

# Overview of the Carbon Benefits Project (CBP) tools and Linkages to WOCAT

**19<sup>th</sup> WOCAT Network Meeting**  
**16<sup>th</sup> May 2019, Addis Ababa**

**Mark Easter<sup>1</sup>, Eleanor Milne<sup>1</sup>, and Keith Paustian<sup>1</sup>**

**<sup>1</sup>Natural Resources Ecology Laboratory and  
Department of Soil and Crop Sciences**

**Colorado State University**

[Mark.Easter@colostate.edu](mailto:Mark.Easter@colostate.edu)

[Eleanor.Milne@colostate.edu](mailto:Eleanor.Milne@colostate.edu)

[Keith.Paustian@colostate.edu](mailto:Keith.Paustian@colostate.edu)

**Tatenda Lemann<sup>2</sup>**

**<sup>2</sup>Universität Bern, Centre for  
Development and  
Environment**

[tatenda.lemann@cde.unibe.ch](mailto:tatenda.lemann@cde.unibe.ch)



**Colorado State University**





## Presentation Outline

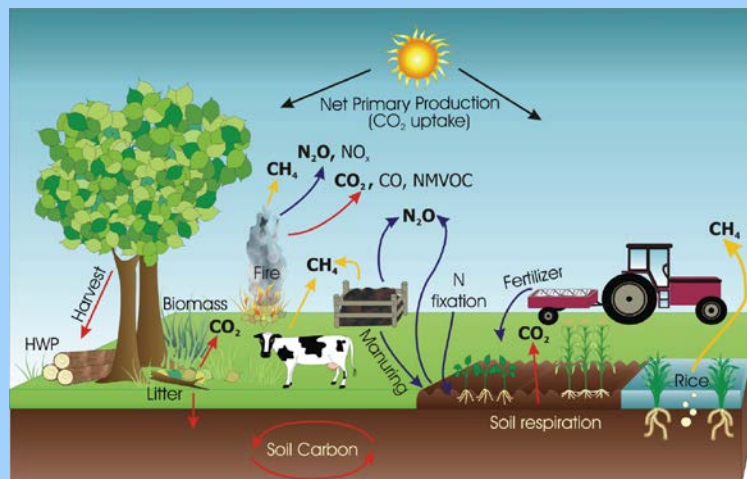
- Description of the CBP Tools
- Current Applications
- Linkages to WOCAT
- Contact Information



# Carbon Benefits Project

## What is the Carbon Benefits Project?

- Began as a Global Environment Facility Initiative in 2008
- Collaborative effort funded to develop a free and open-to-the-public, online resource for assessing the greenhouse gas mitigation effects of land use and land management changes.
- Tool assesses **agriculture, forestry and other land uses**.
- **Recommended and backed by:**
  - UNEP
  - UNCCD
  - 4perMil

