

# India



**A\$0.7** million  
Budgeted funding



**5**  
Bilateral and regional  
research projects



**2**  
Small projects and  
activities

With more than 1.3 billion people, India is the second most populous country in the world, after China, and accounts for 18% of the world's population. Two-thirds of India's population live in rural areas, with landholdings averaging 1.1 hectares. The rural population is highly vulnerable to the impacts of a declining natural resource base, biosecurity threats and climate change.

Worth US\$2.94 trillion, India is the world's fifth largest economy, overtaking the United Kingdom and France. India is emerging as a major agricultural exporter of several key commodities and is currently the largest exporter of rice globally and the second largest exporter of cotton. While the contribution of the agriculture sector to GDP is declining, agriculture remains a major source of employment and accounts for 42% of the total national workforce.

The COVID-19 pandemic and associated lockdowns affected all sectors of the Indian economy; however, agriculture emerged as the main driver of economic growth, recording positive growth of 3.4% (at constant prices) in 2020–21.

Agricultural production has been increasing by an average of 3.6% per year since 2011, due to improved access to inputs such as fertiliser and seed, irrigation and credit facilities. The sector has also diversified from cereal grains to pulses, fruit, vegetables and livestock products, largely driven by evolving demographics, urbanisation and changing consumer demand patterns. However, the sector is still challenged by inefficient market mechanisms, subsidy distortions, lack of storage infrastructure, inefficient use of natural resources and susceptibility to climate change and extreme weather events.

In response to the COVID-19 pandemic, the government announced the 'Atmanirbhar Bharat Abhiyan' (Self-Reliant India) program in 2020. The initiative included institutional credit facilities at concessional rates, creation of an Agriculture Infrastructure Development Fund for projects at farm-gate and aggregation points, and release of emergency funds to provide working capital to farmers through crop loans. The initiative continued into 2021 with increased allocation to the infrastructure fund.

The Government of India, in its various policies and schemes, focuses closely on the role of women in agriculture. It advocates mainstreaming of women's role in agriculture as part of all programs in the agricultural development agenda.

Although 30% of budgetary allocations under various schemes have been made for women farmers, fund utilisation under these schemes has declined. Moreover, due to the complex and varied nature of agriculture in India, there has been a trend of defeminisation in certain pockets of the country. Although policy articulation by the government on the rights of women farmers has shifted, there is still a huge knowledge gap and limited resources to implement gender-inclusive agricultural development strategies.

In June 2020, the leaders of both countries participated in the Australia-India Leaders' Virtual Summit, where they elevated the bilateral Strategic Partnership to a Comprehensive Strategic Partnership. One initiative agreed under the partnership is that India and Australia will boost collaboration on science, technology and research, initially focused on COVID-19 responses. As part of the response being coordinated by Australia's High Commission, in 2021-22 ACIAR is working to clarify the role we can play in supporting the ambition for increased research collaboration between India and Australia.



India and Australia will enhance collaboration on science, technology and research during 2021-22, with one focus being sustainable intensification with a nutrition framework. Photo: Conor Ashleigh. ACIAR project WAC/2020/158

## Country priorities

ACIAR has supported a program of collaborative research with India since 1983. Presently, the ACIAR research program with India is delivered entirely through a regional collaborative approach involving neighbouring countries with shared issues and opportunities. Substantial co-investment from India will increasingly become a desired characteristic of our partnership to maintain an ongoing program of collaboration in future.

The geographic focus on the eastern regions of India and its neighbours will remain the same, with a thematic focus on:

- » management of agricultural water, including rainfed areas in the Eastern Gangetic Plains and coastal zone
- » sustainable intensification and diversification of cropping systems with support of conservation agriculture/zero tillage
- » breeding of improved varieties of wheat and mungbean
- » assisted policy development for farmers' livelihoods and climate change.

Existing collaboration between ACIAR and organisations in India has the potential to evolve into a substantial co-invested partnership providing benefits for both countries. In 2021-22, as part of a partnership refresh between ACIAR and Indian Council of Agricultural Research, we will explore, at India's request, the possibilities for enhanced collaboration in:

- » sustainable intensification with a nutrition framework
- » diversification into new dry-season crops
- » the role of biotechnology in crop development
- » new mechanisation opportunities including farm robotics
- » a next phase of mungbean breeding for high-yielding varieties
- » groundwater management (overexploitation and under-exploitation)
- » co-investment and trilateral collaboration.

## 2021-22 research program

- » 7 ACIAR-supported projects in India
- » 1 project is specific to this country
- » 6 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 India. 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.

