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1. ANNEXES 1: Extended list of Carbon Calculators

Outils	Lien web	Validité géographique	Echelle d'utilisation	Objectif principal lors du développement de l'outil	Type de production
ALU	http://www.nrel.colostate.edu/projects/ALUsoftwa	World	Landscape	Sowftare for helping countries for their GHG inventories. The program can be used to estimate emissions and removals associated with biomass C stocks, soil C stocks, soil nitrous oxide emissions, rice methane emissions, enteric methane emissions, manure methane and nitrous oxide emissions, as well as non-CO 2 GHG emissions from biomass burning.	Cropping,livestock, forest,
Bilan carbone	http://www.associationbilancarbone.fr/bilancarbon	France	Life cycle approach	Global tool for CO2 calculation. Not dedicated to agriculture.	All activities (not only land used based)
Biograce	http://www.idae.es/index.php/id.686/mod.pags/m	Spain	Chain value	Biograce project focus on GHG emissions of bioenergies. It developed 4 calculators for following countries: the Netherland, Spain, UK, Germany. All calculators are homogenous from methodology point of view. Goal: check that biofuels fulfill european requirement for GHG reduction and energy efficiency.	Biofuels
BIOMITRE	http://www.ieabioenergy-task38.org/softwaretools	Not specified, temperate ecosystem?	chain value	Compare biomass sourced energy with fossil fuel. Life cycle approach	Bioenergy
Calculateur AFD	http://www.afd.fr/lang/fr/home/AFD/L-AFD-s-enga	World	Project oriented	Not dedicated to agriculturre but can roughly assess agricultural projects. No emissions from carbon soil. Can't assess impact of different management strategies in agriculture emissions.	Crop, Animal, forest,
Calculator CarbonID	http://www.newhollandcarboncalculator.com/defa	world		Only for calculation of tractors' emissions.	Farming Machinery
CALM	http://www.cla.org.uk/Policy_Work/CALM_Calculat	UK	Farm	Landbased approach, developp carbon accounting for farmers and land manager awareness on CC. Test the impact of environmental schemes (ELS, HLS, organic etc.) on GHG emissions.	Crops/grassland; livestock (detailled),forest
CAR Livestock Calculation Tool version	http://www.climateactionreserve.org/how/protoco	USA		the Climate Action Reserve was founded to ensure integrity, transparency, and financial value in the North American carbon market. Tool only evaluates GHG reduction projects. Not a farm approach.	livestock
Carbon Calculator for New Zealand Agriculture and Horticulture	http://www2.lincoln.ac.nz/carboncalculator/	New zealand	Farm	No special information about it.	Animals, crops and horticulture
Carbon Farming Calculator	http://www.carbonfarming.org.nz/calculators.php	New zealand	Farm	Simpke tool created along with ETS (Emission trading scheme). Rq: agriculture submitted to ETS for non CO2 emission from 2015, the ETS for agriculture will be beared by meat and dairy processors, fertiliser manufacturers and importers, egg producers and live animal exporters. Calculators show a cost for emissions.	Cattles/cropland/forest/
Carbonostic	http://www.carbonostics.com/carbo/data_Source.a	Europe	Life cycle approach	Online life cycle tool for food industry.	All food related activities
CBP	compa.colostate.edu/ http://www.unep.org/ClimateChange/carbon-benefits/cbp_pim/	World	Project	Aim at evaluating GHG emissions and carbon stocks for promoting projet for Sustainable land use. Several tools in web portal:" **simple assesment, detailed assment, Dynamic Modelling = GEFSOC), Socioeconomic"**.	All land based activity (except aquaculture)

Outils	Lien web	Validité géographique	Echelle d'utilisation	Objectif principal lors du développement de l'outil	Type de production
CCT; U.S. Forest Carbon Calculation Tool	http://nrs.fs.fed.us/pubs/2394	USA	Landscape	reads publicly available forest inventory data collected by the U.S. Forest Service's Forest Inventory and Analysis Program (FIA) and generates state-level annualized estimates of carbon stocks on forest land based on	Forest
CFF Carbon Calculator	http://www.cffcarboncalculator.org.uk/carboncalc	UK	Farm	Provide a tool adapted to organic practices. "By measuring your carbon footprint there are **financial** and **marketing** benefits, improvements in **soil health** to be made and **ethical** integrity to be gained."(web site);	Crop/Grassland/livestock
C-fix	http://www.sciencedirect.com/science/article/pii/S	Europe, World ?	Landscape	Model for estimation CO2 flux due to vegetation type. State-of-the-art algorithms describe carbon uptake and release mechanisms of vegetation in relation to meteorological conditions and satellite based quantification of photosynthetically active radiation absorption efficiency. Output is NPP.	All vegetation
Climagri	http://www2.ademe.fr/servlet/KBaseShow?sort=-1	France	Landscape	areas subjected to compulsory or optionnal "PCET" ("Territorial Climate and Energy Policy"; territorial evaluation of GHG). Contribute to increase communication between stakeholders from agricultural field and local/regional politicy makers. Aim at assesing GHG emission and fossil fuel dependency of territories.	Temperate crops and horticulure/ Livestock/Forest
CO2 fix	http://www.efi.int/projects/casfor/models.htm	First developped in Europe, now used in all the world.	Stand scale	Evaluate carbon stock in forest ecosystem; soil C, undergourd/above ground biomass, product. Adapted for testing different forest management strategies and afforestation/agroforestry LUC. Last version works for bioenergy and carbon credit accounting.	Forestry ecosystems,
COLE calculators; GCOLE;COLE;Cole-lite;COLE-EZ	http://www.ncasi2.org/COLE/	USA	Forest plot	of the continental United States. COLE data are based on USDA Forest Service Forest Inventory & Analysis and Resource Planning Assessment data, enhanced by other ecological data.	Forest
COMET-VR/COMET FARM	http://www.cometvr.colostate.edu/	USA	Field	Estimate Soil carbon emissions by "Voluntary Reporting Carbon Management Evaluation Tool (COMET-VR)" COMET farm under development, not available yet.	Agricultural soils
Confronting climate change	http://www.climatefruitandwine.co.za/	South Africa	Farm/industry	Get wine industry ready for CO2 labelling	Wine
CoolFarmTool (Unilever)	http://www.unilever.com/aboutus/supplier/sustain	World	Farm	Product oriented tool. One crop/animal production at a time in the calculator. Tool used by major agro-industry.	Crop, livestock forest
CPLAN *v0 (simple) and v2 (detailled)*	http://www2.cplan.org.uk/index.php?_load=page&	UK	Farm	Farm tool	Crop/forestry/livestock
CTCC; The Center for Urba	http://www.fs.fed.us/ccrc/topics/urban-forests/	USA	City	Calulate C sequestration for urban trees, but also indirect effects like energy savings with shade	Urban trees
Abatement Calculator *Farmer Version and Adviser version*	http://www.dairyingfortomorrow.com/index.php?i	Australia	Farm	Tool for australian milk producers, project oriented. Tool available to calculate GHG emission and sugest abatment strategies.(Baseline vs. With project).	Dairy production (including food production)

Outils	Lien web	Validité géographique	Echelle d'utilisation	Objectif principal lors du développement de l'outil	Type de production
DairyGHG	http://www.ars.usda.gov/main/docs.htm?docid=17	USA ?	exploitation agricole + productions extérieures d'aliments	life cycle approach for milk production	Milk
Diaterre	http://www2.ademe.fr/servlet/KBaseShow?sort=-1	France	Farm	GHG and energy diagnostic at farm level. One same method for all french farms, building of a national database.	Crops; livestock,forest
EGES	http://www.eges.arvalisinstitutduvegetal.fr/form	France	Field	Tool developed by "Arvalis", LCA approach for french crops. All emissions for	Only crops
EX-ACT	http://www.fao.org/tc/exact/ex-act-home/fr/	World	Landscape (region/county/country)	Project oriented tool. Aim at assesing under climate change angle different kind of development projects (focused or not on climate change mitigation).	Crops; livestock,forest
FarmGAS	http://farmgas.farminstitute.org.au/default.aspx http://farmgas.farminstitute.org.au/publicpages/AFIPublic.aspx?ReturnUrl=%2fdefault.aspx	Australia	Farm	Evaluate GHG emissions, evaluate opportunity and cost of some mitigation options (livestock :enteric emission + waste). Prepare farmers in case agriculture becomes subjected to carbon credits after 2015.	Crop, livestock,tree plantintg (environmental planting)
Farming Enterprise GHG Calculator	http://www.isr.qut.edu.au/greenhouse/index.jsp	Queensland Australia	Farm	Farm-based emissions in Queensland	Crops, Cattles
Field crop agriculture and greenhouse gas emissions	http://surf.kbs.msu.edu/ghgcalculator/	USA	Farm	"Calculate and compare the greenhouse gas impact of different cropping systems." Goes with GIS map for US to provide baseline data.	wheat, soybean, switchgrass, silage and oats
Fieldprint Calculator	http://www.fieldtomarket.org/calculator.php	USA	Field	Provide GHG values and compare them to USA standards. Values per quantity of product. Go quite into detail for mangement practices.	Only cropland
Foodprint	http://www.thaifoodprintcal.sci.ku.ac.th/index.htm	Thailand	Chain value	ongoing project, calculator not available yet. Developing "FOODprint®" as a tool to facilitate the calculation of product carbon footprint based on EU and ISO standards . Promoting the adoption of "FOODprint®" among Thai agricultural and food companies to widen the application of carbon footprinting.	Crops/livestock/fisheries/ aquaculture (no forest?)
FullCAM	http://www.climatechange.gov.au/government/init	Australia	Landscape	FullCAM is the integrated compendium of sub-models used to construct Australia's national greenhouse gas emissions accounting for the land sector. Users of the model can determine project-based results on a similar basis to Australia's official recording of greenhouse emissions trends for land use and land use change.	crop, forest
FVS-CarbCalc	http://www.fs.fed.us/fmsc/fvs/whatis/index.shtml http://www.fs.fed.us/fmsc/fvs/software/complete.shtml	USA	Tree, Forest stand	The Forest Vegetation Simulator (FVS) is an individual-tree, distance-independent, growth and yield model (Dixon 2002). It has been calibrated for specific geographic areas (variants) of the United States (Figure 1). FVS can simulate a wide range of silvicultural treatments for most major forest tree species, forest types, and stand conditions.	Forest
GORCAM	http://www.joanneum.at/gorcam.htm	Not specified, temperate ecosystem?	chain value	calculate the net fluxes of carbon to and from the atmosphere associated with land use, land-use change, bioenergy and forestry projects. Not available on website, old model (1995)	Forestry, aforestation
on Australian Dairy, Sheep, Beef or Grain Farms	http://www.greenhouse.unimelb.edu.au/Tools.htm	Australia	farm	One calculator for each farm type (Grain, Cattle etc.)	one calculator for each production type (Grain, cattle etc.)

Outils	Lien web	Validité géographique	Echelle d'utilisation	Objectif principal lors du développement de l'outil	Type de production
HGCA Biofuel GHG Calculator	http://www.hgca.com/content.output/2135/2135/R	UK	chain value	Biofuel GHG calculator	Biofuels
Holos	http://www4.agr.gc.ca/AAFC-AAC/display-afficher.c	Canada	Farm	exploratory tool, rather than as an accounting or inventory tool. Try and evaluate efficicency of project for GHG abatment.	Crops/grassland; livestock tree line (No forest)
Illinois Farm Sustainability Calculator 1.4	http://web.extension.illinois.edu/dsi/projectdetail.	USA, Illinois Region	Farm	Tool to assess farm sustainability based on GHG emissions, nitrate balance, food and energy autonomy.	crop, animal, algae, renewable energy, no forest
INSTITUTO DE INVESTIGACIONES AGROPECUARIAS (INIA)	http://www.inia.cl/link.cgi/Platina/Documentos/DP	Chili	Chain value	4 calculators dedicated for different productions : crops (including export) ; wine, cattle.	for each product type. Nothing for forestry and greenhouse production
International Wine Carbon	http://www.wineinstitute.org/ghgprotocol	World	Chain value	Wine calculator	Only wine
LCA sofware : Simapro, Gabi, UMBERTO, GEMIS etc...	http://www.pre-sustainability.com/content/simapr	Mainly europe and USA	Chain value	Tool designed for any LCA. Theses tools are designed to work with database connected to the interface. Most famous database are LCA food and ecoinvent. "One product at the time approach"	all products
RAPCOE	http://ecoserver.env.duke.edu/RAPCOEv1/	USA	Landscape; Project oriented	Evaluate A-R project. Aditionnality criteria calculation. Pre project and post project tool.	Reforestation/afforestation only
TARAM/TARASM	http://wbcarbonfinance.org/Router.cfm?Page=DocLib&CatalogID=49187	world	Project; LULUCF;	Tool for CDM calculation for afforestatoin/reforestation. Project analysis tool (ex-ante)"The purpose of this spreadsheet tool is to facilitate the application of the following CDM approved methodologies: AR-AM0001, AR-AM0002, AR-AM0003, AR-AM0004, AR-AM0005, AR-AM0006, AR-AM0007, AR-AM0008, AR-AM0009, and AR-AM0010." One tool for large scale project (TARAM), and one for small scale (TARASM).	Forest
UNFCCC	http://unfccc.int/resource/cd_roms/na1/ghg_inventories/index.htm	Developping countries	landscape/country	Software to help inventories for non annex 1 countries.	All activities (not only land used based)
USAID FCC	http://winrock.stage.datarg.net/CarbonReporting/P	Developping countries	Project	USAID Project analysis; according to user guide stand alone version for non USAID project exists.This version could not be reached.	Cropland/Forestry/Livestock except industrial production (poultry)

2. ANNEXES 2 : Questionnaires for main landscape GHG Calculators

2.1. AFD Carbon Footprint ®

Tool developer could not be reached; consequently this questionnaire has not been validated.

