CCAFS – MOT: *a screening tool*

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Important to notice…

- Partnership between the CGIAR program on Climate Change, Agriculture and Food Security (**CCAFS**) & **University of Aberdeen.**
- This tool is still **being developed**;
- We want to **take your suggestions into account** to improve the tool.
- We aim at helping decision-makers to understand the **sources of GHG emissions, mitigation options** and **their potentials**.

Example: Rice production in Indonesia

Country	Indonesia
Climate	Tropical moist
Asian rice climate	Warm humid tropics
Soil texture	Medium
SOC	2
Soil pH	5
Bulk density	1
Crop duration	100 days
Yield	5136 kg.ha^{-1}
Water regime	Multiple drainage
Pre-season water regime	Short-drainage
Fertilisers	Ammonium nitrate – 69 kg; Triple super phosphate – 100 kg; Potassium sulphate - 48 kg; Urea – 351 kg.
Application method	Broadcast
Crop residue	Not incorporated
Tillage	Conventional tillage
Cover crop	Not added
Compost	Incorporated (300 kg)
Manure	Incorporated (150 kg)

Rice produccion in Indonesia

(Advanced option)

Advanced user

INPUT

General	INPUT DATA	
	Region	Latin America
	Climate	Temperate Oceanic
	Is the climate semiari	No

CHOOSE:
Quick user (3 example soil types)
OR
Advanced user (specific soil input)

Soil		**Advanced user**

Advanced User

Soil texture	Coarse
Soil organic C (%)	
Soil N content (%)	0
Soil pH	
Bulk density (g cm^{-3})	

Coarse textured: sands, loamy sands and sa
than 18 percent clay and more than 65 percer

Medium textured: sandy loams, loams, sand
loams, silt, silty clay loams and clay loams wit
clay and less than 65 % sand; the sand fractio
as 82 percent if a minimum of 18 percent of c

Fine textured: clays, silty clays, sandy clays,
clay loams with more than 35 percent clay.

Characterization of broad pH (H2O) classes:

pH ≤ 4.0	Extremely acid
4.0 < pH ≤ 5.5	Very strongly or strongl
5.5 < pH ≤ 7.3	Moderately acid, slightl
7.3 < pH ≤ 8.5	Slightly and moderately
8.5 ≤pH	Strongly and very stron

Crop management	Crop type	Maize

Yield			Unit
	Crop yield		tonnes/ha

Quick user

INPUT

General	INPUT DATA	
	Region	Latin America
	Climate	Temperate Oceanic
	Is the climate semiari	No
Soil		**Quick user**
	Soil characteristics	light soil (e.g. sandy), low SOC
	Soil texture	Coarse
	Soil organic C (%)	1.2
	Soil N content (%)	0.12
	Soil pH	7
	Bulk density (g cm^{-3})	1.7
Crop management	Crop type	Maize

CHOOSE:
Quick user (3 example soil types)
OR
Advanced user (specific soil input)

Coarse textured: sands, loamy sands and sa
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Yield

		Unit
Crop yield		tonnes/ha

Fertilizer input

FERTILIZER INPUT

Quick user

CHOOSE
Quick user (no detailed fertilizer data input is needed)
OR
Advanced user (detailed fertilizer data input is needed)

5 min

Quick User

Select intensity for fertilizer	Low		High	as
Urea - 46.4% N	N	197		(kg ha^{-1})
Super phosphate - 21% P2	P	98.5		(kg ha^{-1})
Muriate of potash / Potass	K	98.5		(kg ha^{-1})

Organic fertilizer	Select the type of organic fertilizer	Select amount of organic fertilizers	(t ha^{-1})
			0
			0
			0

