



# Cropping systems intensification in the salt-affected coastal zones of Bangladesh and West Bengal, India

## Overview

The coastal zones of Bangladesh and West Bengal in India are home to millions of the world's poorest and most vulnerable people, about 65% of whom live below the poverty line. The people of the coastal zone depend mainly on agriculture, the productivity of which is low. Productivity constraints include prolonged water logging during the wet season, increasing soil salinity and the scarcity of low salinity irrigation water in the dry season. Thus, farmers primarily grow low-yielding late-maturing traditional varieties of rice during the wet season and much of the land lies fallow during the dry season.

There are however opportunities for intensification of cropping through efficient use and optimal management of fresh surface water and groundwater resources during the dry season, through improved polder water management, careful planning of the crop calendar, and improved agronomic practices that maximise water productivity.

The project aims to sustainably increase cropping intensity and productivity in the region, particularly in the dry season, through integrated soil, water and crop management.

The project is a collaboration between CSIRO and Murdoch University in Australia, and several Bangladeshi and Indian research organisations and universities, local non-government organisations, officials and farmers.

<b>ACIAR project number</b>	LWR/2014/073
<b>Start date and duration (years)</b>	01 November 2015 (4 years)
<b>Location</b>	Bangladesh and West Bengal, India
<b>Budget</b>	AU \$2.2 million (ACIAR), AU \$550,000 (KGF)

### Project leader(s) and Commissioned Organisation

Mohammed Mainuddin, CSIRO

### Partner country project leaders and their institutions

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## Research

The research is conducted both experimentally in farmers' fields and via computer modelling.

The field experiments include monitoring of the water content and salt concentration in the soil, in order to assess their influence on crop yields. Crop growth experiments are conducted to assess the benefits of several strategies, including:

- » growing shorter duration, higher yielding rice crops in the wet season;
- » sowing dry season crops earlier (made possible by the shorter duration wet season crop);
- » growing a greater variety of dry season crops, including high value vegetable crops;
- » using several soil management techniques including zero tillage; and
- » managing local canals to retain fresh water for use as irrigation in the dry season.

The computer modelling is conducted to extend the usefulness of the field experiments. Field experiments are limited to the particular weather experienced in the few seasons of the project. Computer modelling, using tried and tested crop models which are calibrated with the field experiments, allows assessment of whether good yields will still be obtained in other years with other weather patterns. It also allows assessment of scenarios which cannot be assessed by experiment, such as the likely yield impacts of climate change.

## Achievements

Several suitable and profitable cropping patterns have emerged based on our research over the last two years for the study areas. Highly profitable cropping patterns for Bangladesh sites include sunflower-rice-rice (ie three crops per year), maize-rice-rice, and pumpkin-rice-rice. For West Bengal, profitable cropping patterns include rice-ZT potato-green gram, rice-ZT potato, and rice-maize. Note the greater number of crops per year than the current dominant (80 to 90% of the area) cropping pattern of fallow-fallow-rice. Even the wet season rice using the project management methods has higher yields and greater profitability than is generally the case with traditional farmers' practices.

Zero tillage potato cultivation technology invented at our West Bengal site last year was found to be very successful and profitable compared to traditional ridge-planting practices. We have introduced zero tillage potato cultivation in one of the Bangladeshi sites this year and it was highly successful.

The project has also developed a greater understanding of salinity impacts in these delta environments. This has been applied in the computer modelling of crop growth and yield, and modelling of salt and water dynamics and management in the coastal islands and polders.

## Impact Story

The project has created opportunities for improving the land productivity and profitability, and for helping farmers to increase their incomes. Seeing the greater crop growth and yield, farmers in the experimental trials, and those in adjacent fields, are adopting and expanding our technologies. Around our experimental sites, where previously there were just fallow fields in the dry season, there are now many hectares of green crops. Farmers at one site joined together to excavate canals to enhance the storage of fresh water for dry season irrigation. These successes have received wide coverage in print and electronic media in Bangladesh and West Bengal.

The project is enhancing the capacity of local organisations, and the Australian research groups, to conduct research on crop, soil and water management in these complex and dynamic environments. In addition, five PhD students (three of whom received John Allwright Fellowships from Australia) are working with the project team for their theses. Activities and modelling done in the project shows clear potential for significant science impact.