- Contact information

Institution in charge of technical development :	AFD
Name of the person	calculator developed by JM Jancovici, now managed by Jean-Noël Rouleau and Bertrand Loiseau
e-mail	rouleaujn@afd.fr loiseaub@afd.fr
Web site of the tool	http://www.afd.fr/lang/fr/home/AFD/L-AFD-s-engage/responsabilite-sociale-environnementale-afd/bilan-carbone http://www.afd.fr/home/projets_afd/AFD-et-environnement/changement_climatique/Mesures_Impacts_Climat

- Creation Context and software

First version, creation year	2007
Last update/ Current version	
Availability	Free download from website
Computer support	Excel file
User guide/technical guide	User guide available (only in French).
Complexity of the interface	Excel but still rather simple, user friendly tool (one input sheet for project, one for baseline, one for results)

- Tool main characteristics

Geographical area coverage	world
Working scale	project
User target	Project manager
Main goal for the tool	Tool not specially dedicated to agricultural projects but for all kind of development projects. It can roughly assess agricultural activities. Focus only on major sources. Help project funders to evaluate project on climate change aspects.

- Production analyzed (tick if included)

Temperate crops	Tropical/Equatorial crops	Rice cultivation	Grassland	Dairy Cattles	Other livestock
x	x	no	x	x	x

Field trees, hedges, agroforestry	Perennial production (orchards, vineyards)	Horticultural products; Greenhouses	Forest
no	no	no	no

Comments: the tool does not focus on farming activities and management practices. It focuses on inputs and use general Tiers 1 emissions. Can be adapted for basic chain value assessment

- **Input data**

Detail level	Quite simple data,
Data availability and required user skills	Simple data, however as it includes many aspects (transport, infrastructures, chemicals…), data are spread and might be not so easy to gather. No special agronomic skills needed. There is no default value provided. Even for deforestation, the user need to estimate the quantity of C in trees/ha.
Data consistency checking	No

- Methodology

a) Emission factors

Main methodological references	Based on ADEME Bilan carbone® method. Itself refers to international methodology (IPCC, ecoinvent etc.)
Possibility for user to define local emission factors	Yes, changing the EF sheet.

b) Soil-Climate description

Soil-Climate	Yes/No	Comments
Soil		
Soil type (define classification used)	no	
Texture	no	
Other criteria (ex: % MO)	no	
Climate		
Classification	no	
Measures	no	
GIS approach with underlying soil/climate database	no	

Calculator does not account for C in soil.

c) Perimeter

Perimeter	Yes/No	Comments
Infrastructure	x	
Energy (electricity + gasoil)	x	
Land N2O emissions	x	The EF can be defined by user for taking into account climate/soil properties
Ruminant CH4 Emissions	x	Included in animal EF
Dejection emission	x	Included in animal EF
Emission from N-fixing plants	no	
Off farm emissions (fertilizers, imported food)	x	Life cycle approach, all inputs needed for project are included
Emission from burning crop residues	no	
Emission from rice cultivation	no	
Land use change ,soil/ above/below ground biomass	x	Only deforestation, user must estimate loss of C (not specified if soil carbon, biomass…). No C storage.
Carbon soil changes except LUC (residues, tillage effect)	no	
Peat land	no	
On farm process (drying, refrigeration etc.)	x	All inputs are available
Industrial Process	no	
Transport	x	Detailed EF for taking into account transportation.

- Results

Form	One summary graph and table
Comparison of several scenarios	Yes, project vs baseline approach
Main GHG results	Emissions in CO2 eq for each year of the project. Separation for construction phase/running phase. For each input, associated eq C02 emissions. No detail between gases in results. Does not include area nor yield impacts.
Uncertainties	Given for EF, does not appear in results.
Complementary results (economic aspects; carbon credits, energy, leakage, land productivity, etc.)	Price of t CO2 avoided in €/tCO2 eq

2.2. Agriculture and Land Use National Greenhouse Gas Inventory Software **(ALU)**

- Contact information

Institution in charge of technical development :	Colorado State University, USA;
Name of the person	Stephen M. Ogle;
e-mail	ogle@nrel.colostate.edu
Web site of the tool	http://www.nrel.colostate.edu/projects/ALUsoftware/software_description.html

- Creation Context and software

First version, creation year	2007
Last update/ Current version	last version v3.1.1.0; 2/3/2012
Availability	Can be downloaded after registration and request accepted (3 days). There are no restrictions to download and use the software.
Computer support	ALU Software
User guide/technical guide	Training video (20 min),user guide linked with electronic Help menu
Complexity of the interface	Available in English and Chinese. Not really user friendly, lot of sub-menus, time consuming. Lot of information required to complete an inventory using the IPCC guidelines, and the software even includes the ability to conduct Tier 2 inventories, which requires even more information.

- Tool main characteristics

Geographical area coverage	World
Working scale	Landscape/country
User target	Agricultural/Forestry departments for GHG reporting.
Main goal for the tool	The tool is intended to help countries to report GHG Emissions for Agriculture (module 4) and Land Use and Forestry (Module 5) to UN.

- Production analyzed (tick if included)

Temperate crops	Tropical/Equatorial crops	Rice cultivation	Grassland	Dairy Cattles	Other livestock
x	x	x	x	x	x

Field trees, hedges, agroforestry	Perennial production (orchards, vineyards)	Horticultural products; Greenhouses	Forest
x	x	no	x

Comments: The software user could enter information on greenhouse production and other horticultural crops in the annual and perennial crop management systems. No specific accounting for the greenhouse infrastructure and production system however.

- Input data

Detail level	Detailed data on management practices
Data availability and required user skills	Data availability at country level can be really problematic. Some agronomic skills are necessary to use the software. These are the requirements for the good practice guidance provided by the IPCC.
Data consistency checking	Data control + data quality. For each input window, consistency control, validated by user + third party validation of data.

- Methodology

a) Emission factors

Main methodological references	IPCC 1996 + good practices 2000-2003. Each equation used is provided by software to user. Full transparency.
Possibility for user to define local emission factors	Yes, choice for Tiers 1/2 approaches.

b) Soil-Climate description

Soil-Climate	Yes/No	Comments
Soil		
Soil type (define classification used)	x	IPCC soil types by default, possibility to create new types
Texture		Included in soil type description
Other criteria (ex: % MO)		no
Climate		
Classification	x	Eco-zone classification
Measures		
GIS approach with underlying soil/climate database		Possibility to work with GIS dataset

c) Perimeter

Perimeter	Yes/No	Comments
Infrastructure	no	
Energy (electricity + gasoil)	no	
Land N2O emissions	x	
Ruminant CH4 Emissions	x	
Dejection emission	x	
Emission from N-fixing plants	No/partially	N2O emissions from N-fixing plants is included in terms of residue N inputs, which is consistent with the IPCC guidelines
Off farm emissions (fertilizers, imported food)	no	Following IPCC, chemicals fabrications is accounted for industry, each country responsible for production phase (emissions of soya consumed in Europe accounted for Brazil)
Emission from burning crop residues	x	
Emission from rice cultivation	x	
Land use change ,soil/ above/below ground biomass	x	
Carbon soil changes except LUC (residues, tillage effect)	x	
Peat land	x	
On farm process (drying, refrigeration etc.)	no	
Industrial Process	no	
Transport	no	

- Results

Form	Excel sheet (ALU report), or UNFCC report compatible with UNFCC data base and official report process. No Charts, only tables.
Comparison of several scenarios	Yes, possible to implement mitigation actions and compare with baseline.
Main GHG results	GHG/year for each process analyzed (ex: Enteric methane, manure methane etc.), results in each GHG and in CO2 eq. No GHG/ha, No summary results
Uncertainties	No uncertainties in results yet. We are currently developing code for uncertainty and plan to release this version by the end of 2012.
Complementary results (economic aspects; carbon credits, energy, leakage, land productivity, etc.)	NO

- Past studies using this tool

Number of real study cases (excluding training courses) :	☐<10 <10<X<50 ☒ >50 ☐
Most relevant study cases carried out with the tool? Please indicate if report is available	Several countries are in the process of using the tool for reporting to the UNFCCC in southeast Asia and southern/eastern Africa. Papua New Guinea is the most recent to complete the inventory in ALU for purposes of reporting. Other countries, such as New Zealand, have used the tool as QA check on their inventory.
Published articles in scientific journals?	none
Other relevant publication in non-scientific journals (technical/methodological)	The manual is the most complete description of the program.

- Actual and future development of the tool, evolution expected?

We are developing the biomass C stock change method in the program, which can be used in combination with a national forest inventory. We are also developing the code to conduct an uncertainty analysis for all the source categories based on the simple error propagation method in the IPCC guidelines.

- Extra comments or remarks about the tool or the questionnaire

The program does require considerable activity data, but this is because of the IPCC requirements. However, the program is designed for efficient data entry and archiving, and so this should overall reduce the time commitment for the software user.

Global accuracy of results largely depends on the accuracy of the emission factors that are derived by the user. Ultimately, tier 3 approaches are probably the most accurate, and this program is not designed for tier 3.

2.3. Carbon Accounting for Land Managers CALM

- Contact information

Institution in charge of technical development :	Country Land and Business Association
Name of the person	Derek Holliday
e-mail	Derek.holliday@cla.org.uk
Web site of the tool	http://www.cla.org.uk/Policy_Work/CALM_Calculator/

- Creation Context and software

First version, creation year	Web version created 2005/06
Last update/ Current version	It is updated annually
Availability	Online, free after registration
Computer support	Internet browsers
User guide/technical guide	There is a guide on the opening page as well as information on the side bars.
Complexity of the interface	The interface is not very intuitive, needs some practice to understand the structure of the tool

- Tool main characteristics

Geographical area coverage	UK
Working scale	Farm
User target	Land managers (Farmers, Foresters)
Main goal for the tool	Increase land manager awareness on CC. Test the impact of environmental schemes (ELS, HLS, organic etc.) on GHG emissions.

- Production analyzed (tick if included)

Temperate crops	Tropical/Equatorial crops	Rice cultivation	Grassland	DairyCattles	Other livestock
x	no	no	x	x	x

Field trees, hedges, agroforestry	Perennial production (orchards, vineyards)	Horticulural products; Greenhouses productions	Forest
no	yes	no	x

Comments:

The national Inventory does not include a calculation for hedges although we know that established hedges probably make a contribution.

For the stewardship option, on the basis that every 3rd year the hedge is cut there is a small adjustment made for the extra average biomass

- Input data

Detail level	Detailed management data for every activity.
Data availability and required user skills	All data is information that an average farmer would know. There is no requirement for special skills
Data consistency checking	no

- Methodology

a) Emission factors

Main methodological references	IPCC + DEFRA + National Inventory Report; (the methodological link is not roken)
Possibility for user to define local emission factors	No

b) Soil-Climate description

Soil-Climate	Yes/No	Comments
Soil		
Soil type (define classification used)	no	
Texture	no	
Other criteria (ex: % MO)		Organic and peat soils are covered. We adopt the same protocols as England uses to make UK Kyoto submission
Climate		
Classification	no	
Measures	no	
GIS approach with underlying soil/climate database	no	

c) Perimeter

Perimeter	Yes/No	Comments
Infrastructure	no	
Energy (electricity + gasoil)	x	
Land N2O emissions	x	
Ruminant CH4 Emissions	x	
Dejection emission	x	where manure is taken on to the farm emissions are increased and where moved off the farm emissions exported.
Emission from N-fixing plants	yes	Emissions factors are different for leguminous crops
Off farm emissions (fertilizers, imported food)	x/partially	Does not cover feed but does cover fertiliser. For fertiliser we try to avoid double counting and covers that is used in growing crop not the fert. used by another person
Emission from burning crop residues	no	Not allowed to burn
Emission from rice cultivation	no	
Land use change ,soil/ above/below ground biomass	Yes	20 years basis. Take into account change in carbon soil stock. Take into account above ground biomass increment for forest. Harvested wood counted as a C loss.
Carbon soil changes except LUC (residues, tillage effect)	yes	Residues are taken into account through the emissions factors. Crop emissions factors take account of changes in plant biomass returns to soil. In relation to the tillage effect- the UK does not take this into account.
Peat land	yes	
On farm process (drying, refrigeration etc.)	x	Account for energy consumption, no refrigerating gazes. Calculator accounts for renewable energy production.
Industrial Process	no	
Transport	no	

- Results

Form	Only tables, detailed results for each emission sources. Pdf, html or excel format for report. The development of graphs will provide a useful output
Comparison of several scenarios	The tool allows you to print out different reports and compare and is designed so that it can be easily modified for comparative analysis
Main GHG results	GHG emissions are reported as scope 1 and 2
Uncertainties	no
Complementary results (economic aspects; carbon credits, energy, leakage, land productivity, etc.)	no

- Past studies using this tool

Number of real study cases (excluding training courses) :	☐<10 <10<X<50 ☐ >50 ☒
Most relevant study cases carried out with the tool? Please indicate if report is available	Natural England- Carbon Base line Survey, publically available. The study covered 200 hundred farms. Be3cause the tool is free it has been actively used and promoted by many organisations to raise awareness and deliver advice. Eg the Farming Wildlife Advisory Group. Laurence Gould associates
Published articles in scientific journals?	
Other relevant publication in non-scientific journals (technical/methodological)	

- Actual and future development of the tool, evolution expected?

The CLA have just begun work to update the forestry and woodland section and develop an area that will also deal with energy from wood fuel. This will be completed summer 2012.

