



Australian Government  
Australian Centre for  
International Agricultural Research

**ACIAR 2017-18**  
**Annual**  
**Operational**  
**Plan**





Australian Government

Australian Centre for  
International Agricultural Research

A hand is shown reaching down towards a tomato in a field of many other tomatoes. The entire image is in a monochromatic teal color.

# **ACIAR 2017-18**

## **Annual Operational Plan**

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### **ACIAR Annual Operational Plan 2017-18**

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Cover photo: Jone Kunatui sorts tomatoes on his farm in Sigatoka Valley, commonly referred to as the 'salad bowl' of Fiji. Farming groups, with the help of ACIAR and a participatory guarantee scheme, are scaling up their tomato growing to produce the highest quality all year round to meet the demands of hotels and resorts which largely import fresh fruits and vegetables for use in their restaurants.

Source: Conor Ashleigh

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Panekhiya Devi Yadav picks ripe mungbean in Sohani village, Terai region of Nepal. Panekhiya is part of a farming group contributing to an ACIAR conservation agriculture project. The project aims to develop more intensive, sustainable and timely plantings of the main cereal crops—rice, maize and wheat—which increase yields and allow for a third crop, such as mungbean. Increasing rates of male migration from poor farming households, usually to work in the cities, has led to what is being called the 'feminisation of agriculture'. Women have emerged as the key producers, performing a wide range of tasks related to planning, cropping, managing, processing and marketing. (Photo: Conor Ashleigh/ACIAR)



# Preface

## A new strategy for persistent challenges

The 1982 rationale for establishing the Australian Centre for International Agricultural Research (ACIAR) was that Australian agricultural science has much to offer countries in our region as they seek to improve their food security, by increasing agricultural productivity, sustainability and food system resilience.

That proposition is even more valid today.

In developing countries, the largest proportion of the workforce is typically engaged in the agriculture, fisheries and forestry sectors. Accordingly, achieving productivity gains in agriculture, and improving market access or developing new markets for smallholders, are among the most effective ways to lift people out of poverty as well as reduce hunger and malnutrition.

All countries in the Indo-Pacific region are grappling with the complex, intersecting challenges of how to increase food production by around 70% by 2050, in more variable and challenging climates. Many developing countries in our region confront the ‘double burden’ of simultaneously having significant sections of their population facing chronic hunger, malnutrition and micronutrient deficiency, while growing numbers of people are consuming excess calories and suffering from obesity and associated non-communicable diseases, such as diabetes and heart disease.

The contemporary challenge is not just to grow more food, but to feed more people better, and to do so much more efficiently—using less land, water, energy and nutrients per unit of output, while substantially reducing greenhouse gas emissions.

With the endorsement of the Minister for Foreign Affairs, the Hon. Julie Bishop MP, and the support of the Commission for International Agricultural Research, a new 10-year strategic vision is being developed to position ACIAR for growth and improve performance.

The key elements of the draft 10-year strategy for ACIAR can be summarised as:

1. Framing the ACIAR research portfolio around six high-level objectives: food security and poverty reduction; natural resources and climate change; human nutrition and health; empowerment of women and girls; inclusive agrifood market chains; and building science capacity.
2. Articulating and distinguishing more clearly between three distinctive research partnership models: bilateral country partnerships; multilateral research collaborations; and co-investment with development partners—each with their own procurement pathways, governance frameworks, quality assurance and risk management.
3. Building on predominantly project-level impact assessment to establish more sophisticated portfolio-level monitoring and evaluation, to enable better analysis and reporting against high-level objectives, and to improve portfolio management.
4. Overhauling the capacity-building program to: provide a more rounded, career-oriented training experience for existing scholarship holders; create additional fellowships targeted at women research leaders; build a much more comprehensive alumni network; provide more opportunities for volunteers and farmer-to-farmer exchanges between Australia and developing countries; and formalise a long-term, synergistic partnership with the Crawford Fund.
5. Turbocharging public relations and stakeholder communications activities into a new, better targeted and better resourced outreach program, characterised by a much more attractive, interactive and dynamic online presence, more proactive use of mainstream media, and targeted publications that work better across multiple platforms.
6. Reallocating resources to create more capacity for co-investment with development partners, including the private sector; boost outreach; and develop better portfolio-wide monitoring, evaluation, analysis and synthesis capabilities.
7. Consolidating the ACIAR research portfolio from 13 programs to 10, with restructured research administrative support in three hubs matched to program management workloads.

8. Creating six new Associate Research Program Manager positions to deal with cross-sectoral issues more effectively and provide opportunities for early-career researchers.
9. Restructuring the executive to improve accountability and share workloads more evenly.
10. Replacing project management and finance systems to improve efficiency, performance and accountability, and better manage risk.

During 2017-18, ACIAR will continue to deliver the outcome identified in our rolling Corporate Plan and Portfolio Budget Statement: to achieve more productive and sustainable agricultural systems for the benefit of developing countries and Australia through international agricultural research and training partnerships.

This year 2017-18 will be crucial in the evolution of ACIAR, as the Minister for Foreign Affairs launches our new strategic direction, and we begin to implement the changes necessary to grow our effectiveness and impact.

For more information about any aspect of ACIAR's activities, contact details are in the Corporate Directory at the end of this document. Our website is <aciar.gov.au>.



**Andrew Campbell**  
ACIAR Chief Executive Officer

A handwritten signature in black ink that reads "A. Campbell".



**Don Heatley**  
Chair ACIAR Commission

A handwritten signature in black ink that reads "D. Heatley".

# Overview

## Our research partnerships

The Australian Centre for International Agricultural Research (ACIAR) brokers and invests in research partnerships to build knowledge that enables developing countries to progress crucial development objectives:

- improving food security and reducing poverty among smallholder farmers and rural communities
- managing natural resources and producing food more sustainably, adapting to climate variability and mitigating climate change
- enhancing human nutrition and reducing risks to human health.

In supporting these development objectives, ACIAR ensures that our research programs improve:

- gender equity and empowerment of women and girls
- more inclusive agrifood market chains, engaging the private sector where possible
- scientific and policy capability within our partner countries.

These objectives are consistent with ACIAR's purpose under our enabling legislation. They reflect the Australian Government's policy imperatives articulated in the Australian Overseas Development Assistance (ODA) policy framework, the United Nations (UN) Sustainable Development Goals and the Paris Agreement under the UN Convention on Climate Change, and the priorities expressed by the Minister for Foreign Affairs, the Hon. Julie Bishop MP.

Over the last 35 years, ACIAR has evolved three pathways for generating research proposals and contracting research activity.

The main one is through bilateral partnerships between ACIAR and a partner country. These provide a framework within which ACIAR commissions research from Australian scientists (in universities, the Commonwealth Scientific and Industrial Research Organisation (CSIRO), state government agencies or private firms) to undertake projects consistent with jointly agreed priorities informed by regular ACIAR country consultations. The Aid Investment Plans of Australia's overseas missions will continue to inform ACIAR's bilateral and regional research partnerships.

Our bilateral partnerships are complemented by investment in multilateral global initiatives, chief among which is CGIAR (formerly the Consultative Group for International Agricultural Research). ACIAR manages Australia's contribution to CGIAR

(around A\$20 million annually), and ACIAR staff are involved in the highest levels of governance of the CGIAR system.

Over recent years, a third partnership pathway has emerged, whereby ACIAR co-invests in jointly managed initiatives alongside other donors, such as the Department of Foreign Affairs and Trade (DFAT), the Canadian International Development Research Centre (IDRC), the Syngenta Foundation for Sustainable Agriculture, the Bill & Melinda Gates Foundation and the private sector. These initiatives may be in a single country, or across several countries or a region. This area of the portfolio has grown quickly to around the same magnitude as the multilateral portfolio. This mode of investment is potentially the most suitable for work with the private sector, enabling ACIAR to respond quickly to partnership opportunities.

During 2017-18, ACIAR will articulate and distinguish these investment pathways more clearly in order to:

- ensure that business processes and systems support each pathway professionally and efficiently
- guide the governance required for each type of investment
- ensure that procurement processes for each pathway adequately test research proposals against criteria of value for money, contestability and competitive neutrality.

In our country programs, ACIAR will enhance our focus on Papua New Guinea (PNG) and the Pacific island countries, recognising their serious capacity constraints. Over the coming year, we will develop, or finalise, new country strategies with Myanmar, Timor-Leste, Vietnam and Cambodia. Programs in PNG, Laos and Pakistan, having grown in recent years, have reached capacity limits and will consolidate.

Our programs with China and India will continue to be relatively small and driven by the need for very substantial co-investment. Relationships with Indonesia, the Philippines and PNG will receive particular support over the coming year. We will develop a new program of collaboration with Sri Lanka, starting on a modest scale with aquaculture.

In our regional programs, an emerging consideration for ACIAR is the recent implementation of the Association of Southeast Asian Nations (ASEAN) Economic Community (AEC). ACIAR can help to develop solutions to agricultural problems faced by partner countries engaged with the AEC. It is likely that ASEAN countries will make new demands for



regional cooperation in research and development (R&D), technology transfer and capacity building. By supporting ASEAN, ACIAR will become better engaged with greater regional collaboration. We will seek to establish trilateral technical cooperation partnerships with the more advanced agricultural economies, such as the 'ASEAN 4'—Indonesia, Malaysia, Thailand and the Philippines.

In our multilateral Global Program, the year ahead will see ACIAR continuing to contribute to the implementation of the second round of CGIAR Research Programs. ACIAR will continue to lead the development of a coordinated Australian engagement with CGIAR, and to represent the Pacific Donor Constituency on the System Council. We will also continue to support four other key global partners: the Asia-Pacific Association of Agricultural Research Institutions (APAARI), the Centre for Agriculture and Biosciences International (CABI), the Pacific Community (SPC) and the World Vegetable Center (WorldVeg).

In our co-investment portfolio, ACIAR will work closely with DFAT to progress several significant collaborations including:

- Indonesia Peatland Project—improving community fire management and peatland restoration in Indonesia. The A\$4 million first phase of this ambitious project will start in late 2017, and aims to help the Indonesian Government to reduce peatland fires in Sumatra and Kalimantan, while maintaining rural incomes. The project has elements of fire behaviour, soil science, agronomy, policy and knowledge management.
- TADEP—Transformative Agriculture and Enterprise Development in PNG and the Autonomous Region of Bougainville. This A\$23 million, 6-year program consists of five impact-focused research projects on the PNG mainland and Bougainville, and began in 2015.
- MyFarm. This A\$12 million, 5-year program in Myanmar, which began in 2012, consists of five impact-focused research projects in the central dry zone and Ayeyarwaddy Delta.
- AVCCR (Aik Saath)—the Agricultural Value Chain Collaborative Research program in Pakistan. This A\$12 million, 5-year agricultural value-chains project began in 2016. Component projects will focus on horticultural and livestock value chains.
- Indonesia Smallholder Beef. This A\$12 million 6-year program started in 2016, and consists of two projects that integrate smallholder cattle systems with cropping and plantations.
- SDIP. The Sustainable Development Investment Portfolio (SDIP) is a DFAT regional investment in South Asia of approximately A\$40 million through international and Australian partners (including

ACIAR). ACIAR's component, with a budget of A\$10.5 million, includes the Sustainable and Resilient Farming Systems Intensification (SRFSI) project that began in May 2014. SRFSI is trialling intensification of water-efficient conservation agriculture practices in 40 villages in 8 districts across the Eastern Gangetic Plains of Bangladesh, eastern India and Nepal. During 2017–18, ACIAR will work closely with DFAT and other SDIP partners to develop new complementary research projects with a stronger policy and institutional focus on the food-water-energy nexus issues in the Indo-Gangetic Plain.

- Pacific Community Fisheries. This A\$6 million program consists of two projects focusing on community-based management of near-shore fisheries in Solomon Islands, Vanuatu and Kiribati; and community aquaculture development in Fiji, Samoa, Kiribati and Vanuatu. The program began in 2012. We are discussing an extension with DFAT Pacific Fisheries managers.

In 2017–18, ACIAR will work with DFAT to identify further opportunities for long-term partnerships in which ACIAR-funded research provides a knowledge platform for DFAT-funded development activities.

In 2017–18, ACIAR will develop the next phase of our innovative co-investment partnership with the Canadian IDRC in East Africa and potentially other regions. This will include extending the most promising research projects in the Cultivate Africa's Future (CultiAF) program, and identifying potential new research priorities for longer term partnerships between ACIAR and IDRC.

## Our outreach and capacity

We will promote our research outputs through more effective outreach and raising ACIAR's profile in 2017–18. Our new more strategic approach to outreach is tailored to the information needs of diverse stakeholders in Australia and overseas. A dedicated stakeholder engagement campaign targeting key decision-makers and opinion leaders will communicate the benefits to Australia from ACIAR's work. Making high-quality information about our research findings easily findable and freely available is an important outreach and capacity-building objective. Information is shared through a mix of traditional and online publishing, media engagement and networking activities, including conferences, workshops and sector events.

We will refresh our publishing processes over the next 12 months to take advantage of the contemporary multimedia environment. We will use social media more prominently to draw attention to ACIAR outputs across multiple platforms, and overhaul our online

presence, including a new more interactive, dynamic and informative website.

Building scientific and policy capacity in partner countries is a priority for ACIAR. Informed by a review that was completed in early 2017, we will transform the capacity-building program in 2017-18. Current scholarships, fellowships and training activities will continue while we design the new, enhanced program and implement the administrative arrangements needed for delivery.

Statutory and legislative reporting remains an important requirement. We will publish an annual report, corporate plan, and other operational documents available via our website and in limited numbers of hard copies.

## Monitoring, evaluation and impact assessment

ACIAR values a vigorous and independent system of impact assessment of its investments for accountability and, importantly, learning—to improve the efficiency and effectiveness of delivering research for development (R4D) outcomes and impacts. The R4D projects that we undertake with our in-country partners, in complex and dynamic settings, require a holistic, multidimensional approach to assessing these livelihood, economic, social and environmental impacts.

Mixed-method approaches are required to understand the impact pathways and appraise the resulting development impacts, including capacity development among our research partners and the communities in which we work. Examples of ACIAR's contribution to these methodologies include recently completed impact assessments that identified outcomes and impacts relating to how research outputs build capacity and better link and share information between researchers, policymakers and industry. We presented these methods at technical conferences for peers to review, and further publications are underway. The frameworks developed in these impact assessments will help us to design and adapt project measurement and evaluation activities in future projects to target and track progress towards development impacts.

## Our innovations

During the past decade, off-the-shelf mobile platform technologies, such as smart phones and tablets with applications (apps), have been developed to capture information from the field—all but eliminating problems with paper-based surveys and data collection. This technology removes multiple entry and extraction of individual data sets from spreadsheets. Data capture can occur in real time (depending on mobile coverage), and the technology can easily collect and collate more comprehensive information (e.g. photographs, GPS locations and bar code or tag identification for livestock). Near-real-time feedback can be provided in the field.

Field staff collecting data can receive and share tutorials and information via the technology, potentially extending their roles from enumerator to information service providers. Most importantly, company specialists backstop many of these commercially available apps, which was always a problem with tailor-designed apps.

Since January 2015, ACIAR has supported a rigorous evaluation of commercially available apps for survey and data collection in R&D projects, including an assessment of how apps affect the relationships in the data collection, collation and analysis process—including farmers, technical assistants, researchers and project leaders. Seventeen apps were evaluated, and the Android-based app CommCare emerged as the best suited to ACIAR projects.

## Institutional effectiveness and efficiency

Improving the way we work with all of our partner organisations is a priority for ACIAR. We are committed to business transformation to make our research procurement and administrative processes more effective and efficient, and to provide all ACIAR staff with more access to core information from anywhere in the world.

The upgrade and modernisation of our core business systems began in 2015 with ACIAR's Business Systems Improvement Project (BSIP). Extensive internal and external consultation and workshops informed a new integrated business and information system known as ACE (ACIAR's Collaborative Environment), developed for use on Microsoft's SharePoint platform. The ACE system is in the final stages of user acceptance testing, and is scheduled to be operational from October 2017.



## Empowering women and girls

Gender equity and the empowerment of women and girls are priorities for ACIAR. In line with the Australian Government's aid policy, we are committed to gender equity in the design, delivery and impact of all our activities in order to bring sustained change to both women and men.

During 2017-18, we will implement the recommendations of a new Gender Strategy that looks both internally at our own practices as an organisation, and externally at how our research programs empower women and girls.

Many ACIAR-funded projects already have significant gender components. For example, through a long-term collaboration between Australia and Vietnam, ACIAR is working with the Vietnamese Women's Union in north-western Vietnam to improve food security and rural household incomes. In one district alone, the project is helping over 2,000 women, particularly from ethnic minorities and poor smallholder farming families, to increase vegetable production by up to 30% and sell their surplus vegetables to profitable markets. This equates to an additional 8,200 tonnes of high-value vegetables with a value of US\$3.1 million each year.

In Afghanistan, part of ACIAR's work to rehabilitate the Mazar catchment has provided women with a potential source of income. In all, 540 women (from about 160 women's groups) were trained in nursery techniques for local pistachio, and produced more than 80,000 seedlings which the community transplanted into the catchment.

Three women farmers' groups in PNG were trained in financial literacy and linked to the National Development Bank's microcredit scheme. Access to credit enabled women farmers to hire labour, purchase inputs (seeds, fertilisers, small farm equipment) and use public transport to go to the market (rather than carrying goods on their back). This improved their productivity and income, while reducing their workload. Participating women claimed that their ability to generate income and contribute to children's education and social obligations earned them greater respect from their family and community.

## Overview of planned funding and expenditure

	2015-16 actual A\$m	2016-17 budget estimate A\$m	2017-18 budget estimate A\$m
<b>EXPENDITURE</b>			
Research program <sup>a</sup>	71.53	89.17	90.28
Global program <sup>b</sup>	19.81	19.24	17.59
Education and training <sup>c</sup>	8.08	9.00	8.18
Communicating research results	0.63	0.59	1.50
<b>Total administered costs</b>	<b>100.05</b>	<b>118.00</b>	<b>117.55</b>
<b>Total departmental costs<sup>d</sup></b>	<b>11.34</b>	<b>11.61</b>	<b>10.91</b>
<b>Total</b>	<b>111.39</b>	<b>129.61</b>	<b>128.46</b>
<b>FUNDING</b>			
Administered			
Administered appropriation	81.59	93.99	96.88
Special accounts	18.46	24.01	20.67
<b>Total administered funding</b>	<b>100.05</b>	<b>118.00</b>	<b>117.55</b>
Departmental			
Departmental appropriation	9.65	9.49	9.36
s 74 Retained revenue receipts <sup>e</sup>	1.37	1.63	1.17
Expenses not requiring appropriation <sup>f</sup>	0.32	0.49	0.38
<b>Total departmental funding</b>	<b>11.34</b>	<b>11.61</b>	<b>10.91</b>
<b>TOTAL</b>	<b>111.39</b>	<b>129.61</b>	<b>128.46</b>

<sup>a</sup> Bilateral and multilateral projects, program support and impact assessment

<sup>b</sup> Untied funding to international centres

<sup>c</sup> Not including training within projects

<sup>d</sup> Includes salaries, Executive, Commission, Policy Advisory Council and corporate support

<sup>e</sup> Revenue from external sources

<sup>f</sup> Depreciation, amortisation and audit fees



## Projects by region and country 2017-18

Region and country	Target appropriation budget allocations %	ACIAR base appropriation A\$m	DFAT and other external funding A\$m	Total country funding A\$m		2017-18 total allocation A\$m
				Country	Regional	
<b>Papua New Guinea &amp; Pacific</b>	<b>26.4</b>	<b>19.20</b>	<b>5.30</b>	<b>17.42</b>	<b>7.08</b>	<b>24.50</b>
Papua New Guinea		10.28	3.95	13.41	0.82	14.23
Fiji		2.34		0.88	1.46	2.34
Kiribati		0.93	0.47	0.70	0.70	1.40
Samoa		0.83		0.23	0.60	0.83
Solomon Islands		1.55	0.47	1.01	1.01	2.02
Tonga		1.01		0.51	0.50	1.01
Tuvalu		0.14			0.14	0.14
Vanuatu		2.12	0.41	0.68	1.85	2.53
<b>East Asia</b>	<b>43.7</b>	<b>31.84</b>	<b>2.68</b>	<b>26.10</b>	<b>8.42</b>	<b>34.52</b>
Cambodia		3.13		1.41	1.72	3.13
China		0.76		0.34	0.42	0.76
Indonesia		8.00	2.42	9.40	1.02	10.42
Lao PDR		4.68		2.39	2.29	4.68
Mongolia <sup>a</sup>		0.20		0.06	0.14	0.20
Myanmar		4.42	0.26	3.63	1.05	4.68
Philippines		3.99		3.69	0.30	3.99
Thailand		0.04		0.03	0.01	0.04
Timor-Leste		1.19		1.13	0.06	1.19
Vietnam		5.43		4.02	1.41	5.43
<b>South and West Asia</b>	<b>15.2</b>	<b>11.04</b>	<b>4.03</b>	<b>9.31</b>	<b>5.76</b>	<b>15.07</b>
Afghanistan			1.23	1.23		1.23
Bangladesh		2.72	0.26	1.49	1.49	2.98
India		2.47	0.77	1.75	1.49	3.24
Nepal		1.06	0.31	0.82	0.55	1.37
Pakistan		4.79		4.02	2.23	6.25
<b>Eastern and Southern Africa</b>	<b>14.7</b>	<b>10.72</b>	<b>0.00</b>	<b>8.45</b>	<b>2.27</b>	<b>10.72</b>
Botswana		0.20			0.20	0.20
Ethiopia		2.20		2.10	0.10	2.20
Kenya		1.19		0.94	0.25	1.19
Malawi		0.88		0.80	0.08	0.88
Mozambique		1.16		0.94	0.22	1.16
Republic of South Africa		0.73		0.12	0.61	0.73
Rwanda		0.57		0.57		0.57
Tanzania		1.49		1.27	0.22	1.49
Uganda		0.91		0.91		0.91
Zambia		0.63		0.54	0.09	0.63
Zimbabwe		0.76		0.26	0.50	0.76
<b>TOTAL</b>	<b>100.0</b>	<b>72.80</b>	<b>12.01</b>	<b>61.28</b>	<b>23.53</b>	<b>84.81</b>

<sup>a</sup> The allocation for Mongolia is related to a joint project (LPS/2012/107 *Payments for ecosystems services in the grasslands of China and Mongolia*).

## External funding expenditure

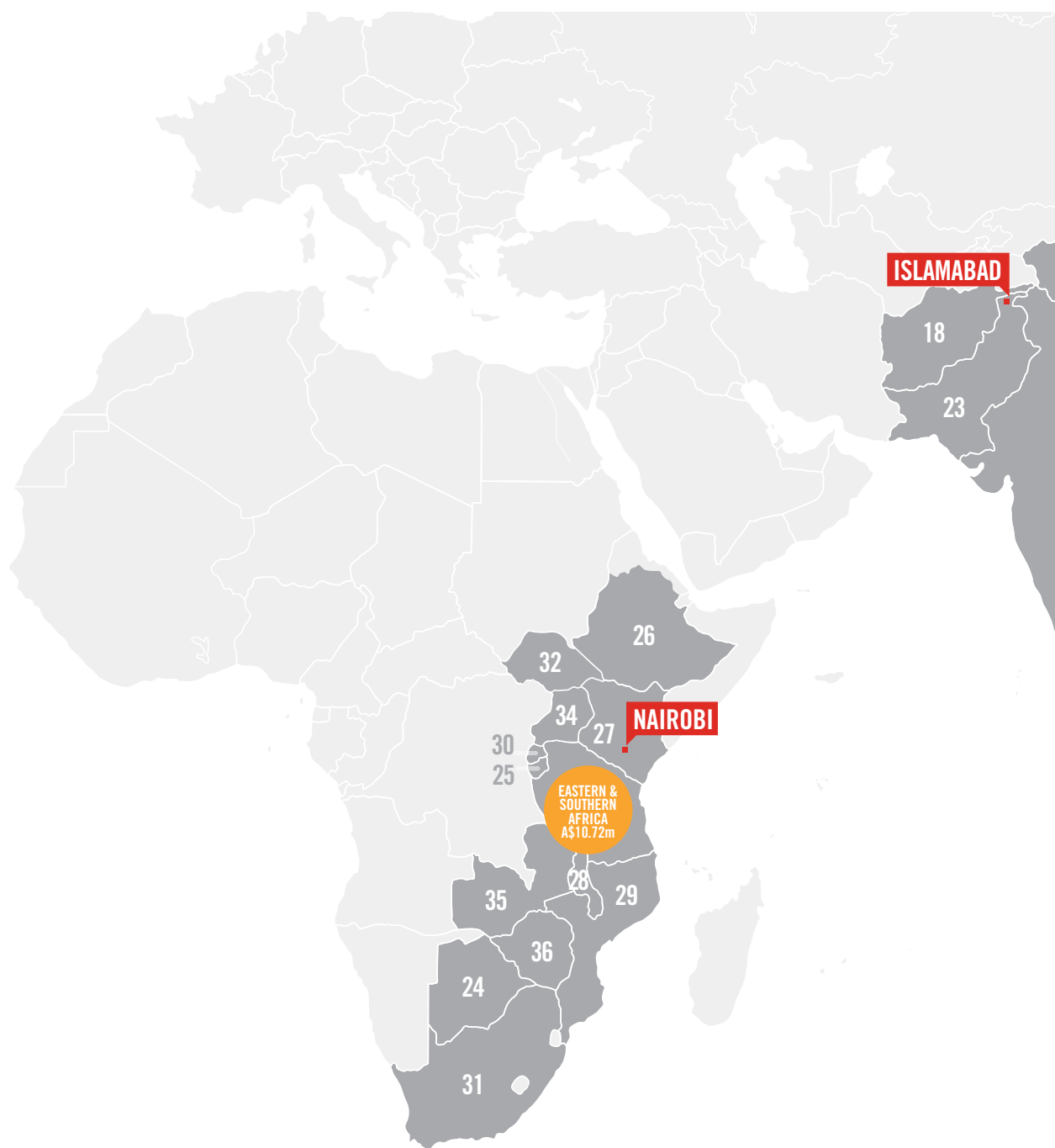
	2015-16 actual A\$m	2016-17 budget estimate A\$m	2017-18 budget estimate A\$m
<b>Pacific</b>			
Papua New Guinea	4.22	6.00	3.95
Pacific island countries	2.22	1.30	1.35
<b>East Asia</b>			
Indonesia	0.37	2.00	2.42
Myanmar	2.71	1.50	0.26
Timor-Leste	2.31		
<b>South and West Asia</b>			
Afghanistan	3.29	2.90	1.23
Pakistan	0.60	2.50	1.46
India	0.36		
Climate-resilient farming systems Eastern Gangetic Plains	1.31	1.50	1.34
<b>Eastern and Southern Africa</b>			
Africa	0.01		
Iraq	0.07		
<b>Other</b>			
Postgraduate scholarships	1.13	5.26	2.73
FAO Regional Consultation on Biotechnologies in sustainable Food Systems and Nutrition			0.68
Funding under negotiation		6.31	5.25
<b>TOTAL</b>	<b>18.46</b>	<b>24.01</b>	<b>20.67</b>

## Capacity building and training—student numbers

	2013-14 (actual)	2014-15 (actual)	2015-16 (actual)	2016-17 (estimate)	2017-18 (estimate)
John Allwright Fellows: total active in year	111	138	130	140	143
John Allwright Fellowships awarded in year	27	27	24	27	7
John Dillon Fellows: total active and awarded in year	10	10	10	10	10



## Countries where ACIAR works and country offices



### Key

#### Pacific

- 1 Fiji
- 2 Kiribati (in part)
- 3 Papua New Guinea
- 4 Samoa
- 5 Solomon Islands
- 6 Tonga
- 7 Tuvalu
- 8 Vanuatu

#### East Asia

- 9 Cambodia
- 10 China
- 11 Indonesia
- 12 Lao PDR
- 13 Myanmar
- 14 Phillipines
- 15 Thailand
- 16 Timor-Leste
- 17 Vietnam

#### South and West Asia

- 18 Afghanistan
- 19 Bangladesh
- 20 Bhutan
- 21 India
- 22 Nepal
- 23 Pakistan

#### Eastern and Southern Africa

- 24 Botswana
- 25 Burundi
- 26 Ethiopia
- 27 Kenya
- 28 Malawi
- 29 Mozambique
- 30 Rwanda
- 31 South Africa
- 32 South Sudan
- 33 Tanzania
- 34 Uganda
- 35 Zambia
- 36 Zimbabwe









**Pacific**

# Regional program summary

ACIAR's Pacific research program currently operates across eight countries in the Pacific region: Fiji, Kiribati, Papua New Guinea (PNG), Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu. The livelihoods, agricultural commodities and production systems in these countries are closely bound by culture; geography, agroecology and climate; focus commodities and industries; and production/industry development issues and constraints. While acknowledging individual country-partner needs and research and development (R&D) priorities, ACIAR's medium-term strategy for the Pacific continues to have a strong regional dimension.

Regional priorities are identified through both regional- and country-level consultations and dialogue; for example, regional high-level forums, such as the Ministers of Agriculture, Fisheries and Forestry Forum and the Heads of Agriculture, Fisheries and Forestry Forum, and close alignment with the Pacific Community (SPC) regional agriculture and fisheries strategies. Regional research programs and projects are implemented in collaboration with regional agencies, including SPC and the University of the South Pacific; CGIAR Centres, such as WorldFish; the World Vegetable Center; and bilateral research and extension agencies.

It is recognised that the Pacific islands have particular research and adoption challenges related to the size of the countries, institutional and other capacities, and remoteness from markets. ACIAR's regional program, and the constituent project portfolio, are designed to address these limiting factors, including a strong emphasis on capacity building and adoption pathways. A feature of this regional approach is the cross-learning that country results can provide to other Pacific island countries, either directly or with suitable adaptation.

This regional approach includes a fully integrated regional program—the second phase of the Pacific Agribusiness Research for Development Initiative (PARDI)—which now consists of a cluster of projects with a cross-disciplinary unifying mechanism. For the Pacific islands, this program will improve rural livelihoods and make them more resilient through increased targeted, sustainable and inclusive agribusiness development. It will enhance understanding and measurement of livelihood improvement and agribusiness performance; develop models to achieve impacts at scale through strategic collaboration with agribusiness-focused projects; develop a 'community of practice' to build agribusiness research capacity and increase the success and sustainability of agribusiness developments; and identify and prioritise new opportunities for agribusiness development.

Multicountry projects in fisheries (pathways to change in Pacific coastal fisheries in Kiribati, Solomon Islands and Vanuatu), forestry (domestication and breeding of sandalwood, agroforestry and coconut timber products) and crops (sweetpotato, indigenous vegetables, commercial vegetables, tropical fruits and cocoa) are also in place. The projects (also listed in the country chapters) that each involve more than one country in the Pacific region, are:

**AGB/2014/057** Pacific Agribusiness Research for Development Initiative (PARDI) Phase 2

**AH/2014/042** Improving the bee industry in Fiji, Papua New Guinea and Solomon Islands (proposed)

**ASEM/2012/084** Promoting traditional vegetable production and consumption for improved livelihoods in Papua New Guinea and northern Australia

**ASEM/2016/101** Climate-smart landscapes for promoting sustainability of Pacific island agricultural systems [Fiji, Tonga]

**CIM/2012/086** Developing a foundation for long-term management of basal stem rot of oil palm in Solomon Islands and Papua New Guinea

**FIS/2010/096** Improving postharvest processing and supply chains of sea cucumbers in Kiribati, Tonga and Fiji

**FIS/2010/098** Diversification of seaweed industries in Pacific island countries [Fiji, Kiribati, Samoa]

**FIS/2012/074** (*multilateral, WorldFish*) Community-based fisheries management in Pacific island countries [Kiribati, Solomon Islands, Vanuatu]

**FIS/2012/076** Improving community-based aquaculture in Fiji, Kiribati, Samoa and Vanuatu

**FIS/2014/060** Developing pearl industry-based livelihoods in the western Pacific [Fiji, PNG, Tonga]

**FIS/2015/031** Fish in national development: contrasting case studies in the Indo-Pacific region [Solomon Islands, Vanuatu]

**FIS/2016/126** Half-pearl industry development in Tonga and Vietnam

**FIS/2016/300** Pathways to change in Pacific coastal fisheries [Kiribati, Solomon Islands, Vanuatu]

**FST/2014/065** Development of durable engineered wood products in Papua New Guinea and Australia

**FST/2014/067** Enhancing value-added products and environmental benefits from agroforestry systems in Papua New Guinea and the Pacific [Fiji, PNG, Solomon Islands, Vanuatu]

**FST/2014/069** Improvement and management of teak and sandalwood in Papua New Guinea and Australia

**FST/2016/025** Developing DNA-based chain-of-custody systems for legally sourced teak [Indonesia, Lao PDR, Myanmar, PNG, Solomon Islands, Thailand]

**FST/2016/158** Domestication and breeding of sandalwood in Fiji and Tonga

**HORT/2010/065** Integrated crop management strategies for root and tuber crops: strengthening national and regional capacities in Papua New Guinea, Fiji, Samoa, Solomon Islands and Tonga

**HORT/2014/077** Enhanced fruit production and postharvest handling systems for Fiji, Samoa, Tonga and Vanuatu

**HORT/2014/078** Aligning genetic resources, production and postharvest systems to market opportunities for Pacific island cocoa [Fiji, Samoa, Solomon Islands, Vanuatu]

**HORT/2014/080** Integrating protected cropping systems into high-value vegetable value chains in the Pacific and Australia [Fiji, Samoa, Tonga]

**HORT/2016/185** Responding to emerging pest and disease threats to horticulture in the Pacific islands [Fiji, PNG, Samoa, Solomon Islands, Tonga]

**HORT/2016/056** Optimising tissue culture of coconut in support of saving the Pacific regional gene bank [Fiji, PNG, Samoa]

**HORT/2016/057** Exploring opportunities for smallholder coffee in Fiji and Vanuatu

**LPS/2016/021** Assessment of markets and production constraints to small ruminant farming in the Pacific island countries [Fiji, Samoa, Vanuatu]

**SMCN/2014/089** Improving soil health, agricultural productivity and food security on atolls [Kiribati, Tuvalu]

**SMCN/2016/111** Soil management for resilient agriculture in Pacific Islands [Fiji, Kiribati, Samoa, Tonga, Tuvalu]



# Pacific island countries

Key statistics <sup>a</sup>	GDP per capita (US\$)	Population (million)
Fiji	9,323.2	0.89
Kiribati	1,994.8	0.11
Samoa	5,934.9	0.19
Solomon Islands	2,200.9	0.58
Tonga	5,534.8	0.10
Tuvalu	3,926.2	0.01
Vanuatu	2,987.9	0.27

Funding	A\$m
2015-16 actual	8.11
2016-17 budget allocation	8.50
2017-18 budget	10.27

<sup>a</sup> Data for 2015 GDP and population from [data.worldbank.org/country](http://data.worldbank.org/country)

## Regional context

**The Pacific region continues to experience significant economic, social and environmental challenges. While extreme poverty—defined as the proportion of the population living below US\$1.25 a day—is rare in the Pacific, poverty remains a big challenge for many countries. Over 20 per cent of people in most Pacific island countries live in hardship and are unable to meet their basic needs. Many people not currently in severe hardship remain vulnerable to falling into hardship due to economic and environmental shocks. The region is particularly prone to disasters including cyclones, severe storms, flooding and earthquakes.**

The countries of the Pacific region are among our closest neighbours and many of their small national populations and economies have been hard hit by extreme weather events and global economic competition. Our research partnerships in this region therefore place special emphasis on various strategies to increase the resilience of agriculture systems.

As a regional neighbour, Australia is well placed to work closely with Pacific island governments and civil society to improve their development. The Australian Government has committed to an elevated engagement (Pacific Partnerships for Development) with Pacific island partners to work together to meet common challenges, raise the standard of living for people throughout the region and, in particular, make more rapid progress towards achieving individual countries' development ambitions.

Australia's priorities for each Pacific island country (PIC) are articulated in their individual Department of Foreign Affairs and Trade (DFAT) Aid Investment Plans, and build on previous country strategies. They emphasise how the aid program in each country will

### Aid Investment Plan, Pacific Regional, 2015-16 to 2018-19

support the broad directions of the new development policy, including measures aimed at improving broad-based economic growth as well as enhancing private-sector development.

Key challenges in achieving these measures include the islands' physical isolation, human and organisational capacity constraints, land tenure disputes and uncertainties, lack of infrastructure, poor transportation logistics, poorly developed supply chains, lack of harmonisation between countries (e.g. in biosecurity laws) and the need to link with, and compete in, major international markets (which may be a special challenge, given the small size and underdevelopment of Pacific domestic markets). In addition, erosion of tariff preferences, population and urban growth, migration of skilled labour, resource depletion and degradation, risks from climate change, fluctuating food and energy prices, and political and economic constraints to effective policy implementation are also recognised as significant impediments to development and progress.

ACIAR's program in the PICs embraces Papua New Guinea (PNG; described in separate section), Fiji, Kiribati, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu. Horticulture, forestry and fisheries sustain many households in these countries and supply the majority of livelihoods as well as food security. The ACIAR strategy works towards underpinning the competitiveness and security of these sectors. Women, in particular, have a central role in household food gardening; and the harvesting, processing and marketing of horticultural, tree crop and fisheries products. Transforming these agricultural, fisheries and forestry systems into sustainable income-generating activities through improved productivity, processing and marketing will enhance food security and self-reliance, and reduce poverty. To achieve sustainable change, ACIAR will help develop innovative approaches that engage, empower and invest in women.

### Rationale for the ACIAR approach

ACIAR recognises that PICs have many problems in common and that individual national research and development (R&D) capacity is limited. As a result, to achieve the most effect, ACIAR has a strong emphasis on working with consortia of countries with similar interests and challenges, through regional organisations—for example, the Pacific Community (SPC) and the University of the South Pacific (USP)—as well as other donor agencies (especially the International Fund for Agricultural Development, IFAD). Collaboration in the design and implementation of these initiatives ensures that R&D efforts target agreed national and regional priorities and deliver outputs effectively.

This approach does not, however, exclude the possibility of investigating individual PIC priorities arising from differences in climate and soils, availability of natural resources, institutional capacity, infrastructure and potential for economic growth, or of undertaking single-country projects when the scale of the problem or unique characteristics warrant such an approach. In such cases, ACIAR supports targeted and mutually agreed single-country projects on major issues of concern, and recognises that such projects can be linked closely with regional extension and community development programs to foster opportunities for dissemination of information and lessons learned across PICs.

ACIAR also works closely with other Australian agencies to develop complementary and jointly funded projects aimed at assessing these national development priorities and regional issues. In a new phase of work, the ACIAR-funded Pacific Agribusiness Research for Development Initiative (PARDI) will provide focused agribusiness research to support

ongoing projects in the horticulture, fisheries, forestry and livestock sectors and to identify new markets and opportunities for long-term pro-poor agribusiness development. There will be a stronger focus on building resilience and understanding and achieving livelihood outcomes through coordinated technical research projects. New work will also occur in collaboration with the Australian-funded Pacific Horticultural and Agricultural Market Access (PHAMA) program. As both programs enter their next phase of implementation, PHAMA continues to assist PICs to gain and maintain access to key markets for selected high-value Pacific products, while PARDI helps to strengthen other links in production and postharvest value chains. PHAMA has recently moved into PNG where it is working closely with several ACIAR projects.

