

Parallel session L2.1: Developing and evaluating climate-smart practices

**Evaluating agricultural mitigation and
scaling up climate-smart practices
using the FAO **EX-Ante Carbon-balance Tool****



Martial Bernoux



Institut de recherche
pour le développement

Louis Bockel
Uwe Grewer



Food and Agriculture Organization
of the United Nations

Jean-Luc François
Nicolas Rossin



AGENCE FRANÇAISE
DE DÉVELOPPEMENT

Ademola Braimoh



WORLD BANK GROUP



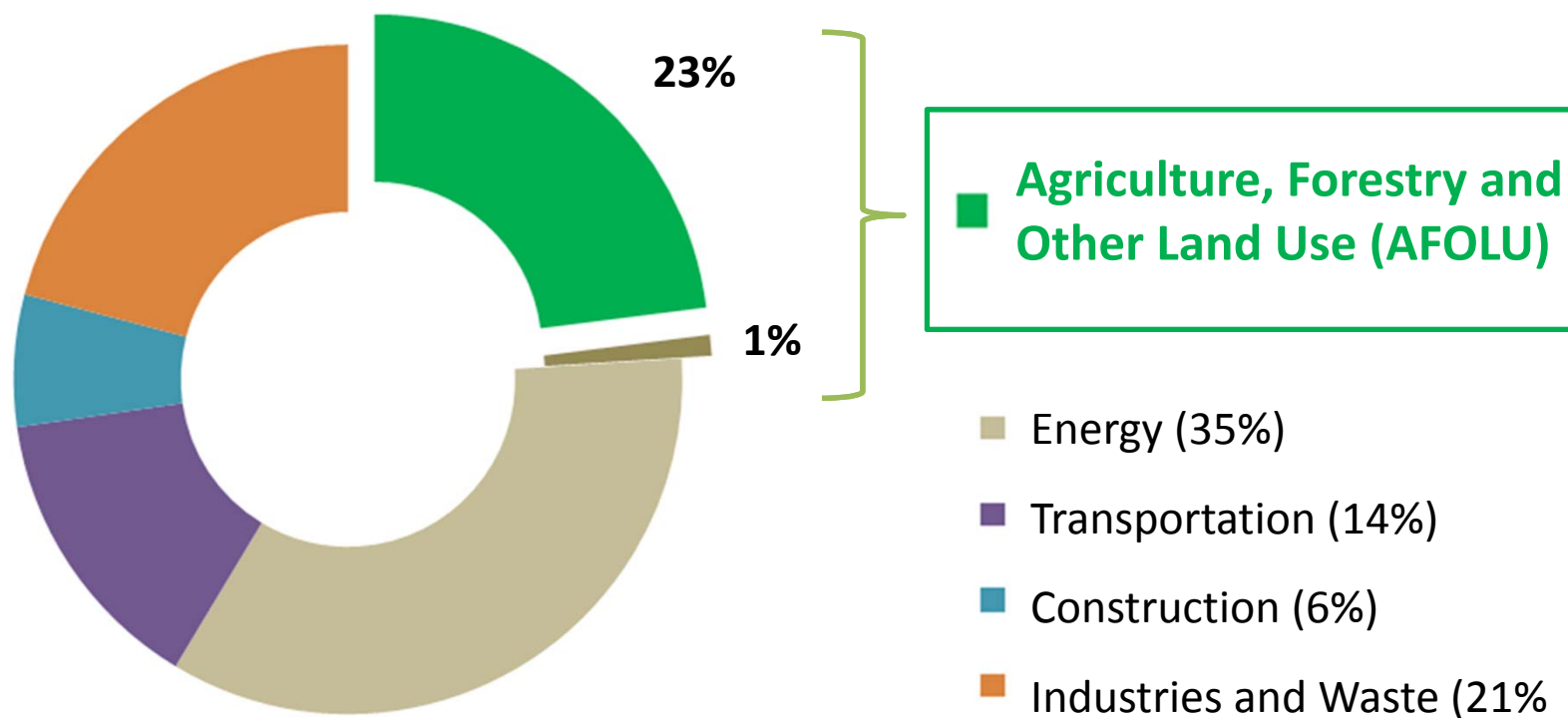
Evaluating agricultural mitigation and scaling up climate-smart practices using the FAO EX-Ante Carbon-balance Tool



Background

Share of GHG

Total emissions in 2010 (49,5 Billions tons of CO₂-eq)



Adapted from 5th IPCC Assessment Report – WG3 – Chapter 1 (2014)



Evaluating agricultural mitigation and scaling up climate-smart practices using the FAO EX-Ante Carbon-balance Tool



Background

Share of GHG

AFOLU concerned by all GHG

Total emissions in 2010 (49,5 Billions tons of CO₂-eq)

**Annual average for
2000-2010**

(Billions tons of CO₂-eq)

Agriculture : 5,0 to 5,8

Land-use change: 4,3
to 5,5

23%



AFOLU/LULUCF

For last década:

CO₂: at least 10% of anthropogenic CO₂ emissions

CH₄: ~ 50% of anthropogenic CH₄ emissions

N₂O: ~ 60% of anthropogenic N₂O emissions

Adapted from 5th IPCC Assessment Report – WG3 – Chapter 1 (2014) and WG1- Chapter 6

Background

AFOLU is also mitigation



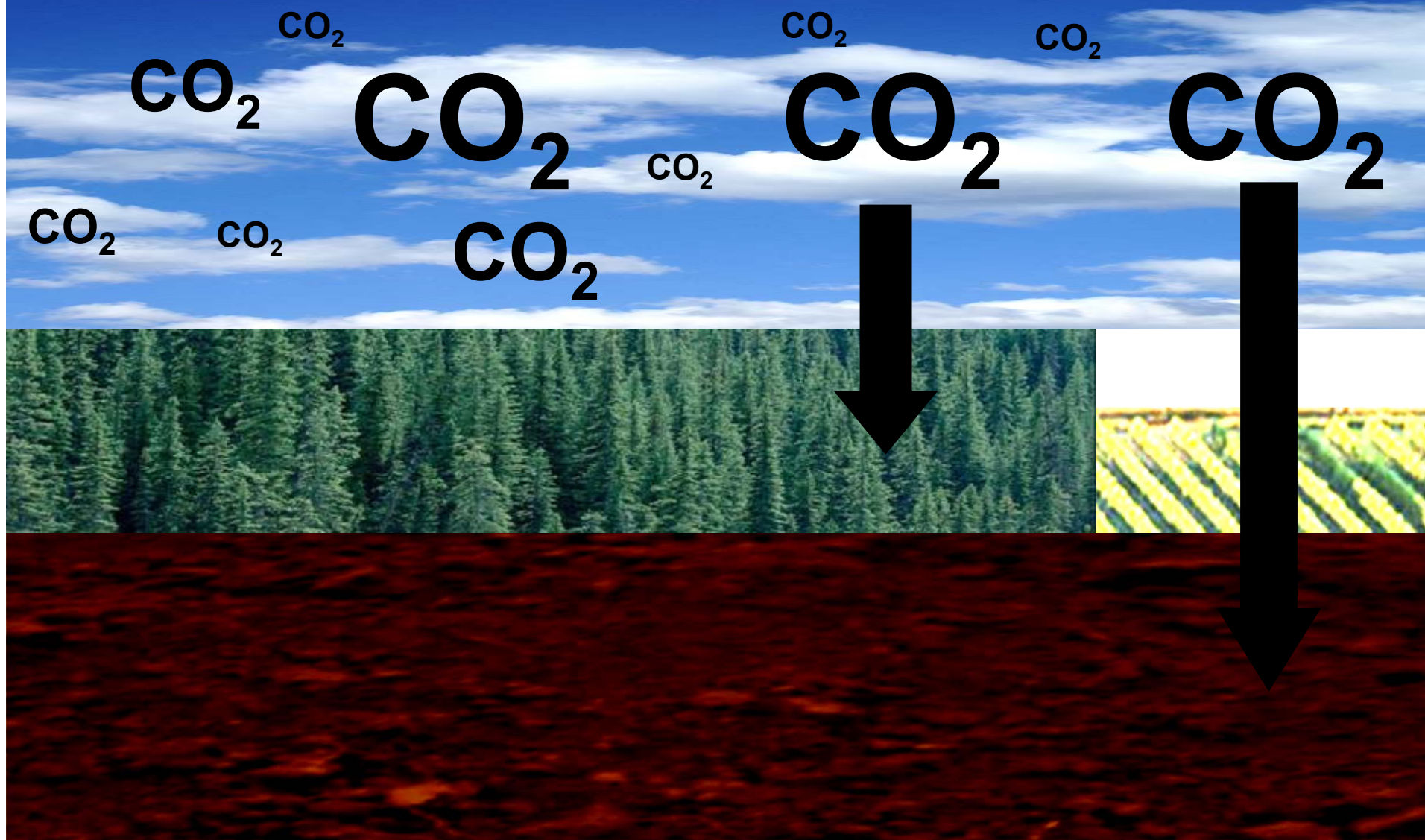


Evaluating agricultural mitigation and scaling up climate-smart practices using the FAO EX-Ante Carbon-balance Tool