We would like to extend the ability to deal with scope 3 emissions information (eg for feed) and presentation of graphical data as well as address some of the supply chain calculation issues that currently are not assessed.

The CLA would also like to make some changes to the calculator to better align ourselves with the Defra corporate carbon reporting process.

Allowing the user to see data for emissions per unit area or emissions per unit of energy produced as well as £ per unit of turnover might also help it to be a better business tool too!

2.4. Carbon Benefits Project, focus on "simple assessment tool"

- Contact information

Institution in charge of technical development :	GEF, Colorado State University,
Name of the person	Eleanor Milne;
e-mail	eleanor.milne@colostate.edu; mark.easter@colostate.edu
Web site of the tool	http://www.unep.org/ClimateChange/carbon-benefits/cbp_pim/ http://carbonbenefitsproject-compa.colostate.edu/

- Creation Context and software

First version, creation year	2011
Last update/ Current version	
Availability	4 tools : -Simple assessment: available online, free after registration (module concerned by the questionnaire). -detailed assessment : not available yet - Dynamic Modeling = GEFSOC model, free download - Socioeconomic: free online after registration
Computer support	Internet browser, works best with Mozilla Firefox but can be used with any browser
User guide/technical guide	User guide available for each module. For methodological aspects, web-portal provides IPCC guides.
Complexity of the interface	Somehow user friendly. Some bugs identified trying the tool. (ex: manure management, pblm with some crop rotations). Quite time consuming, even for simple assessment (need to re-enter all data each time for initial, baseline and final). Need for manually saving data for each tab ("heavy process"). The tool is available in English, Spanish and Chinese.

- Tool main characteristics

Geographical area coverage	World
Working scale	Project, landscape
User target	Particularly developed for use by GEF project managers, but can be used for non-GEF projects.
Main goal for the tool	Web portal for evaluating land based project. Project assessed can be carbon sequestration oriented or just "socio-economic" development oriented. Different level of assessment provided depending on the type of project (see the different modules: **simple assessment, detailed assessment, Dynamic Modeling, Socioeconomic tools**). Possibility to work ex-ante, ongoing on ex-post evaluation. Tool focus on land use emissions.

- Production analyzed (tick if included)

Temperate crops	Tropical/Equatorial crops	Rice cultivation	Grassland	Dairy Cattles	Other livestock
x	x	x	x	x	x

Field trees, hedges, agroforestry	Perennial production (orchards, vineyards)	Horticultural products; Greenhouses	Forest
x	x	no	x

Comments: One of the few tools accounting in detail for agroforestry practices.

- **Input data**

Detail level	Medium level of detailed management data (residues, manure etc.). Mainly qualitative or % data
Data availability and required user skills	Based on "expert" knowledge, need some agronomic skills. Level of knowledge designed to be commensurate with that found in someone running a land management project.
Data consistency checking	Data consistency checking for areas, in each land category.

- Methodology

a) Emission factors

Main methodological references	Simple assessment: Tiers 1➔ calculation process based on the IPCC method detailed assessment: Tiers 2➔ calculation process based on the IPCC method Dynamic modeling: Tiers 3➔ GEFSOCModeling and Measurement: Tiers 3➔ Remote sensing approach + extensive ground truthing
Possibility for user to define local emission factors	Not in simple assessment, yes in detailed one.

b) Soil-Climate description

Soil-Climate	Yes/No	Comments
Soil		
Soil type (define classification used)	no	
Texture	no	
Other criteria (ex: % MO)	no	
Climate		
Classification	no	
Measures	no	
GIS approach with underlying soil/climate database	x	Area is selected on google map directly. If the user does not upload their own soil/climate information then the system uses default soil and climate layers. If you go to 'Project Description' on the menus then choose 'view supporting spatial data' you can view the default datasets used http://cbp-web1.nrel.colostate.edu/SpatialData. We use IPCC Soils Classes derived from the Harmonized World Soils Database and IPPC land use climate regions.

c) Perimeter

Perimeter	Yes/No	Comments
Infrastructure	no	
Energy (electricity + gasoil)	no	
Land N2O emissions	x	
Ruminant CH4 Emissions	x	
Dejection emission	x	
Emission from N-fixing plants	no	
Off farm emissions (fertilizers, imported food)	no	
Emission from burning crop residues	x	
Emission from rice cultivation	x	
Land use change ,soil/ above/below ground biomass	x	Account for soil C changes, above and below ground biomass increase.
Carbon soil changes except LUC (residues, tillage effect)	x	Yes, results obtained from IPCC tiers 1 equations. For more details use detailed assessment or GEFSOC.
Peat land	x	
On farm process (drying, refrigeration etc.)	no	
Industrial Process	no	
Transport	no	

- Results

Form	pdf report, tables, no graph. Coming shortly; there will be the option to produce a detailed report which is in Excel format so users can do further analysis on the results.
Comparison of several scenarios	Comparison Baseline and with project. Input of initial situation does not appear in results.
Main GHG results	Emission GHG/project; GHG/year; GHG/ha. GHG estimation for baseline situation, with project situation and net difference (Carbon benefit) between the 2 situations. Detailed results for each land use. Difference between gases, all in CO2 eq.
Uncertainties	Value for uncertainties provided.
Complementary results (economic aspects; carbon credits, energy, leakage, land productivity, etc.)	For simple assessment no complementary results. However the complementary results can be implemented by the other tool on the platform. In the report leakage are mentioned, but no information provided. The user has the option of inputting results from their own leakage assessment and this will appear in the report if they do so.

- Actual and future development of the tool, evolution expected?

The detailed report is being finalized and will be available soon. This is an Excel file which gives emissions for each source broken down by category and sub-category. It also gives the IPCC equation used with values for parameters in the equation. Users can map results using a GIS. The detailed assessment will be ready for use later this year.

2.5. Carbon Calculator for New Zealand Agriculture and Horticulture

- Contact information

Institution in charge of technical development :	AERU Lincoln university, NZ
Name of the person	**Caroline Saunders**
e-mail	Caroline.Saunders@lincoln.ac.nz
Web site of the tool	http://www2.lincoln.ac.nz/carboncalculator/

- Creation Context and software

First version, creation year	2008
Last update/ Current version	
Availability	Free online
Computer support	Internet browser, works at least with IE and Mozilla
User guide/technical guide	Simple user guide (2pages) available
Complexity of the interface	Simple, user friendly

- Tool main characteristics

Geographical area coverage	NZ
Working scale	Farm
User target	Farmers , agricultural consultants, policy makers
Main goal for the tool	Raise awareness

- Production analyzed (tick if included)

Temperate crops	Tropical/Equatorial crops	Rice cultivation	Grassland	Dairy Cattles	Other livestock
x	no	no	x	x	x

Field trees, hedges, agroforestry	Perennial production (orchards, vineyards)	Horticultural products; Greenhouses	Forest
no	x	no	no

- Input data

Detail level	Simple input data; some input data can be obtained using OVERSEER model.
Data availability and required user skills	Data easily available, only limited agronomic skills required. Possibility to account for contractor works (in hours and area).
Data consistency checking	No

- Methodology

a) Emission factors

Main methodological references	No transparency. Only reference to the methodology: " The calculator is based upon general standards for carbon footprinting developed from international standards."
Possibility for user to define local emission factors	No

b) Soil-Climate description

Soil-Climate	Yes/No	Comments
Soil		
Soil type (define classification used)	no	
Texture	no	
Other criteria (ex: % MO)	no	
Climate		
Classification	no	
Measures	no	
GIS approach with underlying soil/climate database	no	

c) Perimeter

Perimeter	Yes/No	Comments
Infrastructure	no	
Energy (electricity + gasoil)	x	
Land N2O emissions	x	
Ruminant CH4 Emissions	x	
Dejection emission	x	
Emission from N-fixing plants	no	
Off farm emissions (fertilizers, imported food)	x	Life cycle approach
Emission from burning crop residues	no	
Emission from rice cultivation	no	
Land use change ,soil/ above/below ground biomass	no	
Carbon soil changes except LUC (residues, tillage effect)	no	
Peat land	no	
On farm process (drying, refrigeration etc.)	no	
Industrial Process	no	
Transport	no	

- Results

Form	One summary graph and table
Comparison of several scenarios	No
Main GHG results	Annual emissions: results for each gas in CO2eq : CO2eq/ha; CO2eq/kg product (economic allocation)
Uncertainties	Not mentionned
Complementary results (economic aspects; carbon credits, energy, leakage, land productivity, etc.)	For carbon credits, website send user to "CarbonFarmingGroup calculator"

- Past studies using this tool

Number of real study cases (excluding training courses) :	☐<10 <10<X<50 ☐ >50 ☐
Most relevant study cases carried out with the tool? Please indicate if report is available	
Published articles in scientific journals?	
Other relevant publication in non-scientific journals (technical/methodological)	

- Actual and future development of the tool, evolution expected?

The tool was always meant to fill a gap when the development of carbon Footprinting was in its infancy and also to raise awareness among the farming community. **No more updating of the tool.**

2.6. Carbon Farming Group Calculator, NZ

- Contact information

Institution in charge of technical development :	Carbon Farming Group (NGO)
Name of the person	Clayton Wallwork
e-mail	clayton@carbonfarming.org.nz
Web site of the tool	http://www.carbonfarming.org.nz/calculators/

- Creation Context and software

First version, creation year	Version 1 – 2008 This was based on the 2007 New Zealand Greenhouse Gas Inventory which used average emissions per animal type – sheep, cow, beef cattle etc.
Last update/ Current version	2010 Base on revised emission factors from the Climate Change (Agriculture Sector) Regulations 2010
Availability	Free Online tool, no registration needed
Computer support	Online, works with Mozilla en IE.
User guide/technical guide	Some information directly on website, no user/methodological guide. Free phone number for questions and email support.
Complexity of the interface	Very simple; user friendly

- Tool main characteristics

Geographical area coverage	New Zealand
Working scale	Farm
User target	Farmers and small scale forest owners
Main goal for the tool	Prepare agricultural sector for CO2 market. Simple tool created along with ETS (Emission trading scheme) in NZ. Rq: agriculture submitted to ETS for non CO2 emission from 2015, the ETS for agriculture will be beared by meat and dairy processors, fertiliser manufacturers and importers, egg producers and live animal exporters. Calculators show a cost for emissions when the agriculture sector is brought into the New Zealand Emissions Trading Scheme (NZETS). The NZETS began trading on 1 July 2010.

- Production analyzed (tick if included)

Temperate crops	Tropical/Equatorial crops	Rice cultivation	Grassland	DairyCattles	Other livestock
x	no	no	x	x	x

Field trees, hedges, agroforestry	Perennial production (orchads, vineyards)	Horticulural products; Greenhouses	Forest
no	no	no	x

- Input data

Detail level	Very basic information. Based on farmer information obtained during business as usual activity
Data availability and required user skills	No agronomic skills needed, basic computer skills, access to internet
Data consistency checking	no

- Methodology

a) Emission factors

Main methodological references	Following national laws: Agriculture: Climate Change (Agriculture Sector) Regulations 2010. Forestry : Climate Change (Forestry Sector) Regulations 2008 National average : http://www.legislation.govt.nz/regulation/public/2010/0335/35.0/DLM3253073.html" \l "DLM3253080
Possibility for user to define local emission factors	None

b) Soil-Climate description

Soil-Climate	Yes/No	Comments
Soil		
Soil type (define classification used)	no	Calculator works on national average, does not aim at comparing practices.
Texture	No	
Other criteria (ex: % MO)	No	
Climate		
Classification	No	
Measures	No	
GIS approach with underlying soil/climate database	No	

c) Perimeter

Perimeter	Yes/No	Comments
Infrastructure	no	
Energy (electricity + gasoil)	x	In separate calculator, as not included in ETS schemes for agriculture (affect the up-stream energy industry)
Land N2O émissions	x	(nitrogen fertilizer)
Ruminant CH4 Emissions	x	Hidden within animal Emission factor
Dejection emission	x	Hidden within animal Emission factor
Emission from N-fixing plants	no	
Off farm emissions (fertilizers, imported food)	No	Does not account for emissions at mineral fertilizer fabrication.
Emission from burning crop residues	no	
Emission from rice cultivation	no	
Land use change	no	
Carbonsoil changes except LUC (residues, tillage effect)	no	
Peat land	no	
On farm process (drying, refrigeration etc.)	x	In separate calculator, as not included in ETS schemes for agriculture (affect the up-stream energy industry)
Industrial Process	no	
Transport	no	

- Results

Form	Tables with cumulated CO2 emissions, every 5 years up to 2030.
Comparison of several scenarios	No
Main GHG results	Only CO2 equivalent, no detail between GHG
Uncertainties	no
Complementary results (economic aspects; carbon credits, energy, leakage, land productivity, etc.)	Cost for stocking/emission according to carbon price. Shows impact of forestry offsetting. Many hill country farms in NZ have forest woodlots and could use these as a potential offset, if carbon accounting is undertaken at the farm level.

- Past studies using this tool

Number of real study cases (excluding training courses) :	☒<10 <10<X<50 ☐ >50 ☐ See infosheets, at http://www.carbonfarming.org.nz/articles.html
Most relevant study cases carried out with the tool? Please indicate if report is available	http://www.carbonfarming.org.nz/articles.html
Published articles in scientific journals?	
Other relevant publication in non-scientific journals (technical/methodological)	http://www.landcare.org.nz/files/file/338/can-carbon-support-resilient-northland-farms.pdf

- Actual and future development of the tool, evolution expected?

As New Zealand and science improves and changes are made to climate change legislation the calculator will be updated.

If we receive feedback from the farmer audience for improvements these are also considered and undertaken after testing.