In crops and livestock, the focus is on identification and management of constraints to productivity, and on understanding and engaging in markets for high-value products from these sectors. Maintaining soil health as production systems are intensified is recognised across the region as a key challenge in ensuring sustainability and resilience in the face of climate change and extreme weather events.

In the fisheries sector, ACIAR will focus on managing sustainable production from oceanic and inshore fisheries, developing alternatives through aquaculture, and increasing economic returns through improved product quality and better market linkages. The forestry program will promote the development of value-adding forest industries, whereby landowners will derive benefits from both timber and non-timber forest products, and increased resilience through the development of agroforestry systems. There will be increased attention given to the provision of improved tree germplasm and to the development and strengthening of integration between production systems and markets through efficient and equitable value chains.

ACIAR continues to support a scholarship program to build R&D capacity within the region. Following an external review in 2013, the postgraduate training scheme has been strengthened through enhanced Australian mentoring support for students from the region to study for a higher degree at USP, conducting their thesis research in association with relevant ACIAR projects.

### PIC priorities

Priorities for ACIAR-PICs cooperation are reviewed and updated in regular consultation with relevant government, community and private-sector stakeholders. Forestry consultations were held in Vanuatu in December 2011, Solomon Islands in

March 2012 and Fiji in August 2012. In addition, ACIAR attends regional priority-setting meetings, including those of the Regional Conference of Heads of Agriculture and Forestry Services and the SPC Heads of Fisheries. These processes lead to a close alignment between ACIAR's priorities and those of SPC.

Key areas identified as research priorities across the medium term include:

- integration and sustainability of agriculture, fisheries and forestry resource management and development
- research into increasing resilience and reducing the impact of climate change on the development of sustainable agriculture, fisheries and forestry
- underpinning of the competitiveness of agriculture, fisheries and forestry value chains.

## 2017–18 research program

ACIAR supports research to address the three PIC priorities through the following subprograms.

### Food and nutritional security

This subprogram has two major emphases. First, it aims to develop and implement strategies to underpin improved and sustainable productivity and quality of food staples and high-value horticultural crops. It has a particular focus on integrated crop management (ICM), including sustainable management of crop pests and diseases, and maintaining soil health. The second emphasis is on increasing household incomes through market-driven diversification of production by exploiting new market niches, genetic diversity, and new products and processing.

ACIAR's main work on vegetables builds on experiences learned in several bilateral projects. Movement towards commercial production of vegetables in the Pacific islands has led to various threats to health, the environment and the sustainability of production systems, due to a lack of access to adequate supporting technologies and expertise and the absence of a well-developed regulatory environment. This work is being pursued in a new project focusing on the problems associated with emerging pests and diseases.<sup>1</sup> A closely related project focuses on ICM strategies for managing plant protection problems in sweetpotato, yams and taro, focusing on weevil pests in sweetpotato, viruses that prevent dissemination of yam germplasm, and leaf blight of taro.<sup>2</sup>

A related project that focuses on building and maintaining the fertility of soils is helping to improve food garden systems on atolls for production, diet diversity and water resource protection is getting underway in Kiribati and Tuvalu.<sup>3</sup> A new project is studying soil management for adaptation to environmental change in PICs.<sup>4</sup> Other new research will examine ways to increase or protect environmental livelihood security (ELS) under a variable or changing climate through community-driven management of agricultural landscapes to achieve this aim.<sup>5</sup>

Fish is by far the most important and fastest growing animal-source food, and is a critical contributor to food and nutrition security in many countries. Yet, this critical role of fish is poorly represented in global debates about food security and development. There is a limited understanding, particularly among those outside the sector, of the long-term contribution the fisheries sector can make to the challenges of food security, poverty alleviation and improved wellbeing. This lack of information includes the importance and impact of small-scale fisheries. A small research project aims to fill this gap by collating best-available evidence of the impact of small-scale fisheries to build a case for research for development in this field. Solomon Islands is just one of several countries that will benefit from this work.<sup>6</sup>

### Fisheries resource management and development

This subprogram aims at developing and implementing strategies to sustainably manage, use and add value to natural resources associated with fisheries.

The research has two major focal areas. The first is farming a range of marine (mariculture) and freshwater (aquaculture) species, which provide opportunities for regional businesses and income generation at the local level. For example, a project on pearl culture in Tonga, Fiji and PNG is improving husbandry techniques along the entire production line, as well as opening up new opportunities via segmentation of the pearl industry.<sup>7</sup> This involves new pearl products developing opportunities for specialisation in spat collection, and separating juvenile oyster production from farming of adult, seeded pearl oysters. Particular emphasis is placed on involvement of communities in the farming operations, especially in spat collection and husbandry of juvenile oysters. Women's groups are engaged in jewellery-making businesses using mother-of-pearl and mabè (half) pearls. Development of the half-pearl industry is being supported in Tonga and Vietnam.<sup>8</sup>



Development of the seaweed industry is the focus of a project operating in Fiji, Samoa and Kiribati.<sup>9</sup> The project has three areas: production of the major seaweed species for carrageenan gel (widely used in food manufacturing); farming and postharvest processing of the edible seaweed commonly known as sea grapes; and development of bioactive compounds from seaweeds (e.g. fertilisers, stockfeed and pharmaceutical products).

Aquaculture research on a freshwater fish, tilapia, is being undertaken in Fiji, Samoa and Vanuatu in conjunction with the aquaculture section of SPC.<sup>10</sup> The research centres on improving breeding stocks and supply of juveniles, feeding and pond culture. Within the same project, breeding and sea ranching of sea cucumbers is being investigated in Kiribati.

The second focus area for the fisheries cluster is management of near-shore artisanal fisheries. One project aims to facilitate improved local and national governance of near-shore fisheries, with the ultimate aim of ensuring the nutritional security, productivity and resilience of fisheries systems and community livelihoods in Solomon Islands, Vanuatu and Kiribati.<sup>11</sup> Another builds on an SPC initiative (*A new song for coastal fisheries*) and involves research on the role of fish in meeting the nutritional needs of PICs over the next 20 years.<sup>12</sup> A third project is undertaking research on harvesting and processing wild-caught sea cucumbers, specifically with the intent of improving processing quality and thus getting better returns for fishing communities.<sup>13</sup>

A new project will examine pathways to change in Pacific coastal fisheries in Kiribati, Solomon Islands and Vanuatu.<sup>14</sup> In Samoa, reef colonisation and socioeconomic impacts from trochus translocations to Samoa are being studied.<sup>15</sup>

## Agriculture and forestry value chains

This subprogram aims to support the identification and development of opportunities for domestic, inter-island and international trade for agricultural, fisheries and forestry products and agribusiness, with a view to increasing economic growth in PICs. It includes a range of activities with both regional and individual-country dimensions, including market research, strengthening agribusiness linkages, analysing and increasing the efficiency of value chains, and identifying and developing value-adding opportunities. For example, replanting currently underutilised or badly eroded marginal lands with diverse high-value tree crops can offer both livelihood benefits and environmental gains. Such transitions should show a positive carbon balance.

Much of the work of this subprogram is organised under the 'umbrella' of PARDI II—a new phase

of agribusiness research which will focus on improving Pacific livelihoods and making them more resilient through strategic, sustainable and inclusive agribusiness development.<sup>16</sup> PARDI II will develop a 'community of practice' in agribusiness research working with a portfolio of ACIAR agribusiness-focused projects in the horticulture, forestry, fisheries and livestock sectors. Working with researchers, businesses, non-government organisations and communities in existing projects, PARDI II will support additional agribusiness research necessary to achieve sustainable and inclusive impacts at scale. It will also support research to identify new agribusiness development opportunities in other commodities and situations, especially in more peripheral areas and particularly for the domestic or regional markets.

PARDI II will actively engage and identify opportunities to collaborate with other R&D providers, donors and projects in the Pacific (e.g. IFAD, the Food and Agriculture Organization of the United Nations (FAO), the World Bank and the European Union), as well as support capacity building and communication. In particular, PARDI complements the PHAMA program (which addresses regulatory and market access issues), and activities are closely coordinated for greater impact when both initiatives work with the same partners on the same commodities, as in the case of cocoa.

In Solomon Islands and PNG, work is being undertaken to support the management of basal stem rot in oil palm trees, mainly by seeking host-plant resistance. Oil palm (*Elaeis guineensis*) is a long-term perennial crop of great economic importance in South-East Asia and the Pacific (PNG and Solomon Islands), providing much needed income to both large plantations and smallholders. Basal stem rot, caused by the fungus *Ganoderma boninense*, poses a major threat to the oil palm industry, with basal stem rot incidence increasing with each successive planting.<sup>17</sup>

## Horticulture

Within the framework of the new agribusiness initiative, a new project will strengthen cocoa value chains in PICs (Fiji, Samoa, Solomon Islands and Vanuatu) and Australia, helping smallholders to link to high-end chocolate makers, which are private-sector partners in the project.<sup>18</sup> A new small project will explore opportunities for smallholder coffee in Fiji and Vanuatu.<sup>19</sup>

Building on two promising activities initiated under the previous agribusiness initiative, a new full-scale project will develop 'protected cropping' as a means of improving the supply of high-value vegetables to domestic tourism and hospitality markets in Fiji, Samoa and Tonga.<sup>20</sup> In addition to trialling technical

innovations, the project will help farmers to better organise themselves to produce and sell into these demanding markets.

A similar approach—applying cross-cutting principles but tailoring interventions to the priorities of each country—is being pursued for tropical fruits, which are produced in all the PICs but mainly for local markets. Building on previous work with specific tree crops (papaya, breadfruit) and on the PARADI whole-of-value-chain approach to targeting interventions, a broad-based project is being launched to support the growth of this sector over several years.<sup>21</sup>

Two of these projects include research that specifically tackles resilience of farming systems in the face of climate change and extreme weather events. First, the cocoa project<sup>18</sup> will evaluate ‘cyclone-resistant’ production systems through trellising approaches to cocoa farming. Second, as economic viability of tree crop value chains in the Pacific is often undermined through wind damage associated with frequent cyclone events, the tree crops project<sup>21</sup> includes activities to build tree crop resilience through improved management and dwarfing varieties, focusing on breadfruit (a key species in traditional and new agroforestry systems).

A small project will examine ways of optimising tissue culture of coconut in support of saving the Pacific regional gene bank (by moving the existing gene bank within PNG, new collecting around the Pacific and establishing back-up collections in Fiji and Samoa—all of these activities will require better technologies and skills in tissue culture).<sup>22</sup>

## Livestock

Livestock research aims to increase productivity and improve the marketing options of smallholder cattle producers in Vanuatu, thus contributing to increases in rural household incomes, meeting undersupplied existing and emerging beef markets, and developing the national beef industry.<sup>23</sup> A small research project is assessing small ruminant value chains and production systems in the PICs to identify opportunities for improving smallholder participation in these value chains.<sup>24</sup>

A new project will aim to identify and mitigate constraints to the bee industry in PNG, Fiji and Solomon Islands to provide increased opportunities for smallholder producers and small-to-medium enterprises along the market value chain for honey and other bee products and services.<sup>25</sup>

## Forestry

Forestry projects in the PICs relate to the development of locally appropriate systems for growing plantation trees, such as sandalwood,

teak, whitewood, *Canarium* and other high-value native trees, as well as research into value-adding opportunities for the timber products.

In Solomon Islands, for example, over 20,000 farmers have established small teak plantations that are now at least 15 years old, but they are widely dispersed and currently lack markets for this timber. In Malaita and Guadalcanal provinces and Western Province, two projects are undertaking integrated research to enhance economic opportunities from teak-based agroforestry systems and secondary forest management systems<sup>26</sup> as well as the production of high-quality timber using chainsaw mills and solar drying.<sup>27</sup> This will encourage smallholder adoption of agroforestry systems and management of secondary forests, with improved prospects for selling the timber products to improve their livelihoods.

Another project is researching processing techniques and new markets for value-added fruit and nut produce grown in agroforestry systems in Fiji, Solomon Islands, PNG and Vanuatu. Designed to assist landowners to receive early returns from these systems, the project will conduct research on appropriate value-added processing systems and build capacity within communities to operate businesses marketing these products.<sup>28</sup> This project also aims to develop catchment revegetation systems linked to markets, such as tourism, that could fund these activities. The project should contribute to greater resilience for local communities to cyclones and other extreme weather events, in terms of reducing soil erosion and flooding, and providing communities with a range of income sources that will help them recover after such events. Similar thinking underpins a new project focusing on supporting agroforestry development in Fiji, but with greater emphasis on policy dimensions.<sup>29</sup>

A new project is examining the domestication and breeding of sandalwood in Fiji and Tonga<sup>30</sup> and another is developing DNA-based chain-of-custody systems for legally sourced teak.<sup>31</sup> A large new project aims to advance the Vanuatu planted forestry sector by improving the availability of improved tree germplasm and facilitating wider smallholder adoption of three high-value forestry species: *Canarium*, sandalwood and whitewood.<sup>32</sup> It will also continue research on developing markets for whitewood timber produced from smallholder plantations in northern Vanuatu.

## Innovation in data collection

ACIAR has been exploring the use of digital data collection applications (apps) (DDCAs) with encouraging results, including reduced time and improved accuracy in collecting data (compared with paper-based methods), and increased capacity

for knowledge sharing and project monitoring. Two small regional research projects ensuing from the pilot Mobile Acquired Data (MAD) study are being undertaken in Myanmar, Pakistan, Vanuatu and Vietnam. The projects aim to provide direct support to the four core projects partnering in use of this technology with an at-scale evaluation of DDCAs within these projects (MAD 2) and evaluation of a staged adoption and implementation strategy (MAD 3).<sup>33,34</sup> The purpose is to ensure successful and sustainable deployment of CommCare—the app chosen as most suitable by the pilot study—while evaluating the support options and process to guide future projects seeking to incorporate DDCAs.

## 5-year country outcomes

- Development of a Pacific Soil Portal supporting improved land management and resilience to changes in climate and other conditions
- Molecular characterisation of *Ganoderma* isolates from infected oil palms
- Increased adoption of sustainable cropping and aquaculture by small-scale producers
- Development of new technologies and practices in natural resource management for the forestry and fisheries sectors
- Development of a ‘community of practice’ in agribusiness research for development
- Demonstrated opportunities for sustainable and inclusive agribusiness development to improve livelihoods and community resilience
- Achievement of wider market access for smallholders, aligning farm production to meet quality and nutritional requirements, and for those growing teak or other timber species such as whitewood
- Contribution to the development of land-use policies suited to transitioning to sustainable agroforestry sector in Fiji and Vanuatu
- Increased understanding of the economic and social benefits of catchment rehabilitation and remediation strategies in Fiji and Vanuatu
- Fifteen women trained in business management and value-added processing of agroforestry products in Solomon Islands
- A report produced on effectiveness and impacts of transferring agroforestry knowledge and managing community-based nurseries through Rural Training Centres
- Domestication strategy devised for sandalwood in Vanuatu and training of extension officers in the delivery of Master Tree Grower programs
- A report produced on governance options for sloping land agroforestry
- Financial and growth estimates provided for various commodities
- Needs and priorities agreed for strengthening extension services relating to tropical fruit value chains in at least two PICs
- Seaweed and pearl production contributing to economic development of participating communities
- Soil improvement approaches appropriate to small-scale vegetable production on the outer atoll islands of Kiribati identified
- Partnerships established to commence a project to improve the production and marketing of honey in PNG, Solomon Islands and Fiji
- Oil palm nursery in Solomon Islands screened for symptomatic *Ganoderma*-infected plants
- Assessment of small ruminant production and marketing systems in Fiji, Samoa and Vanuatu completed
- On-farm cattle production data systems established (using MAD) at project sites in Vanuatu
- A regional project on overcoming soil constraints commenced
- The use of digital data collection applications explored in Vanuatu

## 2017–18 project outputs

- Livelihood and resilience criteria and frameworks devised for identifying and evaluating agribusiness development opportunities
- Opportunities identified and four targeted agribusiness research activities established to support sustainable impacts at scale in horticulture, forestry, fisheries and livestock projects

### Key Research Program Managers

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## Current and proposed projects

- <sup>1</sup> **HORT/2016/185** Responding to emerging pest and disease threats to horticulture in the Pacific islands
- <sup>2</sup> **HORT/2010/065** Integrated crop management strategies for root and tuber crops: strengthening national and regional capacities in Papua New Guinea, Fiji, Samoa, Solomon Islands and Tonga
- <sup>3</sup> **SMCN/2014/089** Improving soil health, agricultural productivity and food security on atolls
- <sup>4</sup> **SMCN/2016/111** Soil management for resilient agriculture in Pacific islands
- <sup>5</sup> **ASEM/2016/101** Climate-smart landscapes for promoting sustainability of Pacific island agricultural systems
- <sup>6</sup> **FIS/2017/003** (*multilateral, WorldFish*) The contribution of small-scale fisheries research to a food secure world
- <sup>7</sup> **FIS/2014/060** Developing pearl industry-based livelihoods in the western Pacific
- <sup>8</sup> **FIS/2016/126** Half-pearl industry development in Tonga and Vietnam
- <sup>9</sup> **FIS/2010/098** Diversification of seaweed industries in Pacific island countries
- <sup>10</sup> **FIS/2012/076** Improving community-based aquaculture in Fiji, Kiribati, Samoa and Vanuatu
- <sup>11</sup> **FIS/2012/074** (*multilateral, WorldFish*) Community-based fisheries management in Pacific island countries
- <sup>12</sup> **FIS/2015/031** Fish in national development: contrasting case studies in the Indo-Pacific region
- <sup>13</sup> **FIS/2010/096** Improving postharvest processing and supply chains of sea cucumbers in Kiribati, Tonga and Fiji
- <sup>14</sup> **FIS/2016/300** Pathways to change in Pacific coastal fisheries
- <sup>15</sup> **FIS/2016/128** Reef colonisation and socioeconomic impacts from trochus translocations to Samoa
- <sup>16</sup> **AGB/2014/057** Pacific Agribusiness Research for Development Initiative (PARDI) Phase 2
- <sup>17</sup> **CIM/2012/086** Developing a foundation for the long-term management of basal stem rot of oil palm in Papua New Guinea and Solomon Islands
- <sup>18</sup> **HORT/2014/078** Aligning genetic resources, production and postharvest systems to market opportunities for Pacific island cocoa
- <sup>19</sup> **HORT/2016/057** Exploring opportunities for smallholder coffee in Fiji and Vanuatu
- <sup>20</sup> **HORT/2014/080** Integrating protected cropping systems into high-value vegetable value chains in the Pacific and Australia
- <sup>21</sup> **HORT/2014/077** Enhanced fruit production and postharvest handling systems for Fiji, Samoa, Tonga and Vanuatu
- <sup>22</sup> **HORT/2016/056** Optimising tissue culture of coconut in support of saving the Pacific regional gene bank
- <sup>23</sup> **LPS/2014/037** Increasing the productivity and market participation of smallholder beef cattle farmers in Vanuatu
- <sup>24</sup> **LPS/2016/021** Assessment of markets and production constraints to small ruminant farming in the Pacific island countries
- <sup>25</sup> **AH/2014/042** Improving the bee industry in Fiji, Papua New Guinea and Solomon Islands (proposed)
- <sup>26</sup> **FST/2012/043** Enhancing economic opportunities offered by community and smallholder forestry in Solomon Islands
- <sup>27</sup> **FST/2014/066** Improving returns from community teak plantings in Solomon Islands
- <sup>28</sup> **FST/2014/067** Enhancing value-added products and environmental benefits from agroforestry systems in Papua New Guinea and the Pacific
- <sup>29</sup> **ADP/2016/147** Improving agroforestry policy for sloping land in Fiji
- <sup>30</sup> **FST/2016/158** Domestication and breeding of sandalwood in Fiji and Tonga
- <sup>31</sup> **FST/2016/025** Developing DNA-based chain-of-custody systems for legally sourced teak
- <sup>32</sup> **FST/2016/154** Enhancing returns from high-value agroforestry species in Vanuatu
- <sup>33</sup> **GMCP/2016/004** At-scale evaluation of digital data collection apps (DDCAs) in ACIAR projects—Mobile Acquired Data phase 2 (MAD 2)
- <sup>34</sup> **GMCP/2016/042** Mobile Acquired Data phase 3 (MAD 3)—evaluation of staged adoption and implementation strategy



# Papua New Guinea

## Key statistics<sup>a</sup>

GDP per capita (US\$)	1,038.5
Population (million)	7.6

## Funding

A\$m

2015-16 actual	8.74
2016-17 budget allocation	12.10
2017-18 budget	14.23

<sup>a</sup> Data for 2015 GDP and population from [data.worldbank.org/country](http://data.worldbank.org/country)

## Country context

**PNG has experienced robust economic growth for over a decade, with expanding formal employment opportunities and strong growth in government expenditure and revenues. This economic performance has been driven by high international prices for PNG's mining and agricultural exports, and in more recent years construction activity related to the liquefied natural gas (LNG) project ... PNG's strong overall growth has not translated into equitable development for Papua New Guineans ... inequality between men and women, poor health and education services, and rapidly growing population are challenges to its future prosperity.**

Papua New Guinea (PNG) is still a predominately rural society with more than 85% of the population residing in traditional communities, many of which are remote in both coastal and inland areas. Many depend largely on subsistence agriculture, fishing and informal cash crop activities for food, employment and income-earning opportunities. The agriculture sector continues to be the safety net of PNG society, employing about half of the labour force and generating 15% of gross domestic product (GDP). While an estimated 30% of the land in PNG is suitable for agriculture, only 2.2% is currently being utilised for commercial agricultural production. In addition, PNG's agricultural productivity is generally low due to poor farming practices, infrastructure and market access as well as inadequate access to essential knowledge and farm inputs.

According to the National Agriculture Development Plan 2007-2016, over the last decade, while population growth averaged 2.7%, growth in the agriculture sector has averaged only around 1%. This slow growth has particularly impacted rural

### Aid Investment Plan, Papua New Guinea, 2015-16 to 2017-18

families. The plan aims to enhance agricultural productivity, the scale of production, market access and income generation through smart partnerships and innovative, sustainable and entrepreneurial farming systems and agro-industry.

Notwithstanding recent high average rates of economic growth, PNG stands at a critical moment in its development. Despite a booming economy and vast natural resources, poverty rates remain high at 37%. Unexpectedly, in rural areas, where access to customary land should lead to better access to food, the rate of food poverty was estimated at 28.5% of the population compared with 14.4% in urban areas. High dependence on subsistence agriculture also raises levels of vulnerability to natural disasters and changing environmental conditions.

Sustainable management of the forestry and fisheries sectors is also vital for PNG's economic growth. The PNG Forest Authority estimated in 2014 that forests covered more than 70% of the country, contributing significantly to rural livelihoods through timber and non-timber forest products as well as

being an important buffer against climate change. The fisheries sector is also a major source of revenue, with many coastal communities heavily dependent on marine and aquatic resources for food and trade. Sustainable management of the fisheries and forestry sectors is essential to ensure ongoing contributions to the economy and livelihoods.

Despite many development challenges, PNG remains focused on its aspiration to graduate to middle-income status by 2050. The PNG Department of National Planning and Monitoring recently updated a new National Strategy for Responsible Sustainable Development (StaRS), wherein forestry and biodiversity, fisheries and marine resources, agriculture and livestock were identified as strategic assets for investment and pillars for economic growth.

Australia values its long-standing ties with PNG—having a shared history and shared geography. As its nearest neighbour and close regional partner, a stable and prosperous PNG is clearly in Australia's interest. Australia's relationship with PNG has evolved, reflecting a more mature, focused and innovative response to PNG's development priorities. In line with the recommendations of a 2014 PNG Aid Assessment, and consistent with the objectives of the 2014 PNG–Australia Economic Cooperation Treaty, the Department of Foreign Affairs and Trade (DFAT) Aid Investment Plan for PNG in 2015–16 to 2017–18 is focusing on three objectives: promoting effective governance; enabling economic growth; and enhancing human development. Australia's support to agricultural research, through ACIAR, is a significant contributor to all three objectives and supports PNG's ambitions for promoting responsible and sustainable development.

A key component of Australia's involvement with the agriculture sector in PNG is the Transformative Agriculture and Enterprise Development Program (TADEP) which is co-funded by DFAT and ACIAR. The multidisciplinary research program aims to improve the livelihoods of rural men and women in PNG through five component research projects. In line with the PNG Government Medium Term Development Plan 2 2016–2017, the projects within TADEP collectively aim to foster private-sector-led development in agriculture, increase agricultural productive capacity and improve access to markets for farmers, particularly women farmers. Training priorities are met mainly through targeted activities within projects, although support for postgraduate degrees in Australia is also a significant contributor to capacity development.

## Country priorities

ACIAR has a formal program of consultation with PNG to establish priorities for research collaboration, as well as annual smaller consultations and industry workshops to fine-tune these priorities. The most recent set of overall formal consultations was held during March–October 2011, with updating consultations for the fisheries and forestry programs in February–March 2016. A country consultation to reassess priorities is planned for late 2017.

The key research priorities of ACIAR's program of collaborative research with PNG are to improve livelihoods by enhancing incomes and market access, through:

- overcoming social, cultural and policy constraints to gaining benefits from agricultural technologies, particularly with respect to gender equity and the role of women
- smallholder vegetables and starchy staples
- commodity and market-chain analysis to guide policy and improve production and marketing for cocoa, coffee, coconut and oil palm crops
- enhanced germplasm quality for high-value species and improvement in community forestry and agroforestry systems
- market development and value-adding in wood and non-wood products
- working with private-sector partners and farmers to enable the adoption of promising agricultural technologies to be scaled up
- enhanced livelihoods from smallholder fisheries, and inland and marine aquaculture
- increased household income through enterprise diversification
- sustainability and resilience of production systems, including livestock health and production.

Key principles in designing and executing the program include:

- building capacity at both research and institutional levels
- engaging with the private sector, industry bodies and non-government organisations (NGOs) in partnership with government, in both undertaking research and implementing research results that directly contribute to economic development
- research that assists smallholder farmers and landowners to improve their incomes through increased market access
- understanding the social, cultural and economic issues affecting farmer decision-making and management of risk, and the factors influencing adoption of new technologies

- close linkages between ACIAR-funded programs in PNG and Pacific island countries (PICs) where relevant
- gender awareness and the empowerment of women and girls.

## 2017–18 research program

ACIAR supports research to address the priorities for PNG through the following subprograms.

### Social and cultural research

ACIAR research in PNG has a focus on the roles of women in agriculture, including women's access to markets and their uptake of new technologies. Two projects are examining opportunities and constraints for women in making the transition from subsistence farming to cash and commercial enterprises.<sup>12</sup>

An integral part of TADEP delivery will be scaling out to a broader range of commodities and geographies with a particular focus on women. This will be achieved through participation and partnering in the program and, in the longer term, through undergraduate/postgraduate curricula at selected PNG universities.

The program is based on improved adoption of innovations that respond to needs and deliver benefits to PNG's smallholder farmers. Emphasis is placed on research that is economically, culturally, socially and environmentally relevant to smallholder farmers. Research aims to help understand the factors affecting innovation, and to respond to socioeconomic and human issues enabling or constraining potential uptake of new agricultural technologies. It works in the sectors of greatest benefit to rural communities, with a particular focus on the empowerment of women and commodities that can be brought to market.

### Vegetables and starchy staples

The production and sale of vegetables and starchy staples provide opportunities to increase and diversify household income. Research is being conducted to improve the understanding the role of traditional vegetables for smallholder growers in both PNG, and school and community gardens in Australia's Northern Territory, with the aim of increasing the diversity of incomes and improved livelihoods.<sup>3</sup>

Root crops are traditional staple foods in PNG and their vital contribution to food security is well recognised. However, the productivity of root crops is declining as a consequence of shortening fallow periods, soil degradation and the build-up of pests

and diseases. Building on the results of previous research, a closely integrated cluster of new projects on sweetpotato is further refining soil-management practices<sup>4</sup> and developing new options for improved crop protection.<sup>5</sup> These two projects provide technical support for a larger project, under TADEP, seeking to strengthen the entire value chain for sustainable and market-oriented sweetpotato-based production systems in the highlands.<sup>6</sup> The work on crop protection will be closely linked with a Pacific region-wide project that is developing integrated crop management (ICM) strategies for managing plant protection problems in sweetpotato, yams and taro, including weevil pests in sweetpotato.<sup>7</sup> Another regional project is focusing on problems associated with emerging horticultural pests and diseases.<sup>8</sup>

### Cocoa, coffee, coconut and oil palm production and marketing

Cocoa, coffee, coconut and oil palm provide major opportunities for PNG producers to increase export earnings and diversify farm incomes. Although large-scale plantations have accounted for much of the production in the past (and continue to do so for oil palm), expanding production of these crops will increasingly be in the domain of smallholders. The ACIAR program is focused on understanding and resolving the social, economic and biophysical constraints to smallholder production of these crops, including the adoption of sustainable ICM practices.

Previous work on cocoa production in East New Britain province showed that smallholders can achieve good yields, even in the presence of cocoa pod borer, if they adopt a package of more-intensive management practices. A project now working country-wide seeks to understand and overcome the constraints that prevent some farmers from adopting these practices, and to supplement the existing package through the deployment of newly available pest-resistant cocoa varieties.<sup>9</sup>

This work in turn feeds into two new projects under TADEP—in Bougainville<sup>10</sup> and other major producing areas<sup>11</sup>—that are strengthening the value chain for cocoa and supporting related enterprise development, from the provision of better planting material, through intensified production techniques, to improved links to higher value markets. Intensification (and diversification) requires transformation in the management of soil health and plant nutrition, which will be guided by a new project linked to the TADEP cocoa projects.<sup>12</sup>

New oil palm research also builds on previous work and focuses on the medium-term effort to better understand host-plant resistance to basal stem rot,



a highly destructive fungal disease that threatens the sustainability of the crop.<sup>13</sup> The project is using molecular markers to identify and exclude the most susceptible clones from future oil palm plantings.

Virtually all cocoa and oil palm smallholders in PNG with access to land also maintain gardens to supply food for their families. But these communities face multiple threats to their food security, including severe population and land-use pressures. In addition, cocoa production is threatened by the devastating cocoa pod borer (*Conopomorpha cramerella*). One project aims to understand the constraints and opportunities faced by these communities, and to design interventions to help them adapt.<sup>14</sup> A new project will examine how livelihoods of smallholder coffee communities in PNG can be improved.<sup>15</sup>

## Forestry and agroforestry, and value-adding processing

The forestry subprogram will focus on three thematic priorities: maintaining work on enhancing availability of improved germplasm for tree growing; processing and value-adding of timber and non-timber products; and enhancing community-based forestry.

Two projects are focusing on enhancing value-added timber processing from planted and natural forests in support of the PNG Government's value-added timber policy, including developing innovative engineered wood products and trialling new ways of strengthening private-sector participation.<sup>16,17</sup>

One project will enhance the availability of improved genetic resources to underpin emerging teak and sandalwood plantation industries.<sup>18</sup> Teak clonal seed orchards have been established in East New Britain province, and sandalwood seed stands will be planted at three locations in Central and Gulf provinces. A small research activity is examining the development of DNA-based chain-of-custody systems for legally sourced teak.<sup>19</sup> Another project under TADEP aims to improve processing efficiency and foster market development for high-value *Canarium* (galip) nut products and thereby improve livelihoods and women's empowerment in East New Britain.<sup>20</sup>

A new project will continue research on enabling community forestry in PNG with activities in Eastern Highlands province, the Ramu-Markham valleys and the Lae region. Research will focus on implementation of family-focused community reforestation activities as well as enhancing livelihoods from the implementation of eco-forestry within community-owned natural forests.<sup>21</sup>

## Fisheries and aquaculture

ACIAR is assisting the PNG National Fisheries Authority in developing the research- and project-management skills of fisheries research staff.<sup>22</sup> The project's aim is to understand the mechanisms, processes and functionality of an integrated capacity-building program to increase management skills underpinning aquaculture and fisheries projects in PNG, and to embed the skills within appropriate institutions.

Fisheries and aquaculture products generate smallholder income, underpin food security and provide the potential for economic development. The ACIAR subprogram in PNG contributes to the sustainable development of capture fisheries and aquaculture resources, evaluates and develops new opportunities and commodities, and enhances economic returns from production within the fisheries sector.

ACIAR's freshwater aquaculture research aims to increase production of tilapia and carp using low-cost and farmer-friendly technologies to improve food and income security for smallholders.<sup>23</sup> Research work is focused in Eastern Highlands province. As well as targeting technical and husbandry improvements, the project is identifying and documenting the social benefits of increased fish production and numbers of farmers involved in aquaculture. A strategic plan for expanding inland aquaculture in PNG will be another output from the project.

Mariculture research in PNG links elements of hatchery-based production of fish and invertebrates, community engagement in sea ranching, business development for communities and fish exporters, and capacity development through engagement with the National Fisheries College and the National Fisheries Authority.<sup>24</sup> A project developing the western Pacific pearl industry is investigating bottlenecks and the development of opportunities in the fledgling pearl-culture industries in Tonga and Fiji, and determining the potential for introducing 'half-pearl' culturing to PNG.<sup>25</sup>

Other research assists the development of locally based coastal sport-fishing ventures in PNG to enhance community livelihoods.<sup>26</sup> Additional benefits of this project include: conserving vital fisheries resources by converting potentially unsustainable capture fisheries into viable release fisheries; providing the incentive and knowledge for local communities to support ecosystem health and resilience; promoting the ideal of sustainable resource use; and facilitating multi-enhancing capacity building across fisheries research, business and tourism. Another project aims to work with PNG scientists to characterise the shark and ray resources of PNG, and thereafter develop a framework for managing the fishery on a sustainable basis.<sup>27</sup>



Description and risk assessment of the bycatch communities in the Gulf of Papua prawn fishery is underway<sup>28</sup> and the development of legal value chains and alternative markets for Western Province fisheries is in progress.<sup>29</sup>

## Diversification and income generation

Diversification into new crop and livestock enterprises (e.g. flowers, fruits, non-timber forest products, small ruminants, and indigenous fish and poultry species) has the potential to provide smallholders with valuable additions to their whole-farm income and increase household resilience through mixed-farming systems. This subprogram aims to help smallholders diversify their production by identifying alternatives, linking farmers to markets, improving postharvest handling, reducing input costs while increasing yield and productivity, and sustainably managing landowner resources.

In East New Britain province, as well as in Solomon Islands and Vanuatu, research has been focusing on new value-added processing technologies and options for developing markets for the anticipated large volume of *Canarium* (galip) nuts that will become available within 5 years. This work is being taken a further step towards full commercial development utilising the National Agricultural Research Institute's pilot nut-processing factory at Kerevat under a TADep project.<sup>30</sup>

A new project aims to improve the production and marketing of honey in PNG, Solomon Islands and Fiji.<sup>31</sup> The bee industry in these countries is smallholder-based and provides business opportunities, particularly for women, with resultant benefits for family and community life.

## Sustainability and resilience of production systems

ACIAR assists in the proper diagnosis and evaluation of threats to both PNG and Australia from emerging pests and diseases and, as appropriate, develops immediate responses or longer term sustainable management strategies to deal with them. Capacity building and close collaboration with relevant Australian and PNG agencies play an important role in strengthening biosecurity arrangements. A project in plant health research seeks to improve understanding of Bogia coconut syndrome, a lethal disease of coconuts.<sup>32</sup> Based on these insights, the project will work to develop a containment and management strategy, and will provide the knowledge base to save the Pacific regional coconut gene bank, which is immediately threatened by the disease. A small project will examine ways of optimising tissue culture of

coconut in support of the gene-bank project, as all the activities involved in this will require better technologies and skills in tissue culture.<sup>33</sup>

A new project aims to develop a delivery system to provide functional animal health and production services that meet the needs of smallholder farmers.<sup>34</sup>

In response to a request from the PNG National Agricultural Research Institute, after the most recent El Niño event in the country, which resulted in drought and frost damage to crops, ACIAR is conducting agricultural research into adaptation to climate change. A small research project will undertake a PNG case study engaging agricultural communities in climate-resilient food production adaptation.<sup>35</sup>

## Research monitoring

Work is underway to collect detailed institutional, financial, human resource and research output data from a complete set of agricultural research agencies operating in the region; and to facilitate stakeholders' access to this information through a variety of online tools and publications for inclusion in the Agricultural Science and Technology Indicators (ASTI).<sup>36</sup> ASTI is the leading global program that compiles, analyses and publishes data on agricultural research systems in developing countries. The project will be implemented jointly by the International Food Policy Research Institute (IFPRI) and the Asia-Pacific Association of Agricultural Research Institutions (APAARI), in close collaboration with the main national agricultural research institutes (NARIs) of Cambodia, Indonesia, Laos, Malaysia, Myanmar, Papua New Guinea, Philippines, Thailand, Timor-Leste and Vietnam.

