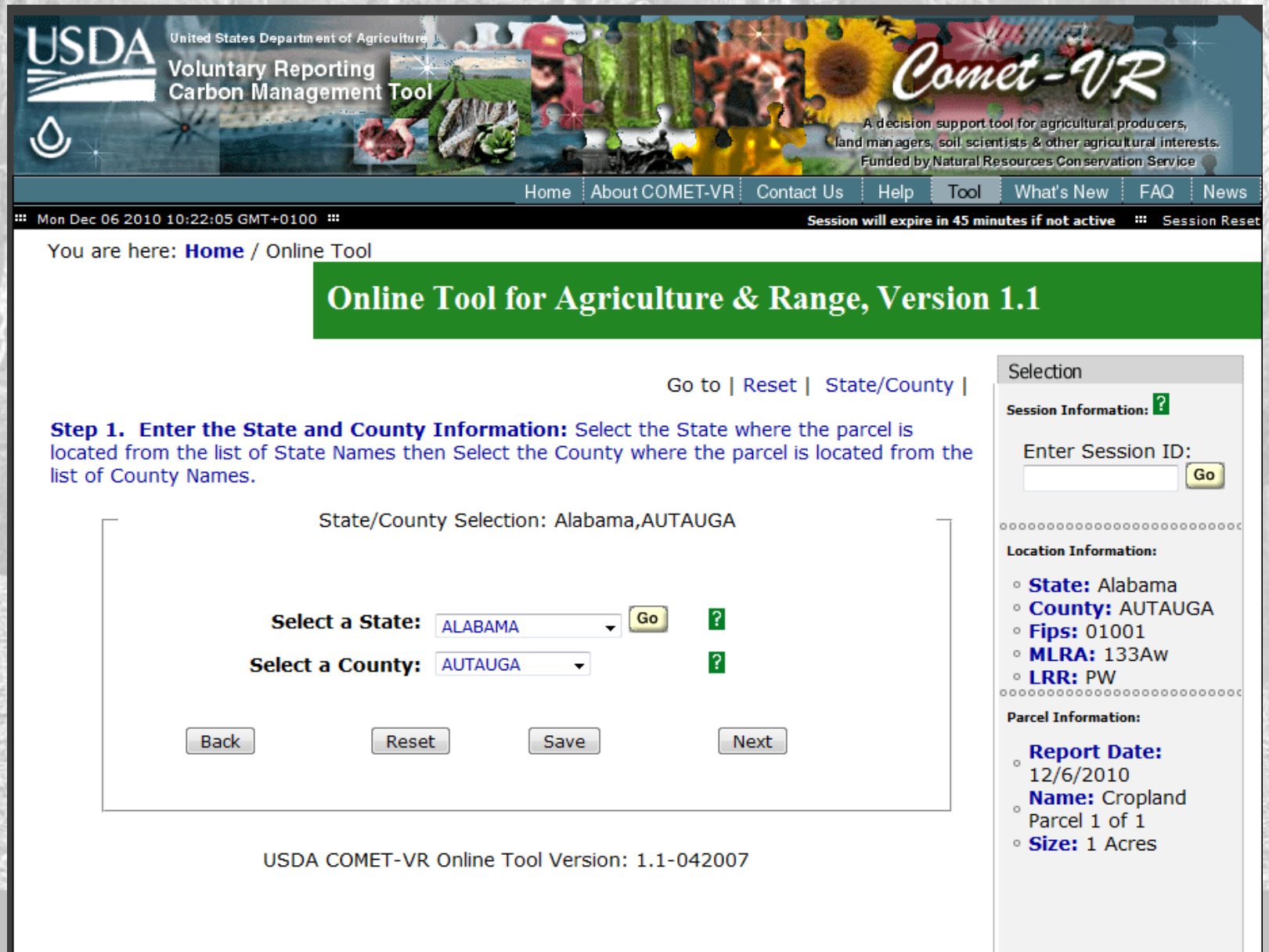
## Emission Factors

-fuel consumption and electricity,
-methane emissions related to livestock,
-released nitrous oxide associated with fertilizer,
-manufacturing of the inputs (fertilizers, lime, xenobiotics…),
-manufacture of machinery (tractors and other).