- Extra comments or remarks about the tool or the questionnaire

Below are the page views on each calculator page since it was launched in June 2008

http://www.carbonfarming.org.nz/calculators.php - 14,442

http://www.carbonfarming.org.nz/calculators2.php - 5,951

http://www.carbonfarming.org.nz/calculators3.php - 3,695

2.7. CFF Organic Farmer and Grower's carbon calculator

- Contact information

Institution in charge of technical development :	Farm Carbon Cutting Tookit
Name of the person	Jonathan Smith
e-mail	jonathan@cffcarboncalculator.org.uk
Web site of the tool	http://www.cffcarboncalculator.org.uk/carboncalc

- Creation Context and software

First version, creation year	2009
Last update/ Current version	Version 3.0, 2012
Availability	Free online
Computer support	Internet browsers
User guide/technical guide	No guide available, methodological references given for each calculation, directly on website. Possible to get to sources but very time consuming
Complexity of the interface	User friendly, however for user interested in informations on methodological hypothesis done, possible to get to sources but very time consuming and no directly available information.

- Tool main characteristics

Geographical area coverage	UK
Working scale	Farm
User target	Farmers and growers
Main goal for the tool	"By measuring your carbon footprint there are financial and marketing benefits, improvements in soil health to be made and ethical integrity to be gained."(web site)

- Production analyzed (tick if included)

• Temperate crops	Tropical/Equatorial crops	Rice cultivation	Grassland	Dairy Cattles	Other livestock
x	no	no	x	x	x

Field trees, hedges, agroforestry	Perennial production (orchards, vineyards)	Horticultural products; Greenhouses	Forest
x	x	x	x

- Input data

Detail level	Each production is detailed, but input parameters stick to quite simple indicators (total production, surface, %). Full farm approach rather than per/ha approach. Detailed for transport, infrastructure and process.
Data availability and required user skills	Limited agronomic skills needed. No default value
Data consistenc checking	No

- Methodology

a) Emission factors

Main methodological references	UK GHG inventory 2010, DEFRA reports, Inventory of Carbon and Energy v2.0, etc.,
Possibility for user to define local emission factors	No

b) Soil-Climate description

Soil-Climate	Yes/No	Comments
Soil		
Soil type (define classification used)	no	
Texture	x	Used for define bulk density with given correspondence table.
Other criteria (ex: % MO)	x	Soil Bulk density, SOM “year -1” et “years 0”.
Climate		
Classification	no	Average UK climate is considered for emission factors.
Measures	no	
GIS approach with underlying soil/climate database	no	

c) Perimeter

Perimeter	Yes/No	Comments
Infrastructure	x	Very detailed
Energy (electricity + gasoil)	x	
Land N2O emissions	x	Chemicals fertilizers included in version 3.0
Ruminant CH4 Emissions	x	
Dejection emission	x	Separate according dejection management.
Emission from N-fixing plants	x	
Off farm emissions (fertilizers, imported food)	x	Imported food and manures accounted. Emission of exported manure is allocated to receiving farm.
Emission from burning crop residues	no	
Emission from rice cultivation	no	
Land use change ,soil/ above/below ground biomass	x	Carbon soil calculated from direct annual soil sampling measures, no model for LUC.
Carbon soil changes except LUC (residues, tillage effect)	x	Direct calculation of soil changes CO2. Emissions due to tillage included, however, does not take into account through modeling changes in tillages practices, or time dynamics for LUC. Account for C soil change through direct measure of SOM.
Peat land	x	
On farm process (drying, refrigeration etc.)	x	Very detailed
Industrial Process	x	Very detailed
Transport	x	Very detailed
Other	x	Possibility to include extra emissions, such as consultant travel millage.

- Results

Form	Only tables, summary and subtotal, no text.
Comparison of several scenarios	Not available easily.
Main GHG results	Only CO2 eq; no N2O or CH4 results. Results in CO2e/full farm, no results/ha or /kg products.
Uncertainties	No
Complementary results (economic aspects; carbon credits, energy, leakage, land productivity, etc.)	No

- Past studies using this tool

Number of real study cases (excluding training courses) :	<10 <10<X<50 >50
Most relevant study cases carried out with the tool? Please indicate if report is available	
Published articles in scientific journals?	
Other relevant publication in non-scientific journals (technical/methodological)	

- Actual and future development of the tool, evolution expected?

New version should be expanded for non organic farming. Calculator will be included in Farm Carbon Cutting Toolkit.

Version 3.0 is nearly ready for release. This includes:

- Revised figures for all emission and sequestration factors where available
- New section – agrochemicals, making the tool accessible to non-organic farmers and growers
- New section – waste (landfill and recycling)
- Improved results display and interpretation
- New factors for farm machinery, imported feed, building materials, renewable energy installations, plant raising media, refrigeration losses and biogas.

2.8. Climagri ®

- Contact information

Institution in charge of technical development :	ADEME; Tool developed by Solagro
Name of the person	S.Martin
e-mail	sarah.martin@ademe.fr
Web site of the tool	www.ademe.fr/climagri

- Creation Context and software

First version, creation year	First version developed in 2009. Trial version tested in 12 French regions in years 2010-2011. For 2012 expert network set up (40 experts trained).
Last update/ Current version	Last update : November 2011
Availability	available after 2 days training by ADEME, after selection price for training : 700 euros, after free use.
Computer support	Excel, no macros
User guide/technical guide	User guide and technical guides in French
Complexity of the interface	Need some practice before using. Not user friendly.

- Tool main characteristics

Geographical area coverage	Metropolitan France
Working scale	Landscape
User target	Agricultural policy makers, “landscape” planning managers, policy makers. Tool implemented by agronomic specialists.
Main goal for the tool	Enable GHG calculation of agricultural sector for areas subjected to compulsory or optional "PCET" ("Territorial Climate Policy"; territorial evaluation of GHG). Contribute to increase communication between stakeholders from agricultural field and local/regional policy makers. Aim at assessing GHG emission and fossil fuel dependency of territories.

- Production analyzed (tick if included)

Temperate crops	Tropical/Equatorial crops	Rice cultivation	Grassland	Dairy Cattles	Other livestock
x	no	no	x	x	x

Field trees, hedges, agroforestry	Perennial production (orchards, vineyards)	Horticultural products; Greenhouses	Forest
x	x	x	x

Comments: Hedges are accounted but rather as forestry systems beside agricultural system than a real homogenous agroforestry system (such as sylvo-pastoralism or alley cropping systems). Be careful with double counting for areas.

- Input data

Detail level	Very detailed technical data for each cropping/animal/forest system,
Data availability and required user skills	Some data can be quite difficult to obtain, depending on the territory analyzed. Data are spread amongst many stakeholders. However many default values are provided for France. Need agronomic and some forestry skills to implement the tool
Data consistency checking	Several checking points: N inputs/production; Straw production/territorial needs and import balance; Feeding/animal needs.

- Methodology

a) Emission factors

Main methodological references	ADEME data base, tiers 2 approach. IPCC 2006
Possibility for user to define local emission factors	Yes, calculator made so user can adapt emission factor. Asset of excel format (no black box). However, overall complexity of calculator's structure implies a significant effort to define new emission factors.

b) Soil-Climate description

Soil-Climate	Yes/No	Comments
Soil		
Soil type (define classification used)	no	Soil carbon content is defined by defect according national average for each land use.
Texture	no	
Other criteria (ex: % MO)	no	
Climate		
Classification	no	Impact of climate not taken into account in the calculator.
Measures	no	
GIS approach with underlying soil/climate database	no	

c) Perimeter

Perimeter	Yes/No	Comments
Infrastructure	Yes partially	Machinery and energy for heating the buildings included. No the buildings.
Energy (electricity + gasoil)	x	
Land N2O emissions	x	
Ruminant CH4 Emissions	x	
Dejection emission	x	
Emission from N-fixing plants	no	Emissions due to residues are accounted but not emissions due to N-fixing process.
Off farm emissions (fertilizers, imported food)	x	
Emission from burning forest/crop residues	no	
Emission from rice cultivation	no	
Land use change ,soil/ above/below ground biomass	no	The effect of LUC does not appear in results. It can be estimated “manually” in comparing C stock in soil and biomass of 2 different land uses. Integrating on time for the change then enables to obtaining annual emission/storage.
Increase in Carbon biomass stock	yes	For forest,Climagri account for increase in C biomass stock, depending on use of forest products (energy, material) and harvesting rates.
Carbonsoil changes except LUC (residues, tillage effect)	Yes partially	Impact of tillage practice not accounted on soil C. o increase in C soil due to residues, residue degradation accounted for N2O emissions.The calculator considers that systems are “at equilibrium”, therefore no soil carbon change happen, except for grassland and hedges that are consider to stock carbon.
Peat land	no	
On farm process (drying, refrigeration etc.)	no	

Industrial Process	no	
Transport	no	

Comments :

Results are presented according GHG emissions, C stock (biomasse+ soil C) and annual C stock variation. Usually calculators only provide GHG emissions and C soil change. Also, the calculators usually only account for increase of forest biomass, not accounting for harvested product.

- Results

Form	Detailed tables and graphs
Comparison of several scenarios	For each scenario, a new spreadsheet has to be completed. Comparison is made by difference between the spreadsheets (non automatic). The scenarios have to be built entirely by the user (non automatical way to test change in management practices)
Main GHG results	Very detailed for each activity and management practices. Detailed GHG emission and energy consumption for each item; GES/Ha; GES/tDry Matter.
Uncertainties	No data on uncertainties for GES emission. (may be included in next version)
Complementary results (economic aspects; carbon credits, energy, leakage, land productivity, etc.)	"Feeding potential" of the territory, based on FAO dietary requirements and real consumption, focus on protein intake and energy (calorie). Nitrogen balance of territory, food dependency for livestock.

- Past studies using this tool

Number of real study cases (excluding training courses) :	☐<10 <10<X<50 ☒ >50 ☐
Most relevant study cases carried out with the tool? Please indicate if report is available	12 studies in French regions. Study case for whole French metropolitan territory, evaluation of scenarios : "Prospective Energie 2030" (scenarios for energy/agriculture built by French government) ; "France facteur 4" (scenarios in order to reach factor 4 in GES emissions by 2050)
Published articles in scientific journals?	No
Other relevant publication in non-scientific journals (technical/methodological)	Climagri, Hors série campagne et Environnement, octobre 2011

- Actual and future development of the tool, evolution expected?

The heart of the project is thus to constitute a restricted network including experts able to analyze agricultural stakes at a territorial scale and to help local leaders to integrate this sector into the local strategies. From 2012, around forty experts are allowed to use ClimAgri® after a training delivered by the ADEME. Some projects may be conducted in 2012.

Developments expected in 2012 :

- approach of uncertainty
- inclusion of 10 main solutions in order to reduce GHG of agriculture (project sheets or automatic solutions in the tool)
- inclusion of some other environmental impacts (air pollution, water consumption etc…) under discussion.

2.9. Cool Farm Tool

- Contact information

Institution in charge of technical development :	University of Aberdeen, Unilever Sustainable Agriculture, Sustainable Food Lab
Name of the person	Jon Hillier (University of Aberdeen)
e-mail	sustainable.agriculture@unilever.com j.hillier@abdn.ac.uk
Web site of the tool	http://www.unilever.com/aboutus/supplier/sustainablesourcing/tools/

- Creation Context and software

First version, creation year	March 2010
Last update/ Current version	November 2011
Availability	free downloadfromwebsite
Computer support	Excel, without macro. Compatible 2010
User guide/technical guide	User guide available, no detailed methodological guide available but scientific paper with detailed methodology. (*Hiller et al. 2011*)
Complexity of the interface	Quite user friendly, especially considering excel software

- Tool main characteristics

Geographical area coverage	World
Working scale	Farm
User target	Farmers
Main goal for the tool	Product oriented tool. One crop/animal production at a time in the calculator. Help farmers to reduce environmental impact, prepare for future CO2 labeling.

- Production analyzed (tick if included)

Temperatecrops	Tropical/Equatorial crops	Ricecultivation	Grassland	DairyCattles	Otherlivestock
x	X	x	x	x	x

Field trees, hedges, agroforestry	Perennial production (orchads, vineyards)	Horticuluralproducts; Greenhouses	Forest
no	X	x	x

- Input data

Detail level	Rather detailed, technical data.
Data availability and required user skills	data available at farm level, unsuitable for territory. Some default data provided in “default crop lookup”, not automatic.
Data consistency checking	No

- Methodology

a) Emission factors

Main methodological references	Simple IPCC Tier 3 method: empirical, non-iterative models
Possibility for user to define local emission factors	There is a “Default factor spreadsheet” that might enable modification by user but there is no guide for doing it.

b) Soil-Climate description

Soil-Climate	Yes/No	Comments
Soil		
Soil type (define classification used)	no	
Texture	x	Fine/medium/coarse
Other criteria (ex: % MO)	x	SOM (ranges); soilmoisture, soildrainage, soil pH
Climate		
Classification	x	Tropical/temperate. No possibilities for semi-arid climates (ex: North Africa)
Measures	x	
GIS approach with underlying soil/climate database	No	

c) Perimeter

Perimeter	Yes/No	Comments
Infrastructure	no	
Energy (electricity + gasoil)	x	
Land N2O emissions	x	
Ruminant CH4 Emissions	x	
Dejection emission	x	
Emission from N-fixing plants	x	
Off farm emissions (fertilizers, imported food)	x	By default, European conditions.
Emission from burning crop residues	x	CH4 and N2O from burning accounted. Burning residues also reduce soil C on long term by decreasing C input in soils.
Emission from rice cultivation	x	
Land use change	x	Accounted if change occurs in last 20 years.
Carbonsoil changes except LUC (residues, tillage effect)	x	Change in tillage practices, residues, idem 20 years period. Above ground, below ground and soil C accounted.
Peat land	no	
On farm process (drying, refrigeration etc.)	+/-	These can be incorporated in the primary processing section. There is work in progress (at demo stage) to incorporate refrigeration and drying.
Industrial Process	x	
Transport	x	

- Results

Form	Summary and very detailed results. Tables and charts.
Comparison of several scenarios	No easy possibilities to compare different scenarios.
Main GHG results	GHG/ha; GHG/ton of product
Uncertainties	No
Complementary results (economic aspects; carbon credits, energy, leakage, land productivity, etc.)	No, impossible to test impact of changing practices regarding production, profitability etc.