## 5-year country outcomes

- Enhanced productivity and income growth through improved management of crops, livestock, fisheries and forestry
- Increased access to domestic and external markets for PNG smallholders and private-sector businesses
- Improved health, nutrition and livelihoods of rural communities through opportunities for diversified food production
- Increased private-sector-led development in agriculture and forestry, with particular improvement in the availability of economic opportunities for women

## 2017–18 project outputs

- Report produced on benefits for women working in wood-processing companies as a result of project activities
- Working commercial model of a *Canarium* (galip) nut processing factory developed, including factory design, costs, equipment, products, and market potential and financial analysis
- Recommendations made on best-bet value-added wood products for selected PNG timber species based on wood properties and processing characteristics
- Report produced on the key constraints for communities practising ecoforestry to sell timber legally
- Social, economic and environmental constraints to industry development by smallholder farmers identified and documented with case studies on crop, fisheries and gender research
- Research options designed and initiated to reduce gaps in agricultural productivity and achieve diversified systems for crop, fisheries and poultry producers
- Partnerships established to commence a program of sweetpotato-system research targeting sustainable production, diversification, value-chain development, value-adding and processing
- Partnerships and testing sites established for the dissemination of improved cocoa varieties and integrated production technologies in at least three major cocoa-producing provinces

### Key Research Program Managers

Dr Chris Barlow, Fisheries

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Dr Robert Edis, Soil Management and Crop Nutrition

Dr Eric Huttner, Crop Improvement and Management

Dr Richard Markham, Horticulture

Dr Mike Nunn, Animal Health

Ms Mellissa Wood, Global Program

### Regional Manager, Papua New Guinea & Pacific

Ms Florence Rahiria

## Current and proposed projects

- <sup>1</sup> **ASEM/2014/054** Identifying opportunities and constraints for rural women's engagement in small-scale agricultural enterprises in Papua New Guinea
- <sup>2</sup> **ASEM/2014/095** Improving opportunities for economic development for women smallholders in rural Papua New Guinea
- <sup>3</sup> **ASEM/2012/084** Promoting traditional vegetable production and consumption for improved livelihoods in Papua New Guinea and northern Australia
- <sup>4</sup> **SMCN/2012/105** Sustaining soil fertility in support of intensification of sweetpotato cropping systems
- <sup>5</sup> **HORT/2014/083** Developing improved crop protection options in support of intensification of sweetpotato production in Papua New Guinea
- <sup>6</sup> **HORT/2014/097** Market-oriented intensification of sweetpotato-based systems in the highlands of Papua New Guinea
- <sup>7</sup> **HORT/2010/065** Integrated crop management strategies for root and tuber crops: strengthening national and regional capacities in Papua New Guinea, Fiji, Samoa, Solomon Islands and Tonga
- <sup>8</sup> **HORT/2016/185** Responding to emerging pest and disease threats to horticulture in the Pacific islands
- <sup>9</sup> **HORT/2012/026** Developing more-effective management strategies for cocoa pod borer in new outbreak areas of Papua New Guinea
- <sup>10</sup> **HORT/2014/094** Developing the cocoa value chain in Bougainville
- <sup>11</sup> **HORT/2014/096** Enterprise-driven transformation of family cocoa production in East Sepik, Madang, New Ireland and Chimbu provinces of Papua New Guinea
- <sup>12</sup> **SMCN/2014/048** Optimising soil management and health in Papua New Guinea integrated cocoa farming systems
- <sup>13</sup> **CIM/2012/086** Developing a foundation for long-term management of basal stem rot of oil palm in Solomon Islands and Papua New Guinea
- <sup>14</sup> **ASEM/2012/072** Strengthening livelihoods for food security among cocoa and oil palm farming communities in Papua New Guinea
- <sup>15</sup> **ASEM/2016/100** Improving livelihoods of smallholder coffee communities in Papua New Guinea (proposed)
- <sup>16</sup> **FST/2012/092** Enhancing value-added wood processing in Papua New Guinea

- <sup>17</sup> **FST/2014/065** Development of durable engineered wood products in Papua New Guinea and Australia
- <sup>18</sup> **FST/2014/069** Improvement and management of teak and sandalwood in Papua New Guinea and Australia
- <sup>19</sup> **FST/2016/025** Developing DNA-based chain-of-custody systems for legally sourced teak
- <sup>20</sup> **FST/2014/067** Enhancing value-added products and environmental benefits from agroforestry systems in Papua New Guinea and the Pacific
- <sup>21</sup> **FST/2016/153** Enabling community forestry in Papua New Guinea
- <sup>22</sup> **FIS/2010/055** Building research and project management skills in fisheries staff in Papua New Guinea
- <sup>23</sup> **FIS/2014/062** Improving technologies for inland aquaculture in Papua New Guinea
- <sup>24</sup> **FIS/2014/061** Improving technical and institutional capacity to support development of mariculture-based livelihoods and industry in New Ireland, Papua New Guinea
- <sup>25</sup> **FIS/2014/060** Developing pearl industry-based livelihoods in the western Pacific
- <sup>26</sup> **FIS/2013/015** Sustainable management of sport fisheries for communities in Papua New Guinea
- <sup>27</sup> **FIS/2012/102** Sustainable management of the shark resources of Papua New Guinea: socioeconomic and biological characteristics of the fishery
- <sup>28</sup> **FIS/2016/049** Description and risk assessment of the bycatch communities in the Gulf of Papua prawn fishery
- <sup>29</sup> **FIS/2016/052** Developing legal value chains and alternative markets for Western Province fisheries in Papua New Guinea
- <sup>30</sup> **FST/2014/099** Enhancing private industry-led development of the *Canarium* nut industry in Papua New Guinea
- <sup>31</sup> **AH/2014/042** Improving the bee industry in Fiji, Papua New Guinea and Solomon Islands (proposed)
- <sup>32</sup> **HORT/2012/087** Bogia coconut syndrome in Papua New Guinea: developing biological knowledge and a risk-management strategy
- <sup>33</sup> **HORT/2016/056** Optimising tissue culture of coconut in support of saving the Pacific regional gene bank
- <sup>34</sup> **AH/2012/032** Enabling smallholder livestock services in Papua New Guinea (proposed)
- <sup>35</sup> **ASEM/2016/041** Engaging agricultural communities in climate-resilient food production adaptation: a Papua New Guinea highlands case study
- <sup>36</sup> **GP/2016/093** Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific







# East Asia

# REGIONAL PROGRAM SUMMARY

Given its geographical proximity and multifaceted engagement with countries of the region, Australia has a clear national interest in a prosperous, peaceful and secure East Asia in which countries cooperate to resolve common problems. Australia has long recognised the benefits of supporting regional processes for promoting peace and economic growth. Of Australia's Official Development Assistance to South-East Asia, 46% is for agricultural purposes.

Australia's economic and security interests remain inextricably linked with the countries of South-East Asia. With a population of 620 million and a combined gross domestic product (GDP) of around US\$2.5 trillion, the region remains an increasingly important partner for Australian trade and investment. In 2014, total trade with Association of Southeast Asian Nations (ASEAN) countries (Laos, Myanmar, Vietnam, Cambodia, Indonesia and the Philippines) amounted to over A\$100 billion, more than with Japan, the European Union or the United States of America.

Despite the continuing strong economic performance of some countries in the region, other countries (e.g. Laos and Timor-Leste) continue to experience high rates of rural poverty. Furthermore, large areas of rural poverty still exist in the better-performing countries.

In Indonesia, for example, the poverty rate was 10.9% in 2016, according to World Bank figures, and many others remain just above the poverty line. In 2016, more than 28 million Indonesians lived on less than rupiah (Rp) 293,000 (roughly A\$29) per month. Despite being a member of the Group of Twenty (G20—the premier international forum for cooperation on global economic governance) and considered the world's 10th largest economy in terms of purchasing power parity, 40% of Indonesia's population are still vulnerable to falling back into poverty at any time. Small shocks, such as illness, disasters or job loss, can easily cause this. The trend towards increasing urbanisation, population growth and the expansion of domestic markets for agricultural products are creating both opportunities and challenges for farmers and the rural poor.

ASEAN has recently created a single market and production base, called the ASEAN Economic Community, which allows the free flow of goods, services, investments and skilled labour, and the freer movement of capital, across the region. With over 600 million people, ASEAN's potential market is larger than the European Union or North America. Next to the People's Republic of China and India, ASEAN has the world's third largest labour force that remains relatively young. The ASEAN Economic Community

is founded on four basic initiatives: creating a single market and production base; increasing competitiveness; promoting equitable economic development; and further integrating ASEAN with the global economy.

ACIAR's program in the East Asia region is the largest of the four regions where it operates but the percentage of projects that are regional is relatively small (12% of budget), reflecting the strong bilateral relationships that ACIAR has with individual countries in East Asia. However, several factors drive the continued development of regional projects in East Asia:

- Increasingly, expertise being developed in one country is being mobilised to assist other countries within the region; for example, spiny lobster development in Indonesia, following an earlier project in Vietnam.
- Our work with some countries within the region (especially China and Thailand) is predicated on the projects being regional. Examples of this include: a project on grasslands management developed with China and Mongolia; and the deployment of biosecurity expertise and approaches, previously developed in Thailand, to Cambodia, Laos, Myanmar and Vietnam.
- ACIAR is actively pursuing opportunities for trilateral projects targeted at agricultural research and development (R&D) support to third countries with co-funding by both ACIAR and one of the more developed economies in the region; for example, proposed trilateral activities between Indonesia, Timor-Leste and Australia aimed at expanding soybean and other legume production in Timor-Leste.
- ASEAN's drive towards regional integration and connectivity is likely to create increasing demand from individual countries and regional bodies for research support that harmonises approaches in some agricultural issues across countries (e.g. biosecurity and food safety).

Current regional projects (also listed in the following country chapters) include:

**ADP/2012/107** Strengthening incentives for improved grassland management in China and Mongolia

**ADP/2014/047** Improving policies for forest plantations to meet smallholder, industry and environmental needs in Lao PDR and Vietnam

**AGB/2012/059** Towards more-profitable and sustainable vegetable production systems in north-western Vietnam and Australia

- AGB/2012/078** Developing value-chain linkages to enhance the adoption of profitable and sustainable cassava production systems in Vietnam and Indonesia
- AGB/2014/035** Improving livelihoods in Myanmar and Vietnam through sustainable and inclusive vegetable value chains
- AGB/2016/007** Benefits of annual mango market and trade analysis in Asia-Pacific [Indonesia, Pakistan, Philippines, Vietnam]
- AGB/2016/031** Developing a trade model and information network for cattle and beef trade sector of South-East Asia and China [Myanmar, Vietnam]
- AGB/2016/032** Developing an emergency response and long-term management strategy for cassava mosaic virus in Cambodia and Vietnam
- AGB/2016/033** Evaluating options for reducing agricultural transport costs and improving market access for smallholders in South-East Asia [Indonesia, Lao PDR, Vietnam]
- AGB/2016/055** Evaluation of a pilot MBA studentship scheme to identify new sources of agribusiness research capacity [Indonesia, Vietnam]
- AGB/2016/163** Innovative and inclusive agriculture value chain financing [Indonesia, Myanmar, Vietnam]
- AGB/2016/196** Sustainable and inclusive cattle and beef industry development in South-East Asia and China [China, Myanmar, Vietnam]
- AH/2010/045** Improving livelihoods through animal health and biosecurity research in the Mekong region [Cambodia, Lao PDR, Myanmar, Vietnam]
- AH/2012/065** A regional approach to enhance smallholder pig systems in Timor-Leste and eastern Indonesia
- AH/2012/066** Improving production and competitiveness of pig-production systems in the Philippines and Australia through better health and biosecurity
- AH/2014/055** Interventions to mitigate disease risk and add value to cross-border pig trade between Lao PDR, Vietnam and China
- AH/2014/056** Improving small ruminant health, production and regional trade in Myanmar [Bangladesh, China, Lao PDR, Myanmar]
- ASEM/2012/081** Improving market engagement, postharvest management and productivity of the Cambodian and Lao PDR vegetable industries
- ASEM/2014/053** Developing cassava production and marketing systems to enhance smallholder livelihoods in Cambodia and Lao PDR
- CIM/2014/079** Establishing the International Mungbean Improvement Network [Australia, Bangladesh, India, Myanmar]
- CSE/2012/077** Mechanisation and value-adding for diversification of lowland farming systems in Lao PDR and Cambodia
- FIS/2010/042** Expansion and diversification of production and management systems for sea cucumbers in the Philippines, Vietnam and northern Australia
- FIS/2010/100** Enhancing mollusc production in northern Vietnam and Australia
- FIS/2012/100** Improving the design of irrigation infrastructure to increase fisheries production in floodplain wetlands of the Lower Mekong and Murray–Darling basins
- FIS/2012/101** Development of mariculture technology for giant grouper in the Philippines, Vietnam and Australia
- FIS/2016/122** Scaling-up community-based sea cucumber culture in the Philippines and northern Australia [also includes Vietnam]
- FIS/2016/126** Half-pearl industry development in Tonga and Vietnam
- FIS/2016/130** Accelerating the development of finfish mariculture in Cambodia through south-south research cooperation with Indonesia
- FST/2012/091** Biological control of galling insect pests of eucalypt plantations in the Mekong region [Cambodia, Lao PDR, Thailand, Vietnam]
- FST/2014/064** Maximising productivity and profitability of *Eucalyptus* and *Acacia* in Indonesia and Vietnam
- FST/2014/068** Management strategies for *Acacia* plantation diseases in Indonesia and Vietnam
- FST/2016/025** Developing DNA-based chain-of-custody systems for legally sourced teak [Indonesia, Lao PDR, Myanmar, Papua New Guinea, Solomon Islands, Thailand]
- GMCP/2016/004** At-scale evaluation of digital data collection apps (DDCAs) in ACIAR projects—Mobile Acquired Data phase 2 (MAD 2) [Myanmar, Pakistan, Vanuatu, Vietnam]
- GMCP/2016/042** Mobile Acquired Data phase 3 (MAD 3)—evaluation of staged adoption and implementation strategy [Myanmar, Pakistan, Vanuatu, Vietnam]

**GP/2016/093** Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific [Cambodia, Indonesia, Lao PDR, Myanmar, Papua New Guinea, Philippines, Thailand, Timor-Leste, Vietnam]

**HORT/2010/069** Enabling improved plant biosecurity practices in Cambodia, Lao PDR and Thailand

**HORT/2012/003** Building a resilient mango industry in Cambodia and Australia through improved production and supply-chain practices

**HORT/2012/020** Integrated crop management to enhance vegetable profitability and food security in the southern Philippines and Australia

**HORT/2012/083** Management of sugarcane streak mosaic in Indonesia and Australia

**HORT/2012/095** Tropical tree fruit research and development in the Philippines and northern Australia to increase productivity, resilience and profitability

**HORT/2012/097** Integrated management of *Fusarium* wilt of bananas in the Philippines and Australia

**HORT/2012/098** Improved postharvest management of fruits and vegetables in the southern Philippines and Australia

**HORT/2015/042** Development of area-wide management approaches for fruit flies in mango for Indonesia, Philippines, Australia and the Asia-Pacific region

**HORT/2016/190** Integrated crop management for mango in Cambodia and the Philippines to meet market quality standards (proposed)

**LPS/2016/027** Assessing goat production and marketing systems in Lao PDR and market linkages into Vietnam

**SMCN/2009/056** Sustainable productivity improvements in allium and solanaceous vegetable crops in Indonesia and sub-tropical Australia

**SMCN/2012/071** Improving water and nutrient management to enable double cropping in the rice-growing lowlands of Lao PDR and Cambodia

**SMCN/2012/075** Management practices for profitable crop-livestock systems for Cambodia and Lao PDR

**SMCN/2012/103** Improving soil and water management and crop productivity of dryland agriculture systems of Aceh and New South Wales

**SMCN/2014/049** Improving maize-based farming systems on sloping lands in Vietnam and Lao PDR

**SMCN/2014/088** Integrated resource management for vegetable production in Lao PDR and Cambodia



# Cambodia

## Key statistics

GDP per capita (US\$)	3,490.4
Population (million)	15.57

## Funding

	A\$m
2015–16 actual	2.30
2016–17 budget allocation	3.10
2017–18 budget	3.13

<sup>a</sup> Data for 2015 GDP and population from [data.worldbank.org/country](http://data.worldbank.org/country)

## Country context

Over the past two decades, Cambodia has had one of the fastest growing economies in the world, but this growth has come from a very low base. Notwithstanding its strong recent economic growth, Cambodia continues to face major development challenges. Poverty has fallen dramatically—from 53 per cent of the population in 2004 to less than 20 per cent in 2012—but Cambodia remains one of the world’s least developed countries. It was ranked 128 of 168 countries on the basis of GDP per capita in 2012. There is much to be done if Cambodia is to continue its impressive economic growth and poverty reduction. The barriers are clear. Further investment is needed to improve infrastructure, increase agricultural productivity, and deliver better quality health and education services.

### Aid Investment Plan, Cambodia, 2015 to 2018 (DFAT)

Cambodia’s annual gross domestic product (GDP) has been growing by at least 7% since 2011. Because of this sustained economic performance, Cambodia attained lower-middle-income status as of 2015, according to the World Bank. Among the biggest contributors to GDP growth are the industry, services, finance and tourism sectors. The Asian Development Bank expects that Cambodia will keep pace with this growth in 2017.

With more than 70% of Cambodians relying on agriculture for their livelihoods, the country undoubtedly remains a predominantly rural society. However, agriculture, which used to play a dominant role in GDP growth, has had a challenging year and shown minimal advance.

In 2016, Cambodia remained in the grip of debilitating drought—the worst in 50 years—which started in early 2015, caused by a lengthy El Niño phenomenon bringing excessive heat, decreased rains and

resulting in an increased level of food insecurity in affected areas. Most of the 25 provinces of Cambodia experienced critical water shortages and, based on government estimates, approximately 2.5 million Cambodians were severely affected. Hundreds of livestock died, rural villagers became sick from dehydration, and irrigation canals, ponds and wells across the country ran dry.

A United Nations survey of affected households found that, by the end of the El Niño, debt among low-income families increased by an average of US\$1,200 as loans were taken on to buy seed and animals to replace failed crops and dead livestock. Furthermore, with at least 18% of crops failing, over 60% of the households questioned experienced income loss, with an overall 19% net reduction in income. Considering that some 75% of Cambodia’s women are employed in agriculture, women and female-headed farming households shouldered the brunt of the economic and social costs.

In response to the impact of the drought, Prime Minister Hun Sen has committed to expanding irrigation and improving how drought is tackled in the future. The Central Bank is also working with microfinance institutions to address the financial needs of those recovering from the drought.

Given the impact of the drought in 2016, along with the decline of global food prices and more competitive global rice market, the World Bank recently reiterated its advice issued in 2015, for the government 'to move the focus from higher production and exports to stronger rice-based farming systems that are diversified, commercial, and resilient to climate change, and supported by a modernized value-chain and cost-effective logistics'. In the meantime, the Asian Development Bank projects that the agriculture sector will experience some growth in 2017 but it could be little more than 1%.

For the Cambodian Government, agricultural development (diversification, value-adding, productivity) remains a key priority. Under the National Strategic Development Plan 2014–2018, the government targets an annual growth rate of 4% in the agriculture sector. The vision is to modernise Cambodia's agriculture through 'the application of techniques, new technologies, mechanization and irrigation to improve the yield rate, and diversify activities into high value crops, livestock, and aquaculture in an environmentally sustainable manner'.

The Cambodian Ministry of Agriculture, Forestry and Fisheries identifies the following as its national objectives:

- improve food security, productivity and diversification
- improve market access for agricultural products
- improve and strengthen the institutional and legislation framework
- ensure access to land resources for the rural poor through a process of land reform for land tenure and land market development
- create possibilities for the poor to access land by improving land tenure security and land markets, resulting in a reduction in land disputes
- ensure sustained access to fisheries resources for the rural poor by encouraging fisheries reform
- promote forestry reform to ensure sustainable forestry resource management and access to forestry resources for the rural poor
- ensure better management of natural protected areas, including mangrove forests, through processing data on land use, forest coverage, infrastructure and geographical divisions between protected areas.

Australia has a long history of bilateral relationship with Cambodia. Its commitment to Cambodia's development is demonstrated by the considerable Official Development Assistance being delivered by different agencies of the Australian Government. Based on Australia's Aid Investment Plan 2015 to 2018 (AIP), Australia will continue its longstanding support for Cambodia's agriculture sector through aid investments that provide access to modern farming techniques, lift productivity and crop quality, promote gender equality and improve the incomes of thousands of farmers.

## Country priorities

Australia supports Cambodia's agricultural development through its program of assistance under ACIAR. ACIAR priorities align well with the overall purpose of the aid program—to promote Australia's national interest by contributing to sustainable growth and poverty reduction—and the AIP. In Cambodia, ACIAR's priorities include:

- more productive and sustainable management of groundwater, irrigation and soil fertility, and advances in crop nutrition, to achieve intensification and diversification of production systems
- growth in horticultural farm-level productivity through improved seed usage and emphases on product quality, postharvest handling and market-chain participation
- raised animal productivity by improving nutrition and methods for disease prevention and control, adjusted to farm conditions
- enhanced crop and forestry values and market opportunities through enterprise diversification, breeding and conservation practices, together with innovations in mechanisation, value-adding and postharvest handling
- improved access for smallholders to agricultural extension services, mechanisation, and postharvest services and technology, leading to increased farmer capacity to access markets and adapt to climate change.

In 2017, ACIAR will consult and discuss with the Cambodian Government its strategic priorities for the next 10 years.

## 2017–18 research program

ACIAR's research program in Cambodia has two main themes: rice-based farming systems; and agricultural diversification.

## Securing productivity of rice-based farming systems

Rice remains Cambodia's most important staple crop, occupying 90% of all agricultural land. While agricultural diversification is critical, farming families still emphasise the importance of rice food security at the household level.

Rice system productivity research includes development of sustainable intensification and diversification models in underdeveloped north-western Cambodia.<sup>1</sup> Water management and fertiliser concerns with rice-based farming continue to be analysed, with current research examining the potential of several dry-season, high-value non-rice grain and forage crops suitable for growing after rainfed rice in the lowland Mekong region, and their compatibility with local soils and crop water requirements.<sup>2</sup> Labour shortages and soaring wage rates are stimulating the use of machines, such as combine harvesters and seed drills, and the links of field mechanisation and grain dryers to crop diversification are being investigated with the aim of improving smallholders' farming efficiency and profitability.<sup>3</sup> Another project is examining the uptake of agricultural technologies among farmers in Battambang and Pailin provinces.<sup>4</sup>

## Improving diversification options for smallholders

### Production and marketing of non-rice crops

Establishment of fruit and vegetable supply chains for markets is being researched. One project aims to develop integrated vegetable (tomato, chilli, sweet pepper and leafy vegetables) production and postharvest management packages for adoption by growers and communities in Siem Reap, Kampong Thom, Takeo and Kampot provinces.<sup>5</sup> The focus of this work is on food safety, out-of-season production, supply chains for domestic markets and postharvest handling. Options for soil and water management in vegetable production are being analysed in both Cambodia and Laos.<sup>6</sup> Other horticultural research is focused on improving production through better plant biosecurity practices. The aim is to develop biosecurity research and development (R&D) and technical diagnostic skills in Thailand, Laos and Cambodia to underpin development of potential international market opportunities for Mekong horticultural products.<sup>7</sup>

Another project has been working to improve mango production and postharvest systems used by medium- and small-scale farmers, predominantly in Kampong Speu province, for supplying high-quality fruit to both domestic and export (e.g. Vietnamese) markets.<sup>8</sup>

A new project (which is part of a coordinated regional program on mango) will continue some aspects of this work—especially the search for more sustainable ways to manage pests and diseases and to control flowering.<sup>9</sup> Flower induction allows farmers to adjust the timing of their crop to better supply market needs and secure higher returns, but better technologies are needed to avoid threats to health and long-term damage to the trees.

A new study is aimed at identifying the options to increase the adoption of profitable and sustainable technologies for cassava, and evaluating opportunities for production and marketing systems to enhance smallholder livelihoods.<sup>10</sup> Another new project will research the extent and impact of Sri Lankan cassava mosaic disease in Cambodia and Vietnam.<sup>11</sup>

Understanding the most suitable land use and required site-specific soil management is the focus of a new project in Cambodia's uplands, to assist farmers choose the best crops and management for their specific situation.<sup>12</sup>

### Ruminant livestock

Cattle and red meat are emerging as important products for Cambodia, both domestically and for trade with regional neighbours. An integrated program of animal health and production research for development (R4D) in Cambodia has a special focus on ruminants. A current project aims to develop village-based biosecurity to improve management of livestock disease risks<sup>13</sup>, while a new project will examine sustainable feeding and health risk factors in Cambodian livestock systems.<sup>14</sup>

In addition, improved methods to assess disease risk and strategies for disease control will be developed, thereby providing results to support the South-East Asia and China Foot-and-Mouth Disease (SEACFMD) control program of the World Organisation for Animal Health (OIE) and participating countries, to assess and control livestock biosecurity risks in the Mekong region.<sup>15</sup>

Other regional research aims to identify and promote promising management practices for increasing the overall productivity of crop-livestock systems while sustaining natural resources.<sup>16</sup>

### Forestry

A forestry biosecurity research project aims to develop appropriate biological controls for gall wasp pests of eucalypt plantations in the Mekong region, by importing and testing natural enemies of these insects from Australia.<sup>17</sup> The research in Cambodia is a component of a regional project involving Laos, with some related work in Thailand and Vietnam.

## Fisheries

Fish is an essential component of food security in the Lower Mekong Basin. In Cambodia, approximately 80% of the animal protein consumed originates from freshwater fisheries, and the fisheries sector provides full-time and part-time work for around 2 million people. The resource is under threat from loss of habitat, primarily through water management developments on the Mekong River and its tributaries, which will stop fish migration and change the natural hydrological cycles. A new project will examine ways to accelerate the development of finfish mariculture in Cambodia through south-south research cooperation with Indonesia.<sup>18</sup>

Despite its recognised importance in Cambodia, the critical role of fish is poorly represented in global debates about food security and development. There is a limited understanding, particularly among those outside the sector, of the long-term contribution the fisheries sector can make to the challenges of food security, poverty alleviation and improved wellbeing. This lack of information includes the importance and impact of small-scale fisheries. A small research project aims to fill this gap by collating best-available evidence of the impact of small-scale fisheries to build a case for R4D in this field. Cambodia is just one of several countries that will benefit from this work.<sup>19</sup>

## Research monitoring

Work is underway to collect detailed institutional, financial, human resource and research output data from a complete set of agricultural research agencies operating in the region; and to facilitate stakeholders' access to this information through a variety of online tools and publications for inclusion in the Agricultural Science and Technology Indicators (ASTI).<sup>20</sup> ASTI is the leading global program that compiles, analyses and publishes data on agricultural research systems in developing countries. The project will be implemented jointly by the International Food Policy Research Institute (IFPRI) and the Asia-Pacific Association of Agricultural Research Institutions (APAARI), in close collaboration with the main national agricultural research institutes (NARIs) of Cambodia, Indonesia, Laos, Malaysia, Myanmar, Papua New Guinea, Philippines, Thailand, Timor-Leste and Vietnam.

## 5-year country outcomes

- A soil information system for upland areas developed and contributing to selection of land-use options
- Significant progress in establishing, consolidating and strengthening biosecurity management systems and institutions
- Improved nutritional status through integrated and diversified food sources
- Better-informed smallholder communities and extension processes

## 2017-18 project outputs

- Testing undertaken of improved postharvest systems in rice-based farming systems, notably rice drying practices
- Non-rice cropping options during the dry season tested in rice-based systems
- New ways developed to accelerate the development of finfish mariculture
- Integrated livestock and crop-based farming systems in Cambodia assessed as part of a continuous and longer-term research activity
- Out-of-season production opportunities and constraints identified for Cambodian vegetables
- Capacity in animal disease management and control improved
- A new project on site-specific soil management for Cambodian uplands begun
- A regional research program for improving production and marketing of vegetables commenced
- Partnerships established to begin a project to improve livestock biosecurity in the Mekong region

### *Key Research Program Managers*

Dr Chris Barlow, Fisheries  
Mr Tony Bartlett, Forestry  
Dr Jayne Curnow, Agricultural Systems Management  
Dr John Dixon, Cropping Systems and Economics  
Dr Rodd Dyer, Agribusiness  
Dr Robert Edis, Soil Management and Crop Nutrition  
Dr Richard Markham, Horticulture  
Dr Mike Nunn, Animal Health  
Ms Mellissa Wood, Global Program

### *Regional Manager, Cambodia, Lao PDR, Myanmar & Thailand*

Ms Dulce Carandang Simmanivong



## Current and proposed projects

- <sup>1</sup> **CSE/2015/044** Sustainable intensification and diversification in lowland rice systems of north-western Cambodia
- <sup>2</sup> **SMCN/2012/071** Improving water and nutrient management to enable double cropping in the rice-growing lowlands of Lao PDR and Cambodia
- <sup>3</sup> **CSE/2012/077** Mechanisation and value-adding for diversification of lowland farming systems in Lao PDR and Cambodia
- <sup>4</sup> **ASEM/2013/003** Uptake of agricultural technologies amongst farmers in Battambang and Pailin provinces, Cambodia
- <sup>5</sup> **ASEM/2012/081** Improving market engagement, postharvest management and productivity of Cambodian and Lao PDR vegetable industries
- <sup>6</sup> **SMCN/2014/088** Integrated resource management for vegetable production in Lao PDR and Cambodia
- <sup>7</sup> **HORT/2010/069** Enabling improved plant biosecurity practices in Cambodia, Lao PDR and Thailand
- <sup>8</sup> **HORT/2012/003** Building a resilient mango industry in Cambodia and Australia through improved production and supply-chain practices
- <sup>9</sup> **HORT/2016/190** Integrated crop management for mango in Cambodia and the Philippines to meet market quality standards (proposed)
- <sup>10</sup> **ASEM/2014/053** Developing cassava production and marketing systems to enhance smallholder livelihoods in Cambodia and Lao PDR
- <sup>11</sup> **AGB/2016/032** Developing an emergency response and long-term management strategy for cassava mosaic virus in Cambodia and Vietnam
- <sup>12</sup> **SMCN/2016/237** Land suitability assessment and site-specific soil management for Cambodian uplands
- <sup>13</sup> **AH/2011/014** Village-based biosecurity for livestock disease risk management in Cambodia
- <sup>14</sup> **AH/2016/131** Sustainable feeding and health risk practices in Cambodian livestock systems
- <sup>15</sup> **AH/2010/045** Improving livelihoods through animal health and biosecurity research in the Mekong region
- <sup>16</sup> **SMCN/2012/075** Management practices for profitable crop–livestock systems for Cambodia and Lao PDR
- <sup>17</sup> **FST/2012/091** Biological control of galling insect pests of eucalypt plantations in the Mekong region
- <sup>18</sup> **FIS/2016/130** Accelerating the development of finfish mariculture in Cambodia through south–south research cooperation with Indonesia
- <sup>19</sup> **FIS/2017/003** (*multilateral, WorldFish*) The contribution of small-scale fisheries research to a food secure world
- <sup>20</sup> **GP/2016/093** Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific

# China

## Key statistics

GDP per capita (US\$)	14,450.2
Population (million)	1,371

## Funding

	A\$m
2015-16 actual	0.83
2016-17 budget allocation	0.90
2017-18 budget	0.76

\* Data for 2015 GDP and population from [data.worldbank.org/country](http://data.worldbank.org/country)

## Country context

Australia has largely phased out bilateral aid to China. A small number of ongoing projects provide targeted assistance, including a human rights technical cooperation program and a program helping to strengthen the health system in the Tibet Autonomous Region. In recognition of China's growing role as an aid donor, Australia and China signed a Memorandum of Understanding (MoU) for development cooperation in 2013, which was then renewed in 2017. The MoU facilitates Australia and China cooperating on shared objectives ... The first project under the MoU, targeting malaria in Papua New Guinea, began in 2016. Climate change is an emerging area of cooperation between Australia and China. We have a Bilateral Climate Change Partnership initiated by a 2004 MoU and enhanced by a 2014 MoU, which provides for an annual Ministerial Dialogue and practical, collaborative projects in areas of mutual interest.

### China Country Brief (DFAT)

After decades of rapid economic growth, China's gross domestic product (GDP) growth dropped to 6.7% in 2016. Clearly China's economy is now undergoing profound restructuring and transition, and the government is trying to cut excessive production capacity, boost domestic consumption and encourage the development of the service sector.

Agriculture serves as the foundation of China's economy and food security plays a key role in ensuring national stability in the country. In 2016, China released its 13th Five-Year Plan for Economic and Social Development (2016–2020), which sets out China's strategic intentions and defines its major objectives, tasks and measures for economic and social development for the next 5 years. The plan states that, by 2020, China will maintain a medium-high rate of growth to ensure its 2010 GDP, the per capita personal income of residents will double, and China will increase the ratio of research and development (R&D) expenditure to 2.5% of GDP.

The main features of the plan relevant to agriculture include: improving grain production; promoting agricultural structural adjustments; supporting the integrated development of primary, secondary and tertiary industries in rural areas; ensuring farm product quality and safety; and developing eco-friendly agriculture.

Poverty reduction is one of the top priorities of the Chinese Government. Over the past 30 years, China has lifted over 700 million people out of poverty, according to The Right to Development—China's Philosophy, Practice and Contribution, a white paper issued by China's State Council in December 2016. China announced in 2015 that it would end poverty by 2020 and, in 2016 alone, some 10 million people were lifted out of poverty through various poverty reduction measures. However, at the end of 2015, there were still 55.75 million people living under the poverty line (China Statistical Yearbook 2016).

The Chinese Government attaches great importance on agriculture. For the past 14 years, China's No. 1 Central Government Document has always been on agriculture. The 2017 No. 1 Document, which was released on 5 February 2017, stresses structural reform on the supply side to increase farmers' incomes and ensure effective supply. After years of good harvests, China has grown out of a food shortage period, but structural problems remain unsolved—some produce is oversupplied while some is in short supply. The main features of the No. 1 Document are:

- improving quality and efficiency in agricultural production
- developing highly efficient animal husbandry and aquaculture
- improving the overall quality of farm produce and food safety
- building modern agribusiness parks
- reducing the use of chemical fertilisers and insecticides
- launching large-scale water-saving programs
- promoting e-commerce in rural areas
- strengthening R&D and extension
- implementing precision poverty reduction measures to ensure that another 10 million people are lifted out of poverty.

ACIAR's program in China targets strategic partnerships and improving the sustainability of agricultural production. Research focuses on policy and technical issues associated with better management of livestock, land and water resources in north-western China and crop-livestock systems in Tibet Autonomous Region (TAR).

In evaluating sustainable production, the need to raise farmers' incomes through increased productivity and marketability of produce is also covered in the research design. To reach those most affected by poverty and land degradation, the program will increasingly target rainfed crop-livestock systems, and ACIAR will consult with its Chinese partners to engage in joint regional- and national-level research initiatives. As China is a large and emerging economy with a substantial agricultural research network and capacity, opportunities for partnerships with other countries in the region will be explored. This is consistent with the Chinese Government's aims. These opportunities for mutual research collaboration will be more appropriate as China's development progresses.

In view of the significant human and financial resources now available within the Chinese national agricultural research system, and the strong mutual benefits to Australia, all ACIAR activities in China involve substantial co-investment from the Chinese partners.

## Country priorities

ACIAR consultation with China to prioritise research collaboration includes meetings with senior leaders and researchers from the Ministry of Science and Technology and Ministry of Agriculture and Water Resources, as well as the Chinese Academy of Sciences, the Chinese Academy of Agricultural Sciences, universities and provincial authorities. ACIAR will work with its stakeholders in China to ensure that newly developed projects are aligned with the new policies set out in the 13th Five-Year Plan. The priorities for ACIAR's China program in the medium term are:

- development of policies and institutions for grassland management
- integration of crop-livestock systems in favourable areas of TAR and the rangelands of north-western China.

## 2017–18 research program

Research in China focuses on livestock production and health, and grazing management. In north-western China over the past 50 years, the temperate grasslands have become degraded due to a five-sixfold increase in the number of people and livestock. However, these grasslands are remarkably resilient and recover both in yield and biodiversity if given the chance with lower grazing pressure.

An interdisciplinary project is studying ways of strengthening incentives for managing grasslands in China and Mongolia.<sup>1</sup> Livestock production is the primary source of income generation for rural communities in TAR but animal productivity is low and only supports household incomes that are well below the national average. Productivity is constrained by seasonal lack of high-quality feed which results in low milk yields, extended calving intervals, low growth rates and high animal mortality. The challenge is to improve livestock nutrition without reducing grain production in valleys or compromising the condition of pastoral areas.

A current project aims to provide smallholder farmers with strategies to improve the health and production of their flocks of goats and sheep, and to develop improved understanding of market opportunities so that smallholders can make better-informed decisions.<sup>2</sup> Another project aims to identify interventions to mitigate disease risk and add value to cross-border pig trade between Laos, Vietnam and China.<sup>3</sup>

A recently commenced project aims to improve the livelihoods of smallholder livestock farmers in the cropping and agro-pastoral areas of central TAR by increasing dairy and sheep meat production. This will be achieved by increasing the quality and year-round availability of feed, determining the nutritional requirements and genetic suitability of local and improved livestock breeds for dairy and meat production, and piloting promising interventions with farmers.<sup>4</sup>

Another project has a component to learn lessons on how agricultural market reforms took place in China and what lessons can be learnt for Pakistan's agricultural markets to enhance growth, employment and productivity.<sup>5</sup>

Two new regional projects are focusing on building a sustainable and inclusive cattle and beef industry, including development of a beef trade model and information network for South-East Asia and China.<sup>6,7</sup>

## 5-year program outcomes

- Established regional agricultural research interventions jointly funded by Australia, China and third-country collaborators
- Improved smallholder access to cropping and livestock techniques in TAR to alleviate poverty
- Economically efficient and environmentally sustainable grassland management policies and programs

## 2017–18 project outputs

- Recommendations published for efficient and environmentally sustainable grassland management options
- Current sheep and cattle meat production systems, their challenges and opportunities for increasing production assessed

### *Key Research Program Managers*

Dr Rodd Dyer, Agribusiness  
Dr Mike Nunn, Animal Health  
Dr Ejaz Qureshi, Agricultural Development Policy  
Dr Werner Stür, Livestock Production Systems

### *Country Manager*

Mr Wang Guanglin

## Current projects

- <sup>1</sup> **ADP/2012/107** Strengthening incentives for improved grassland management in China and Mongolia
- <sup>2</sup> **AH/2014/056** Improving small ruminant health, production and regional trade in Myanmar
- <sup>3</sup> **AH/2014/055** Interventions to mitigate disease risk and add value to cross-border pig trade between Lao PDR, Vietnam and China
- <sup>4</sup> **LPS/2014/036** Developing profitable dairy and sheep meat production systems in central Tibet—China
- <sup>5</sup> **ADP/2014/043** Agricultural market reform in Pakistan to enhance growth, employment and productivity
- <sup>6</sup> **AGB/2016/031** Developing a trade model and information network for cattle and beef trade sector of South-East Asia and China
- <sup>7</sup> **AGB/2016/196** Sustainable and inclusive cattle and beef industry development in South-East Asia and China



# Indonesia

## Key statistics

GDP per capita (US\$)	11,057.6
Population (million)	257.6

## Funding

	A\$m
2015-16 actual	5.78
2016-17 budget allocation	8.20
2017-18 budget	10.42

<sup>a</sup> Data for 2015 GDP and population from [data.worldbank.org/country](http://data.worldbank.org/country)

## Country context

Indonesia's recent economic progress has been impressive, having almost doubled its GDP from 2001 to 2012 and reduced poverty levels by roughly half. However, Indonesia's prospects for securing growth at past levels are not certain. Growth has slowed and the risk that it could fall further is real ... Low growth means the poor will find it harder to escape poverty ... As nearly two thirds of Indonesia's poor live in rural areas, [Australia] will continue to focus on the development of the agricultural sector. We will encourage inclusive economic growth by strengthening the operation of agricultural markets, improving food security, raising agricultural productivity, and helping to boost poor farmers' incomes and employment by addressing constraints such as access to loans. We will also increasingly look to better connect implementation programs with policy dimensions and facilitate private sector-led investment in better agricultural practices and services.

With its emerging economy, Indonesia remains an important partner for Australia due to its strategic position and the role the country is playing in the region. It has an enormous population, currently more than 257 million, and offers diverse opportunities for collaboration with mutual benefits shared between both countries.

Based on the spread of the country's landscape and its natural resources, the Indonesian Government continues to place high priority on agriculture and related sectors. These broad sectors include, but are not limited to, crops, livestock, forestry, marine fisheries and aquaculture. These sectors are critical to reducing poverty, improving food security and empowering women and girls.

The Indonesian Government has defined nine priority areas for development across all sectors. The five main ones comprise: (1) ensuring food security

### Aid Investment Plan, Indonesia, 2015-16 to 2018-19 (DFAT)

and achieving self-sufficiency in key commodities, including developing policy to support export commodities, substituting imports and facilitating production of bio-energy raw materials; (2) improving agricultural product competitiveness; (3) facilitating development of infrastructure and agro-industry in villages; (4) empowering and facilitating farmer protection by means of establishing appropriate regulation and the provision of subsidies; and (5) improving governance.

Fisheries and forestry are as important as the agriculture sector. The Indonesian Government places high priority on any efforts to improve the welfare of farmers and fishers, on innovation and technology dissemination, and climate-change adaptation and mitigation, as well as peatland rehabilitation and fire management.

This year will mark ACIAR's 35th year of collaboration with Indonesia. From such a longstanding partnership, significant impacts have been achieved and benefits flowing to farmers, government institutions and individuals are evident in the development of numerous technologies and innovations.

ACIAR programs have reached some of the less-developed regions in Aceh, East Nusa Tenggara, West Nusa Tenggara and Central Sulawesi, as well as selected developed provinces in Java, Bali and Sumatra. Having a diversified and integrated program is expected to provide more flexibility to introduce new approaches that will ensure food security, enhance productivity and quality, and help to develop improved market linkages for smallholder producers of some high-value products.