**ONLY…**

# Existing operational tools

http://www.cometvr.colostate.edu/

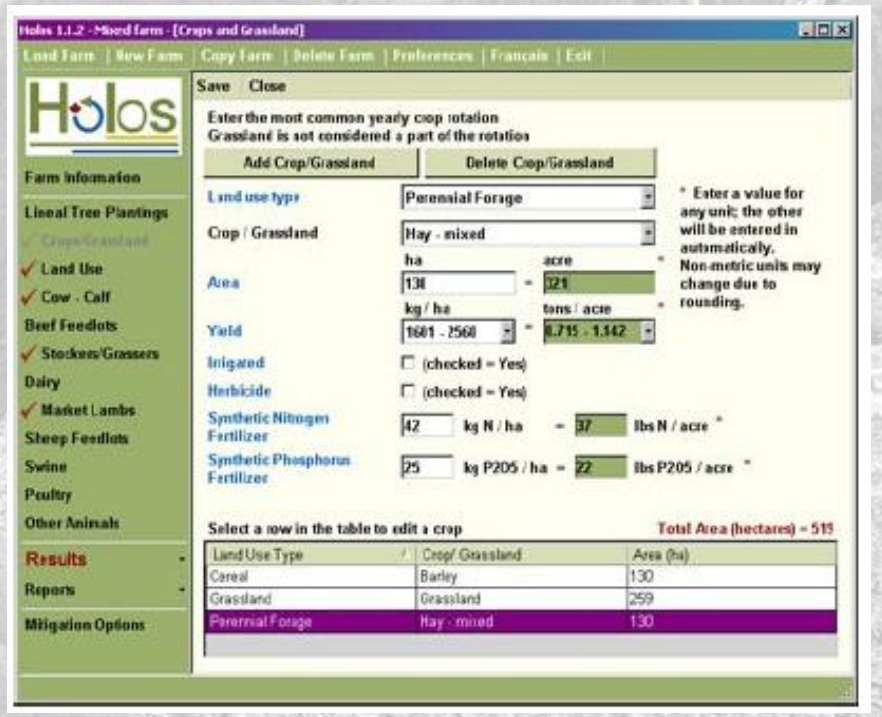


# Existing operational tools

Holos is a whole-farm modelling software program that estimates greenhouse gas (GHG) emissions based on information entered for individual farms.

Holos estimates carbon dioxide, nitrous oxide and methane emissions from enteric fermentation and manure management, cropping systems and energy use. Carbon storage and loss from linear tree plantings and changes in land use and management are also estimated resulting in a whole-farm GHG estimate.

The main purpose of Holos is to envision and test possible ways of reducing GHG emissions from farms.


ftp://ftp.agr.gc.ca/pub/outgoing/HOLOS/Holos_V1.1.2/Holosv1.1.2.zip

# Existing operational tools

Australian Farm Institute

farm gas

Welcome to the FarmGAS greenhouse gas (GHG) emissions calculator. FarmGAS can be used to estimate your farm's annual GHG emissions, both at the individual enterprise activity level and for the farm as a whole, and to examine the financial impacts that different greenhouse mitigation options may have on farm business profitability.

By creating a log-in, you can estimate the financial and greenhouse implications of changing enterprise mix or production options within your farm business by creating 'scenarios' online. The calculator is free to use, and you can access your information at any time.

Australian farm businesses will not be included as participants in the Australian Government's Carbon Pollution Reduction Scheme until 2015 at the earliest. Therefore farmers will not be liable for farm emissions until at least that time. The FarmGAS Calculator provides an estimation of farm greenhouse emissions but is not associated with the CPRS. FarmGAS is simply a decision support tool, which can be used for scenario mapping.