### Crops

In South Asia, adoption and adaptation of many farming system innovations are variable and low outside project areas, particularly for conservation agriculture-based sustainable intensification. A project led by Dr Fay Rola-Rubzen of the University of Western Australia will complete its research on understanding the decision-making behaviour of farm households using a behavioural economics framework. During 2022, the project will report on its testing of interventions on agricultural extension, input provision and service delivery, which are designed to encourage the uptake by smallholder farmers of innovations developed by other ACIAR projects. The project will also strengthen organisational and institutional capacity to better target interventions in the Eastern Gangetic Plains.<sup>1</sup>

Stripe rust (also called yellow rust) is a common and important disease of wheat worldwide. While fungicides can be used for in-crop control, genetic resistance is more economically and environmentally sound. A project led by Professor Robert Park of the University of Sydney has established and equipped a collaborative network of key wheat improvement centres across South Asia and eastern Africa. In its final year, it will consolidate the knowledge base to enable ongoing research and development at the centres. The project has identified markers linked to effective resistance genes, which can be used in pre-emptive breeding and the development of rapid diagnostic tests. The project, which aims to reduce the vulnerability of wheat to stripe rust in South Asia and eastern Africa, also benefits wheat production across the globe, including Australia.<sup>2</sup>

Mungbean is an ideal rotation crop for smallholder farmers. 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 network continues variety development for another 5 years, and extends the network to Kenya and Indonesia, providing access to new genetic material characterised for important traits, and improving cropping options for smallholder farmers in eastern Africa and South-East Asia.<sup>3</sup>

### Water

Australian experts are providing technical support to 5 large land and water management programs in the Indian states of Andhra Pradesh and Odisha. These programs draw on previous ACIAR-supported projects on climate risk management, participatory groundwater management and social learning for irrigation management and governance. Dr Uday Nidumolu of CSIRO Agriculture and Food leads the project, which will work with Indian counterparts to integrate the research, support out-scaling and then co-learn about out-scaling. COVID-19 outbreaks in South Asia mean that training will be delivered online and field activities have been postponed. There is growing interest in the training, and other partners may join during 2021-22.<sup>4</sup>

In the salt-affected coastal zones of the Ganges Delta, which lies in both Bangladesh and India, this project has clearly demonstrated that improved crop, water and salt management can lift agricultural productivity and rural welfare when projects engage with farmers to understand their needs and priorities. A second phase of this work, led by Dr Mohammed Mainuddin of CSIRO, will use predictive modelling techniques, field trials and targeted demonstration to identify and implement packages of technologies, such as new cropping systems and improved water management that are tailored to the characteristics of different parts of the Ganges Delta region. Key to the process will be identification of risks to adoption due to variable climate and variable environments. The outputs of this project will provide information to support implementation of the Bangladesh Delta Plan 2100.<sup>5</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. A new project, starting in 2021, aims 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. Dr Tamara Jackson of the University of Adelaide leads this project that begins with understanding the existing context for diversification in the region, covering a range of different 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>6</sup>

The Sustainable Development Investment Portfolio drew on Australian expertise and technologies to improve integrated management of water, energy and food production in the basins of the Indus, Ganges and Brahmaputra rivers. ACIAR supported 10 projects over 8 years within this program in Bangladesh, India and Nepal. A small project will prepare delegates to build on the outcomes of the Sustainable Development Investment Portfolio at international and regional dialogues in the second half of 2021. Led by Dr Avinash Kishore of the International Food Policy Research Institute, a core team of local partners will undertake participatory 'foresight for food' exercises in their respective domains and then communicate their aspirations and concerns to policymakers and other stakeholders in the regional food systems.<sup>7</sup>

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### Research Program Managers

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See page 197 for contact details.

## Current and proposed projects

1. Enhancing farm-household management decision-making for increased productivity in the Eastern Gangetic Plains [Bangladesh, India, Nepal] (CSE/2012/108)
2. Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa [Ethiopia, India, Nepal, Pakistan] (CIM/2014/081)
3. International Mungbean Improvement Network 2 [Bangladesh, India, Indonesia, Kenya, Myanmar] (CROP/2019/144)
4. Water management for small-holder farmers: outscaling ACIAR research in Andhra Pradesh Drought Mitigation Program [India] (WAC/2018/164)
5. Mitigating risk and scaling-out profitable cropping system intensification practices in the salt-affected coastal zones of the Ganges Delta [Bangladesh, India] (LWR/2019/073)
6. Transforming smallholder food systems in the Eastern Gangetic Plains [Bangladesh, India, Nepal] (WAC/2020/148)
7. Regional foresight for food systems in the Eastern Gangetic Plains [Bangladesh, India, Nepal] (WAC/2020/158)



New cropping technologies and improved water management techniques will be identified in a new project in the salt-affected coastal zones of the Ganges Delta, which lies in both Bangladesh and India. Photo: Conor Ashleigh. ACIAR project WAC/2019/134