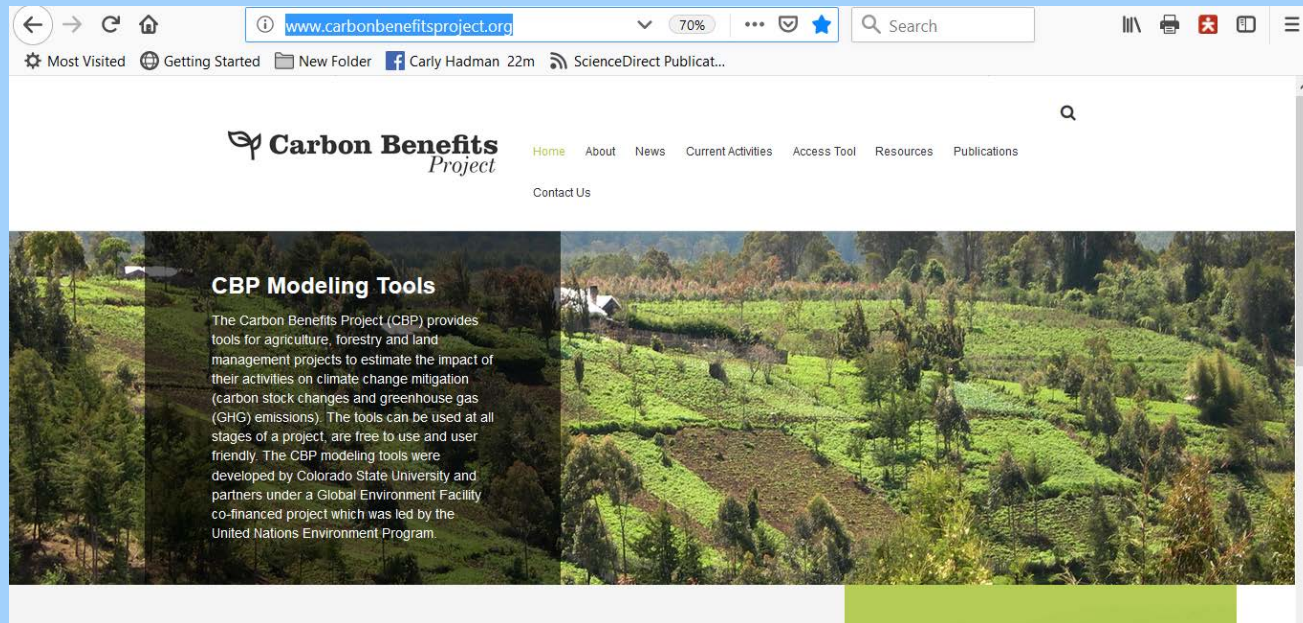


Net  
GHG  
Benefit

The tools are available online:

[www.carbonbenefitsproject.org](http://www.carbonbenefitsproject.org)

<https://cbp.nrel.colostate.edu/>



Comprehensive Help, Tutorials, and Support  
Available Within the Tool



# Carbon Benefits Project

Start Here → Project Description → Guidance → Analysis Tools →

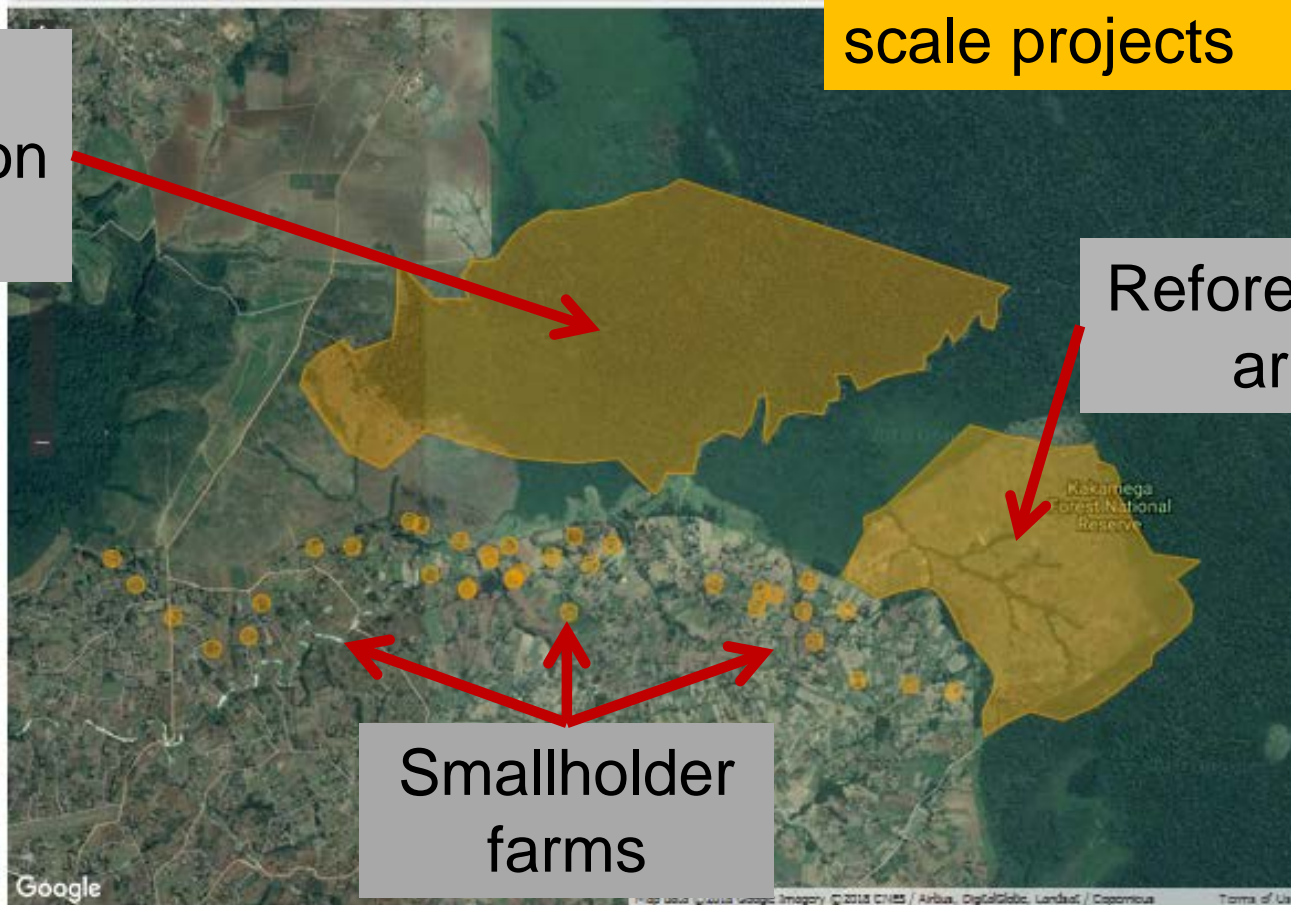
Pan / Zoom Add Area by point Add Area by polygon Edit/Modify Point or Polygon Delete Area