To include o
CHOOSE
Compost, **M**
in **Baseline**

10 min

Advanced user

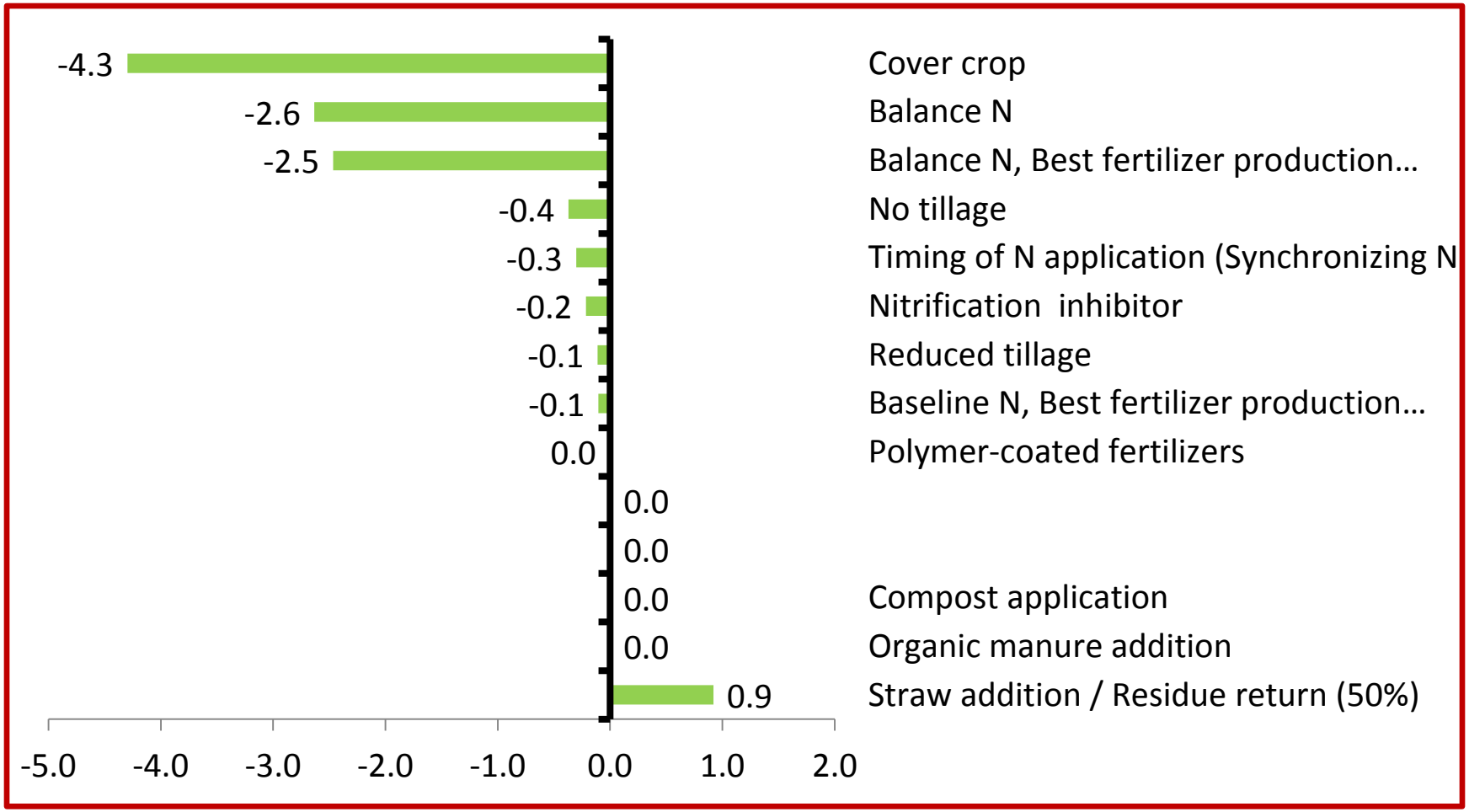
For advanced user please fill in the section below

Synthetic Fertilizer	**Synthetic Fertilizer**	**Fertilizer Type**	**Nutrient or Product**	**Amount**	**Unit (Amount)**	**Application Method**
	Fertilizer 1	Anhydrous ammonia - 82% N	N	65	kg/ha	Apply in solution
	Fertilizer 2	Triple super phosphate - 48% P2O5	P	122	kg/ha	Broadcast
	Fertilizer 3	Muriate of potash / Po		122	kg/ha	Broadcast
	Fertilizer 4	None			kg/ha	Select
	Fertilizer 5	None			kg/ha	Select
	Fertilizer 6	None			kg/ha	Select
	Fertilizer 7	None			kg/ha	Select
	Fertilizer 8	None	N		kg/ha	Select
Organic Fertilizer	**Organic Amendment**	**Type**	**Nutrient or Product**	**Amount**	**Unit (Amount)**	
	Organic fertilizer 1	None	Product	6	tonnes/ha	Select
	Organic fertilizer 2	None	Product	50	kg/ha	Select
	Organic fertilizer 3	None	Product	50	kg/ha	Select