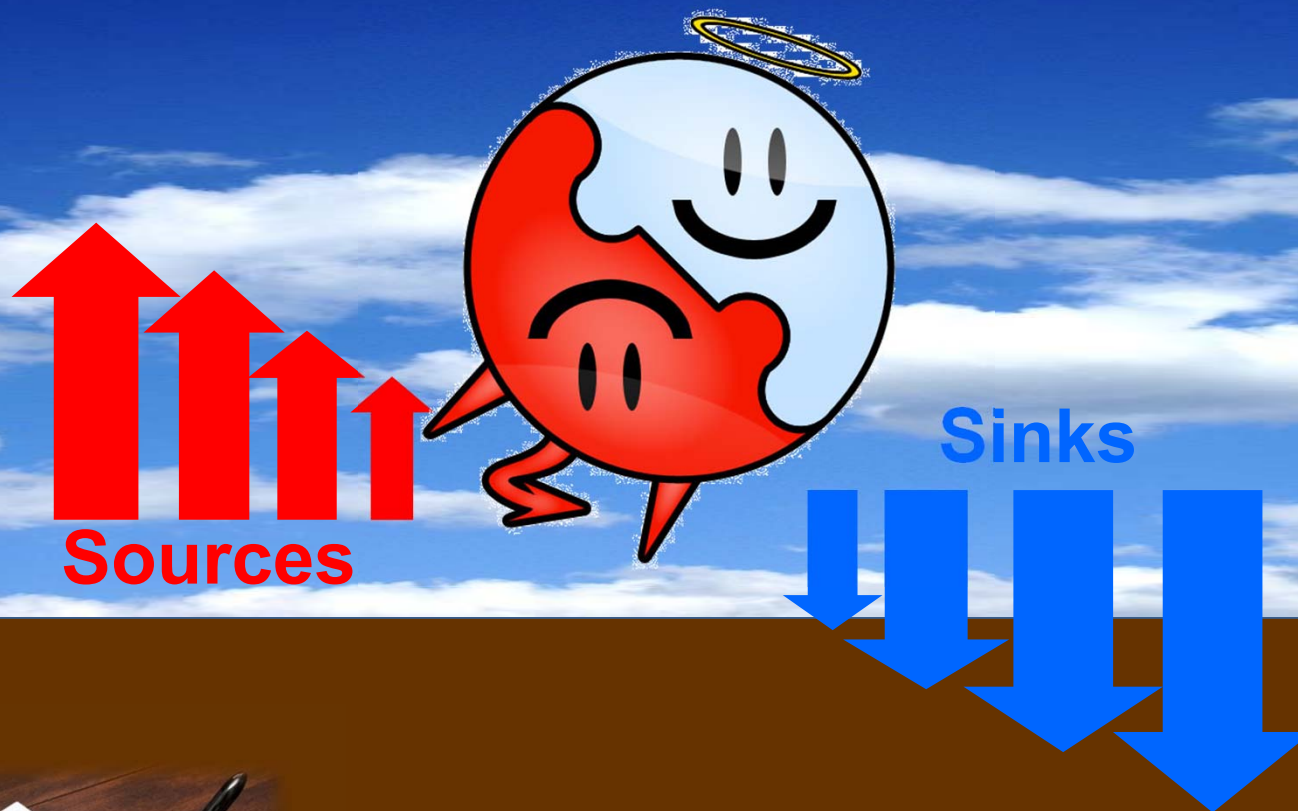


Background

Terrestrial Sinks



Background



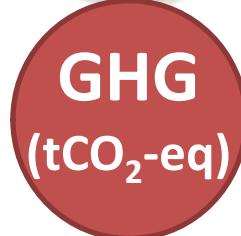
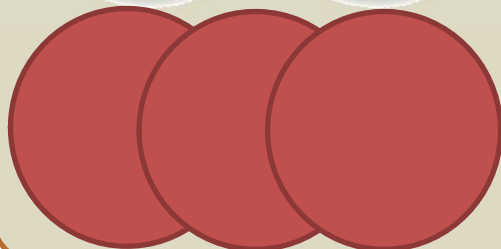
How to correctly account for sources and sinks?

Background

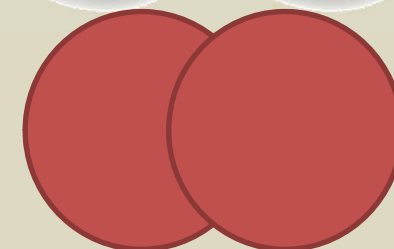
A full landscape approach is needed

How to double the production?

Option A



Option B



Background

A full landscape approach is needed

How to double the production?

Option A

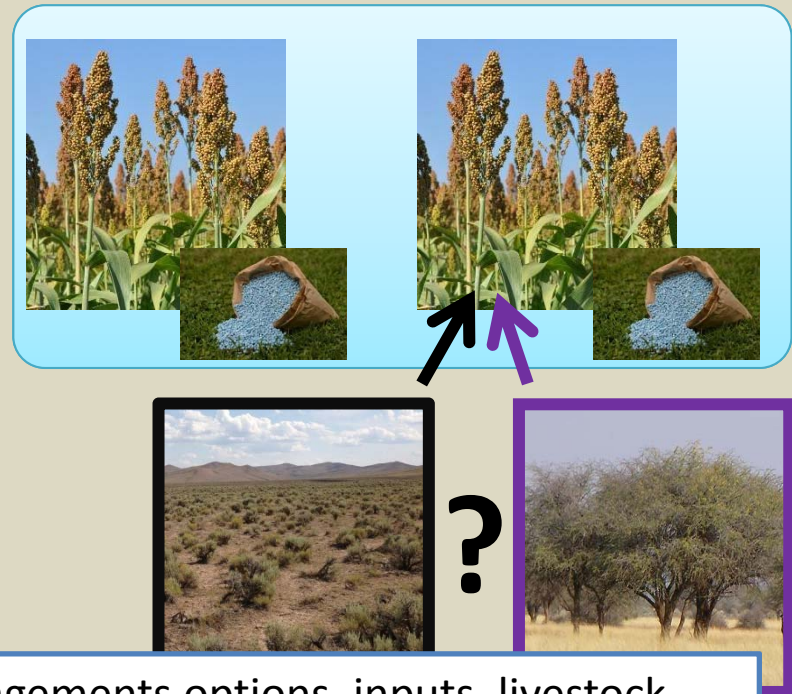


Option A?

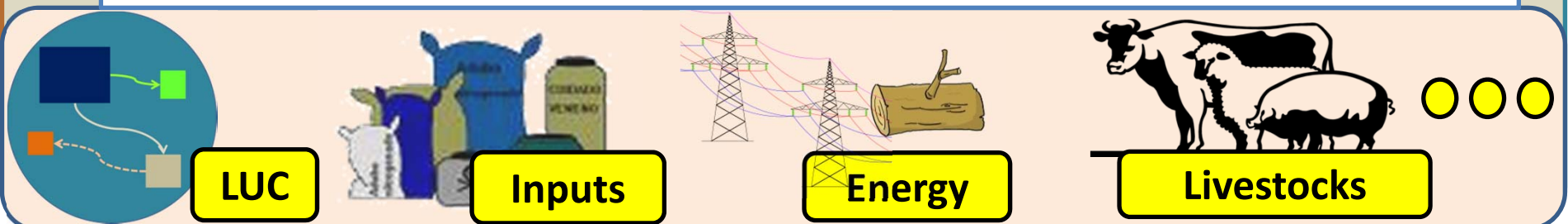
or

Option B?