CBP can analyse complex landscape scale projects

Avoided deforestation area

Reforestation area

Smallholder farms



Back

Next



# Carbon Benefits Project

## Simple Assessment – Rapid Assessment Tool

Carbon Benefits Project: Modelling, Measurement and Monitoring

Language: English Wednesday 14 November 2018

Project Name (ID): Simple Assessment tutorial 2017(1000000402) (Change) View/Update Profile

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

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

### Annual Crops Stage 1 of 1: Cropping Systems

Forestland ✓  
Grassland ✓  
Settlements ✓  
Wetlands ✓  
Annual Crops ✓

▶ Cropping Systems ✓

Perennial Crops ✓  
Agroforestry ✓  
Livestock ✓

1 Select Project Activity Area/Group

Introduced Agroforestry [201 ha] ✓ [View Project Activity Areas](#) (opens in new window)

2 Select an Annual Cropping System

Annual Cropping System

Continuous wheat/barley/oats/upland rice

Fallow - wheat/barley/oats/upland rice

Continuous maize/sorghum/millet

Fallow - maize/sorghum/millet

Maize/sorghum/millet legume

Maize/sorghum/millet intercropped with legume

Fallow - maize/sorghum/millet intercropped with legume

Continuous wetland rice

Wetland rice - wheat

Continuous vegetables

Vegetables - wheat/barley/oat/upland rice

Continuous cotton/tobacco

Vegetable - cotton/tobacco

Continuous root crop

Cassava/potato/manioc - vegetable

Cassava/potato/manioc - wheat/barley/oat

Cassava/potato/manioc - maize/sorghum/millet

Hay

Wheat or similar rotation with hay/pasture

Maize or similar rotation with hay/pasture

Carbon (tC/ha)	Residue Management	Area (ha)
Collected		190

190

Save Finished

- Simple Data Entry
- Dropdown Lists
- IPCC Tier 1



# Carbon Benefits Project

## Detailed Assessment – Allows Deeper Inquiry

3 Cropping System Planting Sequences

Add Delete

Year	Crop 1 (required)	Crop 2 (optional)	Crop 3 (optional)
------	-------------------	-------------------	-------------------

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

### Emission Factors

Forestland ✓

- Forest Types and Age Ranges ✓
- Natural Losses and Wood Removal ✓
- Emission Factors ✓

Grassland ✓

Settlements ✓

Wetlands ✓

Annual Crops ✓

Perennial Crops ✓

Agroforestry ✓

Livestock ✓

1 Select a Factor

Show List of Greenhouse Gas Equations and Factors

- Factors in **green text** are good candidates for improvement through a measurement and monitoring program. They can be edited.
- Factors in **black text** are more complex and/or expensive to measure though they can be improved through a measurement and monitoring program. They can be edited.
- Factors in **red text** are either very difficult and/or expensive to measure, or they are well understood and cannot be improved upon, or they are physical constants. They cannot be edited.