- Past studies using this tool

Number of real study cases (excluding training courses) :	☐<10 <10<X<50 ☐ >50 ☒ (several hundred)
Most relevant study cases carried out with the tool? Please indicate if report is available	Major tool for agroindustry
Published articles in scientific journals?	Jonathan Hillier ,Christof Walter , DaniellaMalin , Tirma Garcia-Suarez , Llorenç Mila-i-Canals ,Pete Smith. 2011"A farm-focused calculator for emissions from crop and livestock production Haverkort A.J., **Hillier J.G.** Cool Farm Tool – Potato: model description and performance of four production systems. Potato Research*, in review.* **Hillier J.G.**, Brentrup F., Wattenbach M., Walter C., Garcia-Suarez T., Mila-i-Canals L., Smith P. Which cropland greenhouse gas mitigation options give the greatest benefits in different world regions? Climate and soil specific predictions from integrated empirical models. Global Change Biology, accepted.

Other relevant publication in non-scientific journals (technical/methodological)	**Jonathan Hillier**, Pete Smith, Tobias Bandel, Stephanie Daniels, Daniella Malin, Hal Hamilton, Christof Walter 2011. Farm-scale greenhouse gas emissions using the Cool Farm Tool: application of a generic farming emissions calculator in developing countries. In DESIGNING AGRICULTURAL MITIGATION FOR SMALLHOLDERS in DEVELOPING COUNTRIES .

- Actual and future development of the tool, evolution expected?

Linking to databases (re-engineering in e.g. php, html5)

Use of regional Tier 2 factors

More explicit accounting for processing operations

Peat soils

2.10. CPLAN. A suite of calculators – Focus on Cplan v2

- Contact information

Institution in charge of technical development :	SEE360, Farming consultancy;
Name of the person	Drew Coulter; Ron Smith, & Jan Dick
e-mail	drew@cplan.org.uk
Web site of the tool	CPLANV0 http://www2.cplan.org.uk/index.php?_load=page&_pageid=3 CPLANv1 and CPLANv2 http://www2.cplan.org.uk/index.php?_load=page&_pageid=23

- Creation Context and software

First version, creation year	Launched to the public June 2007
Last update/ Current version	Launched to the public June 2009
Availability	2 versions : -one free, simple but still quite detailed, covering most aspects of farm Cplan v0 -one more complete version Cplanv2 : registration and fee : 25-35€ per calculation This questionnaire focuses on Cplanv2, the most complete version of the tool.
Computer support	Online tool
User guide/technical guide	Discussion guide available with focus on Scotland. However it is not really a methodological guide for the tool, as it presents main methodological issues concerning GHG emissions but does not state clearly how CPLAN calculator deals with it.
Complexity of the interface	User friendly

- Tool main characteristics

Geographical area coverage	Designed for UK, some parameters (animal breading) can be used across the world but the tool is not really adapted for use outside of UK in current version. Do not use for non-temperate regions.
Working scale	Farm
User target	Farmers, Farmer consultant.
Main goal for the tool	Calculator first designed in 2006 after a demand from a Scottish farmer. Special focus on uncertainties and assessment of mitigation strategies.

- Production analyzed (tick if included)

Temperate crops	Tropical/Equatorial crops	Rice cultivation	Grassland	Dairy Cattles	Other livestock
X	no	no	x	x	x

Field trees, hedges, agroforestry	Perennial production (orchards, vineyards)	Horticultural products; Greenhouses	Forest
No	x	no	x

Comments: CPLANv2 for agroforestry and horticultural products but this use is not promoted on the website; there are no specific soil emissions for crop residues left on the soil in greenhouses so we can only model emissions assuming the residues are removed.

- Input data

Detail level	Very detailed, especially for animal productions. Possibility to use standard livestock (from national statistics) or to define it.
Data availability and required user skills	Need expert agronomic knowledge. Data available at farm level, impossible to obtain at territory level. But CPLANv1 used at this level – the three tools have all been developed for specific purposes.
Data consistency checking	No

- Methodology

a) Emission factors

Main methodological references	IPCC 2006
Possibility for user to define local emission factors	No

b) Soil-Climate description

Soil-Climate	Yes/No	Comments
Soil		
Soil type (define classification used)	yes	Mineral/organic soils
Texture	no	
Other criteria (ex: % MO)	no	
Climate		
Classification	no	
Measures	x	T°
GIS approach with underlying soil/climate database	x	Selection of 1 world region, determine average T° but no other climate or soil parameters.

Comments:

For climate section, CPLANV2 does not have this choice directly but it does allow you to choose one of 9 world regions with specific parameters reflecting climate (W Europe, E Europe, N America, Latin America, Oceania, Africa, Middle East, Asia, Indian subcontinent) plus UK and also gives freedom to choose a mean temperature between 10 and 28 deg C – but this affects only livestock calculations; we don't have soil parameters except for land use change and that is UK specific

c) Perimeter

Perimeter	Yes/No	Comments
Infrastructure	no	
Energy (electricity + gasoil)	x	UK electricity loads which reflect the current generation mix
Land N2O emissions	x	
Ruminant CH4 Emissions	x	
Dejection emission	x	Detailed method according dejection management
Emission from N-fixing plants	x	Yes, we have N fixed by legumes in the calculations
Off farm emissions (fertilizers, imported food)	no	Only direct emissions accounted.
Emission from burning forest/crop residues	no	
Emission from rice cultivation	no	
Land use change ,soil/ above/below ground biomass	x	CPLANv2 reflects the time to equilibrium of carbon in the new land use category, can be up to 300 years in the UK – however the most important changes are recent. The calculator code works in the same way as the UK National Inventory Report. The user can choose to entering only the last 20 years land use change data.
Carbonsoil changes except LUC (residues, tillage effect)	no	No impact of tillage practices. Carbon soil changes from tillage, permanent grassland and long-term crop residues are only in the consultancy version
Peat land	x	Yes, we have drying of peat effects in the histosol category and we have peat removal
On farm process (drying, refrigeration etc.)	no	Can partly be accounted through energy consumption Only N20, CH4 and CO2 considered, do not consider HFCs for example
Industrial Process	no	
Transport	partially	Own transport included as in fuel consumption; we do not have a pre-calculator which translates distance into fuel use

- Results

Form	Tables, no summary chart.
Comparison of several scenarios	Not directly.
Main GHG results	GHG for main activities (animal, fertilization, residues) Detailed output directly reflects complexity of input data.
Uncertainties	Yes : confidance interval provided for each emission
Complementary results (economic aspects; carbon credits, energy, leakage etc.)	No

- Past studies using this tool

Number of real study cases (excluding training courses) :	☐<10 <10<X<50 ☐ >50 ☐ yes
Most relevant study cases carried out with the tool?	
Published articles in scientific journals?	
Other relevant publication in non-scientific journals (technical/methodological)	Smith, R., Risbridger, C., Dick, J., Harcus, S., Bews, P., and Coulter, A. G. 2010., Mitigation greenhouse gas emissions from Scottish farms. In Climate, water and soil; science, policy and practice. SAC, Edinburgh. 366-371. http://www.sac.ac.uk/mainrep/pdfs/confproceedings2010.pdf. Dick, J., Smith, P., Smith, R., Lilly, A., Moxey, A., Booth, J., Campbell, C., Coulter, D., 2007. Calculating farm scale greenhouse gas emissions. SEE360. 29pp. www.cplan.org.uk.. Dick, J., Smith, R., Clark, N., 2010. Greenhouse Gas Emissions and UK Farming: a Farmers' Survey. SEE360. 7pp. www.cplan.org.uk.. Rees, R.M.,Topps, C.F.E., McGovern, R., Dick, J.M., Smith, R., Coulter, A.G., 2008. Managing carbon in a Scottish farmland. In Land management in a changing environment. SAC, Edinburgh. 76-83.

- Actual and future development of the tool, evolution expected?

Tool currently in annual review and new website expected to launch June 2012

2.11. Diaterre®

- Contact information

Institution in charge of technical development :	ADEME
Name of the person	Audrey Trévisiol
e-mail	audrey.trevisiol@ademe.fr
Web site of the tool	http://www2.ademe.fr/servlet/KBaseShow?sort=-1&cid=96&m=3&catid=24390

- Creation Context and software

First version, creation year	2010 (October). It follows and is inspired from several french GHG tools, main one being “Planete”, and Diapason
Last update/ Current version	2010
Availability	After 1 or 3 days training depending on previous skills on "farm energy dependency assment". Complete methodological guide available. Prices :300- 800 € net TVA; depending on the training
Computer support	Software in Java language
User guide/technical guide	User guide and methodological guide available in French. Guide of « reference values », Emission Factors and default technical data used. Not available in English.
Complexity of the interface	Rather user friendly considering a “large scope tool (energy + GHG focus”. Hard to get a fast overview of farms emissions.

- Tool main characteristics

Geographical area coverage	France (metropolitan)
Working scale	Farm, possibility so separate each activities in the farm.
User target	Farmers, tool implemented by agronomist consultant
Main goal for the tool	GHG and energy consumption diagnostic at farm level. One same method for all French farms, building of a national database with regional references. At the end of each analysis, the new study case is added to the national database. In France, based from the results off each analysis, an abatement strategy plan is designed together by the farmer and the consultant.

- Production analyzed (tick if included)

Temperate crops	Tropical/Equatorial crops	Rice cultivation	Grassland	Dairy Cattles	Other livestock
x	no	no	x	x	x

Field trees, hedges, agroforestry	Perennial production (orchards, vineyards)	Horticultural products; Greenhouses	Forest
x	x	non	no

Comments: Includes renewable energy production.

- Input data

Detail level	Very detailed
Data availability and required user skills	Available at farm level, not adapted for territory level. Skills in agronomy and energy/GHG needed. Training is compulsory to obtain the tool.
Data consistency checking	Limited to total surface. No consistency checking for technical data (yields, etc);

- Methodology

a) Emission factors

Main methodological references	Ges'tim, Bilancarbone, PLANETE, Ecoinvent, IPCC, INRA Arrouyas et al. (concernant les sols),
Possibility for user to define local emission factors	No

b) Soil-Climate description

Soil-Climate	Yes/No	Comments
Soil		
Soil type (define classification used)	no	
Texture	no	
Other criteria (ex: % MO)	no	For C soil content, national average used.
Climate		Climactic variable not really integrated in the tool.
Classification	no	Climatic area defined for the estimation of accommodation energy consumption.
Measures	no	
GIS approach with underlying soil/climate database	no	

c) Perimeter

Perimeter	Yes/No	Comments
Infrastructure	x	
Energy (electricity + gasoil)	x	Separation between direct/indirect energy; production and consumption of renewable energy.
Land N2O emissions	x	IPCC 2001
Ruminant CH4 Emissions	X	
Dejection emission	X	
Emission from N-fixing plants	no	
Off farm emissions (fertilizers, imported food)	X	
Emission from burning crop residues	no	
Emission from rice cultivation	no	
Land use change ,soil/ above/below ground biomass	x	Only change in soil C accounted. Above/below ground biomasse not accounted.
Carbon soil changes except LUC (residues, tillage effect)	no	No C soil changes accounted depending residue and tillage practices. Follows CITEPA methodology.
Peat land	no	
On farm process (drying, refrigeration etc.)	yes	
Industrial Process	no	
Transport	no	

- Results

Form	Table and graph, Excel, Word, OpenOffice and pdf format
Comparison of several scenarios	Possibility to simulate few actions, all concerning renewable energy (wood, solar, methanisation). No possibilities for testing directly improved agronomic practices (no-till, improved varieties, feeding, reduced fertilization etc.)
Main GHG results	GHG/farm; Results detailed for each activity. Possibility to get GHG/functional unit (ex GHG/ 1000 L milk), and GHG/ha.
Uncertainties	Existence of uncertainties on GHG results is mentioned in text above results, but no quantitative value provided for uncertainties.
Complementary results (economic aspects; carbon credits, energy, leakage, land productivity, etc.)	Direct/indirect Energy consumption, Nitrogen Balance, water consumption.

- Past studies using this tool

Number of real study cases (excluding training courses) :	☐<10 <10<X<50 ☐ >50 ☒
Most relevant study cases carried out with the tool? Please indicate if report is available	3500 farms evaluated bewteen 1999-2010 for Planete; 500 for Dia'terre (feb 2012).
Published articles in scientific journals?	no
Other relevant publication in non-scientific journals (technical/methodological)	Synthesis of all diagnostics done : 2006, 2010. « Références PLANÈTE 2010 »available online.

- Actual and future development of the tool, evolution expected?

Many updating idea for the tool.

- New indicators : economic benefits, comparison between simple and detailed method for fertiliser emissions.
- Possibility to calculate the effects of abatement strategies, considering energy, economic or GES savings.
- Report on PPE format (Energy Performance plan, from french department of agriculture.
- A new version designed especially for training

- Extra comments or remarks about the tool or the questionnaire
  Diaterre offers a global approach on energy (direct + indirect) and GHG (emissions + stock changes). Possibility to split results between each farm activity. Transparent tool concerning methodology. Time requirements depends on the level of accuracy desired. Data collection is usually about ½ day, and data analysis and GHG abatement strategy design ½ day more.

