

# Bangladesh

 **A\$2.11** million  
Budgeted funding

 **11**  
Bilateral and regional  
research projects

 **2**  
Small projects and  
activities

## Agriculture plays a pivotal role in the Bangladesh economy and in the lives of the vast majority of the population.

The agriculture sector accounts for more than half of employment in Bangladesh. Notwithstanding its transformation from a country of chronic food shortages to one of net food grain self-sufficiency, Bangladesh still faces very substantial food security challenges. While poverty is steadily declining, many people still live below the poverty line.

Recently, Bangladesh has made impressive progress in achieving national food security. Investments in agricultural research have played a pivotal role in driving productivity increases of major crops. The ongoing challenge is to improve productivity of low-lying areas and rainfed cropping systems and increase rural incomes. This goal is adversely affected by increasing seasonal climate variability, reduced freshwater river flows and seawater intrusion.

Climate change is the most pressing issue for Bangladesh, with varying levels of vulnerability and impacts across the country. Coastal areas are prone to salinity intrusion and tropical cyclones, the floodplains in the central areas are prone to floods, the north-western region is prone to drought, the north-eastern region is prone to flash floods and the hilly regions are prone to erosion and landslides.

Bangladesh is an active participant in the global effort to combat climate change and must develop adequate adaptive capacity to protect its people and economy. In view of the substantial long-term challenges presented by climate change, the government has developed a long-term Bangladesh Delta Plan 2100 that focuses on developing approaches to sustainable management of water, environment and land resources.

The Bangladesh Climate Change Strategy and Action Plan is the de facto policy document that provides strategic direction for work on climate-change related issues. Many elements of climate-change adaptation in the country are also being addressed through specific sectoral policies. Recent consultations highlighted that the consequences of climate change on rural livelihoods is the most pressing issue facing Bangladesh and is likely to drive thinking about future priorities for research collaboration with ACIAR.

Key priorities for Bangladesh (National Agriculture Policy 2018) that align with ACIAR objectives are:

- » diversification of crops, including production of high-value crops
- » development and promotion of stress-tolerant, disease-resistant and nutritious crop varieties
- » improvement of crop production systems for market-oriented agriculture
- » building national capacity in innovation
- » extension of technologies to increase overall productivity growth and reduce the difference between research farm and field-level yields.

ACIAR supports regional approaches to assisting Bangladesh, including in the areas of natural resource management, improving trade connectivity and encouraging investments to empower women to participate in cross-regional trade opportunities.

## Country priorities

Bangladesh has been an ACIAR partner country since the mid-1990s. Over time, the ACIAR program has shifted towards a farming systems approach supporting broader food security aspects, improved production and diversification of the rice-based farming systems, and adaptation to climate change. This approach includes research on short-duration varieties of pulses to fit the farming system, conservation agriculture-based technologies and related mechanisation, saline land management and adaptation to climate change. ACIAR-supported programs in Bangladesh have focused on the undulating lands of the north and north-west regions and the coastal region (which is the poorest and most vulnerable region in the country). Bangladesh's ability to maintain food security given its high vulnerability to the impacts of climate change underpins the priorities for our support.

Key agricultural production challenges are common to many countries of South Asia, and we play a role in strengthening regional research linkages between Bangladesh and other countries, particularly India (Bihar and West Bengal states) and Nepal (eastern Terai region).

Consultation with key research and development stakeholders in Bangladesh and Australia established the ACIAR-Bangladesh Collaboration Strategy 2021-2030 and confirmed the following priorities for research collaboration:

- » crop improvement, with a focus on wheat, maize and pulses
- » improved farming systems, with a focus on cropping systems and diversification
- » water management, with a focus on managing both quantity (scarcity, groundwater and waterlogging) and quality (salinity)
- » soil fertility and soil management
- » markets, diversification and agricultural value chains
- » agricultural mechanisation.