Factor Name	Factor Type	Units	Source Category	SubSource Category
EF: Organic Soil Emission Factor	Recommend Default Only	tonnes C/ha/yr	Soil C Stocks	Organic Soils
Bwp: Previous Aboveground Biomass Stock	Field Measurement	tonnes dm/ha	Biomass C Stocks	Deforestation
Bwp: Previous Aboveground Biomass Stock	Field Measurement	tonnes dm/ha	Biomass C Stocks	Shifting Cultivation
SOCreff: Reference Soil Carbon Stock	Laboratory Measurement	tonnes C/ha	Soil C Stocks	Mineral Soils
Bwr: Remaining Aboveground Biomass Stock	Field Measurement	tonnes dm/ha	Biomass C Stocks	Deforestation
Bwr: Remaining Aboveground Biomass Stock	Field Measurement	tonnes dm/ha	Biomass C Stocks	Shifting Cultivation
R: Root:Shoot Ratio	Complex Measurement	unitless	Biomass C Stocks	Deforestation
R: Root:Shoot Ratio	Complex Measurement	unitless	Biomass C Stocks	Forestland
R: Root:Shoot Ratio	Complex Measurement	unitless	Biomass C Stocks	Shifting Cultivation
D: Wood Density	Field Measurement	tonnes dm/m3	Biomass C Stocks	Timber Harvest and Fuelw Gathering
Gw: Aboveground Biomass Growth Increment	Field Measurement	tonnes dm/ha/yr	Biomass C Stocks	Forestland
Geff(CO <sub>2</sub> ): CO Emission	Complex Measurement	g kg-1 dry	Biomass Burning	Deforestation

- Greater Flexibility, users may create project-specific trees and crops
- IPCC Tier 2
- Users may either use IPCC emission factors or create their own.



# Carbon Benefits Project

## Socio-economic tools

Carbon Benefits Project:  
Modelling, Measurement and Monitoring

Welcome mark Easter ( Sign out )  
Language: en-GB Thursday 21 June 2012  
Project Name Kenya Example June 2012 ( Change )  
View/Update Profile

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

### Cost-Benefit Analysis: Introduction

The Cost-Benefit Analysis shows the net benefits of a land use activity over time, assessing if it is financially rational for a land user to implement.

#### Why carry out a Cost-Benefit Analysis?

- Aids in the decision-making process on which land use activities are most profitable for land users to impl
  - Helps to determine the main barriers to carbon friendly practices such as the initial investment barrier and
  - Identifies tradeoffs that land users have to make in order to implement that land use activity
  - Can be taken further with a simple Sensitivity Analysis to find out the primary factors responsible for the activity that makes it profitable or not
- Facilitates judgement on the mitigation measures needed (e.g. subsidies) for land use activities or technologies required technically efficient but economically inappropriate for the land user to implement.

## Cost-Benefit Analysis

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

### DPSIR: Driving Forces, Pressures, State, Impacts, Responses

The Driver-Impact-Response Analysis (also referred to as DPSIR) is a simple framework that helps provide the user with an understanding of the land-user rationale for adoption or non-adoption of specific land management practices. It organises and links qualitative information effectively for analysis.

```
graph TD; DF[Driving Forces] --> P[Pressures]; P --> S((State)); S --> I[Impacts]; I --> R((Responses)); R --> DF; R --> P; R --> S; R --> I;
```

**Driving Forces**  
Indirect drivers of system change - may be biophysical, socio-economic or institutional in nature. They are the underlying explanations for the adoption or non-adoption of a particular management practice.