Wherever opportunities exist, ACIAR seeks to implement its Indonesian research program as part of a whole-of-government approach, especially with the Department of Foreign Affairs and Trade (DFAT) and the Department of Agriculture and Water Resources (DAWR).

## Country priorities

ACIAR works with Indonesia to define research priorities and implement programs and projects. Next users of research are usually involved during the development of projects, to embed activities within value chains and at the farming-community level, and to link researchers with a wide range of stakeholders, including farmers, the private sector, non-government organisations (NGOs), extension services and policymakers. While the program emphasises implementation of research through institutional partnerships, ACIAR also supports the longer-term sustainability of research outcomes through both individual capacity building and institutional development.

The medium-term (2012-16) research strategy, agreed in February 2012, indicates the following priorities:

- strengthened livestock production, biosecurity and marketing systems
- increases in the productivity, profitability and competitiveness of Indonesian horticultural and other high-value plant products
- more-profitable smallholder aquaculture systems and enhanced management of capture fisheries
- enhanced livelihoods from forestry products and services
- support for profitable agribusiness systems through improved smallholder access to markets and increased competitiveness in rapidly transforming markets

- improvement in marketing and trade policies to underpin agribusiness development.

Indonesian stakeholders confirmed that the existing country priorities are still valid. Further discussion is still needed, however, to reflect the dynamics in each sector.

## 2017-18 research program

ACIAR supports research to address the six Indonesian priorities through the following subprograms.

### Livestock management and marketing systems

ACIAR has been supporting beef cattle research in Indonesia for more than 10 years, with a major cluster of beef projects focused on eastern Indonesia. This research emphasises technology development for on-farm application by smallholder farmers, and on-farm work is being integrated with projects that assess broader characteristics of the beef supply chain.

A current project is investigating the integration of herbaceous tropical legumes into grain cropping systems in East Nusa Tenggara province.<sup>1</sup> It is examining the benefits of legume-based cropping systems both for subsequent crops and associated livestock. A new project will develop simple, low-cost feed rations for cow-calf and cattle-fattening operations that markedly increase the profitability of smallholder and small-scale feedlot fattening systems. Supplementary feeds will complement local feed resources and be based on a small number of low-cost, locally available ingredients.<sup>2</sup> This project builds on previous research that demonstrated the principles of using low-quality feeds, such as rice straw, in combination with small amounts of supplements for efficient cow-calf production. It also showed that strategic use of high-energy by-products can increase both cattle growth rates in fattening systems and farm income.

Two projects are investigating the health and production of smallholder beef cattle and the marketing of beef in Indonesia.<sup>3,4</sup> The projects aim to improve both beef supply and the livelihoods of smallholder beef producers and other beef value chain participants in Indonesia. A related small research activity is updating software used in animal nutrition (SoFT: Selection of Forages for the Tropics).<sup>5</sup>

In a complementary line of research, a project is working regionally to assist in meeting the rising demand for animal protein through pig husbandry.<sup>6</sup>

## Horticultural and other high-value plant products

The focus of ACIAR's support to the Indonesian crop sector is on vegetable production and marketing systems, with additional investment in the sugar industry and continuation of work on mango. The aim is to develop environmentally and socially sustainable integrated production systems and improve the market competitiveness of these industries.

Tropical fruit research, having addressed major pest and disease problems in banana, mango and mangosteen, will focus on further development of an integrated fruit-fly management program for mango and associated crops. Based on the success of the area-wide management approach in mango farming systems in West and Central Java, a new project will extend the work to Bali and provide support to other partners and projects wishing to use this approach in other countries.<sup>7</sup> Another new project aims to examine the regional benefits of annual mango market and trade analysis.<sup>8</sup> A project that is improving production of shallots, garlic and chilli in Indonesia will continue through 2017–18, particularly through the development of clean seed systems and better management of agrichemicals.<sup>9</sup>

In line with the Indonesian Government's emphasis on self-sufficiency in major agricultural commodities, a continuing project is focusing on tackling virus diseases of sugarcane, aiming to increase the profitability of smallholder sugarcane farmers by developing a reliable integrated disease management strategy.<sup>10</sup> A small project will examine the management of key coastal areas of Indonesia to improve agricultural productivity and resilience to climate change.<sup>11</sup> Research to increase the overall productivity of farming systems in tsunami-affected regions in Aceh is based on previous work undertaken by ACIAR—field-testing a range of promising production technologies while sustaining the natural resource base.<sup>12</sup>

## Aquaculture systems and enhanced capture fisheries management

The Indonesian Government's priorities in this area include combating illegal, unregulated and unreported (IUU) fishing by reviewing fishing vessel licences and setting up new regulations on the capture and export of juveniles in some species (lobster, swimming crab, mud crab, grouper and milkfish).

In line with this, the priorities for ACIAR's subprogram are the diversification and development of aquaculture and the improved management of important marine fisheries. A continuing program of research on several commercially important fish stocks has provided a shared and better view of the

fisheries characteristics and resource status, including for some high-value, internationally shared stocks.

Aquaculture is an important industry for both coastal and inland communities in Indonesia. One project is developing technologies to expand resources of marine lobsters, and is currently focusing on identifying husbandry requirements for production of lobsters in marine cages to be used for restocking purposes.<sup>13</sup>

A new project on seaweeds will identify constraints and knowledge gaps for seaweed production, improve the quality of seaweeds produced, and develop innovative products from seaweeds and their processed waste streams.<sup>14</sup> Another project will research the acceleration of the development of finfish mariculture in Cambodia through south-south research cooperation with Indonesia.<sup>15</sup>

A new project to estimate productivity of Indonesia's tuna fisheries resources to increase sustainable benefits will be activated in 2017.<sup>16</sup> A small project is developing a bilingual web-based fish identification tool for field use in Indonesia.<sup>17</sup>

## Forestry products and services

Government priorities for forestry in Indonesia include community forestry, improved land management options for fire-wise villages, rehabilitation of degraded peatland forests, climate-change mitigation, enhancing plantation productivity, forest product processing, management of plantation diseases and enhanced agroforestry and non-timber forest product systems.

ACIAR's forestry projects in Indonesia focus on enhancing and sustaining value from forest plantations, agroforestry systems and natural forests. Priorities include improving smallholder plantation management and investment decisions. One project is continuing work on community-based commercial plantation forestry, aiming to increase the capacity of farmer forest groups to make better investment decisions. The project will work in Gorontalo, Lampung, South Sulawesi, Yogyakarta and Central Java provinces, analysing the social and economic dimensions of two alternative community-based systems and how they can be adopted more widely.<sup>18</sup>

Another current project aims to improve productivity and profitability of short-rotation *Eucalyptus* and *Acacia* plantations in Indonesia, and provide information on the comparative benefits and limitations of these trees to smallholders in Sumatra and Java.<sup>19</sup> Another project continues important forest health research that aims to reduce the impacts of two very damaging fungal diseases (*Ganoderma* and *Ceratocystis*) that are affecting *Acacia* plantations in South-East Asia.<sup>20</sup>



Other research is investigating systems for enabling payments to smallholders for carbon sequestration by natural forests.<sup>21</sup> This project aims to support the development of policy on reducing emissions from deforestation and forest degradation, as well as institutional arrangements at the national, provincial and local levels, to facilitate effective implementation and equitable distribution of its benefits to communities. It is working at the provincial and district levels in Riau, Central Kalimantan and Papua provinces.

A new forestry project will examine the diversification of market-based integrated agroforestry systems in Indonesia.<sup>22</sup> This project will enhance the production and marketing of timber and non-timber forest products and foster improved extension and policy approaches in Gunungkidul, Sumbawa, Central Lombok and South Central Timor regencies. It will also establish new research in support of Indonesia's Thousand Bamboo Villages initiative on the island of Flores.

A major new multidisciplinary program of research will underpin Indonesia's commitments to achieve fire-wise villages and restoration of large areas of peatland previously degraded by fire.<sup>23</sup> The project will conduct research to prevent fires in peatlands and facilitate profitable and sustainable alternative livelihoods as well as improve peatland restoration practices. It will also examine ways to improve access to, and use of, knowledge on fire prevention and peatland management.

A small project will explore constraints to the development of sandalwood plantations in Central Java<sup>24</sup> and a new regional project is developing DNA-based chain-of-custody systems for legally sourced teak.<sup>25</sup>

## Profitable agribusiness systems

ACIAR's agribusiness research program aims to: improve smallholder access and competitiveness in rapidly transforming markets; identify and promote profitable market opportunities and agribusiness systems; and enhance smallholder access to market information, knowledge, skills and technology options. Through these priorities, the program will increase capacity in market and business development, and value-chain analysis.

Accelerating growth and improving the market integration of high-value fruits and vegetables is a priority for the Indonesian Government. Ongoing research is identifying opportunities to enhance farmer-market linkages for chilli, shallot, mango and citrus and develop policy options that will strengthen seed markets.<sup>26</sup>

Research with Indonesian and global coffee and cocoa and certification companies is evaluating the impacts of certification schemes, buyer linkages, geographical indicators and downstream processing on smallholder livelihoods and environmental sustainability.<sup>27</sup>

Rapid growth and diversification of cassava-based processing and product markets has also provided important income-generating opportunities for poor farmers. However, problems of emerging plant diseases, volatile prices, soil degradation and processing pollution are persistent. New regional research is exploring how strengthening linkages between cassava value-chain actors can increase adoption of technologies such as disease-free planting material and sustainable and profitable crop management practices.<sup>28</sup>

Indonesia currently supplies only 20% of its domestic milk needs from local sources, with almost all milk produced in Java by smallholder producers with only three or four dairy cows. A new project will identify and overcome barriers to adoption, develop policy options and evaluate innovative extension strategies that will increase production, efficiency and household income of smallholder dairy farmers in Java and other provinces.<sup>29</sup>

A project involving policy research to support sustainable agricultural intensification will fill a gap in the uplands in Indonesia and will provide sociological, economic and policy input into (and complement) other projects that are focused on biophysical and agronomic research.<sup>30</sup>

A new project is evaluating infrastructure and policy scenarios for reducing transport costs and improving market access using case studies of smallholder agri-food value chains in Indonesia, Lao PDR and Vietnam.<sup>31</sup> A new project will be examining innovative and inclusive agricultural value-chain financing.<sup>32</sup> Another new project will undertake an evaluation of a pilot Master of Business Administration (MBA) studentship scheme to identify new sources of agribusiness research capacity.<sup>33</sup>

## Research monitoring

Work is underway to collect detailed institutional, financial, human resource and research output data from a complete set of agricultural research agencies operating in the region; and to facilitate stakeholders' access to this information through a variety of online tools and publications for inclusion in the Agricultural Science and Technology Indicators (ASTI).<sup>34</sup> ASTI is the leading global program that compiles, analyses and publishes data on agricultural research systems in developing countries. The project will be implemented jointly by the International Food Policy Research Institute (IFPRI) and the



Asia-Pacific Association of Agricultural Research Institutions (APAARI), in close collaboration with the main national agricultural research institutes (NARIs) of Cambodia, Indonesia, Laos, Malaysia, Myanmar, Papua New Guinea, Philippines, Thailand, Timor-Leste and Vietnam.

## 5-year country outcomes

- Expanded engagement in food value chains by smallholders with domestic and export market access
- More-effective, sustainable and efficient management of crops, livestock, forestry and fisheries by smallholders through understanding and adopting improved production and distribution pathways
- Improved evidence of costs and advantages of alternative agricultural, domestic and trade policy options
- Reduced poverty through improved natural resource management

## 2017–18 project outputs

- Master tree grower training delivered and evaluated in five locations
- Fifteen farmer group nurseries established and 50,000 seedlings of teak, other timber and bamboo clones planted by farmers
- Draft acacia deployment strategy prepared for enhancing resistance to *Ceratocystis*
- New multidisciplinary project on fire management and peatland restoration designed and commissioned
- Research on beef cattle value chains utilising feed resources from palm plantations in Sumatra and Kalimantan commenced
- Cattle growth response curves to various locally available feed resources determined
- A new program of research on community-based beef production systems begun, aimed at significantly improving both beef supply and the livelihoods of smallholders and other participants in beef value chains
- Flowering behaviour and seed yield of a several herbaceous legumes determined in a range of locations in East Nusa Tenggara as a basis for development of local seed supply systems
- Actual and potential benefits from improving fruit-fly management in selected mango value chains evaluated

- Recommendations to enhance farmer participation in citrus, shallot, chilli and mango value chains developed
- Evidence gathered about the effectiveness of certification schemes and geographical indications for coffee and cocoa to provide farm-level environmental and livelihood benefits
- Strategies and policies devised to support development of sustainable, profitable and smallholder-inclusive dairy supply chains in North Sumatra and West Java
- Production and health management techniques made available for marine species grown in hatcheries and farms
- Data gathered to guide management plans for pelagic fisheries
- New knowledge generated that fills research gaps in socioeconomic data to confirm, guide, encourage or dispel the current rationale for policy and program decision-making in upland landscapes
- Profitable dryland agriculture in Aceh demonstrated
- Approaches to produce cleaner planting material of shallot and garlic developed

### Key Research Program Managers

Dr Chris Barlow, Fisheries  
 Mr Tony Bartlett, Forestry  
 Dr Rodd Dyer, Agribusiness  
 Dr Robert Edis, Soil Management and Crop Nutrition  
 Dr Richard Markham, Horticulture  
 Dr Mike Nunn, Animal Health  
 Dr Ejaz Qureshi, Agricultural Development Policy  
 Dr Werner Stür, Livestock Production Systems  
 Ms Mellissa Wood, Global Program

### Country Manager

Ms Mirah Nuryati

## Current and proposed projects

- <sup>1</sup> **LPS/2012/064** Integrating herbaceous forage legumes into crop and livestock systems in East Nusa Tenggara, Indonesia
- <sup>2</sup> **LPS/2013/021** Profitable supplementary feeding strategies for fattening smallholder cattle in Indonesia
- <sup>3</sup> **AH/2015/047** Improving smallholder beef value chains in rain-fed cropping systems
- <sup>4</sup> **LPS/2015/048** Improving smallholder beef supply and livelihoods through cattle-palm system integration in Indonesia

- <sup>5</sup> **LPS/2016/097** Update of SoFT (Selection of Forages for the Tropics)
- <sup>6</sup> **AH/2012/065** A regional approach to enhance smallholder pig systems in Timor-Leste and eastern Indonesia
- <sup>7</sup> **HORT/2015/042** Development of area-wide management approaches for fruit flies in mango for Indonesia, Australia and the Asia-Pacific region
- <sup>8</sup> **AGB/2016/007** Benefits of annual mango market and trade analysis in Asia-Pacific
- <sup>9</sup> **SMCN/2009/056** Sustainable productivity improvements in allium and solanaceous vegetable crops in Indonesia and sub-tropical Australia
- <sup>10</sup> **HORT/2012/083** Management of sugarcane streak mosaic in Indonesia and Australia
- <sup>11</sup> **SMCN/2016/050** Management of key coastal areas of Indonesia to improve agricultural productivity and resilience to climate change
- <sup>12</sup> **SMCN/2012/103** Improving soil and water management and crop productivity of dryland agriculture systems of Aceh and New South Wales
- <sup>13</sup> **FIS/2014/059** Expanding spiny lobster aquaculture in Indonesia
- <sup>14</sup> **FIS/2015/038** Improving seaweed production and processing opportunities in Indonesia
- <sup>15</sup> **FIS/2016/130** Accelerating the development of finfish mariculture in Cambodia through south-south research cooperation with Indonesia
- <sup>16</sup> **FIS/2016/116** Estimating productivity of Indonesia's tuna fisheries resources to increase sustainable benefits
- <sup>17</sup> **FIS/2016/048** Developing a bilingual web-based fish identification tool for field use in Indonesia
- <sup>18</sup> **FST/2015/040** Enhancing community-based commercial forestry in Indonesia
- <sup>19</sup> **FST/2014/064** Maximising productivity and profitability of *Eucalyptus* and *Acacia* in Indonesia and Vietnam
- <sup>20</sup> **FST/2014/068** Management strategies for *Acacia* plantation diseases in Indonesia and Vietnam
- <sup>21</sup> **FST/2012/040** Enhancing smallholder benefits from reduced emissions from deforestation and forest degradation in Indonesia
- <sup>22</sup> **FST/2016/141** Diversifying market-based integrated agroforestry systems in Indonesia
- <sup>23</sup> **FST/2016/144** Fire-wise villages and peatland restoration in Indonesia
- <sup>24</sup> **FST/2016/024** Understanding constraints to development of sandalwood plantations in Central Java
- <sup>25</sup> **FST/2016/025** Developing DNA-based chain-of-custody systems for legally sourced teak
- <sup>26</sup> **AGB/2009/060** Improved market integration for high-value fruit and vegetable production systems in Indonesia
- <sup>27</sup> **AGB/2010/099** Evaluating smallholder livelihoods and sustainability in Indonesian coffee and cocoa value chains
- <sup>28</sup> **AGB/2012/078** Developing value-chain linkages to enhance the adoption of profitable and sustainable cassava production systems in Vietnam and Indonesia
- <sup>29</sup> **AGB/2012/099** Improving milk supply, competitiveness and livelihoods in smallholder dairy chains in Indonesia
- <sup>30</sup> **ADP/2015/043** Policy research to support sustainable intensification in Indonesia's upland landscapes
- <sup>31</sup> **AGB/2016/033** Evaluating options for reducing agricultural transport costs and improving market access for smallholders in South-East Asia
- <sup>32</sup> **AGB/2016/163** Innovative and inclusive agriculture value chain financing
- <sup>33</sup> **AGB/2016/055** Evaluation of a pilot MBA studentship scheme to identify new sources of agribusiness research capacity
- <sup>34</sup> **GP/2016/093** Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific



# Lao PDR

## Key statistics<sup>a</sup>

GDP per capita (US\$)	5,691.3
Population (million)	6.80

## Funding

	A\$m
2015-16 actual	5.09
2016-17 budget	5.30
2017-18 budget	4.68

<sup>a</sup> Data for 2015 GDP and population from [data.worldbank.org/country](http://data.worldbank.org/country)

## Country context

**Laos has made strong economic progress since the introduction of market-based economic reforms in the 1980s. Standards of living have improved for many people but the country still faces significant development challenges. The benefits of economic growth have not been shared equally and some social development indicators remain very weak. Educational opportunities diverge significantly depending on geography, gender and ethnicity.**

In 2016, the Lao People's Revolutionary Party Congress was held and the body reaffirmed its commitment to sustained economic growth. In addition, the Government of Laos launched its 8th National Socio Economic Development Plan 2016-2020, which is focused on its aspirations to graduate from the Least Developed Countries list by 2020. Laos has one of the highest levels of gross domestic product (GDP) growth in Asia and is among the world's 15 fastest growing economies. All this came about as a result of significant market reforms implemented in the 1980s. Sustained investments in hydropower, mining and commercial agriculture resulted in a GDP growth of approximately 8% per annum. It is forecast that Laos will sustain at least 7% growth through to 2019.

This land-locked country is still predominantly rural, with more than 70% of the Lao population living in rural areas and depending largely on agriculture and natural resources for their livelihoods. According to the Agriculture Census 2010-2011, there are around 783,000 farm households in Laos. Of this number, more than 90% grow rice or engage in rice-based farming. The agriculture-forestry sector employs more

### Aid Investment Plan, Laos, 2015-16 to 2019-20 (DFAT)

than 70% of the total labour force, and accounted for 24.8% of GDP in 2013-14, down from 42.0% in 2005-06, with a modest growth rate of 3.2% per annum. There has been a major shift from subsistence toward market-oriented agriculture—from 6% in 1999 to 30% in 2011. Notwithstanding these many improvements, the majority of Lao farmers remain at a subsistence level characterised by low inputs and outputs and farms that are generally small, averaging 2.4 hectares.

Poverty rates have fallen significantly. The Lao Expenditure and Consumption Survey 2012-13 showed that poverty declined from 33.5% in 2002-03 to 23.2% in 2012-13. However, poverty remains widespread in rural areas. The rural poverty rate, at 88% in 2012-13, is almost three times the rate in urban areas. Agricultural households (and those headed by an unemployed person) have the highest poverty rates. They are also the most vulnerable to shocks from farm produce price fluctuations, loss of land and adverse weather conditions.

The Government of Laos' Agricultural Development Strategy 2025 and Vision 2030 aim to achieve an average growth rate of 3.4% by 2020 to maintain



the contribution of agriculture to overall GDP of 19% (Ministry of Agriculture and Forestry 2015). The sectoral priorities include 'ensuring food security, producing comparative and competitive agricultural commodities, developing clean, safe and sustainable agriculture and shifting gradually to the modernisation of a resilient and productive agriculture economy linking with rural development contributing to the national economic basis'. With this vision, the emphasis will be on ensuring food security, safety and nutritional security; commercialisation of agricultural products with high value addition; and the sustainable use and management of natural resources.

In 2017, Australia and Laos commemorate 65 years of a strong diplomatic relationship (from 1952). This is the longest unbroken diplomatic relationship with Laos and is underpinned by deepening economic ties, community links and development cooperation. Australia's aid to Laos aims to build prosperity and reduce poverty while helping Laos to take advantage of economic integration with the region. Under the new Aid Investment Plan (2015-16 to 2019-20), the bilateral aid program will focus on three objectives: basic education, human resource development, and a stronger trade regime and more competitive private-sector growth. Australia's support through ACIAR on agricultural research plays an increasingly important role as Laos works towards its goals on agricultural development, poverty reduction and inclusive economic growth.

## Country priorities

In 2016, during the Country Partnership Dialogue between ACIAR and the Government of Laos, the existing strategic priorities were reaffirmed as ongoing concerns and the government requested ACIAR to continue its support on:

- efficient and sustainable forestry industries, including non-timber products, with suitable climate-change resilience
- innovative livestock systems that allow for intensification and land-use requirements while raising animal health and biosecurity levels
- fisheries programs that focus on habitat and fish-passage protection, and improved returns on indigenous aquaculture in reservoirs and lakes
- improved institutional, training and communication frameworks that enable smallholders to adopt and adapt new technologies, and enhance the capacity development of researchers and educators
- more-cost-effective and sustainable production systems through the application of mechanisation, diversification and intensification in rice-based farming systems, together with enhanced crop quality, quarantine standards and value-adding for domestic and export markets

- improved natural resource management that benefits livelihoods and food security, through delivering land-use options to smallholders, with attention to both water and nutrient management within climate-change adaptation.

## 2017-18 research program

ACIAR supports research to address the six priorities for Laos through the following subprograms.

### Market-driven alternatives to shifting cultivation in upland regions

Market alternatives to shifting cultivation (where land is cultivated until its fertility diminishes, then left until fertility is regained) are needed for sustainable livelihoods, and livestock production provides one such alternative. Research in this subprogram examines livestock productivity in terms of biosecurity threats and sustainable management practices. Losses from diseases of livestock severely reduce village incomes in Laos. As farmers often lack the technical knowledge and skills in livestock diseases, control of rapidly spreading diseases is important, especially given the position of Laos as a major livestock transit route.

A cluster of projects is assessing biosecurity hazards and practices to reduce risk in livestock market chains. A current project is assisting the development of a biosecure market-driven beef production system in Laos<sup>1</sup> and another is focusing on improving risk management of trans-boundary livestock diseases.<sup>2</sup> A new project will build on previous work on pig health and production and will explore public-private interventions to mitigate disease risk and add value to cross-border pig trade between Laos and its neighbours Vietnam and China.<sup>3</sup> Another new project will develop improved methods to assess disease risk and strategies for disease control, thereby providing results to support the South-East Asia and China Foot-and-Mouth Disease (SEACFMD) control program of the World Organisation for Animal Health (OIE) and participating countries, to assess and control livestock biosecurity risks in the Mekong region.<sup>4</sup>

Regional research aims to identify and promote promising management practices for increasing the overall productivity of crop-livestock systems while sustaining natural resources.<sup>5</sup> Another project aims to provide smallholder farmers with strategies to improve the health and production of their flocks of goats and sheep, and develop improved understanding of market opportunities so that smallholders can make better-informed decisions.<sup>6</sup> A small research project will assess goat production and marketing systems in Laos and market linkages into Vietnam.<sup>7</sup>



One current project, the Laos Agricultural Research Fund (LARF3), comprises a small competitive grants program for agricultural researchers in Lao universities and government departments. It aims to provide small start-up research projects where younger researchers can test ideas and build research capacity in themes related to ACIAR projects in Laos.<sup>8</sup> Maize is recognised by the Government of Laos as a priority crop, mainly for export. Research will be undertaken to address production and market-chain problems faced by maize-based farmers on sloping lands, as part of a Mekong region project.<sup>9</sup>

Social research is analysing issues affecting food security in the northern uplands of Laos from the perspectives of smallholder livelihoods, natural resource management and market access.<sup>10</sup>

One project is focusing on identifying opportunities and constraints facing smallholder farmer decision-making and technology adoption in southern Laos.<sup>11</sup>

## Improved profitability of farming systems through diversification

Rural poverty and food insecurity in Laos persist against a background of changing resource use and declining effectiveness of shifting agriculture. Often, little attention is given to the links between public health, nutrition and wellbeing on one hand and livelihood adaptation to changing natural resource pressures (e.g. land and water use) on the other.

The lowlands and uplands in southern Laos have considerable potential to produce market surpluses of non-rice crops and livestock. In these mixed crop-livestock systems, there are opportunities to intensify and diversify the production systems using livestock and post-rice crops. A new project is aimed at identifying the options to increase the adoption of profitable and sustainable technologies for cassava, and evaluating opportunities for production and marketing systems to enhance smallholder livelihoods.<sup>12</sup>

## Rice-based cropping systems

The study of rice-based farming systems builds on 15 years of work supported by ACIAR and the International Rice Research Institute (IRRI) in Laos on varietal introduction, assessment and management in upland and lowland environments. The Ministry of Agriculture and Forestry has set a target of 5.0–5.5 million tonnes of paddy by 2025. The main project in this subprogram investigates mechanisation for cropping and postharvest handling and the links to crop diversification in lowland farming systems.<sup>13</sup> Another project is identifying research issues related to grain and forage crop diversification, and soil fertility and management, with the main aim being

to improve production in both rice and non-rice crops.<sup>14</sup> This research is also investigating crop water requirements to satisfy diversified agricultural production, and water and nutrient use, at the farm level to identify appropriate resource management practices to increase profitability.

## Horticulture

Research in horticulture aims to develop diversification and income-generation opportunities through high-value vegetable production in Laos. For example, work is underway concentrating on improving market engagement, postharvest management and productivity of Lao vegetable industries.<sup>15</sup> Closely linked to this project is new research being undertaken to develop options for soil and water management in vegetable production in both Cambodia and Laos.<sup>16</sup>

Other horticultural research is focused on improving production through better plant biosecurity practices. The aim is to develop biosecurity research and development (R&D) and technical diagnostic skills in Thailand, Laos and Cambodia to underpin development of potential international market opportunities for Mekong horticultural products.<sup>17</sup>

The evaluation of infrastructure and policy scenarios for reducing transport costs and improving market access using case studies of smallholder agri-food value chains in Indonesia, Lao PDR and Vietnam is also underway.<sup>18</sup>

## Improving fisheries productivity in rivers and flood plains

Fish, predominantly from riverine and reservoir capture fisheries, are the main animal protein source for Lao people. Research in this subprogram focuses on improving fisheries productivity to provide sustainable and improved rural livelihoods.

Research funded by ACIAR is rapidly transforming the ability to help rehabilitate floodplain fisheries in Laos. Fish-passage technology and capability is being developed that will permit movement of fish past low-level barriers, such as weirs and flood-control structures. For example, research has, for the first time, effectively provided criteria upon which to base future fish-passage works.<sup>19</sup> This research is providing substantial capacity impacts for rural and regional people, benefiting threatened species and helping to recover declining artisanal fisheries. Further fishway research is facilitating widespread application of fish-friendly mini hydro schemes in river systems in Laos along with the construction of fish-friendly irrigation infrastructure.<sup>20</sup> The work is focused on generating win-win outcomes, ensuring development

can occur with minimal impact on capture fisheries. Recent research is focused on determining the benefit-cost ratio of these activities and ensuring rapid returns on future investment.

## Incomes from forestry and forestry-related products

Laos plans to increase its forest coverage from less than 52% at present to 70% by 2020, to safeguard the country's water resources and enhance rural livelihoods. To reduce shifting cultivation, increase forest cover and improve rural incomes, the government is encouraging the planting of high-value trees such as teak and eucalypts. ACIAR's forestry projects in Laos are exploring the use of teak-based agroforestry systems linked to value-adding industries, as well as payments for environmental services associated with forests, to improve livelihoods.

Research priorities include enhancing agroforestry systems, improving timber processing and marketing, and developing payments for environmental services from sustainably managed smallholder plantations. For example, a teak-based agroforestry project focused on areas in Luang Prabang province is developing improved germplasm and management systems for tree crops and non-timber products.<sup>21</sup> A policy-focused project is developing options for implementing payment for environmental services in Laos, to increase smallholder livelihoods, improve land management practices, and achieve maximum net economic, social and environmental benefits.<sup>22</sup>

A forestry biosecurity project aims to develop appropriate biological controls for gall wasp pests of eucalypt plantations in the Mekong region by importing and testing natural enemies of these insects from Australia.<sup>23</sup> The project will focus on Laos, with some related work in Vietnam, Thailand and Cambodia. Another project aims to provide public policy options for plantations that meet national objectives for smallholder production that will contribute to community and industry development and environmental sustainability in Laos.<sup>24</sup>

A new project aimed at enhancing advanced wood-manufacturing industries will continue research on addressing constraints to farmers selling planted teak to value-added processors and undertake new research to develop engineered wood products from planted timber and thereby enhance livelihoods of farmers and increase the international competitiveness of Lao wood industries.<sup>25</sup> A small research activity aims to develop DNA-based chain-of-custody systems for legally sourced teak in Laos and other countries in the Mekong region where teak is planted or traded.<sup>26</sup>

## Research monitoring

Work is underway to collect detailed institutional, financial, human resource and research output data from a complete set of agricultural research agencies operating in the region; and to facilitate stakeholders' access to this information through a variety of online tools and publications for inclusion in the Agricultural Science and Technology Indicators (ASTI).<sup>27</sup> ASTI is the leading global program that compiles, analyses and publishes data on agricultural research systems in developing countries. The project will be implemented jointly by the International Food Policy Research Institute (IFPRI) and the Asia-Pacific Association of Agricultural Research Institutions (APAARI), in close collaboration with the main national agricultural research institutes (NARIs) of Cambodia, Indonesia, Laos, Malaysia, Myanmar, Papua New Guinea, Philippines, Thailand, Timor-Leste and Vietnam.

## 5-year country outcomes

- Reduced incidence of animal and human (zoonotic) diseases through better knowledge of farm household practices
- Improved livelihoods from commercial tree growing and wood processing
- Wider awareness and ability to manage threats to resources and biodiversity
- Proven practices to reduce yield gaps for staple foods to improve national food security
- Improved management of floodplain fisheries through the use of fish-passage technologies
- Greater capacity for integrated systems research methods in the national agricultural research system
- Improved livelihoods from the commercial growing of trees and processing into high-value products

## 2017-18 project outputs

- New fish-passage technology introduced in the Lower Mekong Basin
- Recommendations provided on four best-bet engineered wood products that could be produced in Laos from teak and eucalypt plantations
- Publication produced on the development of improved teak germplasm and the impacts of spacing and thinning on productivity and value of teak woodlots in northern Laos
- Report delivered on the outcomes and impacts of redistribution of *Leptocybe* parasitoids in partner countries
- Strategies for improving provincial-level extension commenced
- Capacity for integration of rice, water, forage and socioeconomic research increased

- Cost analysis completed of risks to human health in pig-production systems
- Integrated program for ACIAR-supported research on livestock health and production planned and documented
- A regional research program created to assess and control major livestock biosecurity risks in the Mekong region
- Capacity and awareness of integrated systems research methods in the national agricultural research system increased
- Awareness achieved of forest policies and programs
- A program to improve farming systems on sloping lands commenced
- Options for improving soil management during vegetable production introduced
- Options for cropping during the dry season, in rotation with monsoonal rice, introduced and tested

### Key Research Program Managers

Dr Chris Barlow, Fisheries  
 Mr Tony Bartlett, Forestry  
 Dr Jayne Curnow, Agricultural Systems Management  
 Dr John Dixon, Cropping Systems and Economics  
 Dr Rodd Dyer, Agribusiness  
 Dr Robert Edis, Soil Management and Crop Nutrition  
 Dr Richard Markham, Horticulture  
 Dr Mike Nunn, Animal Health  
 Dr Ejaz Qureshi, Agricultural Development Policy  
 Dr Werner Stür, Livestock Production Systems  
 Ms Mellissa Wood, Global Program

### Regional Manager, Cambodia, Lao PDR, Myanmar & Thailand

Ms Dulce Carandang Simmanivong

## Current and proposed projects

- AH/2012/068** Development of a biosecure market-driven beef production system in Lao PDR
- AH/2012/067** Enhancing transboundary livestock disease risk management in Lao PDR
- AH/2014/055** Interventions to mitigate disease risk and add value to cross-border pig trade between Lao PDR, Vietnam and China
- AH/2010/045** Improving livelihoods through animal health and biosecurity research in the Mekong region
- SMCN/2012/075** Management practices for profitable crop-livestock systems for Cambodia and Lao PDR
- AH/2014/056** Improving small ruminant health, production and regional trade in Myanmar
- LPS/2016/027** Assessing goat production and marketing systems in Lao PDR and market linkages into Vietnam
- ASEM/2014/007** Lao PDR Agricultural Research Fund 3
- SMCN/2014/049** Improving maize-based farming systems on sloping lands in Vietnam and Lao PDR
- ASEM/2012/073** Improving food security in northern uplands of Lao PDR through the promotion of market participation
- ASEM/2014/052** Smallholder farmer decision-making and technology adoption in southern Lao PDR: opportunities and constraints
- ASEM/2014/053** Developing cassava production and marketing systems to enhance smallholder livelihoods in Cambodia and Lao PDR
- CSE/2012/077** Mechanisation and value-adding for diversification of lowland farming systems in Lao PDR and Cambodia
- SMCN/2012/071** Improving water and nutrient management to enable double cropping in the rice-growing lowlands of Lao PDR and Cambodia
- ASEM/2012/081** Improving market engagement, postharvest management and productivity of the Cambodian and Lao PDR vegetable industries
- SMCN/2014/088** Integrated resource management for vegetable production in Lao PDR and Cambodia
- HORT/2010/069** Enabling improved plant biosecurity practices in Cambodia, Lao PDR and Thailand
- AGB/2016/033** Evaluating options for reducing agricultural transport costs and improving market access for smallholders in South-East Asia
- FIS/2014/041** Quantifying biophysical and community impacts of improved fish passage in Lao PDR
- FIS/2012/100** Improving the design of irrigation infrastructure to increase fisheries production in floodplain wetlands of the Lower Mekong and Murray-Darling basins
- FST/2012/041** Teak-based agroforestry systems to enhance and diversify smallholder livelihoods in Luang Prabang province of Lao PDR
- FST/2011/003** Effective implementation of payments for environmental services in Lao PDR
- FST/2012/091** Biological control of galling insect pests of eucalypt plantations in the Mekong region
- ADP/2014/047** Improving policies for forest plantations to meet smallholder, industry and environmental needs in Lao PDR and Vietnam
- FST/2016/151** Enhancing advanced wood manufacturing industries in Lao PDR
- FST/2016/025** Developing DNA-based chain-of-custody systems for legally sourced teak
- GP/2016/093** Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific





# Myanmar

## Key statistics<sup>a</sup>

GDP per capita (US\$)	5,249.7
Population (million)	53.9

## Funding

A\$m

2015-16 actual	3.62
2016-17 budget allocation	4.00
2017-18 budget	4.68

<sup>a</sup> Data for 2015 GDP and population from [data.worldbank.org/country](http://data.worldbank.org/country)

## Country context

Myanmar is undergoing a period of remarkable political, economic and social change. After decades of isolation and instability, the country has been partially transformed by three unprecedented reform efforts: a transition to democracy; economic liberalisation; and nationwide peace negotiations ... [Myanmar] is the largest country by land area in mainland South East Asia, has significant natural resources and a young population. It is strategically positioned between two of the world's fastest growing economies (China and India). Myanmar is increasingly active in the region and was Chair of ASEAN in 2014. International interest and engagement in Myanmar has surged. Myanmar has significant potential to benefit from closer integration with global markets through trade liberalisation.

### Aid Investment Plan, Myanmar, 2015 to 2020 (DFAT)

In 2016, Myanmar made its full return to civilian rule and, despite slowing, growth remained strong at 7%. According to the World Bank's Myanmar Economic Monitor, the slowdown resulted from an agricultural supply shock that followed devastating flooding in the country, coupled with declining commodity prices affecting Myanmar's main exports.

Despite the setback, the agriculture sector continues to play an important role in Myanmar's economy, generating 24% of the gross domestic product (GDP) and almost 25% of export earnings. Agriculture continues to account for two-thirds of employment. In 2015-16, agricultural exports exceeded US\$3 billion. Myanmar aims to be the largest exporter of beans and pulses within the Association of South-East Asian (ASEAN) region, and has great potential for further increases in production and export in many other areas of agriculture. However, according to the Oxford Business Group, agriculture will require significant investments, greater mechanisation, the provision of

better financing for farmers and clearer land rights to ensure sustained growth in the future.

Myanmar is still one of the poorest nations in Asia with 25.6% of its 53.7 million people (2014) living below the poverty line. There is a strong link between agriculture and poverty, with poverty rates in rural areas twice as high as in urban areas. Nearly 85% of Myanmar's poor live in the rural areas. Rural women are among Myanmar's most marginalised groups, with high vulnerability to food insecurity and poverty. Myanmar is also at risk of climatic and other natural disasters. According to the United Nations Office for the Coordination of Humanitarian Affairs, Myanmar ranks as one of the most at-risk countries in Asia and the Pacific, being vulnerable to a wide range of hazards, including floods, cyclones, earthquakes, landslides and tsunamis.



On the other hand, Myanmar has abundant arable land, forests, natural resources, minerals, gas, oil and freshwater and marine products. About 75% of the total population reside in rural areas and are principally employed in cropping, livestock, and fishery and forestry sectors for their livelihoods. Rice is the most important crop, accounting for about 80% of the value of sector production. Livestock and fisheries play a critical role in the smallholder mixed fishing and livestock systems that dominate the sector.

Given its huge potential to become a global food supplier, Myanmar needs to intensify its agricultural growth and enhance farm productivity and competitiveness. Development in Myanmar can be sustained once it overcomes constraints that include a weak private sector and inadequate government capacity to oversee the transition to a diversified, outward-oriented market economy.

The newly elected government in Myanmar has economic objectives that give paramount importance to agriculture, with a focus on improving rural productivity. The major objectives for the agriculture sector, of which crops are the major contributors, are to fulfil food security needs, increase foreign exchange through increased exports of agricultural products, and improve rural incomes.

Australia has a longstanding bilateral relationship with Myanmar which started in 1952. Australia's development assistance program in Myanmar reflects its growing engagement with the Government of Myanmar. The Department of Foreign Affairs and Trade (DFAT) Aid Investment Plan 2015–2020 focuses Australian aid on supporting and entrenching Myanmar's reforms through investments in education and inclusive economic growth, particularly through greater private-sector engagement and improved management of natural resources.