The calculator applies the same methodology used by the Department of Climate Change in the estimation of Australia's National Greenhouse Gas Accounts (NGA). Although major livestock and cropping enterprises are provided, FarmGAS does not currently include calculators for dairying, cotton or

New User

Title Dr

First Name

Last Name

Password:

Confirm Password:

E-mail:

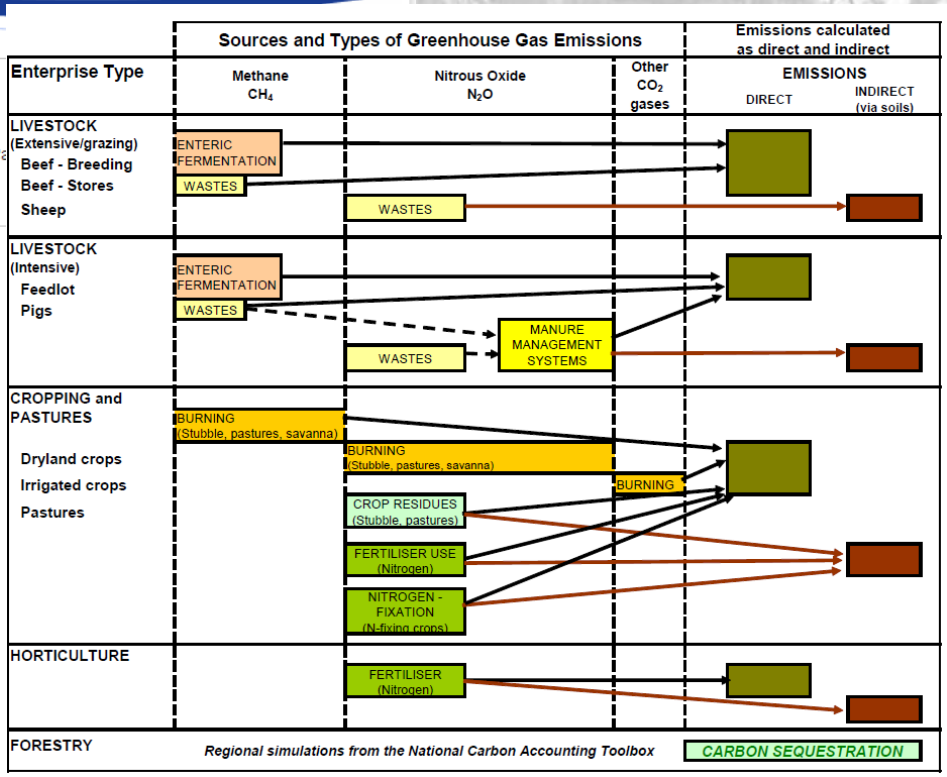
Save

**Download the FarmGas User Guide**

*PDF download (2.35 MB)*

**Download the FarmGas Case Study Report**

*PDF download (3.1 MB)*




Although major livestock and cropping enterprises are provided, FarmGAS does not currently include calculators for dairying, cotton or rice production.

http://farmgas.farminstitute.org.au/

# Existing operational tools


## Dairy Greenhouse Gas Abatement Calculator

The Dairy Greenhouse gas Abatement Strategies Calculator (DGAS) allows farm managers to calculate the impact of adopting different abatement strategies on their total farm GHG emissions and can help them work out the strategies best suited to their farming system.

Abatement strategies modelled by the calculator fall into four categories; herd management, feeding management, soil management and farm intensification. Modelling shows that any farm efficiency improvement will lower GHG emissions/t MS.