Research will focus on farming systems of north, north-west and coastal Bangladesh.

The Krishi Gobeshona Foundation is a strategic partner and co-investor with ACIAR in Bangladesh. The foundation is an agricultural research funding organisation that has made major investments in funding research and capacity building in ACIAR-supported projects. The partnership with the foundation for collaboration in agriculture research and development in Bangladesh was renewed in January 2021 for 5 years.

## 2022-23 research program

- » **13 ACIAR-supported projects in Bangladesh**
- » **6 projects are specific to this country**
- » **7 projects are part of regional projects**

The research program addresses our high-level objectives, as outlined in the ACIAR 10-Year Strategy 2018-2027, as well as specific issues and opportunities identified by ACIAR and our partner organisations. The following sections briefly describe individual ACIAR-supported projects and anticipated outputs in Bangladesh. The projects are grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

### Agribusiness

Success in rural transformation is measured not only by income growth in the rural population, but also by the degree of inclusiveness in the society. A project in China, Bangladesh, Indonesia and Pakistan, led by Dr Chunlai Chen of the Australian National University, endeavours to understand the nature and drivers of rural transformation in order to provide better policy advice to underpin the success of transformation. During 2022-23, researchers will analyse and report on the results of their study into the components of success and the different impacts of rural transformation on women and men.<sup>1</sup>



The priorities of the ACIAR research program in Bangladesh focus on supporting the country to maintain food security given its high vulnerability to the impacts of climate change. Photo: Conor Ashleigh

## Climate Change

There are many potential agricultural management changes that could help farmers adapt to and mitigate climate change, but the pace of climate response is slow. Co-benefits modelling could help accelerate climate response by allowing more efficient screening of many potential interventions at once and comparing them to identify the most promising subset, including those that also deliver social and economic benefits. The Agricultural Model Intercomparison and Improvement Project (AgMIP) is a global collaborative initiative that has developed such a co-benefits modelling approach. A small research activity led by Dr Jonas Jaegermeyr and Erik Mencos Contreras of Columbia University and colleagues in Bangladesh has been trialling these modelling methods in rice production systems. In the final stages of the project, the researchers will identify climate responses with the greatest potential for multiple benefits and revise and validate the methods for application globally.<sup>2</sup>

In south-west Bangladesh, polders are potentially an important feature of agricultural production systems that could facilitate ongoing learning, adjustment and adaptation to climate change. Polders can be managed in various ways to support different types of agricultural production, but previous research has focused on optimising management for current conditions rather than building local capacity to change management as conditions change, including sea levels, tidal surge and patterns of river flows. Led by Mr T.S. Amjath Babu of CIMMYT with the International Centre for Climate Change and Development as well as Australian agricultural learning systems expert Dr Christine King, a new project will co-develop targeted processes and local governing organisations so that locally led social learning can support adaptive management of polders as baseline climate conditions continue to change.<sup>3</sup>

## Crops

In the coastal regions of southern Bangladesh, agriculture centres on the annual cropping of rice in the monsoon season and other crops in the dry (rabi) season. While the system is profitable, it is limited by topography, soil salinity and irrigation availability. A 5-year project led by Professor William Erskine of the University of Western Australia aims to improve productivity and profitability of dry-season cropping on non-saline land, and introduce pulses and wheat with improved salinity tolerance for saline land. Final-year activities for the project include demonstrations of best practice for mungbean, cowpea, garden pea and wheat production, field validation of wheat lines for salinity tolerance, and piloting the deployment of mini-mills to process pulse grains.<sup>4</sup>

Mungbean is an ideal rotation crop for smallholder farmers throughout the Indian Ocean Rim region. The International Mungbean Improvement Network, established through a project led by Dr Ramakrishnan Nair of the World Vegetable Center, helped realise the potential of mungbean to improve cropping system productivity and livelihoods by improving researchers' access to genetic material, and coordinating and providing technical support to variety development in Bangladesh, India, Myanmar and Australia. Phase 2 of the project extends the network to Kenya and Indonesia, expanding the source of germplasm to develop new mungbean varieties, as well as strengthening the capacity of more national mungbean breeding programs.<sup>5</sup>