Partners involved in Dia'terre projects are : ADEME, Ministère de l'Alimentation, de l'Agriculture et de la Pêche (contribution financière), ACTA, AgroSup Dijon, APCA avec les Chambres d'Agriculture, ARVALIS Institut du végétal, CTIFL, FNCIVAM, FNCUMA, IFIP Institut du Porc, IFV, INRA, Institut de l'Elevage, ITAVI, SOLAGRO

2.12. EX-ACT (EX-Ante Carbon-balance Tool)

- Contact information

Institution in charge of technical development :	*The Food and Agriculture Organization of the United Nations* FAO
Name of the person	Martial Bernoux, Louis Bockel
e-mail	EX-ACT@fao.org, martial.bernoux@ird.fr, louis.bockel@fao.org
Web site of the tool	http://www.fao.org/tc/exact/

- Creation Context and software

First version, creation year	*Different beta version tested from June 2009 till November 2009, First version (Version 1) released in December 2009; Version 2 in March 2010, Version 3 in October 2010.* *Present version (3.3) was released in August 2011.*
Last update/ Current version	EX-ACT V3.3
Availability	Free download from website
Computer support	Excel
User guide/technical guide	User guide and technical guide very detailed, and other supplementary material: case studies, comparisons with other tools, policy briefs
Complexity of the interface	Need a little bit of practice to understand the structure lying under the tool. After quite easy to use. Available in English, French, Spanish, Portuguese

- Tool main characteristics

Geographical area coverage	World
Working scale	Project, landscape, whole nation
User target	Project manager, policy makers
Main goal for the tool	Aim at assessing climate change impact of agriculture/forestry development projects (with main purpose not necessarily being climate change mitigation). One strong specificity of this tool is the comparison between actual situation, without project (baseline), with project situation. It makes project managers think in dynamic, thinking about what would be situation in the future, without project. All tools compare actual situation vs. future with project situation.

- Production analyzed (tick if included)

Temperate crops	Tropical/Equatorial crops	Rice cultivation	Grassland	Dairy Cattles	Other livestock
x	x	x	x	x	x

Field trees, hedges, agroforestry	Perennial production (orchards, vineyards)	Horticultural products; Greenhouses	Forest
Not really	x	x	x

Comments:

Some agroforestry systems can be accounted as perennials. However the tool is not designed to assess mix production, or take into account field trees. IPCC does not provide values for these systems.

Categories are quite broad. Tool work by default at category level : ex : it does not provide default values for wheat, sunflower or millet but only for annual production. Same for animals, no difference according age class, breed etc.

- Input data

Detail level	Simple
Data availability and required user skills	Most data easily available at landscape scale and with expert knowledge. Some data on infrastructure might be hard to obtain. For comparing situation, only changes between situations need to be included. For agronomic practices, mostly basic quantitative or qualitative data.
Data consistency checking	Total area consistency checking

- Methodology
  a) Emission factors

Main methodological references	IPCC tiers 1.
Possibility for user to define local emission factors	Possibility to insert Tiers 2 factors, clearly proposed.

b) Soil-Climate description

Soil-Climate	Yes/ No	Comments
Soil		
Soil type (define classification used)	x	Map provided to help user to define dominante soil type. Simplified IPCC Taxonomy approach.
Texture	no	
Other criteria (ex: % MO)	no	
Climate		
Classification	x	IPCC Climatic zone and moisture regime
Measures	x	Average T° and rainfalls can help user define appropriate climatic zone.
GIS approach with underlying soil/climate database	no	

c) Perimeter

Perimeter	Yes/No	Comments
Infrastructure	x	Road + building (concrete, metal)
Energy (electricity + gasoil)	x	
Land N2O emissions	x	
Ruminant CH4 Emissions	x	
Dejection emission	x	
Emission from N-fixing plants	no	
Off farm emissions (fertilizers, imported food)	Yes/No	Fabrication, transport of inputs accounted. Emission of imported food (ex: soja) from a territory outside of the project not accounted.
Emission from burning crop residues	x	
Emission from rice cultivation	x	
Land use change ,soil/ above/below ground biomass	x	Soil, above and below ground biomass accounted according to IPCC method considering a max. effective period of 20 yrs.
Carbon soil changes except LUC (residues, tillage effect)	x	Impact of productivity and residue management on soil C content. Increase productivity (without increase removal) induces C storing in soil.
Peat land	x	
On farm process (drying, refrigeration etc.)	x	First approach on small scale process can be done through energy consumption. However, the tool is not adapted for detailed analysis (in this case better use LCA tools). No possibility to include cold chain.
Industrial Process	no	
Transport	no	Can somehow be included with fuel consumption, but can't be separate from fuel used by machinery then. No truck/plane km approach etc…

Comments: Time dynamic well accounted. The user can choose between immediate/ linear/ exponential adoption of practices.

- Results

Form	Table and graph (lay out not optimized) on excel sheet
Comparison of several scenarios	Yes. Actual situation/ baseline/with project
Main GHG results	GHG/project, GHG/period, GHG/ha. GHG/ha/yr Detailed for each activity and summary. Detail between the different GHG.
Uncertainties	Rough level of uncertainty provided for each activity, depending on the uncertainty for the coefficients
Complementary results (economic aspects; carbon credits, energy, leakage, land productivity, etc.)	No, there is no GHG/ product. No economic parameters included. The possible effect on yield of changes in management practices are not appearing, neither leakage or indirect LUC.

- Past studies using this tool

Number of real study cases (excluding training courses) :	☐<10 <10<X<50 ☒ >50 ☐
Most relevant study cases carried out with the tool? Please indicate if report is available	Several World Bank project: Irrigation and watershed management in Madagascar, 2010; Improvement of rural livelihood for smallholders in Brazil, 2009; cashew nut in Burkina Faso 2009; REDD Congo 2009. Training of project managers in many countries.
Published articles in scientific journals?	Bernoux et al. 2010. Ex-ante greenhouse gas balance of agriculture and forestry development programs Cerri et al. 2010 (EX-ACT used in some calculation/approach) 2 papers submitted
Other relevant publication in non-scientific journals (technical/methodological)	YES see website

- Actual and future development of the tool, evolution expected?

Version 4 will be released in 2012 and will include estimates of yield for main crops and water module

2.13. FarmGAS Scenario Tool

- Contact information

Institution in charge of technical development :	Australian Farm Institute
Name of the person	Renelle Jeffrey
e-mail	jeffreyr@farminstitute.org.au
Web site of the tool	http://farmgas.farminstitute.org.au/default.aspx

- Creation Context and software

First version, creation year	2009
Last update/ Current version	March 2012
Availability	Online, free after registration
Computer support	Internet browsers : IE, Mozilla
User guide/technical guide	A user guide for the March 2012 version is underdevelopment. User guide for the original version is only the list of input data required. Explanations on methodologies are found in the "final report and case studies".
Complexity of the interface	Mediumly user friendly. Detailed management data required. Many default values provided with possibilities to enter user-specific values.

- Tool main characteristics

Geographical area coverage	Australia
Working scale	Farm
User target	Advisors, extension officers, research scientists, research agronomists & Farmers
Main goal for the tool	Evaluate GHG emissions at the farm level in line with the Australian National GHG Inventory methodology (agriculture), evaluate opportunity and cost of some mitigation options (livestock :enteric emission + waste). Prepare farmers in case agriculture becomes subjected to carbon credits after 2015.

- Production analyzed (tick if included)

Temperate crops	Tropical/Equatorial crops	Rice cultivation	Grassland	DairyCattle	Other livestock
x	no	no	x	no	x

Field trees, hedges, agroforestry	Perennial production (orchards, vineyards)	Horticultural products; Greenhouses	Forest
x	x	partially	no

Comments: Dairying, cotton or rice production not included. Beef meat production included. A tool called DGAS is available for dairy systems in Australia. Farmgas can assess horticultural products, but following NGGI recommendation does not include infrastructure and energy, which can be major GHG sources in greenhouse productions.

- Input data

Detail level	Detailed technical and economic data. Some are compulsory, other are optional
Data availability and required user skills	No major problem for data availability at farm level.
Data consistency checking	Some overall consistency checking (full area must corresponds to crop + pasture + forest)

- Methodology

a) Emission factors

Main methodological references	NGGI (agriculture) methodology (2006).
Possibility for user to define local emission factors	Emission Factors can be modified and could be changed to reflect local emission factors.

b) Soil-Climate description

Soil-Climate	Yes/No	Comments
Soil		
Soil type (define classification used)	no	Soil type and climate data is not necessary for the model as production factors e.g. yield can be entered which are a reflection of soil & climate conditions. The model not driven by physiology factors.
Texture	no	
Other criteria (ex: % MO)	no	
Climate		
Classification	no	
Measures	no	
GIS approach with underlying soil/climate database	No/yes	Soil type and climate are not taken into account in the calculator. Regional average for default technico-economic values are provided.

c) Perimeter

Perimeter	Yes/No	Comments
Infrastructure	No	FarmGAS only used the NGGI 2006 methodology for Agriculture. Infrastructure and energy fall under different NGGIs and are not included in FarmGAS
Energy (electricity + gasoil)	no	Not accounted for GHG, only accounted for economic purposes
Land N2O emissions	x	In relation to pastures & crops
Ruminant CH4 Emissions	x	
Dejection (waste – manure & urine) emission	x	
Emission from N-fixing plants	x	User define choice
Off farm emissions (fertilizers, imported food)	no	Emission off farm (fertilizer production, imported fodder and concentrates etc…) not included
Emission from burning crop residues	x	Include savannah burning emissions as well
Emission from rice cultivation	no	
Land use change ,soil/ above/below ground biomass	no	Soil C emission and storage not accounted for under Australia's current Kyoto Protocol Inventory. Indeed, risk of drought and fire might induce major soil C release in Australia.
Carbonsoil changes except LUC (residues, tillage effect)	no	NO2 and CH4 from crop residues accounted, but no change of carbon soil.
Forest storage	x	Only above ground biomass C storage accounted
Peat land	no	
On farm process (drying, refrigeration etc.)	no	
Industrial Process	no	
Transport	no	

- Results

Form	Detailed tables
Comparison of several scenarios	Yes Default results correspond to using system default values Revised results correspond to using user defined valued (changing production & emission factors) A revised result could reflect an abatement strategy (e.g. baling residues) or testing a research outcome, for example.
Main GHG results	GHG/yr farm, GHG/ha, GHG/DSE: Dry sheep equivalent; GHG/kg; GHG/head. No uncertainties
Uncertainties	not shown. Tool refers to Australian Governments National Inventory where statistics related to underlying research are reported.
Complementary results (economic aspects; carbon credits, energy, leakage, land productivity, etc.)	cost of mitigation options (only livestock); carbon price, economic description of farm

- Past studies using this tool

Number of real study cases (excluding training courses) :	☐<10 <10<X<50 ☐ >50 ☐ (unknown but between the first and second versions, >50 case studies would have been completed)
Most relevant study cases carried out with the tool? Please indicate if report is available	Most case studies are external to this organisation
Published articles in scientific journals?	Unknown
Other relevant publication in non-scientific journals (technical/methodological)	Case study report available.

- Actual and future development of the tool, evolution expected?
    - Further development to decrease user complexity
    - Development to include a reporting result as close to the National NGGI as possible (i.e. the below changes will be incorporated back in)
    - Additional reporting options
    -
- Extra comments or remarks about the tool or the questionnaire
    - The fundamental basis for the tool is the National Greenhouse Gas Inventory Methodology (NGGI) which is an accounting standard.
    - FarmGAS has taken the National Inventory and made it more relevant at the farm level.
    - The options that have been changed from the national Inventory are:
        - Burning of residues is now optional not automatically included
        - Emissions from Legume pasture are optional and not automatically included
        - FracWET has been changed to a Yes (1) or No (0) answer i.e. the N is available for leaching or not, rather than based on statistical values.
    - The default calculation reflects this change.

2.14. Farming Enterprise Greenhouse Gas Emissions Calculator

- Contact information

Institution in charge of technical development :	Queensland university, Institute for Sustainable Resources QUT ist
Name of the person	Peter Grace
e-mail	isr@qut.edu.au
Web site of the tool	http://www.isr.qut.edu.au/greenhouse/index.jsp

- Creation Context and software

First version, creation year	2009
Last update/ Current version	2009
Availability	Free online
Computer support	Internet browsers
User guide/technical guide	Some help information is included, glossary etc
Complexity of the interface	User friendly

- Tool main characteristics

Geographical area coverage	Queensland, Australia
Working scale	Farm
User target	farmers
Main goal for the tool	Estimate of farm-based emissions in Queensland. FarmGas is entirely EF's (emission factor). The ISR calculator is a combination of a simple (peer-reviewed) simulation model for soil C i.e. SOCRATES, and EF's. The biggest deficiency in modeling in Australia has been lack of a soil C model.

- Production analyzed (tick if included)

Temperate crops	Tropical/Equatorial crops	Rice cultivation	Grassland	DairyCattles	Other livestock
x	X	no	x	x	Limited: only cattle and sheep.

Field trees, hedges, agroforestry	Perennial production (orchards, vineyards)	Horticulural products; Greenhouses	Forest
no	no	no	no

Comments: For crops only fertilizing and irrigation practices accounted.