Option B



Needs to account for all land-use changes, managements options, inputs, livestock,...





Evaluating agricultural mitigation and scaling up climate-smart practices using the FAO EX-Ante Carbon-balance Tool



Background

GHG and C-balance have become essential



International Financial Institution Framework for a Harmonised Approach to Greenhouse Gas Accounting

November 2012

Media release

For immediate release: 30.10.14

Climate Bonds INITIATIVE

**New Climate Bonds Expert Working Group
kicks off to develop eligibility criteria for climate bonds linked to Agriculture and
Forestry investments**

Working group of 15 international experts gets the Standard development under way



Evaluating agricultural mitigation and scaling up climate-smart practices using the FAO EX-Ante Carbon-balance Tool



Background

GHG and C-balance have become essential



Policy

Finance

Private Sector

Developpement

Research

Civil Society



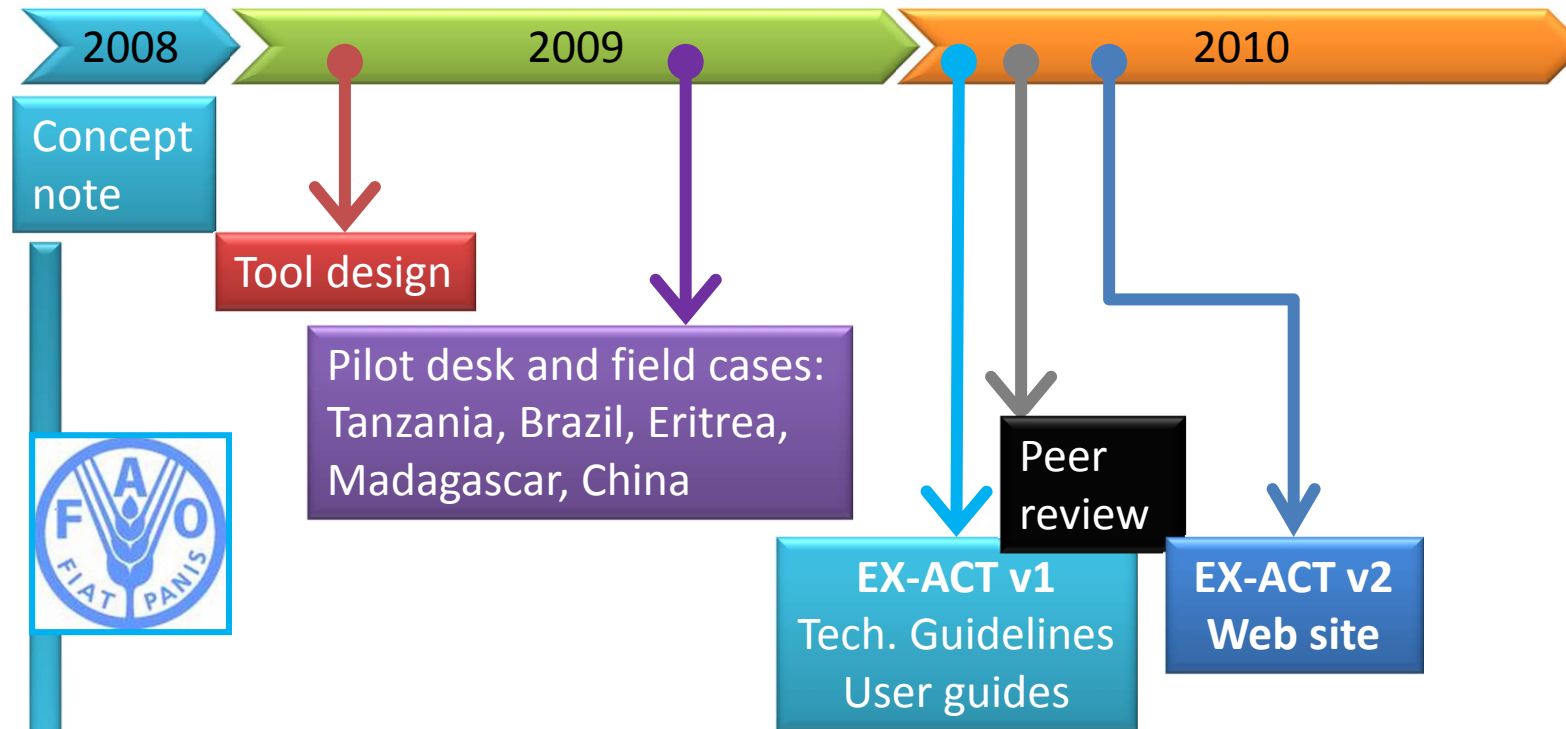


EX-ACT

Evaluating agricultural mitigation and scaling up climate-smart practices using the FAO EX-Ante Carbon-balance Tool



EX-ACT was proposed by FAO as a suitable tool



A **simple** tool to provide **rapid** *ex-ante* estimations of the impact of agriculture **and** forestry development projects on GHG emissions and carbon sequestration, but using data already available (**cost-effective**) within classical formulation or evaluation of existing project.



EX-ACT

Evaluating agricultural mitigation and scaling up climate-smart practices using the FAO EX-Ante Carbon-balance Tool



EX-ACT was continuously updated to adapt to the needs





EX-ACT

Evaluating agricultural mitigation and scaling up climate-smart practices using the FAO EX-Ante Carbon-balance Tool

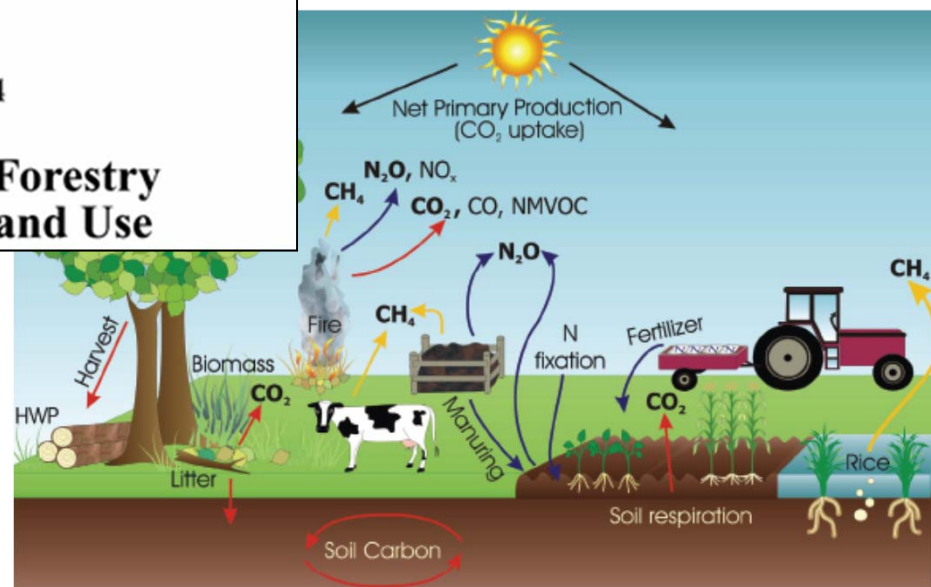
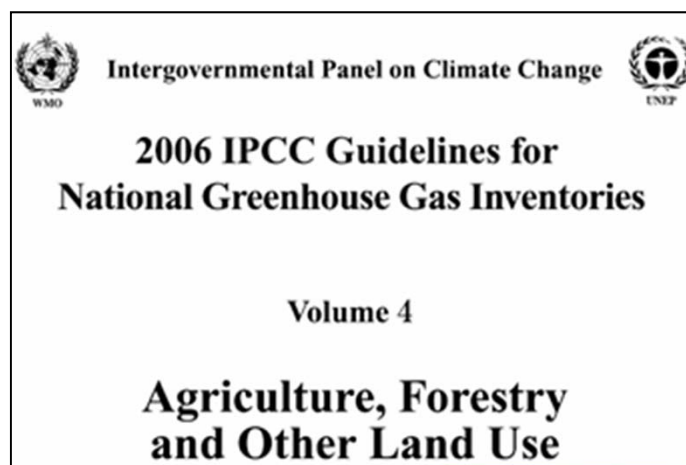
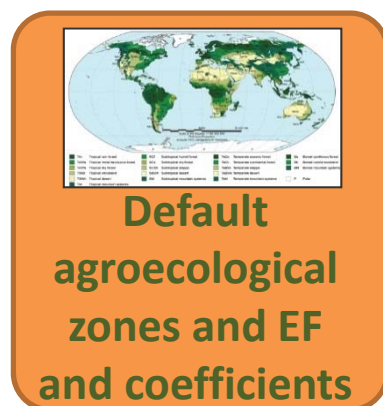
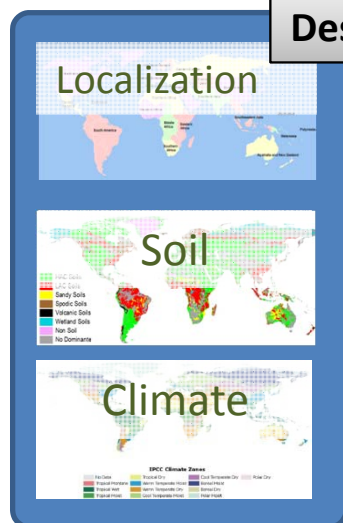