Hybrid wheat has the potential to produce more grain from the same or less land, significantly contributing to food security and land sustainability. However, technical difficulties of hybrid wheat development and the high cost of hybrid seed have constrained the commercial development of new varieties for many decades. Professor Richard Trethowan of the University of Sydney leads a project that aims to extend the benefits of new hybrid wheat systems to researchers, wheat breeders, farmers and consumers in Pakistan, Bangladesh and Ethiopia. The university has developed a novel, cost-effective and practical system to rapidly produce large numbers of wheat hybrid combinations for testing in breeding programs, and to produce large amounts of hybrid seed for sale to farmers at an acceptable cost. The project will establish the performance of the hybrids, and determine effective technical processes and business models to produce the seed in collaboration with the national programs and local seed providers in each country.<sup>6</sup>

Wheat blast is a fungal disease now established in Bangladesh which continues to threaten crops throughout South Asia. A large-scale epidemic is inevitable in conducive conditions, and this will have a large impact on wheat production and food security in the region. Dr Pawan Kumar Singh of CIMMYT leads an ACIAR-funded project to support the operation of the wheat blast screening platform established under a previous ACIAR project. The platform is operated in Jashore by Bangladesh researchers, with support from CIMMYT, and is being used by the global wheat research community. The new project will identify new sources of resistance to wheat blast by continuing to support the platform, map the resistance genes, facilitate the rapid breeding of elite varieties for Bangladesh farmers, and document adoption by farmers of new varieties resistant to wheat blast.<sup>7</sup>

The practice of intercropping (growing 2 crops concurrently in one field) was widespread in the northern cereal-growing belt of the Eastern Gangetic Plains until the early 2000s, when disease restricted the area of wheat production. The recent and widespread production of maize – a wider row crop compared to wheat – creates new possibilities for intercropping. While wide-row intercropping has been investigated in North Asia and South America, little research has been conducted in South Asia. Potential benefits include increased cropping system productivity, increased water, labour and energy-use efficiencies, improved nutrition and food security for rural households, economic empowerment for women, and over the longer term, increased soil health. Ms Alison Laing of CSIRO is leading a small research activity on wide-row intercropping to test initial ideas and prepare a research project to design effective wide-row intercropping and determine its agronomic, social and economic implications in the Eastern-Gangetic Plains.<sup>8</sup>

Previous ACIAR projects have identified crop management options to increase productivity in the Eastern Gangetic Plains. This project led by Professor Fay Rola-Rubzen is identifying behavioural components of household decision-making about the adoption of new practices to support sustainable intensification based on conservation agriculture. In its final year, the project will collect evidence of the outcome of behavioural science-inspired methods to inform and engage farming families.<sup>9</sup>

### Soil and Land Management

The translation of soil health information, particularly soil resilience, is generally of low value to smallholder farmers due to significant knowledge and language differences between those producing the information and their target audience. A new project led by Professor Chengrong Chen of Griffith University will take a transdisciplinary approach to develop soil health information. The project will bring researchers, farmers, extension agents and other stakeholders together to develop a shared understanding of soil-related problems and risks, particularly abiotic climate induced stress factors. The project will improve soil health and the resilience of farming systems in Bangladesh by developing co-designed solutions appropriate for smallholders.<sup>10</sup>



Improved nutrient management for emerging and more intensive cropping systems is the focus of a project in the coastal zone of Bangladesh, led by Murdoch University. Photo: Conor Ashleigh