**Farmer Version**

DGAS Farmer_v1_2.xls

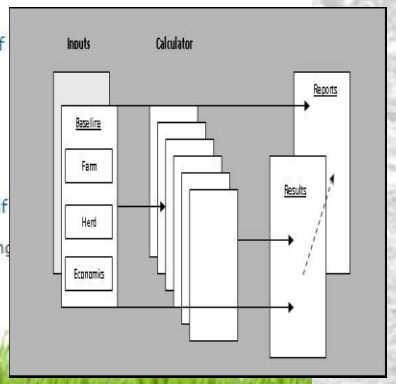
DGASv1.2 calculator Farmer version User Manual.pdf

**Advisor Version**

DGAS V1_2/DGAS_Adviser_v1_2.xls

DGASv1.2 calculator Adviser version User Manual.pdf

Please contact Karen Christie for any inquiries relating
Karen.Christie@utas.edu.au




Site designed by Arris Pty Ltd

Farm Information

## Farm Inputs

ABOUT DGAS | EXCEL

Please enter the information about your farm:

State: TAS | Rainfall (mm): High (>700) | Manure System: MMS-1 Pasture | Help

Tree Plantings after 1990 (ha.): 0 | Dominant Tree Species: 14.None

Farmland (excluding trees):

| | | | |
|---|---|---|---|
| Irrigated Pasture (ha.): | 0 | Irrigated Crops (ha.): | 0 |
| Dryland Pasture (ha.): | 270 | Dryland Crops (ha.): | 26 |
| Total Farmed (ha.): | 296 | | |

Fertiliser Inputs: Help

kg / ha | t / annum

| | N | P | K | S |
|---|---|---|---|---|
| Irrigated Pasture: | 0 | | | |
| Dryland Pasture: | 90 | 5.1 | 10 | 3.8 |
| Irrigated crops: | | | | |
| Dryland Crops: | 9.5 | 5 | 4.8 | 3 |
| Lime: | | | | |

Farm Inputs (p.a.):

Electricity (kw/h.): 93414

Source: Coal

Diesel (L): 6993

Purchased Feed Inputs (tonnes dry matter per annum):

| | | | | | |
|---|---|---|---|---|---|
| Pasture Hay (t.): | 0 | Lucerne Hay (t.): | 0 | Pasture Silage (t.): | 51.3 |
| Cereal/Maize Silage (t.): | 0 | Grain/Concentrate (t.): | 872.1 | By-Product (t.): | 0 |