A Simple tool (Excel® file) and freely available



Description

Default coefficients (tier 1 approach) are from widely accepted methodologies





EX-ACT

Evaluating agricultural mitigation and scaling up climate-smart practices using the FAO EX-Ante Carbon-balance Tool



A Simple tool (Excel® file) and freely available



Description

Default coefficients (tier 1 approach) are from widely accepted methodologies

But the user have always use other values either from direct measurements either from other sources

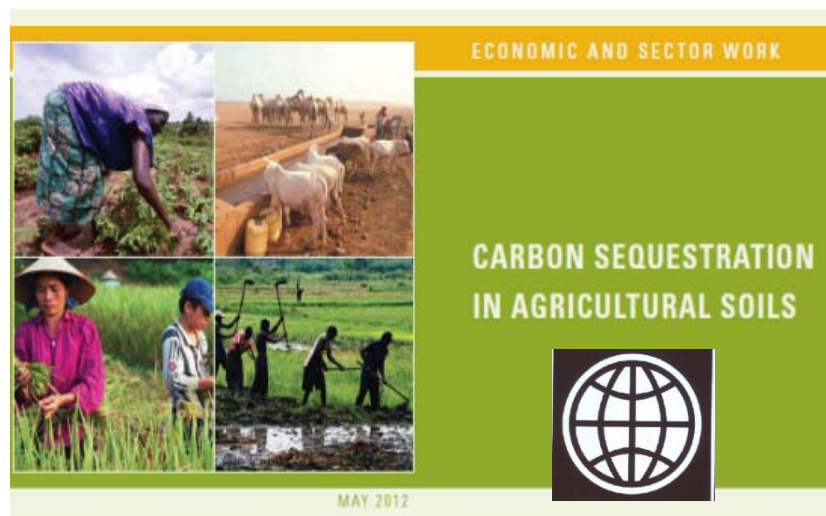
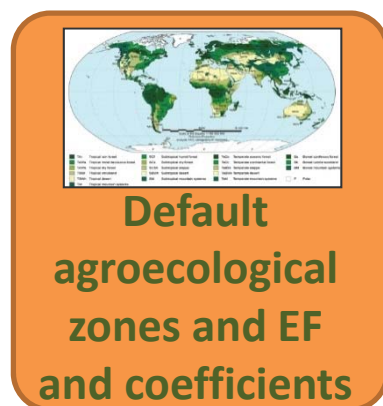
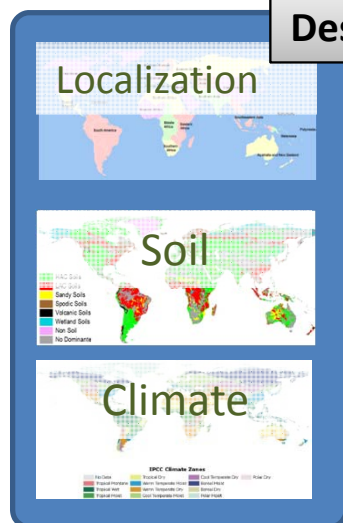
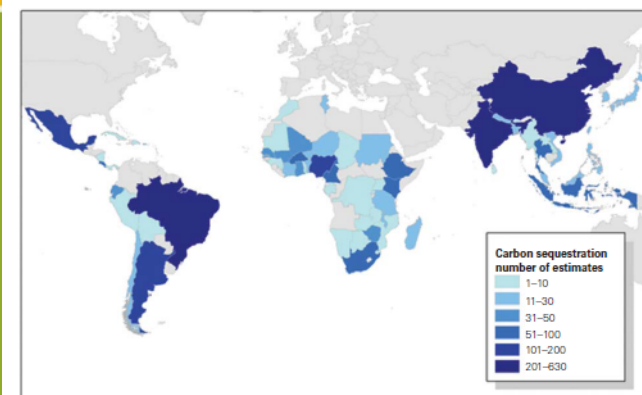


FIGURE 3.1: Geographical Distribution of Carbon Sequestration Estimates





EX-ACT

Evaluating agricultural mitigation and scaling up climate-smart practices using the FAO EX-Ante Carbon-balance Tool



A Simple tool (Excel® file) and freely available

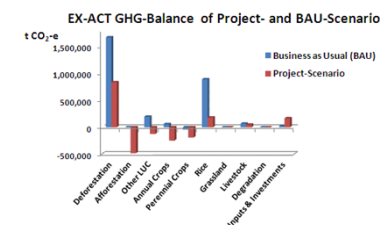


Description

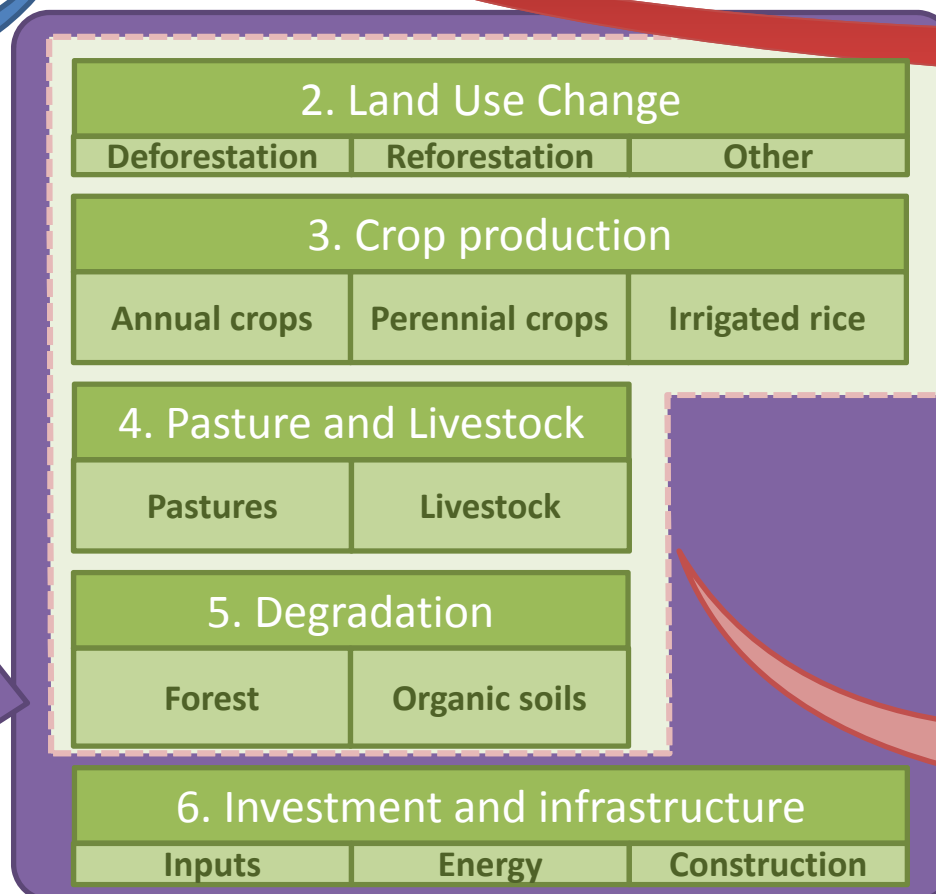
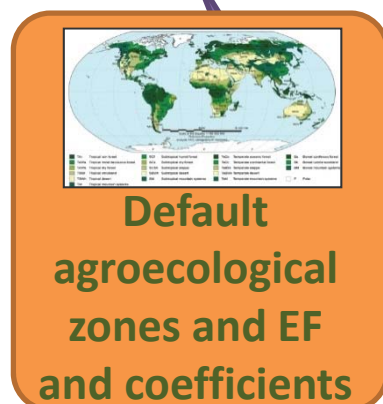
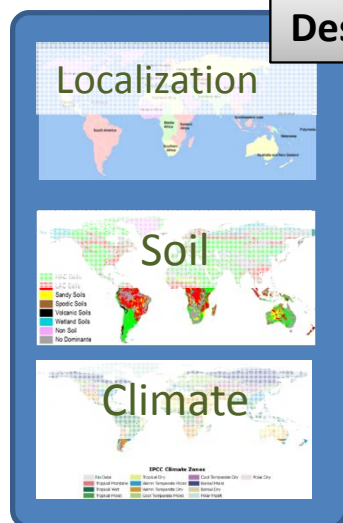
5 major categories