Greenhouse gas emissions

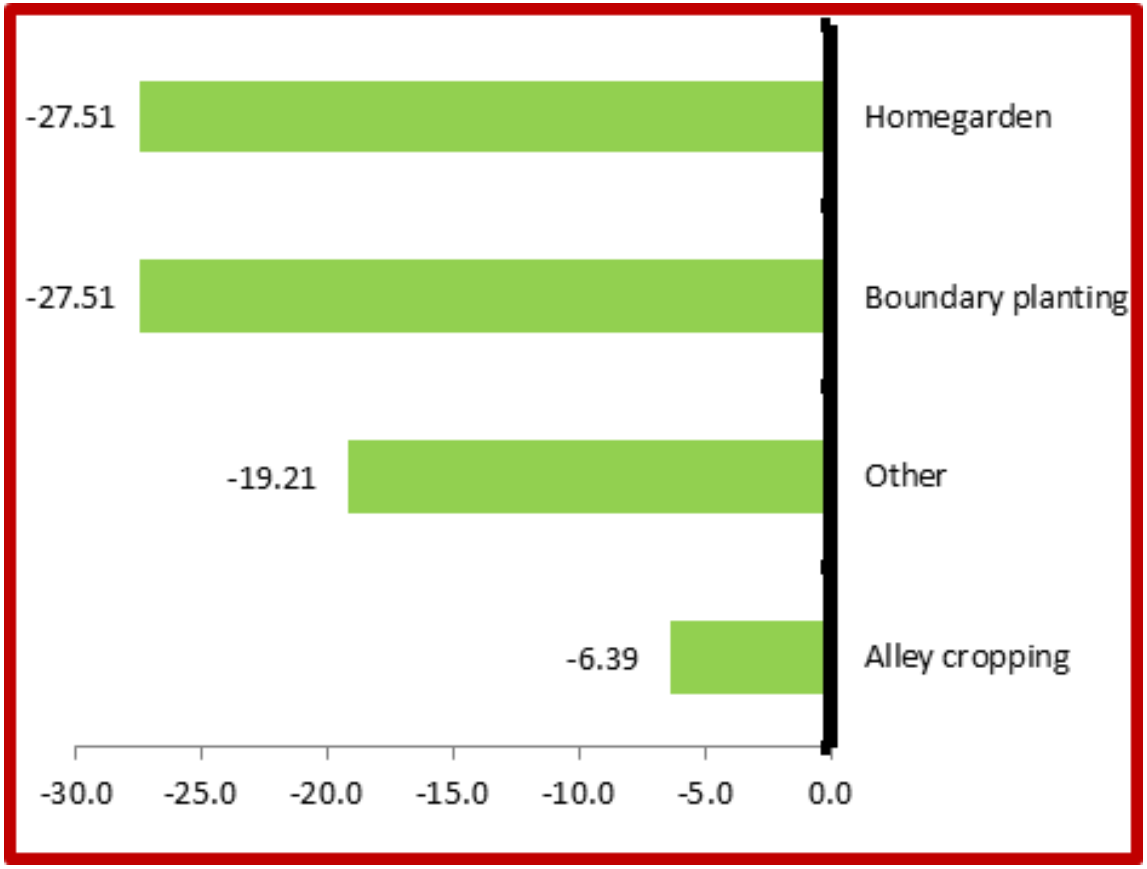
RESULTS			
current management	GHG emission per hectare	4446	kg CO_2 eq ha^{-1}
	GHG per yield	0.035	kg CO_2 eq kg^{-1}

Mitigation options



1000 kg CO_2eq $ha^{-1}.yr^{-1}$

Agroforestry systems



1000 kg CO_2eq $ha^{-1}.yr^{-1}$

Agroforestry is the mixture of trees and crops in cultivated parcels. It may be a key option for the future of modern agriculture.

What distinguishes this tool?

- *It estimates GHG emissions in several crops (34), rice and livestock* ***X***;

- It estimates the mitigation potential of several mitigation options **√**;

- It ranks the mitigation options according to their mitigation potential **√**;

- It joins several empirical models to estimate GHG emissions **√** .

General characteristics of the screening tool*:*

- *Excel-based tool;*
- *Easy and quick to fill (5-10 minutes);*
- *Easy to get the results.*

Empirical models in the tool

Examples:

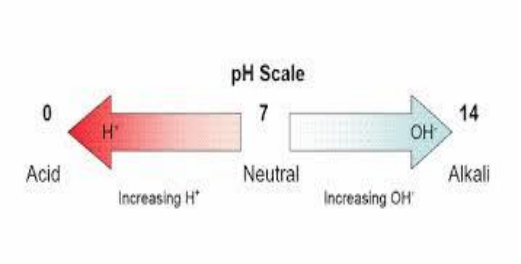
- **Rice:** Yan et al. (2005)
- **Other crops:** Stehfest and Bouwman (2006); Smith et al. (1997); Zhang et al. (2013); Brentrup & Palliere (2014)
- **Livestock:** Herrero et al.(2013)

Nitrous oxide emissions (e.g. maize)

- Stehfest & Bouwman (2006):

$$Log\,(Nemission) = A + \sum_{i=1}^{n} Ei$$

Textura del suelo	Densidad aparente (da) g/cm³
Arenoso	1.65
Franco-arenoso	1.50
Franco	1.40
Franco-arcilloso	1.35
Franco-limoso	1.30
Arcilloso	1.25



Methane emissions in paddy rice

Yan et al. 2006

$$\ln(flux) = constant + a \times \ln(SOC) + pH_m + PWi + WTj + CL_k + OM_l \times \ln(1 + AOM_l)$$

- ***SOC***
- ***Soil pH***
- ***Climate***
- ***Preseason water regime***
- ***Water regime of the growing season***
- ***Type and amount of organic fertiliser***

Mitigacion options

- We chose mitigation options that do not affect crop production capacity. Examples:

Summary

- An **Excel-based tool** – can be used in any pc;
- Uses **empirical models** different from IPCC factors;
- Provides information about **mitigation options** and their **mitigation potential**;
- Maximum time required is **10 min;**
- **Advanced** and **quick user** - Accommodates a range of users.
- It is intended to help **decision-makers**.

Let’s try it

Acknowledgements

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Many thanks &
Questions!