**Pressures**  
Direct drivers of system change - management practices (e.g. forms of tillage, cropping, livestock management etc.) directly responsible for the observed condition and dynamics of the environment (i.e. the State).

**State**  
Represents the condition and dynamics of the environment and consists of the elements (soil, vegetation, atmosphere) that hold, capture and release carbon. Outputs from the CBP biophysical modelling tools provide information on the state.

**Impacts**  
Impacts caused by the condition and dynamic of the carbon-significant elements of the environment. These impacts can be positive/ negative, short term/longer term, biophysical/socio-economic and can help explain the trade-offs land-users make.

**Responses**  
Human interventions, policy responses etc. the project or authorities might consider in order to change land management. Responses can be targeted at the different DPSIR components.

Download DPSIR Guidance (.pdf)

Next >>

## DPSIR Framework

UNFCCC  
Or  
IPCC

Greenhouse Gas Source and Sink Categories	Baseline Scenario (2018 - 2028) Emissions and Removals				Project Scenario (2018 - 2028 ) Emissions and Removals				Carbon Benefits		
	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	GHGs	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	GHGs			
	tonnes CO <sub>2</sub> e/valent				tonnes CO <sub>2</sub> e/valent				Total tCO <sub>2</sub> e	tCO <sub>2</sub> e / ha	tCO <sub>2</sub> e / ha /yr
<b>Agriculture</b>											
A. Enteric Methane		0				7659			7659	7.6	0.76
B. Manure Management		0	0			151	3743		3893	2.9	0.39
C. Rice Cultivation		0				0			0	0	0
D. Agricultural Soils	0	0	11		0	0	8113		8102	8	0.8
E. Prescribed Burning of Savannas		0	0	0		0	0	0	0	0	0
F. Field Burning of Agricultural Residues		0	0	0		0	0	0	0	0	0
G. Other	0	0	0	0	0	0	0	0	0	0	0
<b>Land Use Change and Forestry</b>											
A. Forest and other Woody Biomass	12263				-48136				-60400	-60	-6
B. Forest and Grassland Conversion	62974	0	0	0	0	0	0	0			
C. Abandonment of Managed Lands	0				0						
D. CO2 Emissions and Removals from Soil	13712				-2344						
E. Other	0	0	0	0	0	0	0	0			
<b>Total</b>	88949	0	11	0	-50480	7810	11856	0			

A1		fx		Mineral Soils C Stocks			
	A	B	C	D	E	F	G
10							
11	<b>Equation:</b>						
12	SOC = A * SOCref * Flu * Fmg * CO2-C						
13							
14	<b>Legend:</b>						
15	<b>Abbreviation</b>	<b>Description</b>	<b>Units</b>	<b>Type</b>			
16	A	Area	ha	Quantity Value			
17	AgeRange	Age Range		Stratum			
18	Category	Activity Data Category		Stratum			
19	Climate	Climate		Stratum			
20	CO2-C	CO2-C Conversion Factor	(44 g CO2)/(12 g C)	Constant Value			
21	CropTreeType	Crop/Tree Type		Stratum			
22	Fl	Uncertainty in Flu	Percent	Factor Uncertainty			
23	Fi	Input Factor	unitless	Factor Value			
24	Flu	Uncertainty in Flu	Percent	Factor Uncertainty			
25	Ffu	Land Use Factor	unitless	Factor Value			
26	Fmg	Uncertainty in Fmg	Percent	Factor Uncertainty			
27	Fmg	Management Factor	unitless	Factor Value			
28	InputSoilCIs	Input Soil Class		Stratum			
29	LandUseCIs	Land Use Soil Class		Stratum			
30	MgmtSoilCIs	Management Soil Class		Stratum			
31	Project Activity Area	Project Activity Area Gr		Stratum			
32	SOC	Mineral Soils C Stock	tonnes C	Equation Result			
33	SOCref	Uncertainty in SOCref	Percent	Factor Uncertainty			
34	SOCref	Reference Soil Carbon S	tonnes C/ha	Factor Value			
35	Soil	Soil		Stratum			
36	SubCategory	Activity Data Subcategory		Stratum			
37	Uncertainty (%)	Uncertainty in Equation	Percent	Result Uncertainty			
38	<b>Results:</b>						
39	<b>Project Activity Area</b>	<b>Climate</b>	<b>Soil</b>	<b>Category</b>	<b>SubCategory</b>	<b>MgmtSoilCIs</b>	<b>InputSoilCIs</b>
40	Introduced Agroforestry	Tropical Montane	Low Activity Clay Mineral	Agroforestry	Avacado and Banana w/	Reduced Tillage	Medium
41	Reforestation Area 1	Tropical Montane	Low Activity Clay Mineral	Forestland	Kakamega Native	N/A	N/A
42	Reforestation Area 2	Tropical Montane	Low Activity Clay Mineral	Forestland	Tropical montane agste	N/A	N/A
43	Reforestation Area 3	Tropical Montane	Low Activity Clay Mineral	Forestland	Tropical montane agste	N/A	N/A
44	Reforestation Area 4	Tropical Montane	Low Activity Clay Mineral	Forestland	Tropical montane agste	N/A	N/A