- Input data

Detail level	Very basic data: number of heads, fertilization/ha
Data availability and required user skills	No special agronomic skills needed
Data consistency checking	no

- Methodology

a) Emission factors

Main methodological references	Soil : SOCRATES model Animals : IPCC; Fuel, nitrogen fertiliser and ancillary N2O emissions :Australian National Greenhouse Gas Inventory
Possibility for user to define local emission factors	Tiers 1 approach. No possibilities for changing EF

b) Soil-Climate description

Soil-Climate	Yes/No	Comments
Soil		
Soil type (define classification used)	no	
Texture	no	Yes, embedded as GIS layer
Other criteria (ex: % MO)	no	
Climate		
Classification	no	Annual means, embedded as GIS
Measures	no	
GIS approach with underlying soil/climate database	yes	GIS database with soil and climate characteristics used for input in SOCRATES model.

c) Perimeter

Perimeter	Yes/No	Comments
Infrastructure	No	
Energy (electricity + gasoil)	X	No electricity – as this is minimal
Land N2O emissions	X	
Ruminant CH4 Emissions	X	Included in IPCC EF
Dejection emission	X	Included in IPCC EF
Emission from N-fixing plants	No	
Off farm emissions (manufacturing of fertilizers, imported animal food)	?	
Emission from burning crop residues	No	Assume all kept
Emission from rice cultivation	No	Rice is not in this region
Land use change ,soil/ above/below ground biomass	No	
Carbon soil changes except LUC (residues, tillage effect)	X	Emissions are estimated for conventional tillage systems only. However some C soil emissions included through SOCRATES model. In irrigated situation, additional nitrogen will potentially change SOC due to the fact change in biomass C.
Peat land	no	
On farm process (drying, refrigeration etc.)	no	
Industrial Process	no	
Transport	no	

- Results

Form	Very simple: one table, one pie chart
Comparison of several scenarios	No
Main GHG results	eCO2 emission per year, separation between the different GHG
Uncertainties	Mentioned in introductory text, no value suggested
Complementary results (economic aspects; carbon credits, energy, leakage, land productivity, etc.)	No

- Past studies using this tool

Number of real study cases (excluding training courses) :	☐<10 <10<X<50 ☐ >50 ☐
Most relevant study cases carried out with the tool? Please indicate if report is available	Tested by cotton industry
Published articles in scientific journals?	No
Other relevant publication in non-scientific journals (technical/methodological)	No

- Actual and future development of the tool, evolution expected?

It will be modified in future after EF's change, some minor changes to soil C calc.

- Extra comments or remarks about the tool or the questionnaire

The tools uses a well tested simple soil C model of global significance. SOCRATES is also the soil C model under the Michigan GHG calculator and the US croplands calculator http://surf.kbs.msu.edu/ghgcalculator.

2.15. FullCAM

- Contact information

Institution in charge of technical development :	Department of Climate Change and Energy Efficiency, Australian Government
Name of the person	The Assistant Secretary, National Inventory Systems and International Reporting
e-mail	nationalgreenhouseaccounts@climatechange.gov.au
Web site of the tool	www.climatechange.gov.au/climate-change/emissions.aspx

- Creation Context and software

First version, creation year	FullCAM was publically released in 2005 but has been under development since 2000
Last update/ Current version	The most recent public version of FullCAM is version 3.40 which was released in 2012
Availability	Available for free via download from the Department of Climate Change and Energy Efficiency website. Available from www.climatechange.gov.au/climate-change/emissions.aspx
Computer support	Downloadable web enabled executable. Windows XP service pack 2 onwards. Does not operate on a Macintosh. Requires an internet connection
User guide/technical guide	Quick Start guide for Agriculture and Forests plots available from the menu. Quickstart guide for estate simulations available also from the menu. Contact details for more technical advice is also provided at the end of these documents
Complexity of the interface	Detailed user interface arranged in to a series of 'tabs' which provide users with the flexibility to modify model parameters and settings. Full parameter sets are available for a series of default management systems in Australia. User should spend time reading through the user guide to understand how the model operates and which steps are necessary to run a simulation. A simplified version of FullCAM exists, the Reforestation Modelling Tool (RMT), which is also available from the Department website and is designed to be more user-friendly.

- Tool main characteristics

Geographical area coverage	Australia
Working scale	FullCAM can be operated on the basis of a 'plot' which may represent a user defined area. Also available is an 'estate' functionality, which allows for a series of 'plots' to be simulated and combined into an estate. FullCAM can also be operated as a 'spatial' simulation. When operated within the National Inventory System, FullCAM simulates at a 25m pixel scale
User target	FullCAM is developed for the purpose of calculating carbon stock change in the land sector as part of Australia's national Greenhouse Accounts. The audience for the public version of FullCAM is experts, the scientific community, industry and policy makers. The suite of more user friendly tools, such as RMT, is designed for non-expert users.
Main goal for the tool	FullCAM is the model used to estimate carbon stock change (i.e. CO_2 emissions) in Land Use, Land Use Change and Forestry as part of Australia's commitments under the UNFCCC. One of the main aims of the system design was to develop a tool which would enable consistent estimation of carbon stock changes from the project to the national scale. FullCAM enables Australia to track progress against Australia's target under the Kyoto Protocol Article 3.3 Activities as well as inform policy makers and the public.

- Production analyzed (tick if included)

Temperate crops	Tropical/Equatorial crops	Rice cultivation	Grassland	Dairy Cattles	Other livestock
Yes	Yes	No	Yes	no	no

Field trees, hedges, agroforestry	Perennial production (orchards, vineyards)	Horticultural products; Greenhouses	Forest
No	No	No	Yes

Comments:

Please note that not all tropical production is available in FullCAM, namely; banana, mango, or coffee, however sugar cane is currently available.

Functionality exists to consider grazing effects on carbon stocks in grasslands and croplands, despite livestock type not specifically being identified as dairy cattle or other livestock grazing.

Development is underway to include the 22 field crops which account for ≥ 99% of field crop sowings for Australia, (Unkovich, M., Baldock, J., and Marvanek, S. (2009). Which crops should be included in a carbon accounting system for Australian Agriculture? Crop and Pasture Science. 60(7):617-626.)

An improvement program is underway to evaluate the technical feasibility of inclusion of perennial woody horticultural crops (orchards, vineyards) and other non-forest woody vegetation.

- Input data

Detail level	Users can access the input database used within the National Inventory System through the data builder functionality available in FullCAM. This includes climate, sites, species and management data. While the existing databases which support FullCAM may not represent all species and situations, the software provides the user with flexibility in entering growth, species and other ecosystem parameters which influence carbon stocks.
Data availability and required user skills	See above comment
Data consistency checking	Details of the calibration, validation, verification, quality assurance, quality control, sensitivity and uncertainty analyses, and transparency and review applied to the calculation of Australia's greenhouse gas emissions from Land-Use, Land-Use Change and Forestry (LULUCF) are contained within the National Inventory Report 2010 (Volume 2). http://www.climatechange.gov.au/publications/greenhouse-acctg/~/media/publications/greenhouse-acctg/NationalInventoryReport-2010-Vol-2.pdf

- Methodology

a) Emission factors

Main methodological references	Technical Report Series (http://pandora.nla.gov.au/pan/23322/20050818-0000/www.greenhouse.gov.au/ncas/publications/index.html) National Inventory Report 2010 (Volume 2.) (http://www.climatechange.gov.au/publications/greenhouse-acctg/national-inventory-report-2010.aspx)
Possibility for user to define local emission factors	When operating FullCAM, users can: - Use default data available through the Data Builder; - Modify default data; and - Parameterise the model with their own data.

b) Soil-Climate description - All models are linked to spatial dataset for climate, soil, management practices etc.

Soil parameters:

- Clay percentage
- Potential available water holding capacity
- Topsoil moisture deficit
- Soil carbon fractions

Climate parameters:

- Open pan evaporation
- Average air temperature
- Average rainfall
- Forest Productivity Index

- Perimeter – FullCAM is used to model emissions associated with Land Use, Land Use Change and Forestry (LULUCF)

Perimeter	Yes/No	Comments
Infrastructure	No	Not LULUCF
Energy (electricity + gasoil)	No	Not LULUCF
Land N2O emissions	No	
Ruminant CH4 Emissions	No	Not LULUCF
Dejection emission	No	Not LULUCF
Emission from N-fixing plants	No	FullCAM does not currently model the nitrogen cycle
Off farm emissions (fertilizers, imported food)	No	Not LULUCF
Emission from burning crop residues	Yes	Only CO2
Emission from rice cultivation	No	Not LULUCF
Land use change ,soil/ above/below ground biomass	Yes	
Carbon soil changes except LUC (residues, tillage effect)	Yes	
Peat land	No	
On farm process (drying, refrigeration etc.)	No	Not LULUCF
Industrial Process	No	Not LULUCF
Transport	No	Not LULUCF

- Results

Form	Graph and table
Comparison of several scenarios	The user can run multiple simulations at the same time and have both results windows open for quick comparison. The user can also group projects together e.g. by using the estate function to group multiple plots
Main GHG results	Carbon stock change in: - trees; - crops; - debris; and - soil
Uncertainties	Uncertainty estimates reported in the National Inventory Report 2010 (Volume 2.) (http://www.climatechange.gov.au/publications/greenhouse-acctg/national-inventory-report-2010.aspx)
Complementary results (economic aspects; carbon credits, energy, leakage, land productivity, etc.)	No

- Past studies using this tool

Number of real study cases (excluding training courses) :	☐<10 <10<X<50 ☑ >50 ☐
Most relevant study cases carried out with the tool? Please indicate if report is available	Christie, K., Rawnsley, R., and Donaghy, D. (2008). 'Whole Farm Systems Analysis of Greenhouse Gas Emission Abatement Strategies for Dairy Farms. UT12945.' Final Report to Dairy Australia on the investigation and analysis into greenhouse gas abatement strategies, modelling and decision tools for the Australian dairy industry. Tasmanian Institute of Agricultural Research, University of Tasmania. Burnie, Tasmania. King, K.J., de Ligt, R.M., & Cary, G.J. (2011) 'Fire and carbon dynamics under climate change in south-eastern Australia: insights from FullCAM and FIRESCAPE modelling'. International Journal of Wildland Fire, Volume 20, issue 4, pp. 563-577.

	Law, R., and Garnett, S.T. (2009). 'Understanding carbon in the Northern Territory: an analysis of future land use scenarios using the national carbon accounting tool.' Report to the Tropical Savanna Management Cooperative Research Centre. Charles Darwin University. Darwin. Norris, J., Arnold S., & Fairman, T. (2010). 'An indicative estimate of carbon stocks on Victoria's publicly managed land using the FullCAM carbon accounting model.' Australian Forestry, Volume 73., No. 4., pp 209-219. Paul, K.I., & Polglase, P.J. (2004) 'Prediction of decomposition of litter under eucalypts and pines using the FullCAM model'. Forest Ecology and Management. Volume 191, issues 1-3, pp. 73-92. Paul, K.I., Polglase, P.J, Snowdon, P., Theiveyanathan, T., Raison, J., Grove, T. & Rance, S (2006) 'Calibration and uncertainty analysis of a carbon accounting model to stem wood density and partitioning of biomass for *Eucalyptus globulus* and *Pinus radiata'*. New Forests, Volume 31, issue 3, pp. 513-533. Richards, G.P., & Brack, C. (2004) 'A continental biomass stock and stock change estimation approach for Australia', Australian Forestry, Volume 67, No, 4, pp. 284-288. Waterworth, R., Richards, G.P., Brack, C.L., & Evans, D.M.W (2007). 'A generalised hybrid process-empirical model for predicting plantation forest growth.' Forest Ecology and Management, Volume 238, pp. 231-243. Waterworth, R., & Richards, G.P (2008). 'Implementing Australian forest management practices into a full carbon accounting model.' Forest Ecology and Management, Volume 255, pp. 2434-2443.
Published articles in scientific journals?	Yes
Other relevant publication in *non-scientific* journals/other (technical/methodological)	Aschroft, C. (2007). Addressing Limitations to the Development of a Land Suitability Tool. A discussion paper outlining current technology and future collaboration required for the development of a land suitability tool to aid adaption to climate change in Australia. Australian Greenhouse Office. Canberra. Department of Climate Change and Energy Efficiency (2012). National Inventory Report 2010. Australian Government, Canberra.

- Actual and future development of the tool, evolution expected?
  The Australian Government is making significant ongoing investment in FullCAM and associated systems. These investments are being made to maintain the quality control of FullCAM operations, to ensure the consistency of input data and to enhance the transparency of output data. For example, a FullCAM Outputs Analysis System is under development to allow for the storage of FullCAM output data and to facilitate database queries of these data.

  A suite of more user friendly tools (Reforestation Modelling Tool and Soil Carbon Modelling Tool) are in production and available to download from the Department of Climate Change and Energy Efficiency web site for free.

2.16. HOLOS

- Contact information

Institution in charge of technical development :	Agriculture and Agri-food Canada
Name of the person	José M. Barbieri
E-mail	Holos@agr.gc.ca Jose.Barbieri@agr.gc.ca
Web site of the tool	http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1226606460726&lang=eng

- Creation Context and software

First version, creation year	2006
Last update/ Current version	2008
Availability	Can be downloaded from website for free
Computer support	Holos Program
User guide/technical guide	Methodology & algorithms manual guide on demand
Complexity of the interface	Very user friendly, English/French options, user help information available for each input.

- Tool main characteristics

Geographical area coverage	Canada
Working scale	Farm
User target	Farmers/ Farmers advisers
Main goal for the tool	Exploratory tool, rather than as an accounting or inventory tool. Try and evaluate efficiency of project for GHG abatement.