## Country priorities

To support the Government of Myanmar's goals on agricultural development and consistent with Australia's strategic objective on inclusive economic growth, a multidisciplinary program, MyFarm, has been developed by ACIAR, in collaboration with DFAT, and in consultation with Myanmar counterparts, donors and potential research providers. This long-term country strategy is expected to be finalised in 2017–18. At present, research priorities focus on:

- increasing net production of food and cash incomes of rural households in the central dry zone and Ayeyarwaddy Delta through improvements in, and adoption of, production and postharvest technologies in agriculture, including livestock and fisheries

- building capacity in agricultural, livestock and fisheries research, development and evaluation (RD&E) through program activities, and postgraduate and short-term training
- providing technical assistance and advice on policy strengthening to relevant Government of Myanmar departments.

The program is targeting the immediate needs of the generally vulnerable people of Myanmar through RD&E. There is also be a strong focus on capacity building for both people and institutions, as many of Myanmar's agricultural scientists have been isolated from international cooperation over recent years. ACIAR signed Memoranda of Understanding with the Ministry of Livestock and Fisheries in June 2013 and the Ministry of Agriculture and Irrigation in November 2013 to facilitate implementation of the program.

Future research priorities will be within the following spectrum:

- opportunities for sustainable pro-poor beef industry development and policy
- improvement in the productivity of grain legumes, now including breeding and mechanised harvesting of mungbean
- diversification and intensification of rice-based cropping systems to increase overall productivity and farm income
- development of land evaluation and resource management methods that enable improved planning and management for productive and resilient landscapes
- smallholder and community aquaculture development, and improvement of management of the Ayeyarwaddy River and Delta fisheries
- support for smallholder livestock-based cattle enterprises in the central dry zone
- strengthening of institutional capacity and extension services affecting the acceptability and adoption of promising technologies in the central dry zone and Ayeyarwaddy Delta regions.

## 2017–18 research program

The research program focuses primarily on animal health and production, intensification of rice and legume crops, improved land evaluation methods and adoption of technology by smallholder farmers. For example, current socioeconomic research aims to strengthen institutional capacity and extension services in Myanmar to improve adoption rates in the central dry zone and Ayeyarwaddy Delta regions.<sup>2</sup>

## Animal health, production and management

An animal health project aims to enhance the management, nutrition and health of small ruminants, indigenous cattle and village poultry in the central dry zone.<sup>2</sup> A new project will develop improved methods to assess disease risk and strategies for disease control, thereby providing results to support the South-East Asia and China Foot-and-Mouth Disease (SEACFMD) control program of the World Organisation for Animal Health (OIE) and participating countries to assess and control livestock biosecurity risks in the Mekong region.<sup>3</sup> A new project aims to improve the health, production and regional trade of sheep and goats in Myanmar.<sup>4</sup> Two new regional projects are focusing on building a sustainable beef and cattle industry in Myanmar and neighbouring countries, including development of a beef trade model and information network<sup>5,6</sup>, and a new project will research means to improve cattle health and production.<sup>7</sup>

Fisheries management and aquaculture development are the focus of two related projects that aim to improve the capacity for management of Myanmar's estuarine and inland capture and culture fisheries<sup>8</sup>, and facilitate the emergence of fisheries co-management and small-scale aquaculture as cornerstones of rural food security and livelihoods.<sup>9</sup> A new project will research the development of rice-fish systems in the Ayeyarwaddy Delta.<sup>10</sup>

## Crop production and marketing

Two projects focus on crop production. One is assessing opportunities to increase diversification and productivity of lowland rice-based systems for smallholder farmers in the Ayeyarwaddy Delta.<sup>11</sup> The adoption of new rice varieties and alternative management options will advance the rice harvest and provide options for post-rice crops and greater diversification. The other aims to increase the productivity of pulse and oilseed legumes, which are the most important crops in Myanmar after rice.<sup>12</sup> This work builds on the outcomes of previous ACIAR-funded research and is based in the central dry zone. Farming system diversification and nutrient management options for pulse-based cropping in Myanmar will be the focus of a small research project.<sup>13</sup>

The International Mungbean Improvement Network, led by the World Vegetable Center, is supporting the participation of Myanmar's national mungbean breeding program in an international network comprising Australia, Bangladesh and India.<sup>14</sup> This project will build the capacity of local researchers and accelerate the release of improved mungbean

cultivars. Mungbean is an export crop for Myanmar; increasing productivity would contribute to both economic development and improved nutrition locally. A new project aims to identify improved harvesting and seed production systems for mungbean.<sup>15</sup>

In Myanmar and Vietnam, a new project is developing an understanding of vegetable markets and value chains and identifying opportunities for safe and off-season vegetable production into urban, wholesale and retail markets.<sup>16</sup> This work builds on the lessons and achievements of vegetable research and market development in Moc Chau district, Vietnam. In addition, a new project will explore innovative and inclusive agricultural value-chain financing in Myanmar.<sup>17</sup>

A project on nutrient use to improve yields, profitability and sustainability in central Myanmar builds on existing work on rice and legumes and will include maize.<sup>18</sup> The project will enhance the productivity and profitability of rice- and maize-based production systems, while ensuring environmental preservation through correct use of inputs (fertiliser).

A forestry-related project is researching the DNA-based chain-of-custody systems for legally sourced teak.<sup>19</sup>

## Land management

A project in the central dry zone of Myanmar will develop locally relevant land evaluation methods, including soil surveying and land suitability assessment, and use the information for participatory land-use planning.<sup>20</sup> Within a land-use planning framework, the information generated by the project will be used to identify and prioritise both areas suitable for agricultural intensification and those requiring intervention to protect ecosystem services due to their vulnerability to degradation.

## Innovation in data collection

ACIAR has been exploring the use of digital data collection applications (apps) (DDCAs) with encouraging results, including reduced time and improved accuracy in collecting data (compared with paper-based methods), and increased capacity for knowledge sharing and project monitoring. Two small regional research projects ensuing from the pilot Mobile Acquired Data (MAD) study are being undertaken in Myanmar, Pakistan, Vanuatu and Vietnam. The projects aim to provide direct support to the four core projects partnering in use of this technology with an at-scale evaluation of DDCAs within these projects (MAD 2) and evaluation of a staged adoption and implementation strategy (MAD 3).<sup>21,22</sup> The purpose is to ensure successful and sustainable deployment of CommCare—the app

chosen as most suitable by the pilot study—while evaluating the support options and process to guide future projects seeking to incorporate DDCAs.

## Research monitoring

Work is underway to collect detailed institutional, financial, human resource and research output data from a complete set of agricultural research agencies operating in the region; and to facilitate stakeholders' access to this information through a variety of online tools and publications for inclusion in the Agricultural Science and Technology Indicators (ASTI).<sup>23</sup> ASTI is the leading global program that compiles, analyses and publishes data on agricultural research systems in developing countries. The project will be implemented jointly by the International Food Policy Research Institute (IFPRI) and the Asia-Pacific Association of Agricultural Research Institutions (APAARI), in close collaboration with the main national agricultural research institutes (NARIs) of Cambodia, Indonesia, Laos, Malaysia, Myanmar, Papua New Guinea, Philippines, Thailand, Timor-Leste and Vietnam.

## 5-year country outcomes

- Development and adoption of well-researched technologies for improved smallholder productivity and diversification contributing to nutritional security
- Improved capacity of program partners and collaborators at institutional and farmer levels through training, extension and knowledge sharing
- Assessment of latent agricultural production capacity in priority zones and implementation of actions to overcome limitations

## 2017–18 project outputs

- A multidisciplinary program progressed to improve productivity in the crop, fisheries and livestock sectors
- Initial training, equipment and laboratories established for land evaluation, including first soil sampling and analysis campaign in the central dry zone
- A regional research program created to assess and control major livestock biosecurity risks in the Mekong region
- A regional model created to develop an understanding of the flow of beef products and beef cattle
- Knowledge increased on management of fisheries resources, and research capacity built within government fisheries agencies, through a series of fisheries mini projects

- Mungbean core collection characterised (genotyping and first year of phenotyping)
- Improved understanding demonstrated of vegetable markets and value chains and opportunities for safe, off-season vegetable production and market development by smallholders
- A model demonstrated to increase capacity in agribusiness research methods with key research partners
- A research program commenced on nutrient management for cropping systems in central Myanmar, with an Australia–Myanmar university-to-university partnership forged
- Farming practices, value chains and women's participation affecting mungbean harvesting identified
- The use of digital data collection applications explored

### Key Research Program Managers

Dr Chris Barlow, Fisheries  
 Mr Tony Bartlett, Forestry  
 Dr Evan Christen, Land and Water Resources  
 Dr Jayne Curnow, Agricultural Systems Management  
 Dr Rodd Dyer, Agribusiness  
 Dr Robert Edis, Soil Management and Crop Nutrition  
 Dr Eric Huttner, Crop Improvement and Management  
 Dr Mike Nunn, Animal Health  
 Ms Mellissa Wood, Global Program

### Regional Manager, Cambodia, Lao PDR, Myanmar & Thailand

Ms Dulce Carandang Simmanivong

## Current and proposed projects

- <sup>1</sup> **ASEM/2011/043** Strengthening institutional capacity, extension services and rural livelihoods in the central dry zone and Ayeyarwaddy Delta regions of Myanmar
- <sup>2</sup> **AH/2011/054** Improving livelihoods of small-scale livestock producers in the central dry zone of Myanmar through research on animal production and health
- <sup>3</sup> **AH/2010/045** Improving livelihoods through animal health and biosecurity research in the Mekong region
- <sup>4</sup> **AH/2014/056** Improving small ruminant health, production and regional trade in Myanmar

- <sup>5</sup> **AGB/2016/031** Developing a trade model and information network for cattle and beef trade sector of South-East Asia and China
- <sup>6</sup> **AGB/2016/196** Sustainable and inclusive cattle and beef industry development in South-East Asia and China
- <sup>7</sup> **AH/2016/132** Improving cattle health and production in Myanmar
- <sup>8</sup> **FIS/2011/052** Improving research and development of Myanmar's inland and coastal fisheries
- <sup>9</sup> **FIS/2015/046** Improving governance of Myanmar's inland and coastal fisheries
- <sup>10</sup> **FIS/2016/135** Development of rice-fish systems in the Ayeyarwaddy Delta, Myanmar
- <sup>11</sup> **SMCN/2011/046** (*multilateral, IRRI*) Diversification and intensification of rice-based systems in lower Myanmar
- <sup>12</sup> **SMCN/2011/047** Increasing productivity of legume-based farming systems in the central dry zone of Myanmar
- <sup>13</sup> **SMCN/2016/051** Farming system diversification and nutrient management options for pulse-based cropping in Myanmar
- <sup>14</sup> **CIM/2014/079** Establishing the International Mungbean Improvement Network
- <sup>15</sup> **CIM/2016/174** Improved mungbean harvesting and seed production systems for Bangladesh, Myanmar and Pakistan
- <sup>16</sup> **AGB/2014/035** Improving livelihoods in Myanmar and Vietnam through sustainable and inclusive vegetable value chains
- <sup>17</sup> **AGB/2016/163** Innovative and inclusive agriculture value chain financing
- <sup>18</sup> **SMCN/2014/044** Management of nutrients for improved profitability and sustainability of crop production in central Myanmar
- <sup>19</sup> **FST/2016/025** Developing DNA-based chain-of-custody systems for legally sourced teak
- <sup>20</sup> **LWR/2014/075** Land resource evaluation for productive and resilient landscapes in the central dry zone of Myanmar
- <sup>21</sup> **GMCP/2016/004** At-scale evaluation of digital data collection apps (DDCAs) in ACIAR projects—Mobile Acquired Data phase 2 (MAD 2)
- <sup>22</sup> **GMCP/2016/042** Mobile Acquired Data phase 3 (MAD 3)—evaluation of staged adoption and implementation strategy
- <sup>23</sup> **GP/2016/093** Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific





# Philippines

Key statistics <sup>a</sup>	
GDP per capita (US\$)	7,387.3
Population (million)	100.7
Funding	
	A\$m
2015-16 actual	4.88
2016-17 budget allocation	5.30
2017-18 budget	3.99

<sup>a</sup> Data for 2015 GDP and population from [data.worldbank.org/country](http://data.worldbank.org/country)

## Country context

**The Philippines has experienced significant growth over the past four decades, but unlike many of its Asian neighbours this growth has not resulted in a commensurate reduction in poverty and has been limited to a few sectors of the economy and society.**

Under the new Philippine Development Plan (PDP) 2017–2022, medium-term economic growth is expected to strengthen at 7–8% and be more inclusive. The plan also sets targets to reduce overall and rural poverty incidence by 2022 to 14% and 20%, respectively. The PDP continues to highlight the important role of the agriculture, forestry and fisheries (AFF) sector in achieving the growth and poverty reduction targets of the country. This sector contributes an annual average of 11% to the gross domestic product (GDP). It is the employer of almost one-third of the labour force and supplier of raw materials for the manufacturing sector.

Despite its economic importance and sustained public interventions, the AFF sector remains weighed down by problems of inequality, low productivity and poverty. About 75% of the poor are found in rural areas and the Philippine Statistical Authority reported poverty incidence among farmers and fishers at 38% in 2014. Production and productivity are also variable across the country, with farmers having poor access to inputs, support services and technology. Links to high-value markets are also limited. These problems are further exacerbated by frequent and increasingly intense natural disasters that often wipe out any development in the sector.

### Aid Investment Plan, Philippines, 2015-16 to 2017-18 (DFAT)

To address some of these constraints, the Philippine Government's strategies for the AFF sector (set out in the PDP) include expanding economic opportunities for those engaged in the sector by linking them to higher-value markets; and increasing access of small farmers and fishers to value chains, financing, technology and land and water resources. The government places equal emphasis on ensuring ecologically sustainable use of natural resources and increasing the resilience of susceptible communities to climate and disaster risks. The PDP also recognises the strategic role of science and technology in optimising the growth potential of the AFF sector within its ecological limits. Innovative and focused research and development (R&D) priorities for the sector will be forged to meet the national and global realities.

There is relatively little new land in the Philippines suitable for expanding production, and productivity growth in existing areas over recent years has been low. In addition, the country's high rate of population growth (2% per annum) puts added pressure on the sector to meet the increasing demand for food and raw materials. This is notwithstanding the competing use of the same natural resources (land and water) for other development needs. While rice production

remains a dominant national focus, there is increasing pressure to diversify and produce a range of higher-value food, livestock and fisheries products, as well as other income-producing crops, on increasingly marginal land in the uplands.

The Australian Government's aid program is working with the Philippine Government to promote prosperity, reduce poverty, enhance stability and help respond to the agricultural R&D priorities of the Philippines. ACIAR's work, in particular, aligns with the aid program's focus on agriculture, fisheries and water.

ACIAR's support to the Philippines focuses on research to increase the productivity, marketability and international competitiveness of agricultural products, as well as to reduce the adverse effects of climate change on the rural poor. Underpinning these two priorities is the need to develop more effective extension processes and greater responsiveness to market opportunities.

The emphasis on higher-value products and market competitiveness aims to improve food security by supporting research that can provide smallholder farmers and traders with increased cash income, enabling the purchase of staple foods and access to other basic services and economic opportunities.

The Philippines remains one of the largest importers of rice in the world, at around 1.5 million tonnes in 2015. Part of ACIAR's contribution to research in the Philippines involves providing core funding to the International Rice Research Institute (IRRI) (which is headquartered at Los Baños in the Philippines) and supporting additional IRRI initiatives aimed at maintaining rice productivity and increasing the capacity of rice-based systems to adapt to the negative impacts of climate change and natural disasters. Some of this climate-change research is making use of IRRI's Lloyd T. Evans Plant Growth Facility that allows scientists to simulate and study the impacts of various climate conditions on the properties and growth of rice and other plants. The Australian Government, through ACIAR, provided funds for the construction of this facility.

## Country priorities

ACIAR's medium-term research strategy and geographical priorities in the Philippines are vetted annually through consultations with key research-coordinating agencies, universities, non-government organisations (NGOs) and private-sector stakeholders. In February 2017, ACIAR conducted the second ACIAR-Philippines Partnership Discussion in Manila. The forum, successfully organised in partnership with the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD), brought together 60 heads and

representatives of national and regional partner agencies, including the Department of Foreign Affairs and Trade (DFAT) in the Philippines. Our stakeholders strongly affirmed that the current set of priorities remain valid.

More importantly, our partners expressed a strong desire for more specificity under each research priority. We will conduct an in-depth assessment of the research priorities in consultation with PCAARRD and key stakeholders. This activity will inform the development of a 10-year strategy for research collaboration that will be presented at the next Country Partnership Discussion. Noting that almost half of the projects in Philippines will be completed in 2017 and 2018, we will also undertake a focused effort to identify and rank future ACIAR-supported projects in the Philippines.

ACIAR's program in the Philippines addresses the following key priorities:

- increased market competitiveness of horticultural products
- competitive and sustainable fisheries and aquaculture production
- land and water resource management for profitable and sustainable agriculture
- improved returns from low-input livestock production systems
- mitigating the adverse impacts of climate change on the rural poor
- improved technology adoption by poor Indigenous households in the southern Philippines through understanding and addressing adoption constraints and extension.

## 2017-18 research program

In recent years, ACIAR's Philippines program has had an increasing focus on Mindanao and the Visayas, where the issues of agricultural intensification and a declining natural resource base coincide in upland areas. A significant proportion of farming is carried out in fragile sloping environments or sensitive watersheds, and it is important that intensification of agriculture does not come at the expense of land degradation, particularly in light of the strong cyclones and earthquakes affecting the country.

### Increasing market competitiveness of horticultural products

Major horticultural initiatives involving researchers, government, NGOs and industry partners commenced in 2008, with a total investment of approximately A\$12 million. Together, ACIAR's southern Philippines

fruits and vegetables program aims to improve smallholder and industry profitability and market competitiveness of selected vegetable industries (including potato, tomato, bell pepper, brassicas and leafy vegetables), and identify and implement improvements to domestic and export value chains for tropical fruits (bananas, mango, papaya, durian and jackfruit). The program is achieving this through targeted interventions in policy and regulatory analysis, production, disease and pest management, and postharvest handling. An important feature of this program is a high level of coordination and exchange of experiences among projects and across disciplines, facilitated in collaboration with PCAARRD, leading to greater effectiveness in the delivery and uptake of outputs and exceptional opportunities for individual and institutional learning.

Research is looking at the links between improved value chains, increased farmer income and enhanced community development in the southern Philippines. One cross-cutting project focuses on smallholder-inclusive value chains of target vegetables (tomato, eggplant, bell pepper and leafy vegetables) and mango across four study regions.<sup>1</sup> Another is supporting postharvest research to reduce losses in the product volume and quality of a similar range of vegetables and fruits.<sup>2</sup> This project aims to increase farmer incomes, encourage increased purchasing by consumers, and develop physical facilities and research skills for postharvest R&D in the southern Philippines. In addition, more narrowly targeted projects look at production issues in specific vegetables and fruits.

For instance, a project in the Visayas and Mindanao is developing integrated crop management strategies for vegetables, including 'protected cropping' systems that are resilient in the face of unfavourable weather.<sup>3</sup> This project is part of a coordinated program of work with two PCAARRD projects—*Potato seed production through aeroponics* and *Identification and transmission studies on major diseases of vegetables in Eastern Visayas*. The effort on vegetables is also underpinned by research on soils and crop nutrition to ensure that smallholders have access to sustainable approaches that are best suited to local conditions.<sup>4</sup> A new project will bring together production and postharvest work to develop more sustainable vegetable value chains, with a focus on improving food safety and quality to meet evolving market expectations.<sup>5</sup>

Turning to fruit, specific projects are addressing a range of issues in banana, mango, papaya, durian and jackfruit. *Fusarium* wilt (also known as Panama disease) has devastated commercial banana production in a series of Asian countries and now threatens the crop in the southern Philippines, where banana exports provide a major contribution to

employment and the economy. A novel approach, developed in a series of ACIAR-funded projects, centres on the use of groundcover plants that encourage biological suppression of this soil-borne disease. Combined with appropriate containment measures, this approach is showing considerable potential to sustain profitable banana production.<sup>6</sup> Bacterial crown rot of papaya is also being addressed through integrated management approaches in a project aiming to increase the profitable and sustainable production of this fruit in the southern Philippines.<sup>7</sup> Outcomes of this research will also provide knowledge and information on managing dieback and postharvest rots, and improve Australia's capacity to prevent the entry and establishment of bacterial crown rot. Research on durian and jackfruit is also looking at integrated approaches to disease management and reduction of postharvest losses.<sup>8</sup>

For mango, the current project, which is nearing its end, has focused on 'canopy management' and integrated pest management.<sup>9</sup> Looking ahead, the Philippines will participate in two new projects that form part of a coordinated regional mango program. The first, which will also have research sites in Indonesia, will look at developing area-wide management approaches for fruit flies.<sup>10</sup> Another, with complementary research sites in Cambodia, will look at controlling the timing of flowering and managing pests and diseases to better meet market opportunities and expectations.<sup>11</sup> In addition, a new regional project aims to examine the benefits of annual mango market and trade analysis.<sup>12</sup> Further reviews and consultations with stakeholders will be conducted during the coming year to refine priorities for horticultural research for development in the Philippines.

A small research activity funded at IRRRI as a multilateral project is continuing to decipher the genetic basis of the chalk defect in rice grain, with potential application to all rice-growing countries.<sup>13</sup>

## Fisheries and aquaculture production

ACIAR has been working with Philippine research agencies, both national and regional, to develop and refine technologies for the culture and grow-out of high-value marine species, including mud crabs, groupers and other marine food fishes, sea cucumbers and giant clams. Research is developing commercial-scale hatchery and grow-out technologies for sandfish (a sea cucumber)<sup>14</sup>, recognising the critical nature of adapting systems to social, institutional and biophysical settings in participating communities. In this regard, production of release-size sandfish juveniles has recently increased, with the adoption of a low-cost ocean nursery system that has reduced the hatchery-rearing period from 6 months



to only 2 months. A new project will examine the scaling-up of community-based sea cucumber culture in the Philippines and northern Australia.<sup>15</sup> Another project is focusing on giant grouper production, developing technologies for the control of sex change, hormonal manipulation of reproduction and genetic management, with a view to ensuring that aquaculture of the species is both sustainable and profitable.<sup>16</sup>

Other current research has an environmental focus—quantifying the effectiveness of mass larval reseedling to restore damaged coral communities on reefs in the Philippines.<sup>17</sup> The project has successfully re-established a breeding population of reef corals on a degraded reef system using larval enhancement. These results, among others, have been presented at international scientific conferences and are now influencing the design and development of new projects on reef restoration in other parts of the world. They also hold much potential in influencing policy development for larger-scale coral reef restoration and management in other regions in future.

## Land and water resource management

Many Philippine watersheds have been severely degraded, reducing their capacity to provide vital economic benefits and ecological services. Impacts include decreased agricultural productivity, pollution of water resources (especially with sediment) and increased risk of downstream flooding and landslides. ACIAR will continue to support national watershed R&D programs through targeted research collaboration to identify promising management practices best suited to local conditions.

Research undertaken into forest landscape restoration is being undertaken to enhance food security and livelihoods<sup>18</sup> and efforts are being made to incorporate rubber production into small farms in southern Philippines to increase their viability.<sup>19</sup>

## Improving returns from low-input livestock production systems

Pork accounts for about 60% of all meat produced and consumed in the Philippines. The industry is large and highly diverse, with a wide range of production systems, from large-scale commercial to low-input subsistence, but it is dominated by smallholder farmers. The designation of the Philippines as free of foot-and-mouth disease provides the opportunity to export pigs and pork to hitherto closed markets, such as Singapore. Research on pig respiratory diseases is building on previous work, to scale out successful interventions to two additional regions in the Philippines and to adapt the approach to include

other major pig diseases.<sup>20</sup> It is developing disease surveillance systems to improve returns and the competitiveness of pig-production systems.

## Effects of climate change on smallholder livelihoods

Agriculture in the Philippines is especially susceptible to the adverse effects of climate change through increasing weather variability, higher incidence of climate-related disasters and longer term changes. Smallholder farmers and fishers need access to evidence-based options for managing the effects of climate change. As part of a whole-of-government approach, ACIAR is researching the circumstances under which climate information is useful for decision-making on smallholder farms, and the ability of local government units to mitigate risks for smallholder farmers.<sup>21</sup>

## Technology adoption in the southern Philippines

Current research is building on previous ACIAR work in Mindanao that has highlighted how certain types of community-based extension methods can rapidly enhance agricultural livelihoods.<sup>22</sup> This project is comprehensively testing and evaluating these improved extension methods with respect to conflict-affected areas in the southern and western Philippines.

## Research monitoring

Work is underway to collect detailed institutional, financial, human resource and research output data from a complete set of agricultural research agencies operating in the region; and to facilitate stakeholders' access to this information through a variety of online tools and publications for inclusion in the Agricultural Science and Technology Indicators (ASTI).<sup>23</sup> ASTI is the leading global program that compiles, analyses and publishes data on agricultural research systems in developing countries. The project will be implemented jointly by the International Food Policy Research Institute (IFPRI) and the Asia-Pacific Association of Agricultural Research Institutions (APAARI), in close collaboration with the main national agricultural research institutes (NARIs) of Cambodia, Indonesia, Laos, Malaysia, Myanmar, Papua New Guinea, Philippines, Thailand, Timor-Leste and Vietnam.



## 5-year country outcomes

- Greater self-reliance of rural communities through better access to, and sustained use of, improved agricultural and fisheries technologies
- Greater productivity and resilience in key crops and production systems through the adoption of integrated approaches to pest, disease and soil fertility management
- Enhanced livelihoods of producers and consumers with more-integrated and competitive food value chains and more-effective postharvest handling practices

## 2017–18 project outputs

- Diagnostic systems improved for respiratory diseases of pigs in two selected regions of the Philippines
- New varieties of tomato suitable for 'protected cropping' evaluated for susceptibility to pests and diseases and for acceptability to farmers and markets
- Best-bet guidelines for production and postharvest handling of mango developed and trialled with farmer groups
- Characterisation achieved of constraints, opportunities and community linkages in target fruit and vegetable value chains in five study locations in the southern Philippines
- Understanding achieved of the market situation and value-chain development opportunities that will enhance smallholder net income, livelihoods and community wellbeing for selected fruits and vegetables in the southern Philippines
- Technologies for adding value to jackfruit by processing into products with a longer shelf life evaluated
- Nutrient management recommendations supported by evidence developed for vegetable production in the southern Philippines
- Molecular markers for low-chalk rice lines identified
- At least five new communities engaged in sea-ranching of sea cucumbers based on previous collaborative research
- Techniques made available for mass coral spawning and settlement onto degraded coral reefs
- Information provided for breeding giant grouper for mariculture purposes in the Philippines and Vietnam

### Key Research Program Managers

Dr Chris Barlow, Fisheries  
 Dr Jayne Curnow, Agricultural Systems Management  
 Dr Rodd Dyer, Agribusiness  
 Dr Robert Edis, Soil Management and Crop Nutrition  
 Dr Eric Huttner, Crop Improvement and Management  
 Dr Richard Markham, Horticulture  
 Dr Mike Nunn, Animal Health  
 Ms Mellissa Wood, Global Program

### Country Manager

Ms Gay (Mai) Maureen Alagcan

## Current and proposed projects

- AGB/2012/109** Developing vegetable and fruit value chains and integrating them with community development in the southern Philippines
- HORT/2012/098** Improved postharvest management of fruits and vegetables in the southern Philippines and Australia
- HORT/2012/020** Integrated crop management to enhance vegetable profitability and food security in the southern Philippines and Australia
- SMCN/2012/029** Strategies for improving crop nutrition for cost-effective production of vegetables in the southern Philippines
- HORT/2016/188** Developing more sustainable vegetable value chains to meet evolving market expectations in the Philippines
- HORT/2012/097** Integrated management of *Fusarium* wilt of bananas in the Philippines and Australia
- HORT/2012/113** Integrated management of bacterial crown rot in papaya in the southern Philippines
- HORT/2012/095** Tropical tree fruit research and development in the Philippines and northern Australia to increase productivity, resilience and profitability
- HORT/2012/019** Integrated crop management to enhance mango production in the southern Philippines
- HORT/2015/042** Development of area-wide management approaches for fruit flies in mango for Indonesia, the Philippines, Australia and the Asia-Pacific region
- HORT/2016/190** Integrated crop management for mango in Cambodia and the Philippines to meet market quality standards (proposed)

- <sup>12</sup> **AGB/2016/007** Benefits of annual mango market and trade analysis in Asia-Pacific
- <sup>13</sup> **CIM/2016/046** (*multilateral, IRRI*) Breeding for low chalk in rice
- <sup>14</sup> **FIS/2010/042** Expansion and diversification of production and management systems for sea cucumbers in the Philippines, Vietnam and northern Australia
- <sup>15</sup> **FIS/2016/122** Scaling-up community-based sea cucumber culture in the Philippines and northern Australia
- <sup>16</sup> **FIS/2012/101** Development of mariculture technology for giant grouper in the Philippines, Vietnam and Australia
- <sup>17</sup> **FIS/2014/063** Restoring damaged coral reefs using mass coral larval reseedling
- <sup>18</sup> **ASEM/2016/103** Enhancing food security and livelihoods through forest landscape restoration
- <sup>19</sup> **SMCN/2016/257** Is incorporating rubber into small farms in southern Philippines viable?
- <sup>20</sup> **AH/2012/066** Improving production and competitiveness of pig-production systems in the Philippines and Australia through better health and biosecurity
- <sup>21</sup> **ASEM/2014/051** Action-ready climate knowledge to improve disaster risk management for smallholder farmers in the Philippines
- <sup>22</sup> **ASEM/2012/063** Improving the methods and impacts of agricultural extension in conflict areas of Mindanao, Philippines
- <sup>23</sup> **GP/2016/093** Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific



# Thailand

## Key statistics<sup>a</sup>

GDP per capita (US\$)	16,340.0
Population (million)	67.96

## Funding

A\$m

2015-16 actual	0.26
2016-17 budget allocation	0.60
2017-18 budget	0.04

<sup>a</sup> Data for 2015 GDP and population from [data.worldbank.org/country](http://data.worldbank.org/country)

## Country context

Thailand has been classified as an upper-middle income economy since 2011. The last year, however, has been a difficult one for the country. With the death of King Bhumibol Adulyadej in October 2016 (after 70 years on the throne) and the declaration of a 1-year period of mourning, temporary slowing down and postponement of economic activities are being observed. Still, its economy was projected to be 3.1% in 2016 with private consumption and public spending as key drivers of growth.

In April 2016, the Thai Government declared 74 of the country's 77 provinces as either drought-stricken or drought-affected areas. As a result of the extended drought, Thailand's major crops, such as rice and sugar, were severely hit and prices rose. For instance, given dwindling stockpiles, Thai authorities revised down rice export projections from 10 million tonnes (Mt) to 9 Mt. This caused prices to increase, likely triggering further inflation. Like rice, sugar output dropped during the year. Production estimates of refined sugar for the growing season, beginning in November, were revised downward from 11.6 Mt to 10.0 Mt. However, 2016 ended on a positive note with agriculture rebounding and turning positive at 0.9%.

Agriculture accounts for more than 65% of Thailand's water consumption which means the sector is highly vulnerable to low rainfall. Estimated total losses resulting from the 2015-16 droughts have reached US\$4.4 billion, roughly 0.85% of gross domestic product (GDP), according to the University of the Thai Chamber of Commerce. The Ministry of Agriculture and Cooperation has announced it will provide soft loans to farmers

to assist them in the transition process to see them through the dry spell and its serious impacts. The Thai Government has also launched training programs aimed at educating farmers on alternative crops to facilitate a shift to less water-intensive varieties.

The agricultural sector's contribution to the economy has diminished in recent years due to the expansion of the industrial and services sectors. However, primary production still accounts for around 10.5% of GDP and provides employment for 32% of the national workforce.

The Thai Government is now looking beyond the devastating droughts. It launched the Pracha Rath initiative which aims to establish cooperation between the public and private sectors to achieve sustainable growth and economic diversity, utilising advanced technology to develop an innovation economy in the next decade. The Pracha Rath initiative supports the development of business clusters, with one focusing on food processing and another dedicated to innovative agriculture and biotechnology. It also promotes greater technology use and scientific advances to produce biodiesel and other value-added products from cassava and sugarcane.

Given Thailand's status as an upper-middle income economy, many donors (including Australia) have redefined their relationship with the nation by moving away from the traditional donor-recipient style to that of mutually beneficial partnerships for development outcomes. Since 1994, Thailand has established partnerships with a number of donor organisations to advance development efforts provided to third countries, especially in the Greater Mekong Subregion. Thailand maintains a strong technical cooperation

program that includes development projects, volunteer and expert programs, fellowships, and scholarship and training courses. ACIAR's current program focuses on three issues: implementing the results of earlier projects, with relevance to the poorest farming communities; implementing Mekong regional biosecurity systems; and managing Mekong fisheries—partnering regionally with Laos, Cambodia and Vietnam.

## Country priorities

Australian support to regional economic growth is in part delivered through ACIAR's strategic research interventions. In 2017–18, ACIAR's research efforts will retain an emphasis on the following priorities:

- livestock biosecurity, with a focus on improving vaccination and disease management
- enhanced collaboration with Thai partners to extend joint research initiatives with wider regional programs
- greater alignment on plant biosecurity research and administration between Australia and Thailand.

## 2017–18 research program

Projects are currently underway in Thailand that aim to develop plant biosecurity research and development and technical diagnostic skills in Thailand, Laos and Cambodia, to underpin development of potential international market opportunities for Mekong horticultural products. One will build on previous work in Thailand to develop a 'centre of excellence' that can act as a capacity-building and technical resource for other Mekong countries. Initial work has concentrated on capacity building and network development.<sup>1</sup>

Plant biosecurity research aims to develop appropriate biological controls for gall wasp pests of eucalypt plantations in the Mekong region by importing and testing natural enemies of these insects from Australia.<sup>2</sup> It will focus on Laos, with some related work in Thailand, Vietnam and Cambodia. In addition, research is being undertaken to develop DNA-based chain-of-custody systems for legally sourced teak.<sup>3</sup>

Work is underway to collect detailed institutional, financial, human resource and research output data from a complete set of agricultural research agencies operating in the region; and to facilitate stakeholders' access to this information through a variety of online tools and publications for inclusion in the Agricultural Science and Technology Indicators (ASTI).<sup>4</sup> ASTI is the leading global program that compiles, analyses and publishes data on agricultural research systems in developing countries. The project will be implemented jointly by the International Food Policy Research

Institute (IFPRI) and the Asia-Pacific Association of Agricultural Research Institutions (APAARI), in close collaboration with the main national agricultural research institutes (NARIs) of Cambodia, Indonesia, Laos, Malaysia, Myanmar, Papua New Guinea, Philippines, Thailand, Timor-Leste and Vietnam.

## 5-year country outcomes

- Improved regional capacity for control and management of plant and animal diseases in Thailand and adjacent countries
- Enhanced collaboration with Thai partners to extend joint research initiatives with wider regional programs
- Greater alignment on plant biosecurity research and administration between Australia and Thailand

## 2017–18 project output

- Capacity developed for trade and market access through establishing remote microscopy equipment for routine use in national plant biosecurity centres in Cambodia, Laos and Thailand

### *Key Research Program Managers*

Mr Tony Bartlett, Forestry  
Dr Richard Markham, Horticulture  
Ms Mellissa Wood, Global Program

### *Regional Manager, Cambodia, Lao PDR, Myanmar & Thailand*

Ms Dulce Carandang Simmanivong

## Current and proposed projects

- <sup>1</sup> **HORT/2010/069** Enabling improved plant biosecurity practices in Cambodia, Lao PDR and Thailand
- <sup>2</sup> **FST/2012/091** Biological control of galling insect pests of eucalypt plantations in the Mekong region
- <sup>3</sup> **FST/2016/025** Developing DNA-based chain-of-custody systems for legally sourced teak
- <sup>4</sup> **GP/2016/093** Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific





# Timor-Leste

## Key statistics<sup>a</sup>

GDP per capita (US\$)	2,282.9
Population (million)	1.25

## Funding

A\$m

2015-16 actual	3.60
2016-17 budget allocation	1.90
2017-18 budget	1.19

<sup>a</sup> Data for 2015 GDP and population from [data.worldbank.org/country](http://data.worldbank.org/country)

## Country context

[While] Timor-Leste has made substantial progress in the twelve years since independence ... the benefits of economic growth have been spread unevenly and poverty remains widespread. Most people live in rural areas and are engaged in subsistence farming, with very limited job prospects and without viable incomes. The economy is heavily dependent on government spending, with little private sector growth outside construction. The weak private sector creates few jobs, and is constrained by poor infrastructure, relatively high costs of doing business, difficulties in securing bank loans and skills shortages. Most young people are neither in employment nor gaining the education and skills needed to take up the few available jobs ... A lack of income-generating skills and opportunities and a weak environment for private sector development are major constraints to sustainable growth. Australia seeks to help diversify Timor-Leste's economy by increasing agricultural productivity and marketability, and paving the way to employment opportunities outside agriculture.

Timor-Leste is largely an agrarian society. At 19.2% of gross domestic product (GDP), value-added agriculture is Timor-Leste's fourth highest contributor to non-oil GDP after construction, public administration and defence. Approximately 79% of the nation's labour force is engaged in agricultural activities with the majority relying exclusively on low-input/output subsistence farming. Approximately 50% of households remain below the poverty line. The Ministry of Health's 2014 national nutritional strategy showed 50% stunting, 11% wasting and 38% underweight in children under 5 years old and emphasised dietary diversity by increasing the availability of food from animal sources and reducing micronutrient deficiencies, underlining the need for crop diversification and cash income to purchase off-farm products. Most rural households are on the

### Aid Investment Plan, Timor-Leste, 2015-16 to 2018-19 (DFAT)

edge of the cash economy, producing a median value US\$378 of farm product per person per household per annum, but only selling US\$41 per household per annum.

Oil resources have allowed the Government of Timor-Leste to improve infrastructure, support aged pensioners and veterans through transfer payments, and import and sell subsidised rice. Public spending has created strong incentives for young rural people to move to the capital, Dili, where about 30% of the population now live. This is creating new problems in rural areas, including a lack of incentives to increase agricultural production. An ongoing challenge for the food crops sector in Timor-Leste is the ability to sustainably increase production of the main staples. Increasing the production and acceptability of legume crops would also contribute to improving the poor

nutrition of many Timorese (especially children and women). Crop yields are very low by regional standards. While a range of factors contributes to this low productivity (e.g. limited use of fertiliser, poor crop production practices), availability of improved varieties with higher yields has substantially increased as an outcome of the Australia-funded *Fini Ba Moris* (Seeds of Life) program, which finished in mid-2016. The program resulted in more than 40,000 households using improved varieties, 1,200 community seed production groups producing their own seeds, and 58 farmer associations becoming commercial seed producers—making Timor-Leste now self-reliant for seeds of improved varieties of maize, rice and peanut. TOMAK (*To'os Ba Moris Diak*—Farming for Prosperity), a new agricultural livelihood investment by the Australian Government Department of Foreign Affairs and Trade (DFAT), will build off the foundation established by Seeds of Life and integrate with Australia's other rural initiatives in the country, including investments in market development, rural roads, water and sanitation, and economic governance. ACIAR will engage with its partners in Timor-Leste to align its project investments as much as possible with TOMAK and with the other development partners. ACIAR will also deploy the assets, procedures and human resources from Seeds of Life to assist in managing ACIAR's and other allied projects.