# Detailed Source Category-Level Output



# Carbon Benefits *Project*

## CBP Linkages to WOCAT



Choose appropriate SLM technologies from  
the WOCAT database



Estimate the C and GHG impacts of the SLM  
technologies with the CBP tools



**LandPKS**

Gather field data on land use and  
management using mobile phones and feed  
into CBP or WOCAT

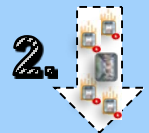




# Carbon Benefits Project



1. Fill in the **WOCAT** questionnaire on SLM Technologies



2. Automatic data transfer from WOCAT to CBP



3. Answer the remaining questions of the **CBP tools** (approx. 60% filled with data from WOCAT)



4. Automatic integration of the GHG assessment into the WOCAT output

## Output of WOCAT questionnaire on SLM Technologies



### Carbon-enrichment of tropical agricultural soil with organic matter (Brazil) Enriquecimento de carbono em solo de lavoura com matéria orgânica (Brazil)

#### DESCRIPTION

Carbon-enrichment of tropical agricultural soils with locally available organic matter in the Cerrado agricultural landscape, Brazil. In the Carbon Benefits Project viable land management strategies were explored to optimize the level of carbon in soil and water, helping to maintain and/or improve ecosystem functions, under changing climatic conditions in the Southern Amazon and the Brazilian Cerrado. In the framework of this project, on-farm experiments were performed to enrich tropical agricultural soils in the medium term, with different types of organic matter (OM). In the experiment the effect of different types of OM amendments on soil carbon and macronutrients (N, P, and K), soil physical properties (water holding capacity and crop yield) and biomass and grain production were assessed. The amendments applied are locally available, and are either free (being waste materials) or considered cost-efficient. The objective of this on-going experiment is to compare the impact of (i) the quality and quantity of OM applied, (ii) and the application methods (directly on the soil surface or incorporation by harrow) on soil chemical and physical properties. It is hypothesized that the addition of OM can enhance crop yields and, potentially, soil biodiversity. The effects of the different OM types, amounts and application methods were evaluated after one, two and three years. From the results, the aim is to provide recommendations for the development of soil OM-enrichment schemes and carbon-friendly landscape management programs for farmers, using local resources.

#### LOCATION

##### Land use

##### Soil type

##### Water supply

##### Harvest of growing seasons per year

##### Duration before implementation of the technology

##### Duration of the technology

##### Dependence on external inputs

##### Soil erosion by water

##### Chemical soil degradation

##### Physical soil degradation

##### Biological degradation

##### SLM measures

##### agronomic measures

##### Structural measures

##### Other measures

##### Other measures

##### Other measures

##### Other measures

##### Other measures

##### Other measures

##### Other measures

##### Other measures

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##### Other measures

##### Other measures

##### Other measures

##### Other measures

##### Other measures

##### Other measures

#### LOCATION



Location: Campo Verde, Mato Grosso, Brazil

No. of Technology sites analyzed:

Geo-reference of selected sites

• -55.0415, -16.17247

Spread of the Technology:

Date of Implementation: less than 10 years ago

(recently)

Type of introduction

through land users' innovation

as part of a traditional system (> 50 years)

during experimental research

through extension/external interventions

Other measures

Other measures

Other measures

Other measures

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Other measures

Source category	Source sub-category	Without Project (Baseline scenario)	With Project (Project scenario)	Incremental difference (Project scenario minus baseline scenario)
		ICO_e	ICO_e	ICO_e
		ICO_e	ICO_e	ICO_e
		Uncertainty (%)	Uncertainty (%)	Uncertainty (%)
Soil Carbon Stocks	Mineral Soils*	13488	2248	24
	Organic Soils	0	0	0
Total Soil Carbon Stocks		13488	2248	24
Total Greenhouse Gas Emissions		-291369	-48061	72

GHG assessment from the CBP tools



# Carbon Benefits Project

## Import Technologies from WOCAT Directly to CBP Tools (Late 2019)

Import  
from  
Here

WOCAT  
Techno-  
logies

Carbon Benefits Project:  
Modelling, Measurement and Monitoring

Welcome Eleanor Milne ( [Sign out](#) )  
16 November 2018  
[View/Update Profile](#)

[Provide Feedback](#) [Help](#)

### Create New Project

[Import](#)

1 Please enter basic project information

Project Name\*

Project ID Code\*

Project Status\*  
Proposal

Project Start Date\*  
Month: mm Year: YYY

Project Duration\*  
Years

Project Country (Countries)\*  
Hold CTRL, then click to select multiple countries

Summary of any Carbon and Greenhouse Gas Benefit Goals

#### WOCAT Technologies

Select a WOCAT entry from the list to import as a CBP project.

Number	Name
Technology 1699	Grassland preservation
Technology 669	Establishment of improved orchards and vineyards
Technology 672	Rehabilitation of degraded pastures with alfalfa
Technology 939	Reduced contour tillage of cereals in semi-arid environments
Technology 1323	Conservation Agriculture
Technology 945	No-till with controlled traffic
Technology 940	Small-scale conservation tillage

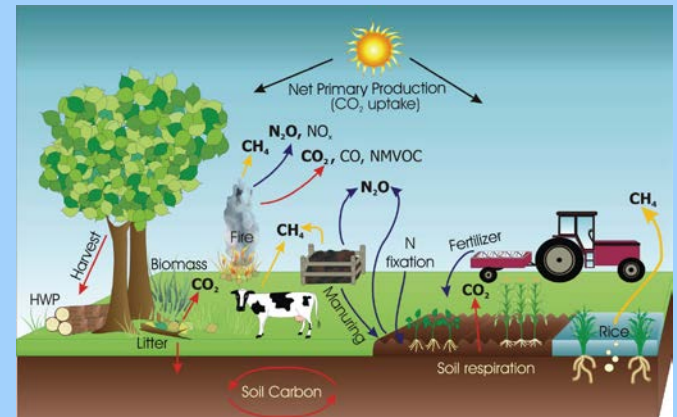
[Select](#)



# Carbon Benefits Project

## Summary

- The Carbon Benefits Project is a GEF-funded, UNEP-implemented initiative.
- Map-based, free and open-to-the-public on the internet.
- Predicts greenhouse gas mitigation benefits of conservation practices.
- Recommended and backed by UNEP, UNCCD, 4perMil.
- Linkage to WOCAT to be released end of 2019, Linkage to LandPKS in process.
- Embedded Socioeconomic Tools.





# Carbon Benefits Project

## Thank You

## አመሰግናለሁ

[Mark.Easter@colostate.edu](mailto:Mark.Easter@colostate.edu)

[Eleanor.Milne@colostate.edu](mailto:Eleanor.Milne@colostate.edu)

[Keith.Paustian@colostate.edu](mailto:Keith.Paustian@colostate.edu)

[Tatenda.Lemann@cde.unibe.ch](mailto:Tatenda.Lemann@cde.unibe.ch)

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