



RESEARCH PROGRAM ON
Climate Change,
Agriculture and
Food Security



A toolkit to prioritise interventions in climate-smart agriculture



Photo credit: Vinaynath Reddy

A range of technological, institutional and policy options have been proposed to help agriculture become climate-smart. These include weather insurance, spatial weather forecasts, agricultural diversification, stress-tolerant crop varieties, community management of soil and water resources, and a range of policies related to water and carbon management.

These interventions have varying costs and economic impacts, and their implementation requires appropriate investment decisions in both on-farm capital and for wider agricultural outreach programmes. Decision support tools are therefore needed that can assist different stakeholders to prioritise and then take strategic interventions to transform South Asian agriculture into being climate-resilient, efficient and adaptive.

Identifying the need for such a toolkit in South Asia, CCAFS has worked with partner organisations to develop and test the Climate Smart Agriculture Prioritisation (CSAP) toolkit. This prioritisation toolkit includes bottom-up, bio-economic and data-driven approaches to support sub-national and local scenario building and facilitate policy making. The toolkit can guide investment decisions and highlight the implications of such investments on income, employment, food security, and the environment.

Objectives

- To develop a decision-support toolkit to provide quantitative information for prioritisation of adaptation interventions in agriculture.
- To demonstrate the use of this toolkit in prioritising investment decisions on climate-smart agriculture in states of India, Nepal and Bangladesh.
- To explore the applicability of using the toolkit for developing national adaptation and mitigation plans (NAP/NAMA).

Partners

National Initiative on Climate Resilient Agriculture (NICRA), Indian Council of Agricultural Research (ICAR) and International Food Policy Research Institute (IFPRI).

Approach

- The CSAP toolkit is built on a spatially-explicit land-use planning framework of agricultural production accounting for (i) spatial crop-yields, inputs/outputs, and production costs, (ii) land, water and labour availability, and (iii) greenhouse gas emissions from agriculture.
- The toolkit is formulated as a linear mathematical programming model (LP) in the General Algebraic Modelling System (GAMS). A simple interface has been implemented to support direct linkage to databases developed and stored in MS Excel.
- It requires a detailed location-specific database on soil, crop varieties, crop area, agronomic practices, irrigation and historical weather information along with socio-economic data.
- This database is set within a spatially-explicit modelling framework that is capable of handling a wide range of constraints and scenarios.

- The dynamic land-use model calculates minimum cost pathways to meet future demand targets under a range of agricultural growth scenarios. Future crop yields, water-use and emissions are forecast under different climate-scenarios using crop-modelling techniques and empirical evidences.
- Based on the dynamic pathways, the toolkit can support decisions on: i) which climate-smart agricultural technologies and practices to invest in ii) where to target the investment, and iii) when those investments should be made.

Initial Results

- The CSAP toolkit modelling framework has been developed and tested in Bihar state of India.
- A very comprehensive agro-ecological database of inputs and outputs of all key crops and livestock has been developed and validated for Bihar.
- The case study has been able to demonstrate the potential of the model to identify priorities for investment in: (i) Crops best suited to delivering target growth under impacts of climate change on yields; (ii) Technologies to deliver targeted growth based on potential yield increase and efficient use of resources; and (iii) Locations for priority investment given existing productive capacity.
- The toolkit prioritises investment decisions for the short-term (2020), while locating those priorities within a medium (2050) and long-term (2080) agricultural growth pathway.
- The CSAP toolkit is available for adaptation prioritisation in agriculture at the national and sub-national level.

ABOUT CCAFS

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