RESET

Herd Information

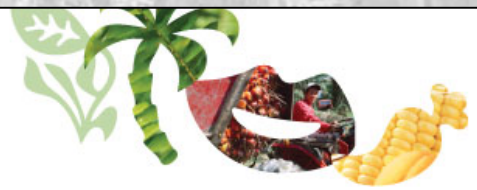
ECONOMICS

http://www.dairyingfortomorrow.com/

# Existing operational tools

Unilever

## Sustainable agriculture: growing for the future



Home | About Us | Programmes | Partnerships | Downloads | Tools | Contacts

### Cool Farm Tool

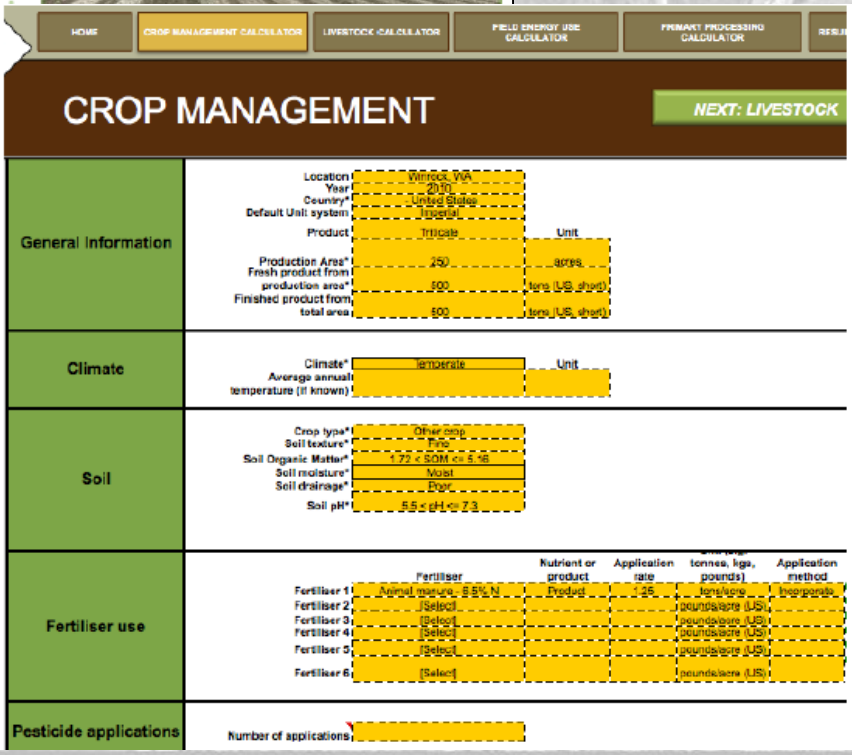
Access the Cool Farm Tool

The Cool Farm Tool is a new greenhouse gas calculator for farming. It's easy to use and gives instant results that invite users to try out alternatives and ask 'what if' questions. The tool was commissioned by Unilever from the University of Aberdeen

The tool is ideal for farmers, supply chain managers and companies interested in quantifying their agricultural carbon footprint and finding practical ways of reducing it. It calculates the greenhouse gas balance of farming, including emissions from fields, inputs, livestock, land use and land use change and primary processing. It uses 'Tier2-type' methods, offering users simple menu choices for parameters that farmers can influence to reduce their carbon footprint.

Reporting greenhouse gas emissions is part of the Metric Reporting requirements of our Sustainable Agriculture Code. The Cool Farm Tool will also be used in a multi-company project on agricultural climate mitigation coordinated by the Sustainable Food Lab, also including Unilever, PepsiCo, Marks & Spencer, Pulse Canada, Yara, Sysco and others. If this is something that would be of interest to you please visit The Sustainable Food Lab to find out more.

- This Cool Farm tool is free and an open source. It is provided under an Attribution-Non-Commercial-Share Alike 2.0 (UK: England & Wales). Click here to view the html text.
- Cool Farm Tool model help
- Warranty and disclaimer




http://www.growingforthefuture.com/content/Cool+Farm+Tool

# Existing operational tools

Cover Maximal range of development projects relevant for the agriculture (livestock included), land use, land use change and forestry sector

english français español

EX-ACT home

Food and Agriculture Organization of the United Nations

for a world without hunger

Google™ Custom Search

- FAO Home
- EX-ACT home
  - Context
  - Application fields
  - Partners
- EX-ACT tool
- User Guides
- Technical guidelines
- EX-ACT applications
- Validating results
- Events
- Publications
- Other Climate Change tools
- Newsletter
- Contacts

## The Ex Ante Carbon-balance Tool

EX-ACT (*Ex Ante* Appraisal Carbon-balance Tool) was jointly developed from three FAO divisions (Policy and Programme Development Support Division [TCS] formerly Policy Assistance and Resource Mobilization Division [TCA], Investment Centre Division [TCI] and Agricultural Development Economics Division [ESA]). It is aimed at providing *ex-ante* estimations of the impact of agriculture and forestry development projects on GHG emissions and carbon sequestration, indicating its effects on the carbon balance.

**On this Web site, you will find all the material and resources related to the EX-ACT tool.**

**New!**

***First EX-ACT Newsletter***

***EX-ACT version 3 and its technical guidelines are now available!***

**Introduction**

- Context
- Application fields
- Partners

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

EASYPol

Online resource materials for policy-making

## The EX-Ante Carbon-balance Tool (EX-ACT)

**Disclaimer**

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The choices of calculation made in this tool are those of the author(s) and do not necessarily reflect the views and choices of the Food and Agriculture Organization of the United Nations.