Livestock production is almost totally managed by individual households, very few of which are specialist livestock raisers. Traditional management systems and poor market access mean that farmers tend to maximise the numbers of unproductive animals.

## Country priorities

ACIAR's research agenda supports Timor-Leste's Strategic Development Plan 2011-30. A new forward-looking country strategy with Australia is in development. The agreed medium-term research priorities are:

- improved smallholder and community livelihoods through adoption of improved varieties of staple crops and legumes
- increased productivity and resilience of livestock, fisheries and horticultural systems
- improved individual and institutional research and development capacity in the Ministry of Agriculture and Fisheries and University of Timor Lorosa'e.

## 2017-18 research program

Research in this program falls under two main themes: improving productivity and market integration of cropping systems; and increasing productivity and resilience of livestock, fisheries and horticulture.

### Improving productivity and market opportunities for crop and legumes

Building on the strength, networks and strategies of Seeds of Life, a research project managed jointly by ACIAR's Crop Improvement and Management (CIM) and Land and Water Resources (LWR) programs is filling knowledge gaps in the area of crops and natural resources management.<sup>1</sup> The aim of the project is to improve agricultural productivity and profitability by: addressing technical and social impediments to annual crops intensification; and establishing fodder tree legumes and sandalwood as a sustainable income source and land management practice. This farming system project will work closely with the cattle enterprise development project (see below) to integrate research on forage production. In addition, a small research activity concluding in 2017 is testing a new method to protect stored grains against insect pests.<sup>2</sup>

### Increasing productivity and resilience of livestock, fisheries and horticulture systems

A medium-term livestock research for development program with a 10-year vision and strategy consisting of on-station testing and on-farm adaptation of small-scale livestock production and health management technologies (especially for cattle, goats and pigs) developed in similar biophysical conditions and farming systems in South-East Asia (especially Indonesia) is being supported by ACIAR.

Previous livestock projects have characterised current cattle production and marketing systems, and introduced forage systems that have been successful in eastern Indonesia. The vast majority of cattle producers in Timor-Leste use extensive grazing systems to grow cattle and use cattle as a way to retain and accumulate capital. However, strong and increasing demand for beef from urban areas provide opportunities for farmers to commercialise and sell fat cattle to these markets. A new project aims to increase the income of smallholder crop-livestock farmers and market-chain operators in Timor-Leste through more efficient, commercially oriented cattle production and improved access to markets.<sup>3</sup>

Research is focusing on pig health and husbandry, particularly the management of classical swine fever, which is endemic in Timor-Leste and most of Indonesia. It will use a regional approach to explore risk factors for the spread of the disease on the island of Timor, and will aim to develop collaboration between Indonesia and Timor-Leste for research on, and implementation of, disease control programs.<sup>4</sup>

## Research monitoring

Work is underway to collect detailed institutional, financial, human resource and research output data from a complete set of agricultural research agencies operating in the region; and to facilitate stakeholders' access to this information through a variety of online tools and publications for inclusion in the Agricultural Science and Technology Indicators (ASTI).<sup>5</sup> ASTI is the leading global program that compiles, analyses and publishes data on agricultural research systems in developing countries. The project will be implemented jointly by the International Food Policy Research Institute (IFPRI) and the Asia-Pacific Association of Agricultural Research Institutions (APAARI), in close collaboration with the main national agricultural research institutes (NARIs) of Cambodia, Indonesia, Laos, Malaysia, Myanmar, Papua New Guinea, Philippines, Thailand, Timor-Leste and Vietnam.

## 5-year country outcomes

- Adoption of new varieties and improved agronomic practices for staple, legume food and feed crops for both household consumption and market
- Community-based land-use planning to sustainably intensify agricultural production
- Increased national and regional understanding of management options for major livestock diseases
- Increased value of agricultural production

## 2017–18 project outputs

- Current land-use practices and potential for cropping intensification assessed in two livelihood zones
- Initial research sites assessed and selected for suitability for forage tree legume and sandalwood agroforestry
- First year trials on rice productivity improvement, alternative crops to rice and crops after rice completed and analysed
- Partnerships established to commence a project to enhance smallholder pig-production systems in Timor-Leste and eastern Indonesia

- National and regional understanding of management options for major pig diseases increased
- At least five promising forages identified for integration into smallholder farming systems
- Initial training of Ministry of Agriculture and Fisheries (MAF) trainers in extension methods and in forage and cattle production, business management and marketing completed

### Key Research Program Managers

Dr Evan Christen, Land and Water Resources  
 Dr Eric Huttner, Crop Improvement and Management  
 Dr Mike Nunn, Animal Health  
 Dr Werner Stür, Livestock Production Systems  
 Ms Mellissa Wood, Global Program

## Current and proposed projects

- <sup>1</sup> **CIM/2014/082** Agricultural innovations for communities for intensified and sustainable farming systems in Timor-Leste (AI-Com)
- <sup>2</sup> **CIM/2015/009** Protecting grains against insect pests
- <sup>3</sup> **LPS/2014/038** Smallholder cattle enterprise development in Timor-Leste
- <sup>4</sup> **AH/2012/065** A regional approach to enhance smallholder pig systems in Timor-Leste and eastern Indonesia
- <sup>5</sup> **GP/2016/093** Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific

# Vietnam

## Key statistics<sup>a</sup>

GDP per capita (US\$)	6,034.9
Population (million)	91.7

## Funding

A\$m

2015-16 actual	3.90
2016-17 budget	5.00
2017-18 budget	5.43

<sup>a</sup> Data for 2015 GDP and population from [data.worldbank.org/country](http://data.worldbank.org/country)

## Country context

Vietnam experienced remarkably rapid economic growth in the two decades following the Doi Moi [(Renovation) policy initiation in 1986], lifting millions of people out of poverty ... But growth has recently slowed, and many of the gains from the initial wave of reforms have already been realised. Vietnam now faces a challenging period as it negotiates the pitfalls of the 'middle income trap', with growth potentially faltering as wages rise and the country becomes wedged uncompetitively between economies based on cheap labour and those based on stronger institutions and higher productivity ... Inequality remains significant and [millions of] people continue to live below the national poverty line. Ethnic minorities have still not benefitted equally from economic growth—although they comprise [more than] 15 per cent of the population, accounting for around half of those living in poverty.

The growth rate of Vietnam's agriculture sector in 2016 was noted as the lowest since 2011, according to the General Statistics Office of Vietnam, with an increase of only 1.36% compared with 2015. The top challenge faced by the sector has been the negative effect of climate change. The Ministry of Agriculture and Rural Development (MARD) reported losses of A\$2.2 billion (around VND38,500 billion) in the last year due to severe cold weather in the north and drought and salinity intrusion in the south. In addition, other major challenges in 2016 included a massive fish death incident along the central coastal region, affecting four provinces, and higher competition for exported commodities in the context of stronger integration with regional and global markets.

There have also been positive changes in the sector, especially in relation to the two national targeted programs—agricultural restructuring and new rural development programs—aimed at sustaining agricultural production, and increasing the prosperity

### Aid Investment Plan, Vietnam, 2015-16 to 2019-20, DFAT

of farmers in rural areas. In addition, there was an increased focus on exported commodities, which were valued at A\$41.8 billion in 2016. According to MARD, 9 of the top 11 commodities have increased in export value by 30%. Food safety is an important concern in Vietnam and efforts are being made to ensure safe production—one of the reasons for this is the more stringent quality demands for exported products. Organic farming is also increasingly practised throughout the country.

The private sector also receives strong support from the Vietnamese Government. Both well-established and start-up companies are encouraged to invest in agriculture.

ACIAR continues to be part of the Australian Government's commitment to development in Vietnam, which underlines equal partnerships in economic growth, security and innovations. ACIAR's Vietnam program has been well aligned with



Vietnam's agricultural priorities under the Science and Technological Co-operation Treaty (2014), focusing on agriculture, aquaculture, food security, environment and natural resource management, as well as the Department of Foreign Affairs and Trade (DFAT) Aid Investment Plan 2015–16 to 2019–20, with aims including: (i) enabling and engaging the private sector for development; (ii) assisting the development and employment of a highly skilled workforce; and (iii) promoting women's economic empowerment, including ethnic minorities.

## Country priorities

ACIAR's research priorities in Vietnam have been identified through extensive consultations with key stakeholders, including annual partnership dialogue with Vietnamese research institutions, non-government organisations and key government representatives (2015), and through sectoral consultations for forestry (2013), fisheries (2011) and specific regions (2008). The following key areas have been identified by ACIAR as medium-term research priorities for Vietnam:

- securing of rice-based farming systems in the Mekong Delta through resilience to the negative impacts of climate change
- optimisation of resource management for profitable and sustainable agricultural production in south-central coastal Vietnam
- poverty reduction through market engagement for smallholder farmers in the north-western highlands
- development of high-value aquaculture industries
- advancement towards higher value plantation forestry products
- advice on climate-related impact and adaptation policy for future agriculture.

To capture the latest changes and needs for development in Vietnam, the program is undertaking a consultative process to devise the next 10-year collaborative research strategy. Refreshed indicative priorities will be widely communicated in the second half of 2017.

## 2017–18 research program

ACIAR supports research to address the six Vietnamese priorities through the following subprograms.

### Resilience of rice-based farming systems to climate change

As a major rice exporter, Vietnam is a significant contributor to regional food security, but low-lying areas in the Mekong Delta are particularly prone to the anticipated negative impacts of climate

change. The main aim of this subprogram is to assist adaptation to climate change at the farm level, emphasising more-efficient use of soil and water resources. A current project focuses on rice production under climate change in this region and is looking at ways to increase yields and profitability of rice-shrimp production systems that are adaptable to environmental change.<sup>1</sup> It includes assessment of pond design and farm management and the surrounding institutional arrangements.

### Optimising resource management in the south-central coastal region

The initial integrating focus of resource management is on development of more-profitable but sustainable field and tree-crop cultivation and beef cattle production. Research will focus on the efficient use of soil and water for crop production in challenging environments (poor sandy soils under water-limiting conditions) in the central coastal region of Vietnam. For example, a new project is assessing potential sources and availability of water for agriculture in the south-central coastal region.<sup>2</sup> It aims to improve knowledge of groundwater resources, which in turn will improve planning and regulation of their use and boost livelihoods on farms through more-productive water and nutrient use.

Another project is working to provide public policy options for plantations that meet national objectives for smallholder production and contribute to community and industry development and environmental sustainability in Vietnam.<sup>3</sup>

### Market engagement in the northern and north-western highlands

Many smallholder farmers in the north-western highlands have not seen the same benefits to livelihood improvements from engagement in the global economy as has the rest of Vietnam. Poverty rates in this region are among the highest in the country, particularly for ethnic minorities. Emerging markets created by improved infrastructure development have created an opportunity for market engagement by smallholder farmers. To meet rapidly increasing market demand, farmers from the north-western highlands are expanding cultivation, especially of maize, onto sloping lands. Changing dietary preferences are providing an opportunity for smallholder farmers to integrate livestock and other high-value production systems as components of their farming systems.

Research will investigate production of, and market opportunities for, fruits and vegetables. A current project is aiming to build on and scale out promising results from recent projects to improve the net

incomes and livelihoods of ethnic minority households in the north-western provinces of Vietnam by increasing access to, and the competitiveness of, markets for Asian temperate (plums and peaches) and subtropical (persimmon) fruit.<sup>4</sup>

The northern part of Vietnam's growing retail sector has limited access to supplies of temperate vegetables during summer. In the north-western highlands, research is looking at enhancing the positive income, livelihood and food security roles that vegetables have in rice-based and temperate-fruit-based farming systems, improving soil management and sustainability, and engaging in high-value regional and urban market opportunities.<sup>5</sup> Another vegetable project is building on earlier research and market development in the Moc Chau district of Vietnam, and focuses on upscaling safe, off-season vegetable production systems in both Vietnam and Myanmar into urban, wholesale and retail markets.<sup>6</sup> A new project is examining innovative and inclusive financing of agricultural value chains.<sup>7</sup>

Another project will focus on identifying and scaling out profitable market-oriented maize-based farming systems that are sustainable for the sloping uplands in Vietnam and Laos.<sup>8</sup> This work extends results from ACIAR and the French Agricultural Research Centre for International Development (CIRAD) research on maize-based farming systems in Vietnam and Laos. The project will mitigate production and market-chain problems faced by farmers on sloping lands in north-western Vietnam, as part of a Mekong region project.

Market demand for beef is increasing rapidly in Vietnam, but domestic beef production has been unable to meet this demand. This has created an opportunity for smallholder beef producers to intensify and increase beef production. However, this requires a shift from extensive grazing of cattle to more intensive production that meets market specifications. A new research project in Dien Bien province, linking with the maize-based farming systems project, aims to improve the income of smallholder cattle producers through intensification of beef cattle production and integration of forage production in upland cropping systems and increased market linkages.<sup>9</sup>

A related new project will examine ways to improve the competitiveness of smallholder pig producers in maize-based farming systems in the north-western highlands.<sup>10</sup> Another new project will examine possible interventions to mitigate disease risk and add value to cross-border pig trade between Lao PDR, Vietnam and China.<sup>11</sup> A small research project will explore ways of improving dairy cattle health and production in Vietnam.<sup>12</sup> Another small project will update the SoFT (Selection of Forages for the Tropics) on-line tool to ensure that it contains the latest information and is accessible for researchers and development professionals in developing countries.<sup>13</sup>

Finally, rapid growth and diversification of cassava-based processing and product markets also provided income-generating opportunities for poor farmers. However, problems of emerging plant diseases, volatile prices, soil degradation and processing pollution remain. A scoping study has provided a detailed understanding of regional and local cassava market dynamics and influences. It has also informed the focus of a new regional project aimed at increasing adoption of disease-free planting material, utilising improved technologies that will increase yields, competitiveness and net incomes of farmers growing cassava, and reduce adverse environmental impacts, such as loss of soil fertility and by-product pollution.<sup>14</sup> A small research project will develop an emergency response and long-term management strategy for cassava mosaic virus in Cambodia and Vietnam.<sup>15</sup>

## Development of high-value aquaculture industries

The Vietnamese Government has invested heavily in research infrastructure and staff development for aquaculture. ACIAR's aquaculture subprogram in Vietnam has been tailored to complement this effort through targeted capacity building in key skill areas (genetics, fish nutrition) as well as the timely transfer and adaptation of suitable aquaculture technologies.

Projects on improving the mariculture of molluscs, sea cucumbers and giant grouper have been operational since 2014. One project is building production capacity in bivalves (oysters, clams) in northern Vietnam to underpin industry development.<sup>16</sup> Another project is developing commercial-scale hatchery and grow-out technologies for sandfish (a sea cucumber), recognising the critical nature of adapting systems to social, institutional and biophysical settings in participating communities.<sup>17</sup> A new project will undertake work on scaling up community-based sea cucumber culture in Vietnam, the Philippines and northern Australia.<sup>18</sup> Research to develop giant grouper mariculture aims to collaboratively devise technologies for breeding the fish in captivity and managing the broodstock and larval rearing in a sustainable and profitable manner.<sup>19</sup> New work will also focus on the half-pearl industry development in Tonga and Vietnam.<sup>20</sup>

## Towards higher-value plantation forestry products

Vietnam has nearly 1 million hectares of Australian *Acacia* and *Eucalyptus* plantations that supply major processing industries and export markets, generating substantial income for smallholder plantation owners and the people engaged in forest

industries. The forestry subprogram adds value through deployment of improved genetic material and development of value-added plantation products. A forestry biosecurity research project aims to develop appropriate biological controls for gall wasp pests of eucalypt plantations in the Mekong region by importing and testing natural enemies of these insects from Australia.<sup>21</sup> The project will focus on Laos, with some related work in Thailand, Cambodia and Vietnam.

A regional project aims to improve productivity and profitability of short-rotation eucalypt and acacia plantations in Indonesia and Vietnam, and to provide information on the comparative benefits and limitations of these trees to smallholders when grown for pulpwood or sawn timber.<sup>22</sup> Another regional project will engage Vietnam in important forest health research that aims to reduce the impacts of two very damaging fungal diseases (*Ganoderma* and *Ceratocystis*) that are affecting acacia plantations in South-East Asia.<sup>23</sup>

A large new project will continue research on the development and adoption of locally appropriate market-based agroforestry systems as well as commence new research on the rehabilitation of degraded forests in north-western Vietnam.<sup>24</sup> The project is working closely with the local Department of Agricultural and Rural Development offices in Son La, Yen Bai and Dien Bien provinces to implement 'exemplar landscapes' featuring application of the new agroforestry systems and to improve livelihood options for the H'mong and Thai ethnic minorities who live in these provinces.

## Other projects

### Animal health, production and marketing

Other research in Vietnam is concerned with smallholder pork and beef production. In addition, animal biosecurity research is developing improved methods to assess disease risk and strategies for livestock disease control in the Mekong region, thereby providing results to support the South-East Asia and China Foot-and-Mouth Disease (SEACFMD) control program of the World Organisation for Animal Health (OIE), and participating countries.<sup>25</sup> A new project will examine market and policy support for international economic integration and food safety in Vietnam.<sup>26</sup> The PigRISK project<sup>27</sup> has almost completed an assessment of food safety risks in pork value chains in northern Vietnam. A follow-on project, SafePork, will now evaluate market-based approaches to addressing the identified risks.<sup>28</sup>

The growing demand for beef in Vietnam is providing an opportunity for smallholder crop-livestock farmers to increase household incomes through more-productive beef breeding and fattening enterprises as part of their farming systems.

Research is focusing on improving farm productivity and market integration for smallholder beef producers in three provinces in central Vietnam.<sup>29</sup> Two new regional projects are focusing on building a sustainable beef and cattle industry in Vietnam and neighbouring countries, including development of a beef trade model and information network.<sup>30,31</sup> Another small research project will assess goat production and marketing systems in Laos and market linkages into Vietnam.<sup>32</sup>

### Crop diversification and marketing

The strong demand for tropical fruits in both domestic and regional export markets continues to grow and provide untapped opportunities for farmers and the fruit industry. A new 10-year strategy for ACIAR tropical fruit research in southern Vietnam provides the focus for new research to improve competitiveness in mango, longan and pomelo value chains. This includes opportunities for market integration, inclusive industry development and value-adding.<sup>33</sup> In addition, a new regional project aims to examine the benefits of annual mango market and trade analysis.<sup>34</sup> Another study is evaluating infrastructure and policy scenarios for reducing transport costs and improving market access using case studies of smallholder agri-food value chains in Indonesia, Laos and Vietnam.<sup>35</sup> Soil research is now being undertaken on crop diversification challenges in the changing environment of the Mekong Delta.<sup>36</sup>

### Capacity building for researchers

An evaluation of a pilot Master of Business Administration (MBA) studentship scheme will be undertaken to identify new sources of agribusiness research capacity.<sup>37</sup>

### Innovation in data collection

ACIAR has been exploring the use of digital data collection applications (apps) (DDCAs) with encouraging results, including reduced time and improved accuracy in collecting data (compared with paper-based methods), and increased capacity for knowledge sharing and project monitoring. Two small regional research projects ensuing from the pilot Mobile Acquired Data (MAD) study are being undertaken in Myanmar, Pakistan, Vanuatu and Vietnam. The projects aim to provide direct support to the four core projects partnering in use of this technology with an at-scale evaluation of DDCAs within these projects (MAD 2) and evaluation of a staged adoption and implementation strategy (MAD 3).<sup>38,39</sup> The purpose is to ensure successful and sustainable deployment of CommCare—the app chosen as most suitable by the pilot study—while evaluating the support options and process to guide future projects seeking to incorporate DDCAs.

## Research monitoring

Work is underway to collect detailed institutional, financial, human resource and research output data from a complete set of agricultural research agencies operating in the region; and to facilitate stakeholders' access to this information through a variety of online tools and publications for inclusion in the Agricultural Science and Technology Indicators (ASTI).<sup>40</sup> ASTI is the leading global program that compiles, analyses and publishes data on agricultural research systems in developing countries. The project will be implemented jointly by the International Food Policy Research Institute (IFPRI) and the Asia-Pacific Association of Agricultural Research Institutions (APAARI), in close collaboration with the main national agricultural research institutes (NARIs) of Cambodia, Indonesia, Laos, Malaysia, Myanmar, Papua New Guinea, Philippines, Thailand, Timor-Leste and Vietnam.

## 5-year country outcomes

- Advanced integration of farm enterprises covering cropping, livestock and forestry with improved and holistic agricultural systems
- Reduced poverty through linking disadvantaged smallholders to markets
- Improved food safety and farmer incomes by enabling participation in export supply chains
- Development and application of scientific and policy options for assessing climate limitations and variability
- Development of policy options to encourage high-value timber production and improved income

## 2017–18 project outputs

- Market opportunities and consumer preferences understood for temperate fruits and indigenous and conventional vegetables in local, provincial, urban and export markets and implications for smallholder market development analysed
- Preliminary recommendations provided for improved market linkages, productivity, food safety, group governance and household livelihoods in smallholder vegetable and temperate fruit systems
- Report produced on local knowledge and culturally specific aspects of adopting market-based agroforestry in north-western Vietnam
- Research partnerships initiated to improve smallholder incomes in the north-western highlands region, through identification of improved market information, market access and value-chain competitiveness for high-value fruits and vegetables

- Hatchery production and farming techniques for edible oysters made available and large-scale industry development being facilitated
- Enhanced knowledge and understanding of forest policies and programs demonstrated
- Knowledge of existing agricultural development policies for food security in Vietnam increased
- Opportunities and constraints for smallholder production and marketing of cassava in different agro-economic settings assessed
- Production guidelines provided for cost-effectively growing and finishing cattle in central Vietnam
- A regional model created to develop an understanding of the flow of beef products and beef cattle
- Potential incentive-based approaches for mitigating risks associated with pig diseases and pork-borne illnesses in pork value chains documented
- Competitiveness of smallholder pig producers in north-western Vietnam assessed
- A program commenced to improve agricultural productivity and sustainability on sloping lands in the north-western highlands
- Rice-shrimp systems improved
- The use of digital data collection applications explored

### Key Research Program Managers

Dr Chris Barlow, Fisheries  
Mr Tony Bartlett, Forestry  
Dr Rodd Dyer, Agribusiness  
Dr Robert Edis, Soil Management and Crop Nutrition  
Dr Mike Nunn, Animal Health  
Dr Ejaz Qureshi, Agricultural Development Policy  
Dr Werner Stür, Livestock Production Systems  
Ms Mellissa Wood, Global Program

### Country Manager

Ms Nguyen Thi Thanh An

## Current and proposed projects

- <sup>1</sup> **SMCN/2010/083** Adaptation to climate change in rice-aquaculture farming systems in the Mekong Delta
- <sup>2</sup> **SMCN/2012/069** Potential sources and availability of water for agriculture in the south-central coast of Vietnam
- <sup>3</sup> **ADP/2014/047** Improving policies for forest plantations to meet community, industry and environmental needs in Lao PDR and Vietnam
- <sup>4</sup> **AGB/2012/060** Increasing competitiveness and market access of smallholders in north-western Vietnam to regional temperate-fruit markets



- <sup>5</sup> **AGB/2012/059** Towards more-profitable and sustainable vegetable production systems in north-western Vietnam and Australia
- <sup>6</sup> **AGB/2014/035** Improving livelihoods in Myanmar and Vietnam through sustainable and inclusive vegetable value chains
- <sup>7</sup> **AGB/2016/163** Innovative and inclusive agriculture value chain financing
- <sup>8</sup> **SMCN/2014/049** Improving maize-based farming systems on sloping lands in Vietnam and Lao PDR
- <sup>9</sup> **LPS/2015/037** Intensification of beef cattle production in upland cropping systems in north-western Vietnam
- <sup>10</sup> **LPS/2016/275** Developing maize-based pig production in north-western Vietnam
- <sup>11</sup> **AH/2014/055** Interventions to mitigate disease risk and add value to cross-border pig trade between Lao PDR, Vietnam and China
- <sup>12</sup> **AH/2016/020** Improving dairy cattle health and production in Vietnam
- <sup>13</sup> **LPS/2016/097** Update of SoFT (Selection of Forages for the Tropics)
- <sup>14</sup> **AGB/2012/078** Developing value-chain linkages to enhance the adoption of profitable and sustainable cassava production systems in Vietnam and Indonesia
- <sup>15</sup> **AGB/2016/032** Developing an emergency response and long-term management strategy for cassava mosaic virus in Cambodia and Vietnam
- <sup>16</sup> **FIS/2010/100** Enhancing mollusc production in northern Vietnam and Australia
- <sup>17</sup> **FIS/2010/042** Expansion and diversification of production and management systems for sea cucumbers in the Philippines, Vietnam and northern Australia
- <sup>18</sup> **FIS/2016/122** Scaling-up community-based sea cucumber culture in the Philippines and northern Australia
- <sup>19</sup> **FIS/2012/101** Development of mariculture technology for giant grouper in the Philippines, Vietnam and Australia
- <sup>20</sup> **FIS/2016/126** Half-pearl industry development in Tonga and Vietnam
- <sup>21</sup> **FST/2012/091** Biological control of galling insect pests of eucalypt plantations in the Mekong region
- <sup>22</sup> **FST/2014/064** Maximising productivity of *Eucalyptus* and *Acacia* plantations for growers in Indonesia and Vietnam
- <sup>23</sup> **FST/2014/068** Management strategies for *Acacia* plantation diseases in Indonesia and Vietnam
- <sup>24</sup> **FST/2016/152** Enhancing market-based agroforestry systems and rehabilitation of degraded forests in north-western Vietnam
- <sup>25</sup> **AH/2010/045** Improving livelihoods through animal health and biosecurity research in the Mekong region
- <sup>26</sup> **ADP/2016/140** Market and policy for supporting international economic integration and food safety in Vietnam
- <sup>27</sup> **LPS/2010/047** Reducing disease risks and improving food safety in smallholder pig value chains in Vietnam
- <sup>28</sup> **LPS/2016/143** SafePork: market based approaches to improving the safety of pork in Vietnam
- <sup>29</sup> **LPS/2012/062** Developing productive, sustainable and profitable smallholder beef enterprises in central Vietnam
- <sup>30</sup> **AGB/2016/031** Developing a trade model and information network for cattle and beef trade sector of South-East Asia and China
- <sup>31</sup> **AGB/2016/196** Sustainable and inclusive cattle and beef industry development in South-East Asia and China
- <sup>32</sup> **LPS/2016/027** Assessing goat production and marketing systems in Lao PDR and market linkages into Vietnam
- <sup>33</sup> **AGB/2012/061** Improving farmer competitiveness and returns in selected tropical fruit value chains in southern Vietnam.
- <sup>34</sup> **AGB/2016/007** Benefits of annual mango market and trade analysis in Asia-Pacific
- <sup>35</sup> **AGB/2016/033** Evaluating options for reducing agricultural transport costs and improving market access for smallholders in South-East Asia
- <sup>36</sup> **SMCN/2016/019** Crop diversification challenges in the changing environment of the Mekong Delta, Vietnam
- <sup>37</sup> **AGB/2016/055** Evaluation of a pilot MBA studentship scheme to identify new sources of agribusiness research capacity
- <sup>38</sup> **GMCP/2016/004** At-scale evaluation of digital data collection apps (DDCAs) in ACIAR projects—Mobile Acquired Data phase 2 (MAD 2)
- <sup>39</sup> **GMCP/2016/042** Mobile Acquired Data phase 3 (MAD 3)—evaluation of staged adoption and implementation strategy
- <sup>40</sup> **GP/2016/093** Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific





# **South and West Asia**

# REGIONAL PROGRAM SUMMARY

The South and West Asia region comprises a set of Indian Ocean Rim countries—Afghanistan, Pakistan, India, Bangladesh, Bhutan and Nepal—that are strategically important for Australia.

South and West Asia have the highest concentration of poor people in the world, with more than 500 million people still living in extreme poverty. Many more people, particularly women, live just above the poverty line and do not have the opportunity to participate in the process of economic growth. The region has the second highest regional Global Hunger Index and a very low Human Development Index. Half the total population of 1.5 billion depends on agriculture for their livelihoods.

South and West Asian countries have a relatively low level of integration despite common historical, geographical, cultural and socioeconomic characteristics—restricting the region's potential growth. While individual economies in South Asia are growing, additional benefits would flow from expanded intra-regional collaboration, knowledge sharing and trade. The South Asian Association for Regional Cooperation (SAARC) is the key institution facilitating economic and political cooperation. It has had limited success in promoting cooperation in the region. However, subregional cooperations, such as the Bangladesh, Bhutan, India, Nepal (BBIN) Initiative, have been more successful in facilitating agreements on transport and energy. Another regional cooperation between South Asian and South-East Asian Countries, BIMSTEC (Bay of Bengal Initiative for Multi-Sectoral, Technical and Economic Cooperation), is seen as a promising avenue to pursue collaborations. There is also great potential for increased technical cooperation on agricultural intensification and policy exchanges on food security.

The South Asia regional program of the Australian Government seeks to underpin Australia's economic engagement in the region by addressing some of the key region-wide barriers to sustainable economic growth and connectivity through the Sustainable Development Investment Portfolio (SDIP) and South Asia Regional Trade Facilitation Program (SARTFP). Gender equality will be a focus in all the investments under the regional program.

Across South Asia, there is limited cooperation on shared regional resources, such as water. As well, in the last 20 years, over 50% of South Asians (more than 800 million) have been affected by at least one natural disaster. Together with such events, climate variability, competing and increasing demands from agriculture, industry (including energy production) and population growth will all impact on water availability. Greater levels of cooperation will be needed to manage these shared resources to ensure their long-term sustainability and capacity to support economic growth and to maintain regional stability.

There are significant opportunities to improve the productivity and sustainability of the rice/wheat-based farming systems through technical, institutional, value-chain and policy research and development (R&D). These countries and Australia share similar challenges to agricultural productivity growth, including drought and water management, and many similar food grain and livestock production constraints. Australian expertise is highly regarded in the region and there would be significant benefits from long-term Australia – South Asia research for development partnerships to deliver technologies for the future farmers of South Asia and Australia. In this connection, ACIAR has a long and strong track record on R&D in the region in improving crop productivity, improved water use efficiency and policy reforms. The regional strategy is focused on the three ecosystems of highlands, plains and coastal zone which are common to India, Bangladesh and Nepal.



There are similar constraints to agricultural productivity and farmer livelihoods across the region. Therefore, ACIAR research partnerships have taken on a stronger regional character. These regional projects (which are also listed in the following country chapters) include:

**ADP/2014/045** Efficient participatory irrigation institutions to support productive and sustainable agriculture in South Asia [India, Pakistan]

**ADP/2016/003** Linkages and impacts of cross-border informal trade in agricultural inputs in eastern South Asia [Bangladesh, India, Nepal]

**ADP/2016/026** Improving policies and institutions for sustainable intensification of agriculture and resilient food systems in eastern Indo-Gangetic plains [Bangladesh, India, Nepal]

**AH/2014/039** A One Health approach to establish effective surveillance strategies for Japanese encephalitis in India and Nepal

**CIM/2014/079** Establishing the International Mungbean Improvement Network [Bangladesh, India, Myanmar, Australia]

**CIM/2014/081** Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa [India, Nepal, Pakistan, Ethiopia]

**CIM/2016/174** Improved mungbean harvesting and seed production systems for Bangladesh, Myanmar and Pakistan

**CSE/2011/077** (*multilateral, CIMMYT*) Sustainable and resilient farming systems intensification in the Eastern Gangetic Plains [Bangladesh, India and Nepal]

**CSE/2012/108** (*multilateral, IFPRI*) Enhancing farm-household management decision-making for increased productivity in the Eastern Gangetic Plains (proposed) [Bangladesh, India and Nepal]

**CSE/2016/037** Informing policies for removing barriers to scaling conservation agriculture based sustainable intensification in the Eastern Gangetic Plains [Bangladesh, India and Nepal]

**CSE/2016/112** Targeting and micro-entrepreneurship for sustainable diversification in the Eastern Gangetic Plains [Bangladesh, India and Nepal]

**HORT/2010/089** Adapting integrated crop management technologies to commercial citrus enterprises in Bhutan and Australia

**LWR/2012/079** Improving dry season agriculture for marginal and tenant farmers in the Eastern Gangetic Plains through conjunctive use of pond and groundwater resources [Bangladesh, India and Nepal]

**LWR/2014/072** Promoting socially inclusive and sustainable agricultural intensification in West Bengal and Bangladesh

**LWR/2014/073** Cropping system intensification in the salt-affected coastal zones of Bangladesh and West Bengal, India



# Afghanistan

## Key statistics<sup>a</sup>

GDP per capita (US\$)	1,925.2
Population (million)	32.52

## Funding

A\$m

2015-16 actual	3.23
2016-17 budget allocation	2.90
2017-18 budget	1.23

<sup>a</sup> Data for 2015 GDP and population from [data.worldbank.org/country](http://data.worldbank.org/country)

## Country context

**Around 76 per cent of the population of Afghanistan lives in rural areas, where agriculture is the main source of livelihood and subsistence. In many rural areas, low crop productivity, cyclical drought and flooding are persistent risks ... Widespread vulnerability to poverty, natural hazards and protracted conflict fuel instability and hinder development and economic growth ... The country's extreme winters see many go without enough food, while three decades of war and the appeal of narcotics cultivation have drawn resources away from legitimate cropping. Humanitarian challenges remain significant, with 12 per cent (3.7 million) of the population displaced or 'of concern', while each year, an estimated quarter of a million people are affected by natural disasters.**

Afghanistan ranked 171 out of 188 countries in the Human Development Index 2015. Australia is targeting three priorities in Afghanistan in its contribution to improving this situation: agriculture; building resilience; and infrastructure. These priorities aim to strengthen rural populations' access to economic opportunities and to protect their livelihoods against shocks. Gender-based violence in Afghanistan is widespread and the maternal mortality rate is among the highest in the world. The Australian Government is committed to international efforts to stabilise Afghanistan and to ensure security in the country.

The operating environment in Afghanistan is complex and the security situation is often challenging to implementation of agricultural research for development (R4D) programs. The three ACIAR projects in Afghanistan are fully funded by the Department of Foreign Affairs and Trade (DFAT) and implemented by the International Center for Agricultural Research in the Dry Areas (ICARDA)

### Aid Investment Plan, Afghanistan, 2015-16 to 2018-19 (DFAT)

and the International Maize and Wheat Improvement Center (CIMMYT). Strong efforts are also being made to collaborate and coordinate with other implementing partners, including government, non-government organisations (NGOs), grower and industry groups, and donor organisations. Running these projects continues to be extremely challenging and expensive, and access by international scientists is limited due to poor security and political uncertainty. Capacity building of Afghan personnel is a cornerstone of the program and the projects are exploring options for transition in which there is greater ownership by the Government of Afghanistan.

ACIAR's collaboration with Afghanistan began in 2002 on wheat and maize varietal improvement. While wheat dominates crop production, maize is also of importance in irrigated areas. Particular attention has been paid to capacity building, improving rust resistance in wheat and promoting improved crop management.

## Country priorities

Prolonged instability has weakened agricultural institutions and constrained Afghanistan's food and livestock production capabilities. Priorities have been developed through visits by ACIAR's Chief Executive Officer (CEO) and other senior staff, and through discussions with leading agricultural research and development (R&D) institutions and government bodies. A 2011 ACIAR–AusAID (Australian Agency for International Development—now absorbed into DFAT) desk study of the agricultural R&D priorities of Afghanistan recognised the key role of agricultural development in the reduction of rural poverty. It recommended a focus on water-limited (rainfed and poorly irrigated) areas and on research to increase productivity of wheat and livestock systems, and improve water management. Crop and livestock intensification is of critical importance to the Government of Afghanistan and is supported by Australia.

The ACIAR country program in the medium term will focus on:

- crop and livestock intensification, including better water management and development of forages for small ruminants
- linkages between the improvement of wheat varieties and agronomy
- community-based watershed management
- working with established programs in agricultural extension and community development to promote adoption of the research results.

## 2017–18 research program

ACIAR has three R4D projects, funded by DFAT, in Afghanistan. One project aims to improve the sustainability of wheat and maize production through deploying robust and productive disease-resistant varieties and by improving wheat-breeding programs and crop husbandry practices.<sup>1</sup> Another project is investigating community interventions aimed at diversifying cropping systems, increasing water use efficiency and building the long-term sustainability of agricultural systems through improved integrated catchment management and agronomic practice.<sup>2</sup> The third project aims to identify suitable forage options and develop best practices for forage production in small-scale crop–livestock systems in the provinces of Baghlan and Nangarhar.<sup>3</sup>

## 5-year country outcomes

- Sustained yield improvements in water-limited crops in selected provinces and agroecological zones
- Expansion of crop–livestock systems, with suitable and accessible agronomic knowledge for male and female farmers
- Capacity building for community-based watershed development

## 2017–18 project outputs

- Higher-yielding disease-resistant maize and wheat varieties released for farmer adoption
- Capacity building of national scientists in community-based watershed development continued
- Community-based watershed sites developed and capacity for this work embedded with the Government of Afghanistan
- Improved crop varieties demonstrated in four provinces
- Line sowing and minimum-tillage wheat crop establishment demonstrated at three hubs
- Eight seed-cleaning machines installed and operating in villages
- Capacity of Afghan partners strengthened in forage evaluation and seed multiplication
- Handover of forage R&D to Afghan partner organisations completed

### Key Research Program Managers

Dr Evan Christen, Land and Water Resources  
 Dr Eric Huttner, Crop Improvement and Management  
 Dr Werner Stür, Livestock Production Systems

### Regional Manager, South Asia

Dr Kuhu Chatterjee

## Current projects

- <sup>1</sup> **CIM/2011/026** (*multilateral, CIMMYT*) Sustainable wheat and maize production in Afghanistan
- <sup>2</sup> **LWR/2008/047** (*multilateral, ICARDA/ICRISAT*) Integrated catchment management and capacity building for improving livelihoods in Afghanistan
- <sup>3</sup> **AH/2012/021** (*multilateral, ICARDA*) Forage options for smallholder livestock in water-scarce environments of Afghanistan



# Bangladesh

## Key statistics<sup>a</sup>

GDP per capita (US\$)	3,339.6
Population (million)	160.9

## Funding

A\$m

2015-16 actual	1.18
2016-17 budget allocation	3.60
2017-18 budget	2.98

<sup>a</sup> Data for 2015 GDP and population from [data.worldbank.org/country](http://data.worldbank.org/country)

## Country context

Poverty has steadily declined over the last 20 years in Bangladesh. However, 47 million people still live in poverty—the highest levels in South Asia—and 28 million of these people are classified as extremely poor, which means they are not able to satisfy their minimum food needs. Another 26 million people are also at risk of falling into poverty. Elimination of extreme poverty is seen by many as one of the hardest challenges facing Bangladesh ... A key driver of economic growth in Bangladesh has been the private sector, through productivity gains in agriculture, small-scale entrepreneurship and garment export. Agriculture remains the largest employer in Bangladesh with approximately 22.7 million people working in the sector.

### Aid Investment Plan, Bangladesh, 2015-16 to 2018-19 (DFAT)

Bangladesh is modernising quickly, supported by solid annual economic growth averaging 6% over the last 10 years. During this period, poverty levels have halved and real per capita gross domestic product (GDP) has almost quadrupled. Political instability has had a disproportionate impact on the poor, exposing them to higher security risks, price rises and limited opportunities to earn an income due to reduced mobility.

Bangladesh's geographical position, with two seaports, opens up opportunities for further economic progress through regional integration, especially with landlocked countries like Nepal and Bhutan, and with north-eastern parts of India. An active civil society has given Bangladesh a reputation for innovation.