Results

Gross and Net balance, results per ha an average per year



Matrix of change





EX-ACT

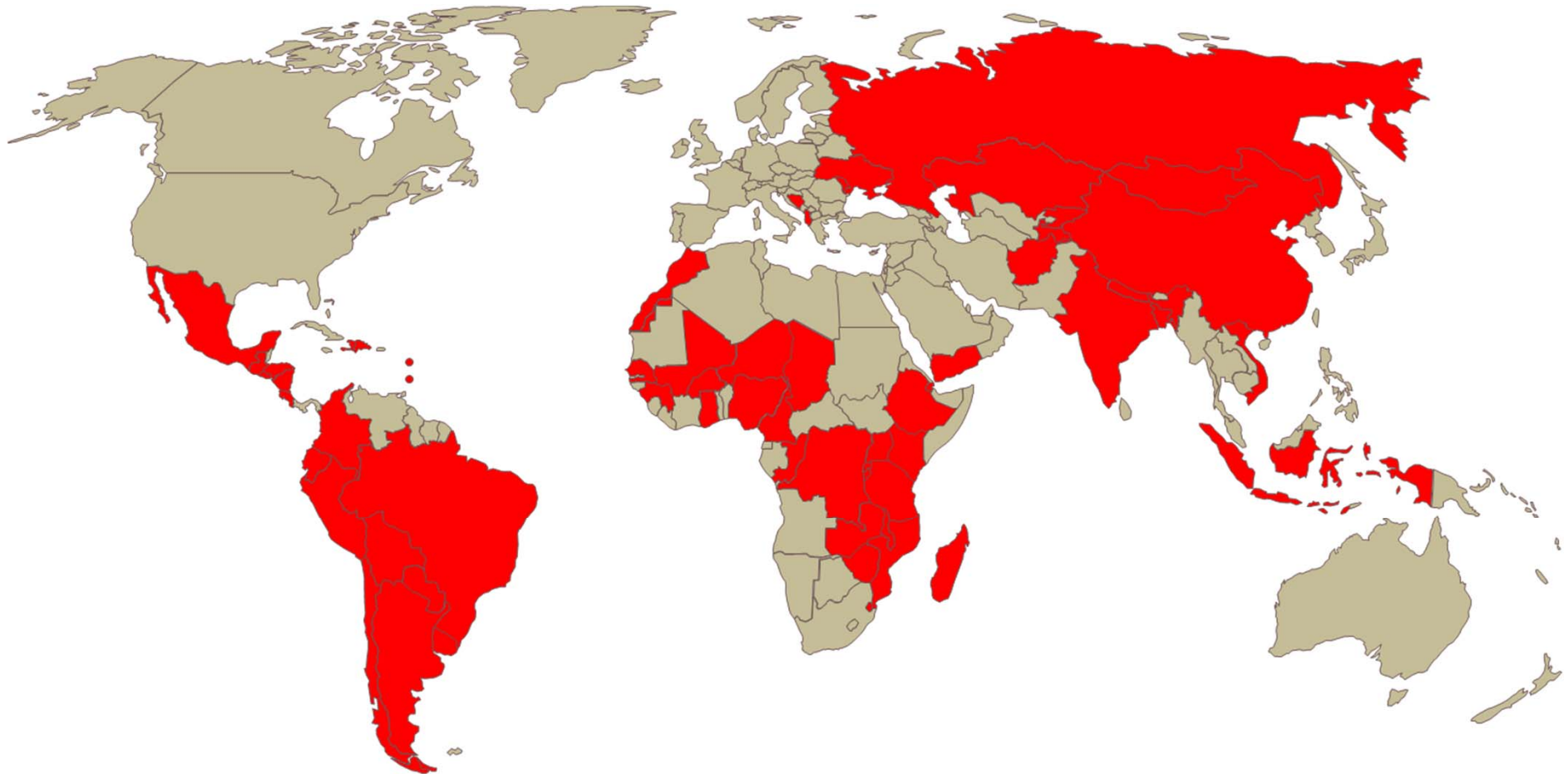


Evaluating agricultural mitigation and scaling up climate-smart practices using the FAO EX-Ante Carbon-balance Tool



A Simple tool (Excel® file) and freely available

Since 2009, EX-ACT was used in more than 60 countries





Other
tools



Evaluating agricultural mitigation and scaling up climate-smart practices using the FAO EX-Ante Carbon-balance Tool

But also, since then other tools are available



CCAFS Report No. 9



Methods for the quantification of emissions
at the landscape level for developing countries
in smallholder contexts

REVIEW OF GHG CALCULATORS IN AGRICULTURE AND FORESTRY SECTORS

*A Guideline for Appropriate Choice and
Use of Landscape Based Tools*



OPEN ACCESS
IOP PUBLISHING

Environ. Res. Lett. 8 (2013) 015019 (9pp)

ENVIRONMENTAL RESEARCH LETTERS

doi:10.1088/1748-9326/8/1/015019

Methods for the quantification of GHG emissions at the landscape level for developing countries in smallholder contexts

Eleanor Milne^{1,2}, Henry Neufeldt³, Todd Rosenstock³, Mike Smalligan⁴,
Carlos Eduardo Cerri⁵, Daniella Malin⁶, Mark Easter¹,
Martial Bernoux⁷, Stephen Ogle¹, Felipe Casarim⁸, Timothy Pearson⁸,
David Neil Bird⁹, Evelyn Steglich¹⁰, Madelene Ostwald¹¹,
Karolien Denef¹ and Keith Paustian¹



RESEARCH PROGRAM ON
Climate Change,
Agriculture and
Food Security



Eleanor Milne, Henry Neufeldt, Mike Smalligan,
Todd Rosenstock, Martial Bernoux, Neil Bird,
Felipe Casarim, Karolien Denef, Mark Easter,
Daniella Malin, Stephen Ogle, Madelene Ostwald,
Keith Paustian, Timothy Pearson and Evelyn Steglich





Other
tools



Evaluating agricultural mitigation and scaling up climate-smart practices using the FAO EX-Ante Carbon-balance Tool



