

The CCAFS-Mitigation Option Tool (CCAFS-MOT) – a demo tool

The CCAFS Mitigation Options Tool (CCAFS-MOT) is an Excel-based tool that brings together several empirical models to estimate greenhouse gas emissions (GHG) in rice, cropland and livestock systems and to provide information about the most effective mitigation options. This tool allows for management-relevant GHG assessments to be made with relatively little effort.

Emissions estimates are in terms of total GHG emitted in kilograms of carbon dioxide equivalent per hectare ($\text{kg CO}_2\text{eq ha}^{-1}$) and in terms of GHG intensity, i.e., kg of carbon dioxide equivalent per unit of product ($\text{kg CO}_2\text{eq kg}^{-1}$). Users choose management practices. The aim of the tool is to accommodate a range of users from an introductory to advanced level, depending on objectives and issues like time, existing knowledge, or data available.

Mitigation options are estimated and ranked according to mitigation potential.

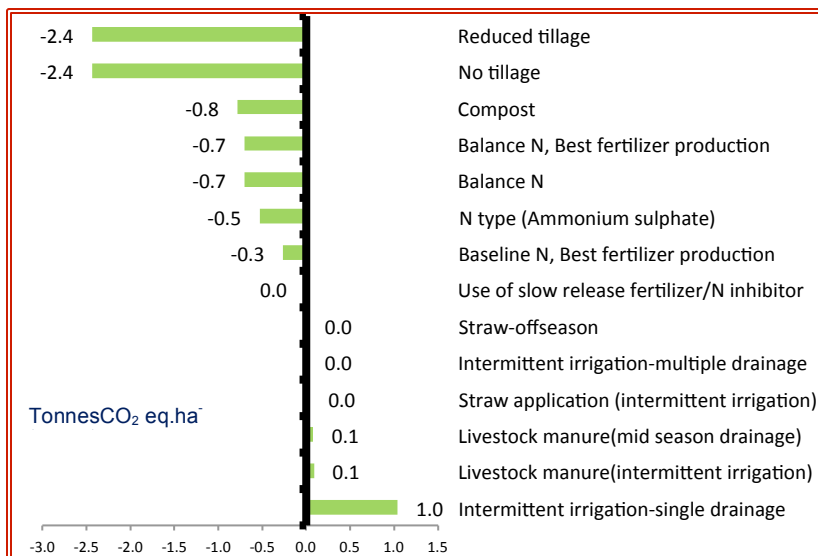
Example: Rice production in Indonesia	
Country	Indonesia
Climate	Tropical moist
Asian rice climate	Warm humid tropics
Soil texture	Medium
SOC	2
Soil pH	5
Bulk density	1
Crop duration	100 days
Yield	5136 $\text{kg}\cdot\text{ha}^{-1}$
Water regime	Multiple drainage
Pre-season water regime	Short-drainage
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)

Users insert values in pink worksheet cells and management practices in blue worksheet cells. Supplementary information is provided.

INPUT		Please select organic fertilizer type from dropdown list.						
General INPUT DATA Input values: Baseline For Cropland and Grassland								
Region	Southeast Asia	<p>Coarse textured: sands, loamy sands and sandy loams with less than 10 percent clay and more than 60 percent sand.</p> <p>Medium textured: sandy loams, loams, sandy clay loams, silt loams, silt, silty clay loams and clay loams with less than 35 % clay and less than 60 % sand. The sand fraction may be as high as 60 percent if a minimum of 10 percent of clay is present.</p> <p>Fine textured: clays, silty clays, sandy clays, clay loams and silty clay loams with more than 35 percent clay.</p> <p>Source: FAO/IIASA/ISRIC/IASIAS, 2006. International Soil Database Version 2.1.1. FAO, Rome, Italy and IASA, Laxenburg, Austria.</p> <p>Characterization of broad pH (pH) classes:</p> <p>pH < 4.0 Extremely acid</p> <p>4.0 - pH < 5.5 Very strongly or strongly acidic</p> <p>5.5 - pH < 7.3 Moderately acid, slightly acid, neutral</p> <p>7.3 - pH < 8.5 Slightly and moderately alkaline</p> <p>8.5 - 9 pH Strongly and very strongly alkaline</p> <p>Source: Dalpan, N.H., 1989. A global data set of soil pH properties. Technical paper 27. International Soil Reference and Information Centre (ISRIC), Wageningen.</p>						
Climate	Tropical moist							
Is the climate semi-arid?	No							
Soil texture	Medium							
Soil organic C (%)	2.00	<table border="1"> <thead> <tr> <th>Field</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td>Crop duration</td> <td>100 Days</td> </tr> <tr> <td>Crop yield</td> <td>5.633 tonnes/ha</td> </tr> </tbody> </table>	Field	Unit	Crop duration	100 Days	Crop yield	5.633 tonnes/ha
Field	Unit							
Crop duration	100 Days							
Crop yield	5.633 tonnes/ha							
Soil N content (%)	0.20							
Soil pH	5							
Bulk density (g cm^{-3})	1							
Crop management	Crop type: Rice Asian rice climate: Warm humid tropics							
Irrigation	Water regime: growin Multiple drainage							

RESULTS			
current management	GHG emission per hectare	2849	$\text{kg CO}_2\text{eq ha}^{-1}$
	GHG per yield	0.509	$\text{kg CO}_2\text{eq kg}^{-1}$

MITIGATION OPTIONS



In the example shown, one hectare of rice in Indonesia with the specified management practices emits 2849 $\text{kg CO}_2\text{eq}$. (0.509 $\text{kg CO}_2\text{eq}$ per kg of rice). The most effective mitigation options are reduced tillage and no tillage.

Dali Nayak, Jon Hillier, Diana Feliciano, and Sylvia Vetter of the University of Aberdeen developed this tool in collaboration with the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), which is a strategic partnership of CGIAR and Future Earth. This research was carried out with funding by the European Union (EU) and with technical support from the International Fund for Agricultural Development (IFAD).