One of Bangladesh's key development challenges is food availability within the context of increasing climate change. Low-lying areas and rainfed cropping systems are negatively impacted by seasonal climate variability, reduced freshwater river flows and seawater intrusion.

The development vision for agriculture under the 7th Five Year Plan (2016-2020) is to ensure food and nutritional security, sustainable intensification and diversification of climate-resilient agricultural systems. The focus will be on transformation from nearly subsistence farming to commercial agriculture. This will be brought about by technological innovations, strengthening of research and extension systems, developing supply chains, and linking farming communities with markets, both local and global.

The plan seeks to ensure women's self-reliance and reduce discriminatory barriers through developmental and institutional measures. In the agriculture sector, the Government of Bangladesh plans to develop women-friendly technologies and business environments. It aims to increase women's participation in market transactions and the capacity development of women for small-scale entrepreneurs. It also plans to recruit more female agricultural workers and increase their participation in technological innovation. The plan also aims to promote collective action and market linkages, and to support homestead agricultural value-addition strategies.



The Australian aid program helps promote stability in Bangladesh and provides the opportunity to engage Bangladesh as a partner in a range of mutual interests in South Asia. It supports regional approaches to regional challenges, including natural resource management, improving trade connectivity and encouraging investments to empower women to participate in cross-regional trade opportunities.

Bangladesh has been an ACIAR partner country since the mid-1990s. ACIAR has initiated the process of consultations with key stakeholders to develop a medium-term strategy. ACIAR's approach includes research on conservation agriculture, farm mechanisation, saline land management and adaptation to climate change, particularly in rice-wheat and rice-maize systems. Because of the similarity of farming systems, production constraints and technologies across the Eastern Gangetic Plains, research linkages on sustainable intensification and diversification are being developed with eastern India and Nepal.

The Krishi Gobeshona Foundation (KGF) has become a key partner for ACIAR in Bangladesh since 2015, currently co-investing in one project.<sup>10</sup> KGF is a Bangladeshi agricultural research funding organisation that has made major investments in funding research and capacity building in ACIAR-led projects.

## Country priorities

Priorities for collaboration are developed through consultations between ACIAR senior staff and leaders of agricultural research and development (R&D) institutions and government bodies in Bangladesh. Concerns are re-emerging about Bangladesh's ability to maintain food security in the light of its high vulnerability to the impacts of climate change. Given the common agricultural production challenges in many South Asian countries, linkages are being strengthened between Bangladesh and other countries in South and South-East Asia, particularly India (Bihar and West Bengal states) and Nepal (eastern Terai region). In addition, the southern region of Bangladesh remains the poorest and the most vulnerable and is a priority for the Government of Bangladesh.

Key areas identified as ACIAR research priorities include:

- intensification and diversification of climate-resilient farming systems
- conservation agriculture approaches to soil and water management
- empowerment of women and marginalised communities
- cropping systems intensification in the rice-wheat system, with a focus on the southern region
- improvement in smallholder livelihoods and human nutrition through diversification into legumes, such as mungbean and chickpea
- responding to the wheat blast epidemics, first detected in Bangladesh in February 2016
- improved management of fertiliser for increased productivity and sustainability.

## 2017-18 research program

Current and proposed projects will focus on intensification and climate resilience of farming systems. One multicountry project is conducting conservation agriculture research in northern Bangladesh<sup>1</sup>, building on the success of past projects in north-western India and other areas of Bangladesh. Another project is investigating how Bangladesh has utilised groundwater resources to promote dry-season production, and what measures can be used to increase the efficiency and sustainability of water use.<sup>2</sup> A new multicountry project will research the effectiveness of modern information technologies to support the practice-change decisions of smallholder women and men on climate-resilient farming systems intensification in the north-west of Bangladesh.<sup>3</sup> Targeting and micro-entrepreneurship for sustainable diversification in Eastern Gangetic Plains is underway.<sup>4</sup> In addition, two new projects aim to improve policies and institutions for sustainable intensification of agriculture and resilient food systems in the Eastern Gangetic Plains.<sup>5,6</sup>

Another project will develop an understanding of the dynamics of informal trade in agricultural inputs across the borders of India and Bangladesh, and India and Nepal, and its impact on resource use efficiency and livelihoods, including gender dimensions of those impacts.<sup>7</sup>

Another regional project (India-Bangladesh) will focus on marginal landholders, the landless, tribal people and those who rely on ecosystem services (such as fishing communities). These marginalised communities are often left behind or harmed by agricultural development. Therefore, this project aims to discover R&D approaches that can enhance more-equitable and less-risky development pathways for these marginalised communities.<sup>8</sup>

A new project aims to provide smallholder farmers with strategies to improve the health and production of their flocks of goats and sheep, and develop improved understanding of market opportunities so that smallholders can make better-informed decisions.<sup>9</sup>

Focusing on the southern region, a project is working on the intensification of cropping systems in the salt-affected coastal zone of southern Bangladesh.<sup>10</sup> Building on the results of the short-duration pulses project that finished in 2015-16, a companion project will explore options for dry-season cropping in the southern region, with an emphasis on salinity management and testing of recently developed Australian salt-tolerant wheat lines.<sup>11</sup>

The Bangladesh national mungbean breeding program is joining India, Myanmar and Australia in the International Mungbean Improvement Network which started in 2015-16 by characterising in multiple environments the mungbean core collection assembled by the World Vegetable Center.<sup>12</sup> A new project (also involving Myanmar and Pakistan) will explore mechanisation of mungbean harvesting.<sup>13</sup> A small research activity is surveying farmers to identify constraints to chickpea production and examining ways in which to protect chickpea from insect pests.<sup>14</sup>

Recently completed preliminary work on wheat blast disease has designed a large project to identify sources of resistance to the disease to mitigate its effects.<sup>15</sup>

Another new project will look at nutrient management for diversified and intensified cropping.<sup>16</sup> This project will undertake research to make the use of fertilisers more effective and profitable, and consider the long-term effects on soils of the very high cropping intensity. This project will also conduct research in the coastal zone where there has been little research on crop fertiliser management.

## 5-year country outcomes

- Improved local rural livelihoods and nutrition through crop diversification
- Sustainable local growth in productivity through use of well-adapted soil and water practices
- Demonstrated adoption of sustainable and resilient cropping and farm management systems

## 2017–18 project outputs

- A project regarding soil and fertiliser management across Bangladesh initiated, providing valuable information to other ACIAR projects
- Knowledge increased of the impacts of cross-border informal trade in agricultural outputs in eastern South Asia (India, Nepal and Bangladesh)
- Mungbean core collection characterised (genotyping and first year of phenotyping)
- Breeding management system implemented by the Bangladesh mungbean breeding team to manage workflow and data
- Supply chain developed, including the private sector, for the minimum-tillage versatile multi-crop planter for use with two-wheel tractors
- Policy options developed for conservation agriculture in Bangladesh
- Initial testing and assessment of sustainable and resilient farming systems intensification in north-western Bangladesh completed
- Knowledge enhanced of the key factors that affect farmers' decisions to take up entrepreneurial ventures, and the effect of climate change-related resource scarcity and shocks on decision-making
- Factors affecting mungbean harvesting identified, including farming practices, value chains and women's participation
- Precision phenotyping platform established for wheat blast in Bangladesh
- First dry-season trials of pulses, wheat or forages in the southern region completed and analysed

### Key Research Program Managers

Dr Evan Christen, Land and Water Resources

Dr John Dixon, Cropping Systems and Economics

Dr Eric Huttner, Crop Improvement and Management

Dr Mike Nunn, Animal Health

Dr Ejaz Qureshi, Agricultural Development Policy

### Regional Manager, South Asia

Dr Kuhu Chatterjee

## Current and proposed projects

- <sup>1</sup> **CSE/2011/077** (*multilateral, CIMMYT*) Sustainable and resilient farming systems intensification in the Eastern Gangetic Plains
- <sup>2</sup> **LWR/2012/079** Improving dry season agriculture for marginal and tenant farmers in the Eastern Gangetic Plains through conjunctive use of pond and groundwater resources
- <sup>3</sup> **CSE/2012/108** (*multilateral, IFPRI*) Enhancing farm-household management decision-making for increased productivity in the Eastern Gangetic Plains (proposed)
- <sup>4</sup> **CSE/2016/112** Targeting and micro-entrepreneurship for sustainable diversification in Eastern Gangetic Plains
- <sup>5</sup> **CSE/2016/037** Informing policies for removing barriers to scaling conservation agriculture based sustainable intensification in the Eastern Gangetic Plains
- <sup>6</sup> **ADP/2016/026** Improving policies and institutions for sustainable intensification of agriculture and resilient food systems in eastern Indo-Gangetic plains
- <sup>7</sup> **ADP/2016/003** Linkages and impacts of cross-border informal trade in agricultural inputs in eastern South Asia
- <sup>8</sup> **LWR/2014/072** Promoting socially inclusive and sustainable agricultural intensification in West Bengal and Bangladesh
- <sup>9</sup> **AH/2014/056** Improving small ruminant health, production and regional trade in Myanmar
- <sup>10</sup> **LWR/2014/073** Cropping system intensification in the salt-affected coastal zones of Bangladesh and West Bengal, India
- <sup>11</sup> **CIM/2014/076** Incorporating salt-tolerant wheat and pulses into smallholder farming systems in southern Bangladesh
- <sup>12</sup> **CIM/2014/079** Establishing the International Mungbean Improvement Network
- <sup>13</sup> **CIM/2016/174** Improved mungbean harvesting and seed production systems for Bangladesh, Myanmar and Pakistan
- <sup>14</sup> **CIM/2016/039** Insect tolerant chickpea for Bangladesh
- <sup>15</sup> **CIM/2016/219** Identification of sources of resistance to wheat blast and their deployment in wheat varieties adapted to Bangladesh
- <sup>16</sup> **LWR/2016/136** Nutrient management for diversified cropping in Bangladesh

# Bhutan

## Key statistics<sup>a</sup>

GDP per capita (US\$)	8,369.8
Population (million)	0.76

## Funding

A\$m

2015-16 actual	0.21
2016-17 budget allocation	0.20
2017-18 budget	0.00

<sup>a</sup> Data for 2015 GDP and population from [data.worldbank.org/country](http://data.worldbank.org/country)

## Country context

Australia is a modest but well regarded donor to Bhutan. Education will remain the central pillar of the bilateral aid program. The overarching goal of the Australian aid program to Bhutan is to build the capacity of individuals and institutions, underpinned by gender equality principles. Two objectives support this goal:

- building human capacity through the provision of scholarships for tertiary education (Australia Awards and Endeavour Awards)
- building institutional capacity through linkages with Australian institutions (public sector and civil society).

Australia's work in the education sector contributes towards achieving the 2030 Agenda for Sustainable Development and the Sustainable Development Goals [SDGs], particularly SDG 4—Quality Education, SDG 5—Gender Equality and SDG 8—Sustainable Economic Growth.

### Bhutan Aid Fact Sheet (October 2016) (DFAT)

Bhutan is a landlocked mountainous country bordered on the north by China and on all other sides by India. About half of the country's people live in remote areas. Bhutan ranked 132 out of 188 countries in the Human Development Index 2015.

Bhutan is continuing to consolidate its newly established constitutional democracy. The guiding principle of Bhutan's economic development is gross national happiness (GNH) rather than gross domestic product. The four pillars underlying GNH cover: (1) sustainable and equitable socioeconomic development; (2) conservation of the environment; (3) preservation and promotion of culture; and (4) good governance. All government programs are assessed against the GNH framework, with the aim of ensuring sustainable, holistic development.

Bhutanese products enjoy free access to the large Indian and Bangladeshi markets and India is Bhutan's main trade, investment and development assistance partner. Agriculture and forestry dominate Bhutan's domestic economy.

The Ministry of Agriculture and Forests' goal for the 11th Five Year Plan (2013–2018) is to achieve 'green' economic growth, inclusive social development, poverty alleviation, and climate-smart sustainable management and utilisation of natural resources. This will be achieved through enhancing food and nutrition security, generating additional employment opportunities to increase mean annual rural household cash income, accelerating renewable natural resources (RNR) sector growth through commercial farming, enhancing conservation of plant and animal genetic resources and natural heritage

sites, enhancing sustainable land and biodiversity resource management, and enhancing efficiency and effectiveness of RNR service delivery.

Bhutan 2020, the country's vision statement and long-term strategy document, states that the vision cannot be attained without ensuring that women have equitable access to self-realisation, development benefits, and participation in decision-making. The Gross National Happiness Commission has issued a protocol for policy formulation that directs all policy proponents to mainstream gender issues in policy preparation. With specific reference to agriculture, the 11th Five Year Plan encourages cooperatives that will empower women and provide them with employment and entrepreneurship opportunities. It recommends that agricultural training locations be decentralised to ensure women's participation.

Australia's support to Bhutan focuses on developing human resource capacity and strengthening tertiary institutions. Scholarships for study in Australia, particularly in the government sector, are Australia's focus for development cooperation with Bhutan.

Several large donors fund agricultural development but the small size of Bhutan's government research and development system and agribusiness sector limits the country's capacity to absorb official development assistance. This is a key reason for ACIAR maintaining a modest level of investment, focusing on developing agricultural research capacity. Earlier ACIAR work in Bhutan focused on disease control in chickens, ruminants and citrus.

## Country priorities

The Bhutanese Government has identified crop irrigation management, integrated crop management of horticultural crops and dairy sector development as priorities for future collaborative programs.

## 2017-18 research program

A major initiative on improvement of citrus production (Bhutan's largest horticultural export industry) began in 2007 and has continued with a second project that is itself reaching an end, with a no-cost extension to December 2017.<sup>1</sup> Previous research identified citrus greening, powdery mildew and irrigation management as key constraints to be evaluated. In the current project, integrated crop management approaches have been developed to address these priorities and tested with growers. Another focus has been the introduction, evaluation and dissemination of improved citrus genetic resources. Consultation with stakeholders continues to determine whether ACIAR investment should be continued and, if so, what the priorities for research and capacity building should be.

## 5-year country outcome

- Achievement of better and more-widespread understanding and application of citrus production practices in key production areas

## 2017-18 project output

- Information on validated crop production practices made widely available to growers in all major production areas

*Key Research Program Manager*

Dr Richard Markham, Horticulture

*Regional Manager, South Asia*

Dr Kuhu Chatterjee

## Current project

<sup>1</sup> **HORT/2010/089** Adapting integrated crop management technologies to commercial citrus enterprises in Bhutan and Australia



# India

## Key statistics<sup>a</sup>

GDP per capita (US\$)	6,100.7
Population (million)	1,311

## Funding

A\$m

2015-16 actual	2.92
2016-17 budget	5.00
2017-18 budget	3.24

<sup>a</sup> Data for 2015 GDP and population from [data.worldbank.org/country](http://data.worldbank.org/country)

## Country context

South Asia has the highest concentration of poor people in the world with more than 500 million people still living in extreme poverty. Many more people, particularly women and those working in the informal sector, live just above the poverty line and are extremely vulnerable to economic and environmental shocks and disasters ... In the past two decades, over 50 per cent of South Asians (more than 800 million people) have been affected by at least one disaster ... There is increased momentum for regional cooperation particularly in the eastern part of the region, where the borders of India, Bangladesh, Nepal and Bhutan converge.

[Objective 1 of the Aid Investment Plan (AIP), South Asia Regional Development Program] is 'increased water, food and energy security in South Asia to facilitate economic growth and improve the livelihoods of the poor and vulnerable (particularly women and girls)'. This objective seeks to respond to major regional development challenges in South Asia—improving transboundary water resource management, increasing access to energy and energy connectivity, and increasing resilient agricultural productivity and farm incomes. [The AIP] targets these three inter-related sectors where Australia is uniquely placed to contribute its expertise and technologies.

### Aid Investment Plan, South Asia Regional Development Program, 2015-16 to 2018-19 (DFAT)

India is a major regional power and, per capita, one that is rising globally; however, its Human Development Index ranking was 130 out of 188 countries in 2015. The greatest concentration of extremely poor people is in the eastern part of the country—around a third of the world's total. India is active within regional groupings such as the South Asian Association for Regional Cooperation (SAARC), the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) and the Brazil, Russia, India, China and South Africa (BRICS) group. A new regional subgrouping of Bangladesh, Bhutan, India and Nepal (BBIN) is active in cooperation and working on power trade, inter-grid connectivity, transit facilities and multimodal transport in the region. There is now a shift

in the focus of the Indian Government from increasing productivity to improving the incomes of farmers. Agricultural progress will now be measured by the real income of farmers and not by gross production of agricultural commodities. The government has set a target of doubling farmers' incomes by 2022. It plans to achieve the target by focusing on: irrigation; seed sector; soil health; investment in cold and value chains; creation of an electronic national farm market where farmers can trade; new crop insurance schemes support; and diversification.

The funding allocation for the agriculture and rural sector has increased over last year with a focus on farm irrigation and creation of new agricultural

universities and outreach centres for research (Krishi Vigyan Kendras—KVK). The draft National Policy for Women 2016 focuses on women in agricultural as a priority area. It states the importance of inclusion of women in agricultural training; hiring them as extension workers and trainers; and providing institutional and funding support for women producer associations. The policy also promotes development of women-friendly technologies/equipment and promotion of sustainable agricultural practices among women farmer groups. The main challenges are the use of innovative data analysis to measure farmers' income on a regular basis, and to mainstream the policy on women within the key ministries and public sector institutions.

Australia has placed India at the forefront of its bilateral partnerships. Both governments recognise the significant potential for further cooperation across a broad range of areas, including water management expertise, science and technology, and agriculture. ACIAR has supported collaborative agricultural research between Australia, India and other South Asian countries since 1983. The national agricultural research system is led by the Indian Council of Agricultural Research (ICAR) and has substantial resources and influence within the Indian program and has great potential to support cooperative activities in the region and in South-East Asia and Africa.

ACIAR's research activities have been increasingly linked to the food security problems of other South Asian countries and thus have a growing regional character, including the programs delivered in conjunction with CGIAR, state agricultural universities, non-government organisations (NGOs), autonomous institutions and the private sector active in the region. An informal consultation of the priorities with key stakeholders in February 2017 confirmed that ACIAR will continue to work with India in a regional approach involving neighbouring countries with shared issues and opportunities. ACIAR will maintain its current relative level of funding to this regional approach. Substantial co-investment from India for our ongoing program of collaboration will become a prerequisite for maintaining our program at this level of funding in future.

## Country priorities

Following the stakeholder consultations in February 2017, ACIAR reconfirmed the priorities of its program in India as developed by ICAR and ACIAR. There was informal agreement (yet to be formalised) that ACIAR continue its efforts towards designing a regional program involving India, Bangladesh and Nepal. The geographical focus within the country will remain the eastern area. A regional approach offers, potentially, transformative advantages through knowledge sharing.

The medium- to long-term strategy is focused around creating regional collaborations that target:

- 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 in relation to farmers' livelihoods and climate change.

## 2017-18 research program

ACIAR supports research to address the four priorities for India through the following subprograms.

### Water management

Better use of rainfall to sustain dry-season production is one of the highest priorities for improving livelihoods in the more marginal rainfed areas of India. Two projects aim to increase understanding of the groundwater resources available and promote their exploitation to deliver improved security of monsoon crops and increased dry-season cropping. The first project is researching the constraints and opportunities of irrigation with small-scale water supplies to improve smallholder livelihoods in the Indian states of Bihar and West Bengal, looking at innovative approaches to conjunctive use of surface water and groundwater in agriculture and aquaculture.<sup>1</sup> This project is also investigating institutional constraints around water and land that hinder development.

The second project in Bihar is undertaking research that aims to identify and support agricultural water reform pathways, and establish water institutions in South Asia to help ensure that water and related resources are appropriately managed.<sup>2</sup>

The coastal zone of West Bengal contains many of the poorest and most vulnerable people in the region and is a priority for government development; therefore, new projects are addressing water and salinity management and cropping system intensification in that area. One of these projects is working in the embankments of the West Bengal Sunderbans region.<sup>3</sup> This is an extremely difficult environment as it is very low lying and, as a result, the land and agriculture are affected by both freshwater flooding due to monsoonal storms and seawater inundation from high tides, storm surges and cyclones. The focus of the project is to improve water management in the embankments that protect the land from the sea, and promote dry-season agriculture by judicious irrigation.

Another project is examining the drivers, developing tools and opportunities, and providing policy options to promote more socially inclusive and environmentally sustainable agricultural intensification in West Bengal and Bangladesh, with an emphasis on water.<sup>4</sup> This project is exploring how agricultural research for development can be targeted to assist those least likely to benefit from traditional approaches, such as women, and landless and Indigenous people.

## Cropping systems

Research is currently being conducted on improved sustainable management of rice and wheat cropping systems to increase cereal rotation and yields of other high-value crops, and improve the efficiencies of water, energy, nutrients and other input use. The research also increases the resilience of cropping systems to climate change and other risks through conservation agriculture, thus stabilising farmers' incomes.

India's national mungbean breeding program is a key partner in the International Mungbean Improvement Network led by the World Vegetable Center and comprising Australia, Bangladesh, Myanmar and India.<sup>5</sup> This project started in 2015–16 by characterising in multiple environments the mungbean core collection.

Research building on past projects in north-western India and Bangladesh is adapting conservation agriculture and water management technologies for Bihar and West Bengal states in eastern India, in close association with related research in northern Bangladesh and the eastern Terai region of Nepal.<sup>6</sup> In this way, regional research collaboration on sustainable intensification is being developed with Bangladesh and Nepal, with the potential for rural economic growth, rural job creation and increased local cross-border trade. A proposed multicountry project will research the effectiveness of modern information technologies to support the practice-change decisions of smallholder women and men on climate-resilient farming systems intensification.<sup>7</sup>

In addition, research to improve post-rainy-season varieties of sorghum to meet the growing demand for grain and fodder for ruminants in India will conclude in June 2018.<sup>8</sup> The project is developing dual-purpose varieties with high grain production and higher quality stover (residue left after harvesting grain) by incorporating the stay-green character into locally adapted varieties in high demand for their specific grain quality.

## Wheat improvement

The Indo-Australian program on marker-assisted wheat breeding (IAP-MAWB) uses genetic markers to select better wheat germplasm for farmers. This program has recently concluded after providing interesting germplasm to the various breeding programs of India and Australia, which will be incorporated in future new wheat varieties. A companion project on deep-rooted wheat will conduct a final year of trials in Australia.<sup>9</sup> A regional project on yellow rust, addressing this growing threat in South Asia, is supporting the research teams of India, Pakistan, Nepal and Ethiopia to better characterise disease variability and to identify new sources of resistance.<sup>10</sup>

The Indo-Australian program as well as the South Asia regional collaboration on wheat breeding will continue to provide information and material potentially of great interest for Australian wheat breeders.

## Agricultural policy

Creating an appropriate domestic policy environment for reform in the agriculture sector has the potential to deliver major benefits. Australia has significant expertise in policy analysis, particularly in assisting India with the implications of its transition from a highly regulated economy to a more open market economy. Targeting and micro-entrepreneurship for sustainable diversification in Eastern Gangetic Plains is being undertaken.<sup>11</sup> This will be supported by the work described above on enhancing farm-household management decision-making for increased productivity in this region. In addition, two new projects aim to improve policies and institutions for sustainable intensification of agriculture and resilient food systems in the Eastern Gangetic Plains.<sup>12,13</sup>

Another project will develop an understanding of the dynamics of informal trade in agricultural inputs across the borders of India and Bangladesh, and India and Nepal, and its impact on resource use efficiency and livelihoods, including gender dimensions of those impacts.<sup>14</sup>

A new project aims to help improve surveillance of Japanese encephalitis virus, which is endemic in northern India and in Nepal, putting about 400 million people at risk.<sup>15</sup> It aims to establish effective surveillance strategies to improve understanding of the ecological drivers of disease activity and to provide early warning to the countries' public health systems.



## 5-year country outcomes

- Wider regional research collaboration between Australian, Indian and other countries' agencies focused on regional priorities covering water management, food security, farming systems intensification and poverty reduction
- Improved linkages for scientific and policy research to enable multidisciplinary collaborations at national and regional levels, including multilateral partnerships
- Improved genetic yield potential and stability for cereals, with benefits for Indian and Australian farmers and with extension to third countries

## 2017–18 project outputs

- Field sites that consider social inclusivity and sustainability in water, land and salinity management in India and Bangladesh established
- Initial testing and assessment carried out of sustainable and resilient farming systems intensification in eastern India
- Knowledge increased of the impacts of cross-border informal trade in agricultural outputs in eastern South Asia (India, Nepal and Bangladesh)
- Priority research and scaling-out challenges assessed for intensification and diversification of sustainable and resilient farming systems in eastern India, Bangladesh and Nepal
- Final workshop of the Indo-Australian program on marker-assisted wheat breeding (IAP-MAWB) held
- Core set of 250 wheat lines selected, multiplied and dispatched for multi-location wheat yellow rust resistance screening
- Trials of women's groups communally renting and managing land established in the Eastern Gangetic Plains
- Knowledge enhanced of the key factors that affect farmers' decisions to take up entrepreneurial ventures, and the effect of climate change-related resource scarcity and shocks on decision-making
- Key institutional constraints to use of groundwater for irrigation and aquaculture identified and approaches to overcome these trialled in the Eastern Gangetic Plains
- Assistance provided with water policy research into improving water management institutions in India and Pakistan
- Mungbean core collection characterised (genotyping and first year of phenotyping)

### Key Research Program Managers

Dr Evan Christen, Land and Water Resources  
Dr John Dixon, Cropping Systems and Economics  
Dr Eric Huttner, Crop Improvement and Management  
Dr Mike Nunn, Animal Health  
Dr Ejaz Qureshi, Agricultural Development Policy

### Regional Manager, South Asia

Dr Kuhu Chatterjee

## Current and proposed projects

- <sup>1</sup> **LWR/2012/079** Improving dry season agriculture for marginal and tenant farmers in the Eastern Gangetic Plains through conjunctive use of pond and groundwater resources
- <sup>2</sup> **ADP/2014/045** Efficient participatory irrigation institutions to support productive and sustainable agriculture in South Asia
- <sup>3</sup> **LWR/2014/073** Cropping system intensification in the salt-affected coastal zones of Bangladesh and West Bengal, India
- <sup>4</sup> **LWR/2014/072** Promoting socially inclusive and sustainable agricultural intensification in West Bengal and Bangladesh
- <sup>5</sup> **CIM/2014/079** Establishing the International Mungbean Improvement Network
- <sup>6</sup> **CSE/2011/077** (*multilateral, CIMMYT*) Sustainable and resilient farming systems intensification in the Eastern Gangetic Plains
- <sup>7</sup> **CSE/2012/108** (*multilateral, IFPRI*) Enhancing farm-household management decision-making for increased productivity in the Eastern Gangetic Plains (proposed)
- <sup>8</sup> **CIM/2007/120** (*multilateral, ICRISAT*) Improving post-rainy sorghum varieties to meet the growing grain and fodder demand in India
- <sup>9</sup> **CIM/2013/011** Indo-Australian project on root and establishment traits for greater water use efficiency in wheat—phase 2
- <sup>10</sup> **CIM/2014/081** Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa
- <sup>11</sup> **CSE/2016/112** Targeting and micro-entrepreneurship for sustainable diversification in the Eastern Gangetic Plains
- <sup>12</sup> **CSE/2016/037** Informing policies for removing barriers to scaling conservation agriculture based sustainable intensification in the Eastern Gangetic Plains
- <sup>13</sup> **ADP/2016/026** Improving policies and institutions for sustainable intensification of agriculture and resilient food systems in eastern Indo-Gangetic plains
- <sup>14</sup> **ADP/2016/003** Linkages and impacts of cross-border informal trade in agricultural inputs in eastern South Asia
- <sup>15</sup> **AH/2014/039** A One Health approach to establish effective surveillance strategies for Japanese encephalitis in India and Nepal





# Nepal

## Key statistics<sup>a</sup>

GDP per capita (US\$)	694.1
Population (million)	28.51

## Funding

A\$m

2015-16 actual	1.16
2016-17 budget allocation	1.50
2017-18 budget	1.37

<sup>a</sup> Data for 2015 GDP and population from [data.worldbank.org/country](http://data.worldbank.org/country)

## Country context

**Australia's aid program is [transitioning] from a phase of post-disaster reconstruction to one of longer-term programmed aid ... [Australia will continue to support basic education and enterprise development.] ... A new program [will focus] on promoting an enabling environment for strong, effective, and inclusive sub-national governance. Gender equality and social inclusion will be a key feature of all major investments and an overarching gender strategy [is being developed].**

### Aid Investment Plan, Nepal, 2016-2020 (DFAT)

Nepal is undergoing a prolonged political transition and recovering from one of the worst disasters in its history. Nepal emerged from civil conflict in 2006 and, in 2008, historic elections completed Nepal's transition to a federal democratic republic. Nepal's overall development progress has been slow and its development indicators are among the lowest in South Asia. The reconstruction following the earthquakes in 2015 continues to have a negative impact on Nepal's growth prospects in the short to medium term. Political instability, constitutional uncertainty and highly centralised government structures all impact on the Government of Nepal's ability to deliver services effectively.

The Agriculture Development Strategy (2014) outlines the vision for a self-reliant, sustainable, competitive and inclusive agriculture sector that drives economic growth and contributes to improved livelihoods and food and nutrition security. The 20-year strategy aims to halve poverty in less than 10 years through an agriculture-led economy. It aims to increase productivity and irrigation coverage. The strategy targets an increase in farm land ownership or joint ownership by women.

The strategy will also guide policies that include women and states that all agricultural programs will be designed to benefit women. It promotes women's organisations and agroenterprises led by women through specific programs. It recommends equal wages for women labourers, recognising women as independent farmers, ensuring women's access to means of production, enhancing their leadership, and improving women's position in different structures of the government, non-government and private sectors. It promotes action to raise awareness of women's rights to land and build the capacity of women in management of irrigation, water resources and finances.

Agriculture in Nepal faces a set of numerous interdependent challenges associated with degrading resources, underdeveloped agricultural institutions and policies, and lack of productive technologies and mechanisation that limit the improvement of farm household livelihoods. The challenges are different in the lowland Terai rice-wheat farming systems (an extension of the Ganges Plain of India) compared with the mixed crop-livestock-tree farming systems of the hill and mountain areas.

Australia and Nepal have a longstanding relationship that continues to strengthen through development cooperation and people-to-people links. Over the years, the Australian Government and private sector have contributed to the economic and social development of Nepal through activities and assistance in the fields of education, health, hydro-electricity, sustainable forestry management, and livestock and grain management.

ACIAR has supported collaborative research in Nepal since the early 1990s, including projects on small ruminants, wheat and legumes. There is now scope for improved integration of soil, water, crop, livestock and tree components of the farming systems, in addition to work aiming to increase the productivity of the individual components through adoption of available technologies.

## Country priorities

Priorities for ACIAR collaboration have been identified through consultations with ACIAR senior research staff and stakeholders in Nepal. Increased farm and forest productivity is seen as a core approach to improved food and nutrition security and enhanced livelihoods. Priorities in the Middle Hills districts impacted by the recent earthquakes were reassessed in 2015.

Given the common agricultural production challenges across the alluvial plains of Nepal, eastern India and Bangladesh, cooperative research linkages are being explored with neighbouring countries, especially focused on conservation agriculture.

## 2017–18 research program

ACIAR has several subregional research projects underway or proposed that involve Nepal. Two subregional projects on climate-resilient farming systems intensification are in the Terai region of Nepal. One project is focusing on conservation agriculture technologies, building on the success of past projects in Bangladesh and north-western India for sustainable and resilient farming systems intensification.<sup>1</sup> A new project will research the effectiveness of modern information technologies to support practice-change decisions of smallholder women and men in the alluvial plains of Terai.<sup>2</sup>

The targeting and micro-entrepreneurship for sustainable diversification is underway in the Eastern Gangetic Plains.<sup>3</sup> Two new projects aim to improve policies and institutions for sustainable intensification of agriculture and resilient food systems in the Eastern Gangetic Plains.<sup>4,5</sup> Another subregional project is looking at the constraints and opportunities of supplemental irrigation with small-scale water supplies to improve smallholder livelihoods.<sup>6</sup>

A forestry project in the Middle Hills region of Nepal is focusing on improved productivity in both mixed crop-tree-livestock farming systems and community forests.<sup>7</sup> This work aims to enhance social institutions, improve markets for forestry products and develop innovative options for using underutilised land in a productive and equitable manner in Kabhre Palanchok and Lamjung districts. The project is examining approaches to scaling up timber utilisation from community forests to assist with the rebuilding program following the 2015 earthquakes.

A regional project involving Nepal, India, Pakistan and Ethiopia is addressing the threat of wheat yellow rust as part of a regional network.<sup>8</sup>

Another regional project will develop an understanding of the dynamics of informal trade in agricultural inputs across the borders of India and Bangladesh, and India and Nepal, and its impact on resource use efficiency and livelihoods, including gender dimensions of those impacts.<sup>9</sup>

A new project aims to help improve surveillance of Japanese encephalitis virus, which is endemic in northern India and in Nepal, putting about 400 million people at risk.<sup>10</sup> It aims to establish effective surveillance strategies to improve understanding of the ecological drivers of disease activity and to provide early warning to the countries' public health systems.

## 5-year program outcomes

- Provision to Nepalese agencies of research and technical information and capacities to enable improved cropping and regional linkages for ongoing research and development
- Definition and communication of improved alternatives for water, forestry and farmland use

## 2017–18 project outputs

- Sustainable and resilient farming systems intensification in south-eastern Nepal assessed
- Key institutional constraints to use of groundwater for irrigation and aquaculture identified and approaches to overcome these trialled
- Knowledge increased of the impacts of cross-border informal trade in agricultural outputs in eastern South Asia (India, Nepal and Bangladesh)
- Women's groups undertaking communal land leasing and irrigation for vegetable production achieved
- Resource book produced on active and equitable community forest silviculture
- Core set of 250 wheat lines selected, multiplied and dispatched for multi-location wheat yellow rust resistance screening
- Partnerships established to commence a project to establish effective surveillance strategies for Japanese encephalitis in India and Nepal

### Key Research Program Managers

Mr Tony Bartlett, Forestry  
 Dr Evan Christen, Land and Water Resources  
 Dr John Dixon, Cropping Systems and Economics  
 Dr Eric Huttner, Crop Improvement and Management  
 Dr Mike Nunn, Animal Health  
 Dr Ejaz Qureshi, Agricultural Development Policy

### Regional Manager, South Asia

Dr Kuhu Chatterjee

## Current and proposed projects

- <sup>1</sup> **CSE/2011/077** (*multilateral, CIMMYT*) Sustainable and resilient farming systems intensification in the Eastern Gangetic Plains
- <sup>2</sup> **CSE/2012/108** (*multilateral, IFPRI*) Enhancing farm-household management decision-making for increased productivity in the Eastern Gangetic Plains (proposed)
- <sup>3</sup> **CSE/2016/112** Targeting and micro-entrepreneurship for sustainable diversification in the Eastern Gangetic Plains
- <sup>4</sup> **CSE/2016/037** Informing policies for removing barriers to scaling conservation agriculture based sustainable intensification in the Eastern Gangetic Plains
- <sup>5</sup> **ADP/2016/026** Improving policies and institutions for sustainable intensification of agriculture and resilient food systems in eastern Indo-Gangetic plains
- <sup>6</sup> **LWR/2012/079** Improving dry season agriculture for marginal and tenant farmers in the Eastern Gangetic Plains through conjunctive use of pond and groundwater resources
- <sup>7</sup> **FST/2011/076** Enhancing livelihoods and food security from agroforestry and community forestry in Nepal
- <sup>8</sup> **CIM/2014/081** Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa
- <sup>9</sup> **ADP/2016/003** Linkages and impacts of cross-border informal trade in agricultural inputs in eastern South Asia
- <sup>10</sup> **AH/2014/039** A one health approach to establish effective surveillance strategies for Japanese encephalitis in India and Nepal





# Pakistan

Key statistics <sup>a</sup>	
GDP per capita (US\$)	5,010.8
Population (million)	188.9
Funding	
2015-16 actual	1.06
2016-17 budget allocation	4.20
2017-18 budget	6.25

<sup>a</sup> Data for 2015 GDP and population from [data.worldbank.org/country](http://data.worldbank.org/country)

## Country context

Pakistan is at the heart of a regional market with a large population, diverse resources, and untapped potential for trade. However Pakistan faces a number of challenges to realising its economic potential. Economic growth continues to be constrained by energy and infrastructure deficits, skills shortages, regional instability and other barriers to trade ... Generating economic growth is the centrepiece of the Pakistan Vision 2025 statement.

In rural areas [Australia aims to] increase livelihood opportunities for poor men and women [by drawing] on its world-class expertise to help Pakistan enhance agricultural productivity and expand revenue streams for farmers, including through improved water management practices, adding value to raw agricultural products and improved access to markets for those products. This will also contribute to improving Pakistan’s food security and nutrition levels, and women’s economic empowerment.

While Pakistan ranked 147 out of 188 countries in the Human Development Index 2015, the Government of Pakistan is making strong efforts to strengthen the economy, and gross domestic product (GDP) growth was expected to rise to 5.2% in 2016-17. If realised, large-scale Chinese investment in the China-Pakistan Economic Corridor over coming years will help to improve infrastructure, lift energy capacity and underpin economic growth in Pakistan. Pakistan’s trade as a percentage of GDP currently stands at around 31%—well behind the average across South Asia of around 50%.

To achieve its aims for the agriculture sector, the Government of Pakistan has recently developed an Agriculture and Food Security Policy that identifies actions needed to address the elements that have contributed to the stagnant growth and inequity that typifies much of Pakistan’s agriculture

### Aid Investment Plan, Pakistan, 2015-16 to 2018-19 (DFAT)

sector. The policy has three pillars: (i) build an innovation-based sustainable agricultural sector; (ii) use public investment to improve the profitability of agriculture; and (iii) ensure food security and freedom from hunger.

The Government of Pakistan has also identified the importance of developing social and human capital and empowering women, to enhance science and innovation skills and employment options for women and the young within rural communities. Pakistan’s Vision 2025 includes the aims to: increase women’s participation in decision-making; and focus on (i) opportunities to enhance development, adoption and growth of best-practice technologies, and (ii) support for trialling small-and-medium enterprise development and village community centres for the mobilisation and innovation of rural communities.



Agricultural issues requiring research in Pakistan include cereal and legume productivity, and crop-diversification and management practices. Natural resource management challenges requiring research include surface and groundwater availability and its effective management at farm and national scales. There is increasing pressure on availability of surface and groundwater water resources for irrigation due to increasing agricultural intensification and competing demands for urban and industrial uses. For example, in Balochistan province and parts of Punjab province, groundwater aquifers are under stress, with falling water levels leading to significant economic impacts on the poor. Inferior irrigation management practices, combined with poor drainage and soil management, have resulted in significant increases in waterlogging and salinity in Sindh province and also parts of the Punjab.

ACIAR has had a program of research collaboration with Pakistan since 1984, with recent projects focused on Pakistan's key fruit crops (mangoes and citrus), livestock (smallholder dairy), agricultural policy and agricultural water management. ACIAR works closely with the Government of Pakistan, the Department of Foreign Affairs and Trade (DFAT), other donor partners, non-government organisations (NGOs) and the Pakistani private sector to provide research and development (R&D) and technical capacity building. Technical support and carefully targeted R&D interventions underpin development programs in Pakistan. The Ministry of National Food Security and Research has been the main implementing partner through its research arm, the Pakistan Agricultural Research Council, along with provincial agriculture departments.