## Water

Improved nutrient management to increase the profitability and sustainability of intensive and emerging cropping systems is the focus of a project in the coastal zone of Bangladesh, led by Professor Richard Bell of Murdoch University. The first phase of the project (2017 to 2021) established that the adoption of fertiliser recommendation tools can decrease production costs and increase income and yield for smallholder farmers. The project has been extended until the end of 2022 to scale out the use of tools developed by the project and advance practice change. The final phase of the project will test a collective action approach for nutrient management and expand the scope for monitoring and evaluation of the innovations.<sup>11</sup>

The Ganges Delta region, in Bangladesh and India, is characterised by poverty, food insecurity, environmental vulnerability and limited livelihood opportunities, and is highly vulnerable to inundation from rising sea levels. Since 2016, ACIAR has partnered with the Krishi Gobeshona Foundation of Bangladesh to lift agricultural productivity, and hence rural welfare, by increasing cropping intensification. A new phase of the partnership, starting in 2022, aims to strengthen farmer confidence in the technologies introduced previously and demonstrate practices that may mitigate or avoid risks due to untimely rainfall and drainage management. Dr Mohammed Mainuddin of CSIRO leads the project that will also provide information to support the implementation of development plans in the region.<sup>12</sup>

The Eastern Gangetic Plains straddles Bangladesh, India and Nepal. The region is home to 450 million people and has the world's highest concentration of rural poverty. People in this region have a high dependence on agriculture for food and livelihood security. Dr Tamara Jackson of the University of Adelaide leads a project to understand the processes and practices of transforming food systems through diversification to improve farm livelihoods while reducing inequity, production risk and unsustainable resource use. By gaining an understanding of the existing context for diversification in the region, and associated technologies, scaling interventions, and policies and programs, the project will consider these elements individually and demonstrate the interactions between them using case studies to highlight where and how diversification has occurred in the past. In subsequent phases, the project will identify priority opportunities with communities and determine their fit with projected climate change and water availability, and the impact of high-level policies.<sup>13</sup>

### Regional Manager, South Asia

Dr Pratibha Singh

### Research Program Managers

Agribusiness: Mr Howard Hall

Climate Change: Dr Veronica Doerr

Crops: Dr Eric Huttner

Soil and Land Management: Dr James Quilty

Water: Dr Neil Lazarow

See page 186 for contact details.

## Current and proposed projects

1. Understanding the drivers of successful and inclusive rural regional transformation: Sharing experiences and policy advice in Bangladesh, China, Indonesia and Pakistan (ADP/2017/024)
2. MAC-B: Mitigation adaptation co-benefits modelling trial in Bangladesh (CLIM/2021/109)
3. Locally led learning to turn polders into flexible assets for adaptation [Bangladesh] (CLIM/2021/137)
4. Incorporating salt-tolerant wheat and pulses into smallholder farming systems in southern Bangladesh (CIM/2014/076)
5. International Mungbean Improvement Network 2 [Bangladesh, India, Indonesia, Kenya, Myanmar] (CROP/2019/144)
6. Accelerating genetic gain in wheat through hybrid breeding in Bangladesh, Ethiopia and Pakistan (CROP/2020/167)
7. Managing wheat blast in Bangladesh: identification and introgression of wheat blast resistance for rapid varietal development and dissemination (CROP/2020/165)
8. Intercropping for intensification and diversification in the Eastern Gangetic Plains [Bangladesh, India] (CROP/2021/155)
9. Enhancing farm-household management decision-making for increased productivity in the Eastern Gangetic Plains [Bangladesh, India, Nepal] (CSE/2012/108)
10. Developing and translating soil health information in Bangladesh with farmers and for farmers to build resilient agricultural systems (SLAM/2021/107)
11. Nutrient management for diversified cropping in Bangladesh (LWR/2016/136)
12. Cropping system intensification in the salt-affected coastal zones of Bangladesh and West Bengal, India (LWR/2014/073)
13. Transforming smallholder food systems in the Eastern Gangetic Plain [Bangladesh, India, Nepal] (WAC/2020/148)