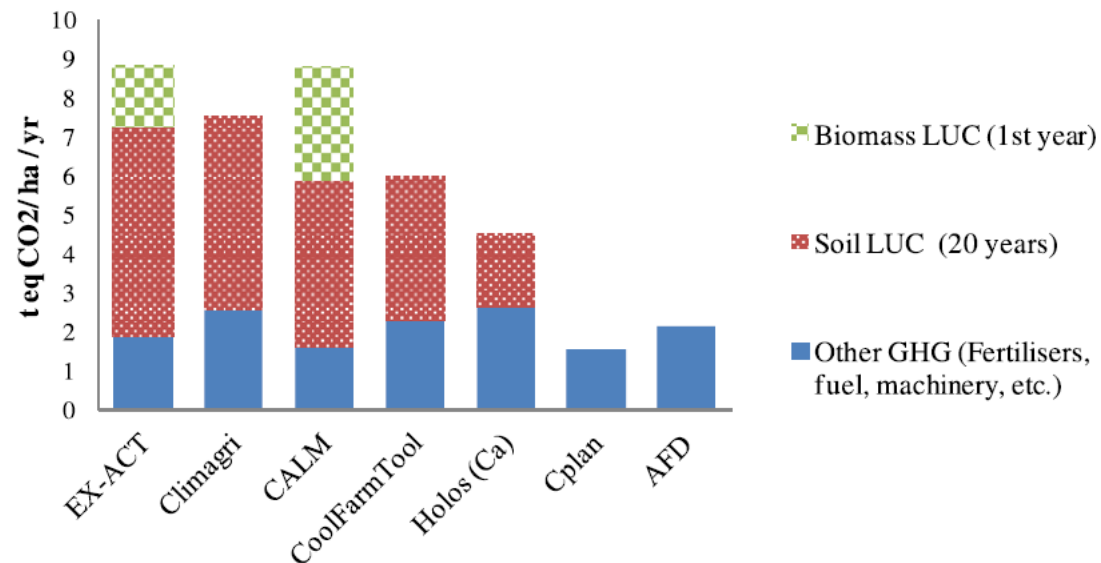
But also, since then other tools are available

All tools are based on the same methodologies (IPCC),
But tools differs according to their aims and scope...

**landscape-scale greenhouse gas
assessment for agriculture and forestry**

18 tools

Vincent Colomb¹, Ophélie Touchemoulin², Louis Bockel^{2,3},
Jean-Luc Chotte¹, Sarah Martin⁴, Marianne Tinlot² and
Martial Bernoux¹



Mean annual net GHG emissions for wheat sown on grassland in temperate conditions (mainly Europe).



Other
tools



Evaluating agricultural mitigation and scaling up climate-smart practices using the FAO EX-Ante Carbon-balance Tool

But also, since then other tools are available



All tools are based on the same methodologies (IPCC),
But tools differs according to their aims and scope...

<http://ird.t-t-web.com/>

Greenhouse gas emission calculators
A selection guide

This selection guide is intended to help potential users select the most appropriate calculator for a landscape-scale greenhouse gas (GHG) assessment of activities in agriculture and forestry. It is based on a [technical report published by FAO](#) which includes appendices with all resource material and descriptions of the individual calculators. The data for this guide is taken directly from on the letter Colomb *et al*, *Selection of appropriate calculators for landscape-scale greenhouse gas assessment for agriculture and forestry*, *Environmental Research Letters*, **8**, 015029, doi:10.1088/1748-9326/8/1/015029. [Click here for the multilingual version of the GHG calculator selection guide which takes account of any new information available..](#)

The classification is based on the main aim of the assessment: raising awareness, reporting, project evaluation or product assessment.

To display the table of suitable calculators at the bottom of the page, select the main aim, at least one geographical area, activity and source and the time and skills available.

Aim

Select the aim of the assessment

- ☐ Raising awareness
- ☐ Reporting - Landscape scale
- ☐ Reporting - Farm scale
- ☐ Project evaluation for carbon market
- ☐ Project evaluation, no carbon markets
- ☐ Product assessment
- ☐ Any

Region

Select one or more regions

- ☐ Australia
- ☐ Canada
- ☐ France
- ☐ New Zealand
- ☐ Sweden
- ☐ United Kingdom
- ☐ USA
- ☐ Developing countries only
- ☒ World

Scope of the assessment

Select all the activities concerned

- ☐ Temperate crops
- ☐ Tropical and equatorial crops
- ☐ Rice cultivation
- ☐ Grassland
- ☐ Dairy cattle
- ☐ Other livestock
- ☐ Field trees, hedges, agroforestry
- ☐ Perennial farming (orchards, vineyards)
- ☐ Horticulture, greenhouse crops
- ☐ Forestry
- ☐ Any

Select all the sources concerned

- ☐ Infrastructure CO₂
- ☐ Fossil fuel and electricity CO₂
- ☐ Soil N₂O emissions from fertilizer and manure
- ☐ Enteric methane
- ☐ Methane from manure
- ☐ N₂O from N-fixing plants
- ☐ N₂O from residues
- ☐ Off-farm emissions (fertilizers, imported food)
- ☐ Burning biomass, GHG other than CO₂
- ☐ Methane from rice paddies
- ☐ Change in soil C stock, direct LUC
- ☐ Change in biomass C stock (above and below ground), direct LUC
- ☐ Change in soil C stock due to change in management practices (tillage, residues)
- ☐ Methane from peat land
- ☐ Off farm processing (mainly CO₂, but also HFC, PFC etc.)
- ☐ Transport CO₂
- ☐ Renewable energy production (solar panels, windmills, biofuels, etc.)
- ☐ Any

Speed and ease of use

Time required for assessment

- ☐ **** less than a day
- ☐ ***
- ☐ **
- ☐ * more than a month

Ease of use

- ☐ **** no specialist skills
- ☐ ***
- ☐ **
- ☐ * formal training required



Example of application



Contents lists available at SciVerse ScienceDirect

Land Use Policy

journal homepage: www.elsevier.com/locate/landusepol



Capturing synergies between rural development and agricultural mitigation in Brazil

Giacomo Branca^{a,b}, Helga Hissa^c, Mara Cristina Benez^d, Katia Medeiros^e, Leslie Lipper^b, Marianne Tinlot^f, Louis Bockel^f, Martial Bernoux^{g,*}

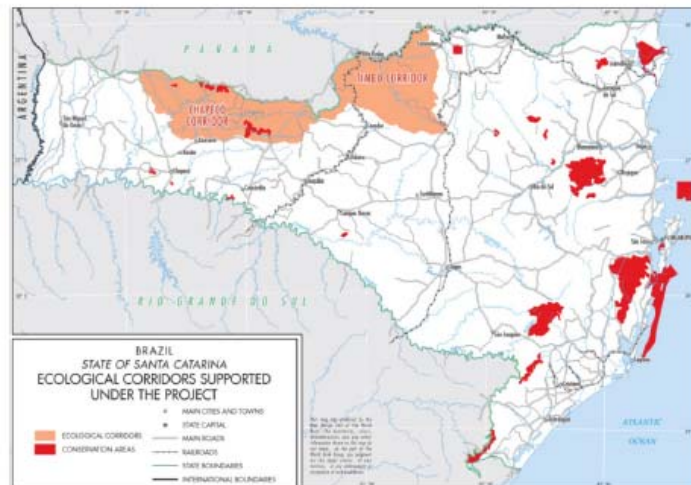


Fig. 1. Map of the SC Rural project area.

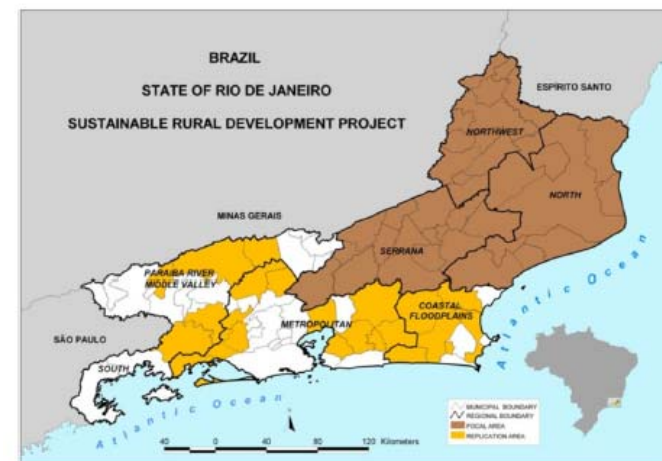


Fig. 2. Map of the Rio Rural project area.



Evaluating agricultural mitigation and scaling up climate-smart practices using the FAO EX-Ante Carbon-balance Tool



Example of application

The Santa Catarina Rural Competitiveness Project (SC Rural)



Cropland area under SLM (ha).

