



RESEARCH PROGRAM ON
**Climate Change,
Agriculture and
Food Security**



Estimating the mitigation co-benefits from adaptation measures



Photo credit: CCAFS South Asia

It is estimated that agriculture in South Asia contributes between 12-14 percent of total regional emissions. Emissions are largely from methane production from rice cultivation, enteric fermentation in ruminant animals, and nitrous oxide from the application of chemical fertilizers and manures.

The potential for reducing emissions in agriculture is often given less attention than adaptation to climate change. Adaptation measures in agriculture focus on efficient use of water and nutrients, disease resistant and drought tolerant seed varieties, soil and residue management, tillage and agroforestry, among others. Many of these adaptation practices are inherently low-carbon. CCAFS South Asia is working with partner organizations to identify and understand the co-benefits of reduced emissions that come with adaptation in agriculture. Our research partners are testing and evaluating a wide range of greenhouse gas mitigation options in different locations and cropping systems in South Asia.

Objectives

- To measure the mitigation co-benefits of technology interventions in farmers' fields.

Locations

Karnal (Haryana), Vaishali (Bihar) and Delhi, India

Partners

International Maize and Wheat Improvement Center (CIMMYT)

Approach

- Identify climate-smart interventions for various crops and cropping system in CCAFS's sites. These include minimum tillage practices, nutrient and crop residue management, irrigation scheduling, methods of crop establishment and cropping system optimization for sustainable intensification.
- Pilot and scale up different climate smart practices and technologies in farmers' fields and research farms. This task includes setting up participatory technology evaluation trials with selected households.
- Use the results from the participatory technology evaluation trial to identify the most promising practices and technologies that have both adaptation and mitigation potentials. Match the inputs needed and outputs produced of the most appropriate climate smart interventions with the resource endowment, needs and perceptions of climate risk of farmers.

- Use the chamber based measurement technique and Cool Farm Tool (CFT) model to quantify the greenhouse gas emissions from various crops at the plot-level. The study includes various tillage practices, crop establishment methods and residue and nutrient management practices on rice-wheat, rice-maize and maize-based systems

Initial Results

- A technical manual identifying best practices in measuring greenhouse gas emissions using the chamber based technique was developed with researchers from the Indian Council of Agriculture Research.
- In this study, the major sources of greenhouse gas emissions from farmers' fields were from fertilizers and energy use.
- Analysis using the Cool Farm Tool indicates that shifting from conventional tillage to zero-tillage based wheat production reduces greenhouse gas emissions by 1.5 Mg CO₂- eq ha⁻¹ season⁻¹.
- Estimates show that using Nutrient Expert Decision Support System (NEDSS) coupled with GreenSeeker based nutrient management can make wheat production carbon neutral under a no-tillage system.
- Integrated tillage and nutrient management would be best strategy for increasing productivity, nutrient use efficiency and profitability while reducing greenhouse gas emissions from agriculture land.

ABOUT CCAFS

The CGIAR Research programme on Climate Change, Agriculture and Food Security (CCAFS) is a strategic partnership of CGIAR and Future Earth, led by the International Center for Tropical Agriculture (CIAT).

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Climate Change, Agriculture and Food Security (CCAFS), South Asia

International Water Management Institute (IWMI)
New Delhi Office; NASC Complex; CG Block
Dev Prakash Shastri Marg, Pusa; New Delhi-110012, India

www.ccafs.cgiar.org/regions/south-asia