- Production analyzed (tick if included)

Temperate crops	Tropical/Equatorial crops	Rice cultivation	Grassland	Dairy Cattle	Other livestock
x	no	no	x	x	x

Field trees, hedges, agroforestry	Perennial production (orchads, vineyards)	Horticulural products; Greenhouses	Forest
x	x	no	no

- Input data

Detail level	Quite detailed data for crop and animal production. Mainly qualitative rather than quantitative data (ex: yes/no ; forage good/average/bad)
Data availability and required user skills	Data available at farm level. Tool users need some knowledge of Canadian situation (good forage for Canada ≠ good forage Maroc). Needs at least basic agronomic skills.
Data consistency checking	Yes, automatic control of some input data by extreme values (ex: enter 1000 fo N input, replaced automatically by 250) or drop down menu.

- Methodology
  a) Emission factors

Main methodological references	IPCC 2006 adapted to Canada, Tiers 2 methods.
Possibility for user to define local emission factors	No

b) Soil-Climate description

Soil-Climate	Yes/No	Comments
<u>Soil</u>		
Soil type (define classification used)	x	soil type (broad functional categories utilizing CANSIS data)
Texture	x	texture (clay, loam, sand)
Other criteria (ex: % MO)	no	
<u>Climate</u>		
Classification	no	
Measures	no	
GIS approach with underlying soil/climate database	yes	The choice of eco-district in GIS module sets up climate parameters for the farm

c) Perimeter

Perimeter	Yes/No	Comments
Infrastructure	no	
Energy (electricity, gasoil)	x	
Land N2O emissions	x	
Ruminant CH4 Emissions	x	
Dejection emission	x	
Emission from N-fixing plants	no	
Off farm emissions (fertilizers, imported food)	x	
Land use change	x	No deforestation/reforestation but other LUC accounted (ex grassland➔cropland). HOLOS does not account for above ground biomass C stocking for trees, LUC only considers soil carbon change.
Carbon soil changes except LUC (residues, tillage effect)	x	Based on CENTURY model for mineral soils. For organic soils, CO2 emission following GIEC 2006, no CH4 emissions.
Peat land	x	
On farm process (drying, refrigeration etc.)	x	
Industrial Process	no	
Transport	no	

1.Methodological guide mention that cultivated peat lands have a net CH4 soil exchange null due to balance between aerobic/non aerobic soil conditions. Usually drainage of wetand induce reduction of CH4 emissions but important loss of soil carbon (CO2 emisssions) and increase of N20 emissions. So far CH4 emissions from wetland not included by IPCC because they are from natural sources. If drainage or rewetting of peatland occurs, then should be accounted carefully.

2. Suppression of fallows on the farm is suggested by Holos as a way to increase carbon storage in soils. However, if fallows are converted to annual crop then soil carbon tends to decrease. Special focus on this point is needed using Holos.

- Results

Form	Tables and chart for main items. Automatic report.
Comparison of several scenarios	Comparison of baseline/project, up to 4 different farms. Testing of change in management practice and comparison with baseline scenario.
Main GHG results	GHG/farm; GHG emission detailed for following items: tree planting, soils, animals, energy.
Uncertainties	Estimated for each emission
Complementary results (economic aspects; carbon credits, energy, leakage, land productivity, etc.)	Yields are part of input data but not related "directly" to GHG emissions (no "eqCO2/kg cereals"). Large choice of mitigation option to test but no impact on production (ex .reduction 25% N fertilizer), some impact described in text box. Holos works considering constant production level. No economic approach.

- Past studies using this tool

Number of real study cases (excluding training courses) :	☐<10 <10<X<50 ☐ >50 ☐
Most relevant study cases carried out with the tool? Please indicate if report is available	
Published articles in scientific journals?	
Other relevant publication in non-scientific journals (technical/methodological)	

- Actual and future development of the tool, evolution expected?

We are developing a completely new tool, Holos R and R stand for Research which will give more opportunity to change and adapt to your specific location to many of the equations. It will be release by the end of 2012 if funds are available.

Also, it will work in Windows 7, 32 and 64 bit.

2.17. Illinoi Farm Sustainability Calculator IFSC

- Contact information

Institution in charge of technical development :	University of Illinois
Name of the person	Peter McAvoy, Timothy Marten, Aaron Petri, Dr. David Kovacic
e-mail	Peter McAvoy: pete@octagonal.org Timothy Marten temarten@gmail.com Aaron Petri petri@illinois.edu
Web site of the tool	http://web.extension.illinois.edu/dsi/projectdetail.cfm?NodeID=4035&type=Research Actually: http://sourceforge.net/projects/ifsc/

- Creation Context and software

First version, creation year	December 2008
Last update/ Current version	May 2010
Availability	Free download from website
Computer support	Microsoft Excel.
User guide/technical guide	Guide is embedded in the spreadsheet. The user can mouse over the red question mark in the top left of every page and see an explanation of the page. There is also an introduction in the start page.
Complexity of the interface	Enormous amount of excel sheets, however color code and design quite simple. Beware, unit in US system (miles, pounds etc.).

- Tool main characteristics

Geographical area coverage	USA, Illinois Region
Working scale	Farm
User target	Farmer, consultant
Main goal for the tool	Tool to assess farm sustainability defined as follow : "A sustainable farm should: 1. Produce all energy needed for operations and embodied energy of inputs on site 2. Sequester more carbon than it produces 3. Produce all feeds needed for animal production 4. Import no chemical nutrients 5. Reduce nitrate runoff by 75% 6. Be economically viable"

- Production analyzed (tick if included)

Temperate crops	Tropical/Equatorial crops	Rice cultivation	Grassland	Dairy Cattles	Other livestock
x	no	no	x	x	x

Field trees, hedges, agroforestry	Perennial production (orchards, vineyards)	Horticultural products; Greenhouses	Forest
no	no	x	no

Comments: Includes algae and renewable energy production. Hortical products included but only for open field production, not for greenhouse production.

- Input data

Detail level	very detailed management data required, at field level; very detailed for animal, especially alimentation (monthly time span).Some default data provided, some references provided for helping user (soil type, fertilizer content etc…)
Data availability and required user skills	Good agronomic skill required
Data consistency checking	Most values provided with range

- Methodology

a) Emission factors

Main methodological references	For soil emissions use Comet-VR. Extended list of reference provided. Not always typical IPCC factor (ex: N2O from N application: 1,25%); Soil C changes throught VR comet, for the rest emissions from different sources. Tiers 2 approach
Possibility for user to define local emission factors	No indication or guide for user to change emission factor. However, as it is excel sheet there is possibility to find the EF used and modify it but it requires a difficult search amongst the 100 sheets.

b) Soil-Climate description

Soil-Climate	Yes/No	Comments
Soil		
Soil type (define classification used)	x	NRC classification
Texture	x	Included in the classification, no measurement needed
Other criteria (ex: % MO)	x	Slope, erosion, PH, P and K
Climate		
Classification	no	No climatic data seems to be used in the model
Measures	no	
GIS approach with underlying soil/climate database	no	

c) Perimeter

Perimeter	Yes/No	Comments
Infrastructure	no	
Energy (electricity + gasoil)	x	
Land N2O emissions	x	N_2O=1 kg per ha + 1.25% of all chemical N
Ruminant CH4 Emissions	x	
Dejection emission	x	
Emission from N-fixing plants	no	
Off farm emissions (fertilizers, imported food)	Only fertilizers	Emissions embodied in imported fertilizers are accounted for. See sheet "Embodied crop energy." Energy embodied in imported food and machinery not included (lack of data).
Emission from burning crop residues	no	No
Emission from rice cultivation	no	No grows rice in Illinois
Land use change ,soil/ above/below ground biomass	Partially	Only changes between pasture and annual crop, value provided by COMET-VR model
Carbon soil changes except LUC (residues, tillage effect)	x	Cf COMET-VR
Peat land	x	
On farm process (drying, refrigeration etc.)	x	Ventilation, lightning etc. Energy for standard post-harvest farming practices accounted
Industrial Process	no	
Transport	x	Detailed: to crop haul, to market place, to slaughter house etc.

Results

Form	Only tables
Comparison of several scenarios	Tool not designed for this, need saving multiple files.
Main GHG results	Lbs CO2 eq/year
Uncertainties	Not provided
Complementary results (economic aspects; carbon credits, energy, leakage, land productivity, etc.)	Energy balance, feed balance, nitrate runoff, manure balance, people fed (based on FAO standard : far from American average diet)

- Past studies using this tool

Number of real study cases (excluding training courses) :	☒<10 <10<X<50 ☐ >50 ☐
Most relevant study cases carried out with the tool? Please indicate if report is available	None
Published articles in scientific journals?	No
Other relevant publication in non-scientific journals (technical/methodological)	No

- Actual and future development of the tool, evolution expected?

The project was developed by master students and one professor. It is ended now and currently there is no more work going on.

2.18. USAID AFOLU Carbon Calculator

- Contact information

Institution in charge of technical development :	Winrock International
Name of the person in charge	Felipe Casarim and Nancy Harris
e-mail	carbonservices@winrock.org
Web site of the tool	http://winrock.stage.datarg.net/CarbonReporting/Welcome/

- Creation Context and software

First version, creation year	2007
Last update/ Current version	2011
Availability	Free after registration.
Computer support	carbonservices@winrock.org
User guide/technical guide	User guide and methodological guides except for crop and grazing land management
Complexity of the interface	user friendly

- Tool main characteristics

Geographical area coverage	119 “developing” countries, covering all countries where USAID is present with land based projects.
Working scale	Landscape or project
User target	Project managers, forestry oriented
Main goal for the tool	Translate LULUC impacts into reportable, quantifiable measures of carbon benefits for developing countries. Help project manager/policy makers to account for carbon sequestration in project planning. Comparison baseline/after project.

- Production analyzed (tick if included)

Temperate crops	Tropical/Equatorial crops	Rice cultivation	Grassland	DairyCattles	Other livestock
X (general category)	X	x	x	x	X except poultry.

Field trees, hedges, agroforestry	Perennial production (orchards, vineyards)	Horticulural products; Greenhouses	Forest
X	X (agroforestry)	no	x

Comments:

Tool is designed to accommodate all levels of formal education from users. All calculators in the Tool function on two levels: Level A and Level B, allowing users to utilize generic default data, or enter Project specific data.

- Input data

Detail level	Simple, mostly qualitative data (low,medium hig fertilisation; management/no management et…)
Data availability and required user skills	Data easily available and clearly displayed. No special agronomic/forestry skills required.
Data consistency checking	no

- Methodology

a) Emission factors

Main methodological references	USAID AFOLU Carbon Tool is designed in tiered approach. Defaut database is constructed with IPCC Tier 1 data or better when available (i.e. World carbon map from Saatchi et al., 2011). Only Co2 emissions from above- and below-ground forest biomass carbon, peat and soil carbon are considered in Tool.
Possibility for user to define local emission factors	All parameters can be modified based on project specific information if know (Level B).

b) Soil-Climate description

Soil-Climate	Yes/No	Comments
Soil		
Soil type (define classification used)	no	
Texture	no	
Other criteria (ex: % MO)	x	Soil carbon content, soil bulk density, only for forest protection, cropland and grazing land management activities.
Climate		
Classification	x	Growth curves under Forest Plantation/Restoration as well as Agroforestry calculators vary according to climatic regions.
Measures	no	
GIS approach with underlying soil/climate database	x	Soil and Climate layers are underlying dataset in the USAID AFOLU Carbon Tool.

c) Perimeter

Perimeter	Yes/No	Comments
Infrastructure	no	
Energy (electricity + gasoil)	no	
Land N2O emissions	no	
Ruminant CH4 Emissions	no	
Dejection emission	no	
Emission from N-fixing plants	no	
Off farm emissions (fertilizers, imported food)	x	Improvements in cropland management/fertilization input result in CO2 emission reduction
Emission from burning crop residues	x	
Emission from rice cultivation	x	Under cropland mangament calculator
Land use change ,soil/ above/below ground biomass	x	Above/below ground biomass accounted. No soil C stocking for plantation.
Carbon soil changes except LUC (residues, tillage effect)	x	
Peat land	x	
On farm process (drying, refrigeration etc.)	no	
Industrial Process	no	
Transport	no	

Comments: Calculators are focused in activities supported by the USAID aiming at providing emission reduction metrics.

- Results

Form	tables
Comparison of several scenarios	Different project activities, different geographical areas, various timelines.
Main GHG results	CO2 equivalent/year
Uncertainties	no
Complementary results (economic aspects; carbon credits, energy, leakage, land productivity, etc.)	None

- Past studies using this tool

Number of real study cases	☐<10 <10<X<50 ☐ >50 ☐
Other relevant publication in non-scientific journals (technical/methodological)	Harris, N. L. and F. M. Casarim. 2010. User Manual for the USAID Forest Carbon Calculator. Submitted by Winrock International under USAID Cooperative Agreement No. EEM-A-00-06-00024-00. Harris, NL, TRH Pearson, FM Casarim and S. Brown. 2011. USAID AFOLU Carbon Tool: Data and Equations for the Forest Management Calculator Submitted by Winrock International under USAID Cooperative Agreement No. EEM-A-00-06-00024-00. Harris, NL, TRH Pearson, and F Casarim. 2011. USAID Forest Carbon Calculator: Data and Equations for the Afforestation/Reforestation Tool. Submitted by Winrock International under USAID Cooperative Agreement No. EEM-A-00-06-00024-00. Harris, N. L. and F. M. Casarim. 2011. USAID AFOLU Carbon Tool: Data and Equations for the Forest Protection Calculator. Submitted by Winrock International under USAID Cooperative Agreement No. EEM-A-00-06-00024-00. Casarim, FM, NL Harris, and S. Brown. 2010. USAIDForest Carbon Calculator: Data and Equations for theAgroforestry Tool. Submitted by Winrock Internationalunder USAID Cooperative Agreement No. EEM-A-00-06-00024-00.