Crops	Area (ha)	
	Without project	With
Beans	32,429	36,032
Millet	21,637	24,041
Soybeans	111,505	123,894
Tomatoes	24,944	27,715
Onion	5,856	6,507
Rice (rainfed)	46,280	51,422
Potato	2,624	2,915
Cassava	7,848	8,720
Total	253,121	281,246

C-sequestration = - 0.5 Mt CO₂eq

But inputs = + 2.2 Mt CO₂eq

With all other activities:

A co-benefit of 0.92 t CO₂eq ha⁻¹ yr⁻¹

The project concerns 936 micro-catchments.
Total area of lands receiving support for improved agricultural systems and natural resources conservation and management totals **661,000 ha**

Balance over 20 years (positive values are net emissions, negative are sinks or avoided emissions)

A wide range of “activities”

Improved annual crop mgt: +1.7

Project activities	Mt CO ₂ e	% of total GHG mitigated	% of total GHG emitted
Expansion of training and extension services (pre-investment)	0.01	–	0.3
Improved annual crop mgt: +1.7	–	–	82.8
Improved livestock production	0.3	–	14.0
Support to the implementation of small-scale agro-industry and to the construction of sanitary installation	0.1	–	2.9
Total GHG emitted	2.1	–	100.0
Improved grassland management	–3.8	26.9	–
Expansion of perennial crops	–0.4	3.0	–
Fencing of riparian areas	–0.9	6.3	–
Expanding agro-forestry systems	–8.8	61.7	–
Ecological corridors and land rehabilitation	–0.3	2.1	–
Total GHG mitigated	–14.3	100.0	–
Total C-balance	–12.2	–	–



Way forward

Evaluating agricultural mitigation and scaling up climate-smart practices EX-ANTE Carbon-balance Tool



Version 6 released TODAY

EX-ACT- v6.xlsx - Microsoft Excel

Accueil Insertion Mise en page Formules Données Révision Affichage Développeur ASAP Utilities Acrobat

Couper Copier Reproduire la mise en forme Presse-papiers Police Alignement Nombre

Arial 10 Renvoyer à la ligne automatiquement Fusionner et centrer

Standard Mise en forme conditionnelle Mettre sous forme de tableau Styles de cellules Insérer

L23

A B C D E F G H I J K L M N O P

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

2

3 Start Description Land Use Change Crop production Grassland Livestock Land degradation Inputs Investments Detailed Results

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

FAO

EASYPol

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Online resource materials for policy-making

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

Version 6.0 - Multilingual Edition

Please select language interface

English

English
Français
Español
中文
Русский
عربي
Non-UN Language

Disclaimer
FAO declines all responsibility for errors or deficiencies in the database or software accompanying it, for program maintenance and upgrading as well as for any damage that may arise from them. FAO also declines any responsibility for updating the data and assumes no responsibility for errors and omissions in the data provided. Users are, however, kindly asked to report any errors or deficiencies in this product to FAO.

0.Start 1.Description 2.LUC 3.Cropland 4.Grassland 5.Degradation 6. Inputs 7. Results Help Yield



Evaluating agricultural mitigation and scaling up climate-smart practices EX-ANTE Carbon-balance Tool



Way forward

Version 6 released TODAY

系统（棉花或甘蔗等多年生系统也将采用）

1. 转变自其他土地用途或转变为其他土地用途的一年生系统（请填写步骤2.前期土地用途变化）

说明	管理方案					定义？	单产？
	改良后的农艺实践	养分管理	免耕/残留物管理	水分管理	粪肥施用	残留物或生物质焚烧	单产 (吨/公顷/年)
森林砍伐后一年生	?	?	?	?	?	NO	
转变为A/R	?	?	?	?	?	NO	
非森林土地用途后一年生	?	?	?	?	?	NO	
转变为其他土地用途	?	?	?	?	?	NO	

3.1.2 一年生系统维持一年生系统（总面积必须保持一致）

填写说明	管理方案					定义？	单产？
	改良后的农艺实践	养分管理	免耕/残留物管理	水分管理	粪肥施用	残留物或生物质焚烧	单产 (吨/公顷/年)
					?	NO	

3.3. Системы затопляемых рисовых полей

Back

Используйте данную часть только если вы хотите уточнить анализ, используя коэффициенты Уровня 2

(значения по умолчанию представлены в ознакомительных целях, в то время как EX-АСТ будет автоматически использовать значения Уровня 2 там, где указано)

Системы	Уровни удаления почвенного углерода		Объем сожженной соломы	
	(т CO ₂ /га/год)		т сухого вещества на га	
Системы рисовых полей другого вида (перестроенные)	По умолчанию		Уровень 2	
Рисовые поля после обезлесения	0		5.5	
Перестроенные в О/Л	0		5.5	

عروش لها من	تفتتوا يلدا ج ا	نوبات	نرات	زوات	زواتنا نم يرارخا سلبتال ازاغ نم لك قصح
عروش لها تنوكم	تفتتوا يلدا ج ا	نوبات	نرات	نراتنا يسرك ا ينك	CO ₂
				نوباتنا يسرك ا ينك	قصح قصح
				نوباتنا يسرك ا ينك	قصح قصح

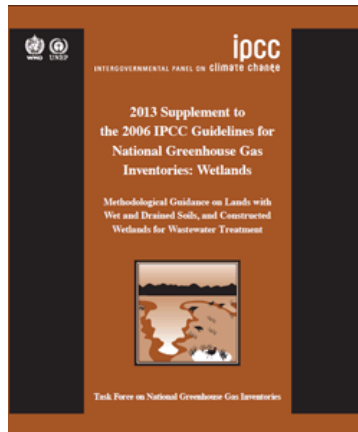


Way forward

Evaluating agricultural mitigation and scaling up climate-smart practices using the FAO EX-Ante Carbon-balance Tool



Inclusion of a “Blue Carbon” module

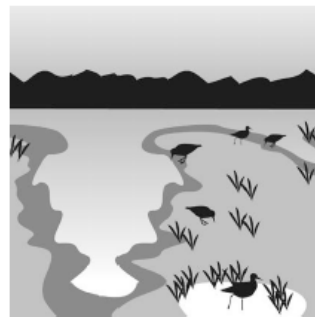


ipcc INTERGOVERNMENTAL PANEL ON climate change

2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands

Methodological Guidance on Lands with Wet and Drained Soils, and Constructed Wetlands for Wastewater Treatment

Edited by
Takahiko Hiraishi, Thelma Krug, Kiyoto Tanabe, Nalin Srivastava,
Baasansuren Jamsranjav, Maya Fukuda and Tiffany Troxler



Task Force on National Greenhouse Gas Inventories

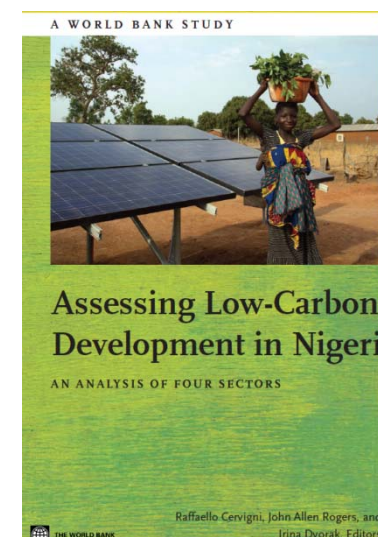
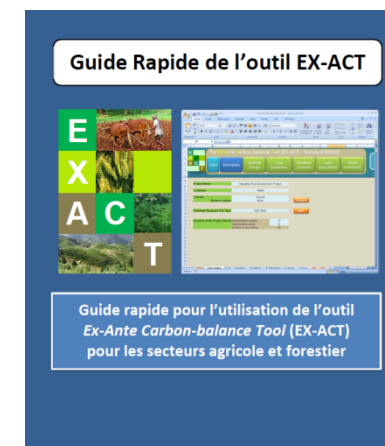
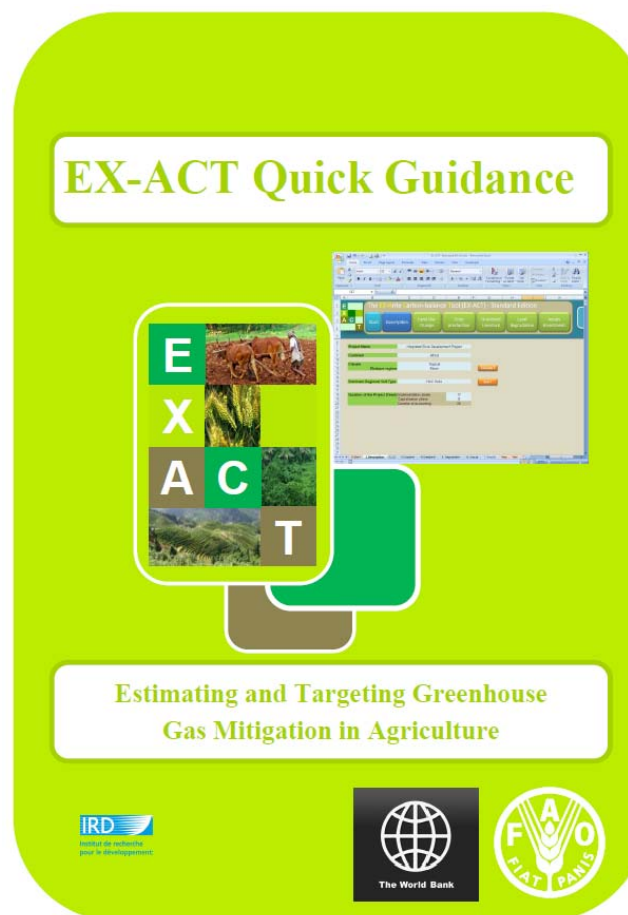
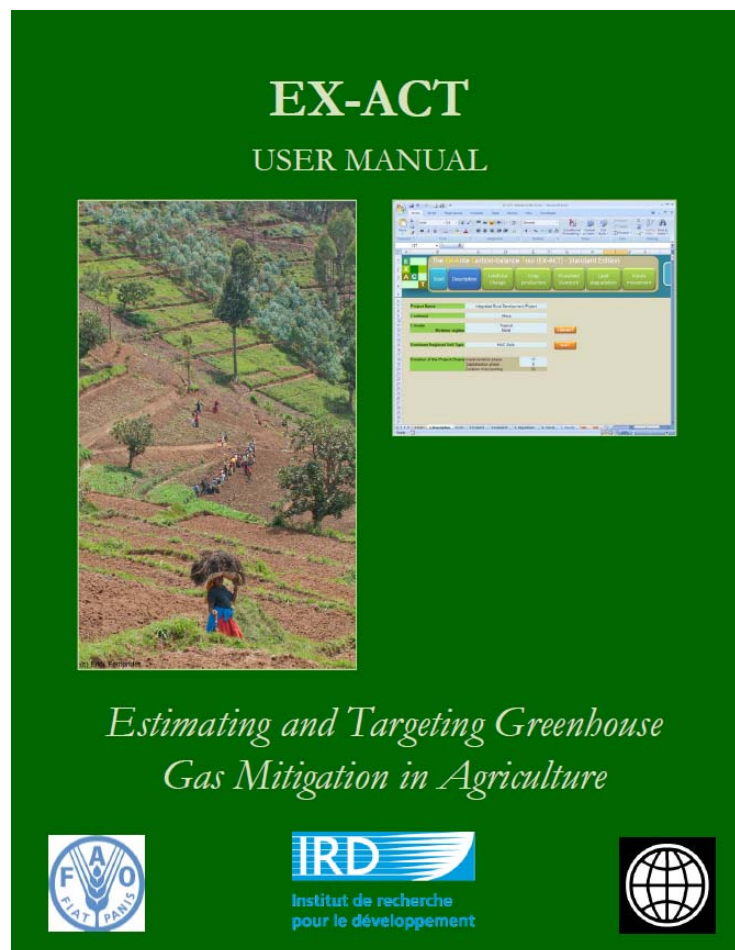




Evaluating agricultural mitigation and scaling up climate-smart practices using the FAO EX-Ante Carbon-balance Tool



All material are available on the EX-ACT website
<http://www.fao.org/tc/exact/ex-act-home/en/>

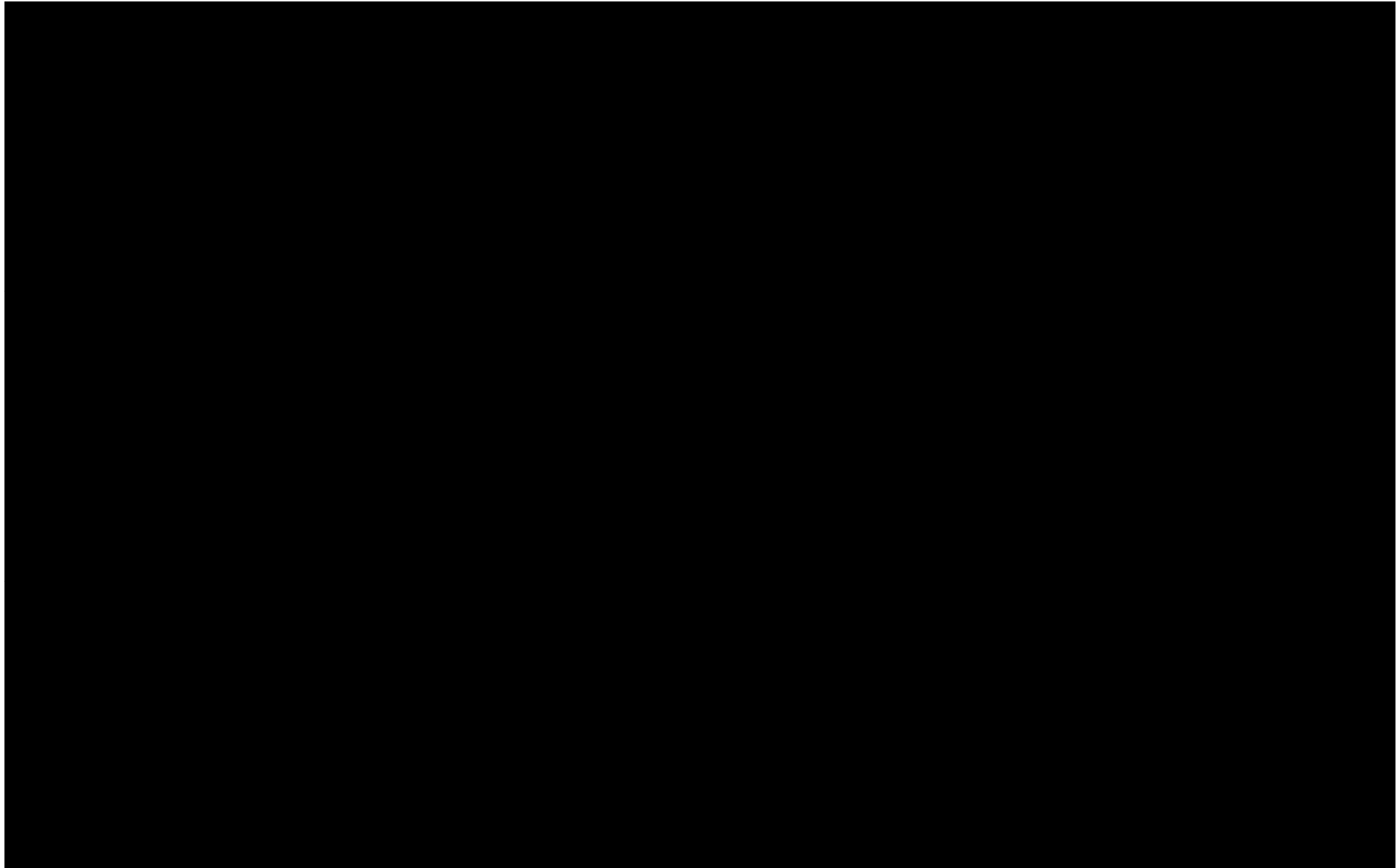




Evaluating agricultural mitigation and scaling up climate-smart practices using the FAO EX-Ante Carbon-balance Tool



E-learning module will be released soon



Parallel session L2.1: Developing and evaluating climate-smart practices

**Evaluating agricultural mitigation and
scaling up climate-smart practices
using the FAO **EX**-Ante **C**arbon-balance **T**ool**



Thank you for the attention