A new co-investment between ACIAR and DFAT, the Agriculture Value Chain Collaborative Research (AVCCR) Program in Pakistan—known as Aik Saath (meaning 'together' in Urdu)—closely aligns to the previous two phases of the Australia-Pakistan Agriculture Sector Linkages Program (ASLP). AVCCR is intended to focus more strongly on collaboration and research in selected agricultural value chains. The rural poor, particularly women, will significantly and equitably benefit from improvements in these strategic value chains. AVCCR will continue to involve private-sector engagement in new and innovative partnerships and collaborations with private-sector projects will make a real difference to livelihoods by reducing poverty and help to achieve the outcomes of the Government of Pakistan's Vision 2025 related to agriculture.

## Country priorities

ACIAR's priorities for Pakistan are based on formal and informal consultations with Pakistani Government agencies and other stakeholders as well as the Australian Inclusive Economic Growth Investment Strategy (AEGIS). Further consultations in 2015, at the end of ASLP program, resulted in the identification of high-priority agriculture value chains that are both valuable and feasible targets for further consideration under the new AVCCR (Aik Saath) program.

Food and water security are among the most pressing challenges for Pakistan, and problems are exacerbated by a growing population. Pakistan has placed food, water and energy security as key pillars of its future development in its Vision 2025. Australia is committed through its aid program to helping Pakistan meet these challenges and has developed a portfolio of projects with this in mind. In 2017-18, ACIAR will seek to align its new investments with Pakistan's new Agriculture and Food Security Policy through ongoing policy discussions at the national and subnational levels.

Policy research is required to identify and support technical, economic and social research and establish water institutions that will help ensure that water and related resources are appropriately managed. Irrigation water supply management is mainly at a provincial level in Pakistan, undertaken by Provincial Irrigation and Drainage Authorities. These authorities, as in many other parts of the world, are following a relatively simple policy agenda that centres on improving water management by devolving decisions to farmers. Often known as participatory irrigation management (PIM), this approach has yielded mixed results, with productivity gains attributable to PIM and irrigation management transfer often failing to materialise. Policy research is also required to identify and understand impacts of existing policies and programs, including institutions and regulatory regimes required to enhance agricultural production, markets and trade.

Key areas identified as ACIAR research priorities in the medium term include:

- improvements in horticultural crop management and value-chain practices, particularly in high-value crops such as vegetables, mango and citrus
- improvements to dairy and beef production and marketing, including genetic aspects, animal nutrition, disease control, effective extension support and capacity building of researchers, as well as value chains for small ruminants
- assessment of productivity issues and disease risk in wheat and smallholder diversification into other crops such as legumes (chickpea, lentil and peanuts)

- assessment of policies related to food and nutritional security, including policies related to pulses production and development of their modern value chains
- understanding of the role and impact of policies, institutions and investment for agricultural growth and inclusive rural transformation
- management of land and water resources, including exploring options for growing crops in salinity-affected areas through appropriate policy interventions and investigating social, economic and capacity constraints.

## 2017-18 research program

ACIAR supports research to address the four Pakistani priorities through the following subprograms.

### Horticultural marketing and production systems

The horticulture sector in Pakistan is significant, both domestically and for exports. High-value horticultural crops, such as citrus, mangoes and vegetables, are an important source of farm income; however, crop management practices are often suboptimal and losses along the value chain are high. Under ASLP, significant progress was made on strengthening the value chains for mango and citrus, while more basic research explored the prospects for developing heat-tolerant varieties of vegetables. Based on these experiences, a project is examining the policy and institutional reforms required to improve horticultural markets in Pakistan. Further work on strengthening selected horticultural value chains is planned under AVCCR (Aik Saath). The choice of localities and crops to be included is based on the potential of various horticultural value chains to deliver broad-based livelihood benefits. This has led to a focus on four crops of particular importance to the rural poor: tomato, chilli, onion and potato.<sup>1</sup> In addition, a new regional project aims to examine the benefits of annual mango market and trade analysis.<sup>2</sup>

### Dairy and meat production and marketing

Dairy is the largest livestock sector in Pakistan, with demand for milk and milk products growing at about 8% per annum, most of which are sourced from small farms with fewer than 10 animals. However, unit animal production is very low despite quite good genetic potential, due to poor nutrition and mismanagement, failure to control diseases and lack of proper marketing. This is compounded by a fragmented research effort and weak extension support services.

At the same time, demand and prices for beef have been rising strongly, opening opportunities for smallholder farmers. Traditionally, beef is a by-product of the dairy sector, utilising male animals and old cows for meat. Thus, there are trade-offs between increasing milk production and growing cattle and buffaloes for meat on farms. A new project will take a whole-farm approach to improve farm profitability from dairy and beef cattle production and marketing.<sup>3</sup> It will also engage with a range of partners to build capacity for more efficient and effective livestock extension.

Two small research projects are examining the potential of new Australian oldman saltbush to fill ruminant feed gaps in arid and saline areas of Pakistan, and assessing the challenges and research opportunities in smallholder goat value chains.<sup>4,5</sup>

### Policy, capacity building and social sciences

A small project is examining existing policies and carrying out economic analysis to advise policymakers on policy reforms critical to reducing constraints to pulses production and trade.<sup>6</sup> A complementary new project is being developed to understand constraints in the development of value chains for pulses and the policies required to overcome them.<sup>7</sup> Other research that aims to identify and support agricultural water reform pathways and establish water institutions in South Asia will help ensure that water and related resources are appropriately managed.<sup>8</sup> A further project aims to facilitate agricultural market reform in order to enhance growth, employment and productivity.<sup>9</sup> Wealth creation among smallholder farmers, through efficient credit systems, is also being researched.<sup>10</sup>

### Cropping systems

Cereal productivity is lower than in equivalent environments elsewhere in South Asia, and there is also unrealised potential for smallholder diversification. A new project is supporting Pakistani participation in a regional program with India, Nepal and Ethiopia, addressing the threat of stripe (yellow) rust in wheat.<sup>11</sup> Another project aims to expand the production of legumes (chickpea, lentil and peanut) by understanding the barriers to improving the productivity and profitability of their cultivation and on-farm testing of agronomic innovations and improved varieties.<sup>12</sup> Research into improved harvesting and seed production systems in mungbean has commenced.<sup>13</sup> This will help provide smallholders with wider options for diversification.

## Water management

Australia is well placed to assist Pakistan in improving irrigation, drainage and salinity management in major cropping systems, and this is an important focus of the research program. In consideration of the research priorities of Pakistan and the ongoing DFAT – Commonwealth Scientific and Industrial Research Organisation (CSIRO) Indus basin project related to whole of Indus basin surface and groundwater modelling, there is a portfolio of four complementary projects. In order to develop a coherent plan of work and gain larger impact from the investment, this set of projects has been branded as the Australian Water Program.

Two ACIAR projects are related to groundwater management and use. Groundwater use is extensive in Pakistan, with some areas completely reliant on groundwater (Balochistan province) and others (Punjab province) using it in conjunction with surface water to increase cropping intensity. In Sindh province, large areas are affected by waterlogging that could potentially be reduced by greater use of groundwater than occurs at present. Thus, an ACIAR project will undertake research that identifies approaches for farmers/communities and managers/policymakers to manage both groundwater quantity and quality while enhancing agricultural productivity. This work will have strong engagement with communities to develop groundwater management options, coupled with data collection and modelling to provide assessment of management options and feedback to the community on groundwater quantity (depth) and quality trends.<sup>14</sup>

A key issue for irrigation in Pakistan is poor irrigation efficiency and the associated impacts on productivity. The DFAT–CSIRO Indus basin project is investigating how and when water is delivered to farms. However, a key component is how farmers manage water on their farms. To increase efficiency of water use and productivity, farmers need to improve their water management and agronomic practices. A new ACIAR project will work with farmers to develop tools to improve their skills. This will entail testing various simple irrigation management tools for measuring soil moisture and soil nutrients and developing appropriate training methods that focus on a co-learning approach. The aim is to encourage farmer-to-farmer-driven learning either as a commercial service or facilitated by an extension service and NGOs.<sup>15</sup>

## Innovation in data collection

ACIAR has been exploring the use of digital data collection applications (apps) (DDCAs) with encouraging results, including reduced time and

improved accuracy in collecting data (compared with paper-based methods), and increased capacity for knowledge sharing and project monitoring. Two small regional research projects ensuing from the pilot Mobile Acquired Data (MAD) study are being undertaken in Myanmar, Pakistan, Vanuatu and Vietnam. The projects aim to provide direct support to the four core projects partnering in use of this technology with an at-scale evaluation of DDCAs within these projects (MAD 2) and evaluation of a staged adoption and implementation strategy (MAD 3).<sup>16,17</sup> The purpose is to ensure successful and sustainable deployment of CommCare—the app chosen as most suitable by the pilot study—while evaluating the support options and process to guide future projects seeking to incorporate DDCAs.

## 5-year country outcomes

- Improved smallholder profitability through integrated farm production and value-chain development with domestic and export market growth
- Strengthened institutional capacity building and training to support ongoing research interventions
- Research-based policy options that promote rural productivity and income growth to reduce poverty and malnutrition
- Understanding impacts of policies, institutions and investment for agricultural growth and inclusive rural transformation
- Improved surface and groundwater management for increased productivity, sustainability and livelihoods

## 2017–18 project outputs

- Increased knowledge and assessment of policies affecting Pakistani agriculture developed and documented for policy decision-makers
- Opportunities to improve livelihoods of smallholders and communities by strengthening selected horticulture market chains identified and collaborative research sites established
- Core set of 250 wheat lines selected, multiplied and dispatched for multi-location wheat yellow rust resistance screening
- Participatory analysis of the pulses situation in six districts completed
- On-farm trials of pulses innovation in agronomy and genetics established in four districts
- Training for Pakistani facilitators of irrigation field schools undertaken in Australia

- Analysis of community understanding of groundwater and surface water management and socioeconomic outcomes for men, women and youth established
- Water policy research undertaken to assist with improving water management institutions in India and Pakistan
- Potential of new Australian oldman saltbush varieties to fill ruminant feed gaps in arid and saline areas of Pakistan assessed
- Smallholder performance enhanced through collaborative supply-chain interventions for innovation practice change, using the horticulture sector as a case study
- Assessment of smallholder goat value chains completed
- Knowledge and understanding of policies affecting further development of the Pakistani agriculture sector increased by producing reports and policy briefs for policy- and decision-makers
- A community of practice to train and mentor organisations to implement an integrated whole-family extension approach established
- Report produced on current status of the use of desiccants for mungbean harvesting
- Policy forums held to increase understanding of pulses production constraints and desired policy options
- Report produced on the economic impact of policies on pulses production and trade
- Papers published on agricultural financing policy in Pakistan; constraints on women's enterprise development in the horticulture and livestock sectors; and financial viability of different credit schemes, based on case studies
- The use of digital data collection applications explored

#### *Key Research Program Managers*

Dr Evan Christen, Land and Water Resources  
 Dr Rodd Dyer, Agribusiness  
 Dr Eric Huttner, Crop Improvement and Management  
 Dr Richard Markham, Horticulture  
 Dr Ejaz Qureshi, Agricultural Development Policy  
 Dr Werner Stür, Livestock Production Systems

#### *Country Manager*

Dr Munawar Raza Kazmi

## Current and proposed projects

- <sup>1</sup> **HORT/2016/012** Strengthening selected horticultural value chains to benefit rural communities in Pakistan (proposed)
- <sup>2</sup> **AGB/2016/007** Benefits of annual mango market and trade analysis in Asia-Pacific
- <sup>3</sup> **LPS/2016/011** Improving smallholder dairy and beef profitability by enhancing farm production and value chain management in Pakistan
- <sup>4</sup> **LPS/2016/022** Potential of new Australian oldman saltbush varieties to fill ruminant feed gaps in arid and saline areas of Pakistan
- <sup>5</sup> **LPS/2016/096** Smallholder goat value chains in Pakistan: challenges and research opportunities
- <sup>6</sup> **ADP/2016/043** Economic analysis of policies affecting pulses in Pakistan
- <sup>7</sup> **ADP/2017/004** Development of modern value chains for pulses in Pakistan
- <sup>8</sup> **ADP/2014/045** Efficient participatory irrigation institutions to support productive and sustainable agriculture in South Asia
- <sup>9</sup> **ADP/2014/043** Policy and institutional reforms to improve horticultural markets in Pakistan
- <sup>10</sup> **ADP/2016/028** Creating wealth in smallholder farms through efficient credit systems in Pakistan
- <sup>11</sup> **CIM/2014/081** Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa
- <sup>12</sup> **CIM/2015/041** Increasing legume production and profitability in legume cropping systems in Pakistan
- <sup>13</sup> **CIM/2016/174** Improved mungbean harvesting and seed production systems for Bangladesh, Myanmar and Pakistan
- <sup>14</sup> **LWR/2015/036** Improving groundwater management to enhance agriculture and farming livelihoods in Pakistan (proposed)
- <sup>15</sup> **LWR/2014/074** Developing approaches to enhance farmer water management skills in Balochistan, Punjab and Sindh in Pakistan
- <sup>16</sup> **GMCP/2016/004** At-scale evaluation of digital data collection apps (DDCAs) in ACIAR projects—Mobile Acquired Data phase 2 (MAD 2)
- <sup>17</sup> **GMCP/2016/042** Mobile Acquired Data phase 3 (MAD 3)—evaluation of staged adoption and implementation strategy





# **Eastern and Southern Africa**

# REGIONAL PROGRAM SUMMARY

On opposite sides of the Indian Ocean, the agricultural environments of Africa and Australia have much in common—the wet tropics of Rwanda and northern Queensland, the semi-arid tropics of eastern Africa and central Queensland, the irrigated schemes of southern Africa and the Murray–Darling Basin, and the arid rangelands of Ethiopia and the Northern Territory. Accordingly, Australian agricultural science has expertise that is directly relevant in the African context. In addition, the free-market orientation and effective architecture of agricultural research in Australia are relevant to Africa as economic growth rates increase on the back of the resources boom, which has led to strong investment by Australian miners. There is also increasing interest from the Australian farm sector to invest in African agriculture.

Africa is home to a greater proportion of poor people than any other global region, and features high levels of food insecurity and very low Human Development Index rankings. Average gross national income per capita in the countries where ACIAR projects are concentrated is in the approximate range of US\$250–900 per annum.

Africa and Australia share similar environmental constraints, such as poor soils and climatic variability. Australia has also met challenges to food security, including poor livestock nutrition, weak adoption of new technologies and low levels of farmer value-chain participation. As a result, Australian expertise and research are highly relevant to Africa, and for three decades a small number of ACIAR projects have delivered research outputs, impacts and capacity to the region.

Current ACIAR projects are strongly aligned with the priorities of the Comprehensive Africa Agriculture Development Programme (CAADP), the Forum for Agricultural Research in Africa (FARA), the 2014 Malabo Declaration and subregional organisations—the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), the Centre for Coordination of Agricultural Research and Development for Southern Africa (CCARDESA) and the Common Market for Eastern and Southern Africa (COMESA). ACIAR has regular informal consultations with the Department of Foreign Affairs and Trade (DFAT) and the Commonwealth Scientific and Industrial Research Organisation (CSIRO) on current and prospective African projects and programs to ensure the best possible synergies. ACIAR will also consult and consider regional agricultural research nodes such as ASARECA and CCARDESA in eastern and southern Africa as long as there are areas of comparative advantage and mutual objectives to partner and work together.

ACIAR projects in southern Africa have a strong livestock and crop–livestock orientation. In eastern and southern Africa, the emphasis lies on various aspects of sustainable farming systems intensification and improved nutrition, with investment in improved water management in line with the dominance of semi-arid and arid zones. Biosecurity is also a regional issue. Eight ACIAR research programs cover a diverse range of research and development (R&D) activities in various parts of Africa.

A higher proportion of ACIAR projects in Eastern and Southern Africa are regional (i.e. operate in more than one country) than in South and West Asia, or East Asia. ACIAR is also examining trilateral partnerships embracing the comparative advantages of Australia and South Asia in assisting Africa; for example, Australian expertise in broadacre conservation agriculture, and South Asian expertise on small-scale farm mechanisation. The regional projects are:

**C2013/079** (Plant Biosecurity Cooperative Research Centre) Australia–Africa Plant Biosecurity Partnership (AAPBP) [Australia, Burundi, Ethiopia, Kenya, Malawi, Mozambique, Rwanda, Tanzania, Uganda, Zambia, Zimbabwe]

**CSE/2013/008** (*multilateral, CIMMYT*) Sustainable intensification of maize–legume cropping systems for food security in eastern and southern Africa II (SIMLESA II) [Ethiopia, Kenya, Malawi, Mozambique, South Africa, Tanzania]

**FSC/2012/023** (AH-managed) Strengthening food and nutrition security through family poultry and crop integration in Tanzania and Zambia

**FST/2014/093** Developing integrated options and accelerating scaling up of agroforestry for improved food security in eastern Africa—Trees for Food Security—2 [Uganda, Zambia]

**GP/2017/011** SFSA Alliance demand-led plant breeding—consolidation—phase 2 (proposed)

(Joint partnership with IDRC) Cultivate Africa's Future (CultiAF) [Kenya, Malawi, Uganda, Zambia]

**LWR/2014/085** A virtual irrigation academy to improve water productivity in Malawi, Tanzania and South Africa

**LWR/2016/137** Transforming smallholder irrigation into profitable and self-sustaining systems in southern Africa [Malawi, Mozambique, South Africa, Tanzania, Zimbabwe]



# Eastern and Southern Africa

Key statistics	GDP per capita (current US\$)	Population (million)
Botswana	6,360.1	2.26
South Africa	5,724.0	54.96
Kenya	1,377.7	46.05
Zambia	1,304.9	16.21
Zimbabwe	924.6	15.60
Tanzania	879.0	53.47
South Sudan	730.6	12.34
Uganda	705.3	39.03
Rwanda	697.3	11.61
Ethiopia	619.2	99.39
Mozambique	529.2	27.98
Malawi	372.0	17.21
Burundi	277.1	11.18

Funding	A\$m
2015-16 actual	11.33
2016-17 budget allocation	11.30
2017-18 budget	10.72

<sup>a</sup> Data for 2015 GDP and population from [data.worldbank.org/country](http://data.worldbank.org/country)

**Australia has a clear national interest in the security, stability and prosperity of Sub-Saharan Africa. African countries are important in global economic and political terms, including in relation to addressing economic growth, trade liberalisation, agricultural productivity and food security, trans-national crime, disarmament, international terrorism and United Nations reform. Many African economies are prospering, presenting increasing opportunities for trade and investment-led development gains**

*To obtain a full picture of ACIAR's engagement in eastern and southern Africa, this chapter should be read in conjunction with the Global Program chapter as the strategies are complementary.*

## Regional context and priorities

Between 1990 and 2015, it is estimated that the prevalence of hunger in Sub-Saharan Africa declined by 31%. Despite this, Sub-Saharan Africa has the highest prevalence (percentage of population) of hunger, with one in four people undernourished, according to the World Food Programme. Over the same period, western Africa made significant progress, reducing the number of hungry people by almost 13 million, but there have been substantial differences in progress among subregions in Sub-Saharan Africa. Middle Africa also saw increases in both the absolute number and prevalence of undernourished people. The absolute number of hungry people doubled, and the percentage of undernourished people rose from 34% to 41%. This was largely due to civil strife and insecurity. In the eastern and southern African regions, the percentages of undernourished people

### Aid Investment Plan, Sub-Saharan Africa, 2015–2019 (DFAT)

dropped from 47% to 32% (eastern Africa), and from 7% to 5% (southern Africa). The Food and Agriculture Organization of the United Nations (FAO) reported that unfavourable climatic and drought conditions over the same period, particularly in the Horn of Africa, saw an increase in the absolute numbers of hungry people of 20% in eastern Africa and 2% in southern Africa. These factors have seriously undermined progress towards improving food security and nutrition outcomes in the region. Reducing poverty in Africa is one of the world's largest development challenges, and the World Bank considers growing the agriculture sector is key to achieving a transformational impact.

The agricultural economy typically accounts for 30–40% of the gross domestic product (GDP) of African countries. More than 70% of the continent's poor live in rural areas, and agriculture is their most important economic activity, employing 65–70% of the labour force, according to the World Bank. Many of the key constraints to economic development are shared across many African nations. These include skills shortages, poor enabling environments for business and governance, food insecurity and low agricultural productivity, humanitarian crises, and gender and other inequalities.

As a relatively small donor in the region, it is important that Australia's aid contribution to Sub-Saharan Africa is carefully targeted for greatest impact. Australian aid has the capacity to make a difference and be recognised if we target sectors where Australian experience and knowledge demonstrably add value; concentrate efforts in fewer countries where we can deepen our engagement; and continue to be a flexible and responsive donor within our chosen areas of expertise. The Department of Foreign Affairs and Trade's (DFAT's) Aid Investment Plan (AIP) for the region includes a commitment to enhance agriculture's contribution to sustainable and inclusive economic growth and food security.

The geographical focus of ACIAR's program is on the eastern and southern African regions where Australia has historical program ties and presence, long-term Australian non-government organisation (NGO) experience, economic and security interests and diaspora links. The thematic focuses of the program include support for good governance and capacity building in the agriculture, extractives and public policy sectors, where Australia has particular expertise and the greatest potential for impact (according to the AIP). Over the next year, ACIAR plans to target approximately 15% of its budget at Africa.

Research program themes have emerged from consultations with national and regional partners, including the Comprehensive Africa Agriculture Development Programme (CAADP) and the Forum for Agricultural Research in Africa (FARA), and build on Australia's expertise in dryland farming and agroforestry systems, water management, livestock health and plant biosecurity.

One theme being addressed is developing locally appropriate agroforestry systems for semi-arid and subhumid regions that can assist farmers to improve food security and livelihoods, diversify their farming systems, enhance climate resilience and support improved land management practices across farming landscapes. This theme also includes work on improving market access for agroforestry products and strengthening community-private-sector partnerships through innovation platforms. Ethiopia, Rwanda, Uganda and Zambia are benefiting from this research.

In eastern Africa, the research emphasis is on intensification and increased resilience in maize-legume-livestock-based mixed farming systems, to achieve improved dietary energy and nutritional quality, and increase household income. Botswana, Rwanda, Uganda and other countries are benefiting from this research.

In southern Africa, the research focus is on livestock and cropping systems for disadvantaged farmers in Botswana, South Africa and Zimbabwe; maize-legume intensification in Malawi and Mozambique; and

irrigation water management in Malawi, Mozambique, South Africa, Tanzania and Zimbabwe. (Tanzania sits in eastern Africa but also belongs to the Southern Africa Development Community; SADC.) Zambia is involved in two of the projects that span both regions, focusing on nutrition and agroforestry.

ACIAR research currently addresses the following aspects of sustainable agricultural development and food security knowledge:

- water management in rainfed and irrigated systems
- improvement of nutrient-dense food crops
- cropping systems resilience and management, including conservation agriculture and small-scale mechanisation
- Diversification of horticultural production and strengthening of market linkages for improved smallholder livelihoods and better nutrition
- ruminant and poultry disease management and production
- fisheries management
- agroforestry systems and innovation platforms
- plant biosecurity
- demand-led crop breeding
- grain, livestock and forestry value chains, especially improved smallholder access to input and produce markets.

ACIAR-supported research in Africa tackles both technological and market/policy challenges covering soil, water, crops, horticulture, livestock, trees, biosecurity and aquaculture. The role of decision-making in production and value chains is recognised. The broad systems approach integrates production management, improved varieties and breeds, input and market chains (with agribusiness a dominant actor), policy and capacity building at both individual and institutional levels.

## 2017-18 research program

With population growth and increasing rural and urban demand for food grains and higher quality meat in both domestic and export markets, there is pressure for improved smallholder livestock and cropping systems to supply sustainability and productivity gains. The research program in eastern and southern Africa focuses on a sustainable intensification approach, in particular of maize-legume-livestock farming systems, and on improved livestock production and value chains. ACIAR's research is also examining the capacity of integrated agroforestry and crop farming systems to enhance food security in eastern Africa. Complementing cropping intensification research, ACIAR supports a number of other research efforts in eastern and southern Africa, such as small-scale mechanisation,



village poultry farming, peri-urban vegetable production, improving approaches to plant breeding and biosecurity capacity building.

Several of the projects being undertaken in this region are delivering benefits to Australian farmers, including profitability of soil fertility, conservation tillage, equipment and system interactions as well as effective, participatory linkages between researchers and service providers.

## Sustainable intensification and resilience of crops

Cropping systems research for development (R4D) focuses on sustainable intensification for improved food and nutrition security. Crops include the most common crops grown by smallholders in eastern and southern Africa and which underpin rural household food and nutrition security, i.e. maize, sorghum, beans, pigeon pea, peanut and forage legumes for livestock. Most of the projects engage with the private sector (e.g. seed companies) at international, regional and local levels.

A large R4D program in this region is sustainable intensification of maize-legume cropping systems for food security in eastern and southern Africa (SIMLESA).<sup>1</sup> Now in its second phase, the project aims to increase farm-level food security and productivity in the context of climate risk and change. It is investigating conservation agriculture, improved germplasm and crop value chains, primarily to improve maize and legume production in six countries that depend on maize as their staple food—Ethiopia, Kenya, Malawi, Mozambique, South Africa and Tanzania. The SIMLESA program is the backbone on which other projects can build fieldwork, with 15 or more research sites in the 6 countries. Linked to SIMLESA is a project in Zimbabwe that aims to provide increased crop-livestock integration and productivity, with scaling out by non-government organisations (NGOs).<sup>2</sup>

Accelerated adoption and scaling out of improved practices are a major aspect of the program. Benefits to women and girls are a strong theme in most of the projects. A new project aims to test institutionalisation of gender-sensitive innovation platforms for sustainable intensification in Rwanda.<sup>3</sup>

In partnership with the Bill & Melinda Gates Foundation, ACIAR research aims to accelerate improvements in sorghum productivity in water-limited areas of Ethiopia.<sup>4</sup> The final year of the project will be devoted to publishing the results and lessons learned and to the completion of one Ethiopian PhD research project at the University of Queensland. Yellow rust is a serious threat to Ethiopian wheat production. Ethiopia is joining the new regional (South Asia) project tackling the yellow rust threat, thereby developing links between Africa and South Asia.<sup>5</sup>

Another project is examining a way to protect grains against pests in Tanzania.<sup>6</sup>

## Livestock production and value chains

Livestock management is identified as an important source of farm-level diversification for smallholder farmers. Research is aiming to provide opportunities for smallholder farmers to meet market requirements and raise awareness of the importance of product quality, sustainability and human nutrition. A project in Botswana aims to increase the production and productivity of small ruminants (particularly goats) by improving animal health and developing market value chains.<sup>7</sup>

An important research theme for the livestock projects is improved linkages between farmers and the private agribusiness sector. A 3-year project in South Africa worked with several supermarkets to develop opportunities for small-scale farmers to supply pasture-fed beef for sale at selected supermarket outlets. Following agreements with supermarkets, the project is now working with small-scale farmers to initiate supply and develop the value chain.<sup>8</sup> A follow-on project will build on this research to establish commercially viable value chains and improve the competitiveness of small-scale beef cattle farmers in South Africa.<sup>9</sup>

Women are largely responsible for household nutrition, and food security is crucial in Tanzania and Zambia where stunting occurs in more than 40% of children aged under 5 years. A project is exploring how to improve food and nutrition security by improving the quantity, quality, accessibility and utilisation of nutrient-rich food of animal and plant origin (e.g. eggs, traditional vegetables) that is available to households.<sup>10</sup> It aims to reduce childhood undernutrition by testing interventions (e.g. controlling Newcastle disease in family poultry) that enhance the role that women play in poultry-crop integration and in improving household nutrition.

## Water management in irrigated systems

Irrigation can contribute strongly to food security in Sub-Saharan African countries; however, African irrigation faces major impediments to providing an adequate return on investment, improving poor market integration and weak water governance institutions, and overcoming significant degradation and abandonment of irrigated land. Despite this, irrigation expansion is taking place, through both government schemes and individual smallholders, and research is therefore needed to increase water use productivity and prevent/reverse environmental degradation in established and new irrigated lands. A new regional project is assessing mechanisms to transform smallholder irrigation into profitable and self-sustaining systems in southern Africa.<sup>11</sup>

Many lessons have been learned concerning the design and construction of irrigation infrastructure but the irrigation skills needed to capitalise on this infrastructure are in short supply. Hence, a project in Malawi, South Africa and Tanzania seeks to develop a system of continual social and institutional learning directed towards improving the profitability and sustainability of irrigated farming.<sup>12</sup> The aim of the research is to increase the productivity of male and female irrigation farmers and the sustainability of irrigation schemes through experiential learning. This will be achieved through skills development coupled with new tools for monitoring soil water and solutes.

## Agroforestry and community livelihoods

In Africa, there is great potential to enhance livelihoods for smallholder farmers and their communities through implementation of locally appropriate agroforestry systems that enhance crop yields and provide additional revenue sources from tree products. In eastern and southern Africa, there is a wide variety of soil and climate types and farmers have different preferences about which trees and crops they want to grow in their farming systems. Therefore, it is necessary to have sound scientific information about the tree–crop interactions under different systems and different sites to guide policies and extension programs and enable farmers to choose agroforestry systems that match their circumstances.

A project working in Ethiopia, Rwanda and Uganda will build on prior research by broadening the scientific knowledge on tree–crop interactions, addressing identified constraints to adoption of agroforestry, and studying the role of communities of practice in facilitating adoption and improved market access.<sup>13</sup>

While many of the products of agroforestry systems can be used directly by farmers, the prospects of substantially enhancing livelihoods require access to markets and the ability of communities to work collaboratively with the private sector to supply the quantity and quality of products the market is seeking. Another project working in Uganda and Zambia is researching the establishment of effective innovation platforms to facilitate greater collective action to enhance farmer access to markets.<sup>14</sup>

## Improving adoption of high-value and nutritious crops

Africa needs more plant breeders. There are fewer than 500 active plant breeders to improve over 50 food, fibre and fodder crops and they are located in only a few of the continent's 54 nations. Many countries do not have a single plant breeder, although they are heavily dependent on

agriculture for food and export income. This gap in plant breeding expertise must be remedied if African agriculture is to ensure food security and become a sustainably profitable sector for millions of smallholders.

The Alliance for Agricultural R&D for Food Security, a partnership between ACIAR, the Syngenta Foundation for Sustainable Agriculture (SFSA) and the Crawford Fund, is addressing the conundrum of plant breeding expertise and low adoption of new plant varieties for many food security crops in Sub-Saharan Africa. On average, the adoption rate across 20 crops in 30 countries of Sub-Saharan Africa is about 35%, compared with adoption rates of new plant varieties in Asia of over 80% and in Latin America of 60%. Demand-led plant breeding combines the best practices in market-led, new variety design with innovative plant breeding methods and integrates both with the best practices in business as a new way of approaching the business of plant breeding to deliver benefits. Integrating demand into new variety design is expected to boost utilisation, encourage market creation and contribute to improved livelihoods for farmers. A demand-led plant variety design project will further develop innovative education models for African universities and strengthen the connectivity between breeders, government policymakers and private-sector crop value chains to enable seed systems to be populated with sought-after, new improved varieties, which stimulate markets and research and development (R&D) investments.<sup>15</sup>

A project on promoting best practices in the production and marketing of high-value, highly nutritious vegetables, to improve income and nutrition, will conclude during 2017 with an evaluation of the impacts achieved around four 'best-practice hubs', in Ethiopia, Malawi, Mozambique and Tanzania.<sup>16</sup> A further small research activity at the 'hub' in Mozambique will look at the effects on the livelihoods of smallholder farmers of linking them more directly, with private-sector facilitation, to commercial markets.<sup>17</sup>

In another dimension of this work, using biodiversity to improve food and nutrition, a pilot study in the Busia district of Kenya has successfully shown how diets and livelihoods can be improved by linking smallholder producers of diverse nutritious vegetables to institutional markets, especially schools.<sup>18</sup> A new scoping study is looking at the further research that will be needed to adapt and apply this model to new locations and situations, elsewhere in Kenya and in neighbouring Tanzania.<sup>19</sup>

## Transforming the agricultural sector

ACIAR's partnership with Canada's International Development Research Centre (IDRC) in the joint research fund, Cultivate Africa's Future (CultiAF), will continue into 2018. The principal objective of CultiAF is to increase productivity and reduce postharvest losses for improved food and nutrition security in eastern and southern Africa by funding innovative applied research in postharvest systems, nutrition and identifying mechanisms for scaling up the most promising research results. It features a cross-cutting focus on adoption of research technologies through private-sector partnership and women's empowerment.

All six subprojects in this project<sup>20</sup> have strong private-sector involvement and the activities in 2017-18 include: better processing and marketing of fish products in Malawi; improving fish postharvest management and value chains in Zambia and Malawi; integrating insects in poultry and fish feeds in Kenya and Uganda; improving the processing of pre-cooked beans for food, nutrition and income in Kenya and Uganda; testing different communication and dissemination models for communicating science for impact; and expanding business opportunities for youth in agri-food systems. Following a positive external evaluation of the program and the IDRC-ACIAR partnership, 2017-18 will see arrangements for developing a second phase get underway.

## Increasing trade and biosecurity capacity

Market access and trade within and outside the region are greatly impeded by a number of policy-induced barriers on top of poor transportation infrastructure. The World Bank estimates that non-tariff trade barriers, such as sanitary and phytosanitary measures, and quantitative restrictions may raise the price of food staples in Africa by 34%. These barriers fragment 'market sheds', preventing the connection of food-surplus and food-deficit regions, reducing the welfare of both, and increasing reliance on external markets.

ACIAR aims to enhance the ability of eastern and southern African biosecurity agencies to improve control of plant pest and diseases through strengthening the biosecurity skills and planning of individuals and institutions within target African countries and the region as a whole. This will support increased production, market access for African farmers, improve regional and international trade and increase food security.

The Australia–Africa Plant Biosecurity Partnership (AAPBP) placement program represents an important step in the formation of a network of plant biosecurity specialists in Africa who work together on the enhancement of plant biosecurity in their countries and across the region—for example, working on a

strategy to manage the emerging fall armyworm incursions in the region. It has built strong professional relationships that will assist trade in plant products between countries, the resolution of phytosanitary problems when they arise and the improvement of access to international markets. The network was further increased by including additional fellows from the public and private sectors in 2016-17 and is already delivering results. ACIAR will provide funding for a Network Coordinator to be hosted in COMESA during 2017-18 to continue to support the work started in the AAPBP, and the Crawford Fund will provide support for an Australia-based mentor to assist the coordinator.<sup>21</sup>

## 5-year regional outcomes

- Improved smallholder access to traditional and modern market chains with higher food safety and quality standards
- Increased and accelerated adoption of innovative farming and forestry practices through extension and capacity-building activities, with a focus on women as producers
- Increased use of multidisciplinary research to facilitate uptake of technical research results through effective synergies between science and policy
- Documented economic and social benefits to farmers from adoption of agroforestry systems
- Improved nutritional quality and diversity of diets
- Strengthened regional plant biosecurity capacity
- Enhanced plant breeding network across Africa
- New partnerships with like-minded organisations funding agricultural research
- Demonstrated and available approaches and tools for transforming smallholder irrigation systems

## 2017-18 project outputs

- Testing of integrated forage–legume–maize systems in two countries in the region documented
- Initial adoption of crop–livestock systems in Zimbabwe assessed
- Partnerships established to commence a project to improve the health and marketing of goats in Botswana
- Dry environments characterised and crop production modelled by the Ethiopian sorghum breeding program
- Knowledge of practices of farming systems intensification enhanced through joint research with national R&D agencies
- Core set of 250 wheat lines selected, multiplied and dispatched for multi-location wheat yellow rust resistance screening

- Impact evaluated of employing best practices to produce and supply high-value vegetables to urban markets at selected sites in at least three African countries
- Small-scale farmers commenced supplying beef cattle to two abattoirs processing pasture-fed beef for sale at selected supermarkets in South Africa
- Multi-stakeholder strategies devised for cooperation in scaling up agroforestry in Ethiopia, Uganda and Rwanda
- Innovation platform models for commercialisation of smallholder agriculture developed at three sites in Uganda and Zambia
- A hub established in South Africa for the provision of simple tools and training for the virtual irrigation academy
- A new project established to scale out simple tools and best practices for transforming smallholder irrigation schemes
- Innovative education module developed for teaching the best-practice plant variety design, to form part of the syllabus for postgraduate degrees (PhD/MSc) in plant breeding in the region
- African regional plant biosecurity Network Coordinator actively working in COMESA and being supported by an Australian mentor
- Phase 2 of CultiAF developed
- Pilot scaling of maize and legume intensification documented

### Key Research Program Managers

Mr Tony Bartlett, Forestry  
 Dr Evan Christen, Land and Water Resources  
 Dr John Dixon, Cropping Systems and Economics  
 Dr Eric Huttner, Crop Improvement and Management  
 Dr Richard Markham, Horticulture  
 Dr Mike Nunn, Animal Health  
 Dr Werner Stür, Livestock Production Systems  
 Ms Mellissa Wood, Global Program

### Regional Manager, Africa

Dr Leah Ndung-u

## Current and proposed projects

<sup>1</sup> **CSE/2013/008** (*multilateral, CIMMYT*) Sustainable intensification of maize-legume cropping systems for food security in eastern and southern Africa II (SIMLESA II)

<sup>2</sup> **CSE/2010/022** (*multilateral, ILRI*) Integrating crops and livestock for improved food security and livelihoods in rural Zimbabwe

<sup>3</sup> **CSE/2016/035** Testing the institutionalisation of gender-fostering innovation systems in Rwanda (proposed)

<sup>4</sup> **CIM/2013/005** A targeted approach to sorghum improvement in Ethiopia

<sup>5</sup> **CIM/2014/081** Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa

<sup>6</sup> **CIM/2015/009** Protecting stored grains against pests

<sup>7</sup> **AH/2010/061** (*multilateral, ILRI*) Improving the health and marketing of goats in Botswana

<sup>8</sup> **LPS/2005/128** High-quality markets and value chains for small-scale and emerging beef cattle farmers in South Africa

<sup>9</sup> **LPS/2016/276** Increasing competitiveness of beef cattle farmers in South Africa

<sup>10</sup> **FSC/2012/023** Strengthening food and nutrition security through family poultry and crop integration in Tanzania and Zambia

<sup>11</sup> **LWR/2016/137** Transforming smallholder irrigation into profitable and self-sustaining systems in southern Africa

<sup>12</sup> **LWR/2014/085** A virtual irrigation academy to improve water productivity in Malawi, Tanzania and South Africa

<sup>13</sup> **FST/2015/039** Development and adoption of locally-appropriate agroforestry systems in eastern Africa

<sup>14</sup> **FST/2014/093** Developing value-chain innovation platforms to improve food security in east and southern Africa

<sup>15</sup> **GP/2017/011** SFSA Alliance demand-led plant breeding—consolidation—phase 2 (proposed)

<sup>16</sup> **FSC/2012/111** (HORT-managed) (*multilateral, WorldVeg*) Improving income and nutrition in eastern and southern Africa by enhancing vegetable-based farming and food systems in peri-urban corridors

<sup>17</sup> **HORT/2017/013** Evaluating improvements in vegetable value chains in Mozambique associated with closer market linkages

<sup>18</sup> **HORT/2014/100** Linking smallholders to markets: scoping study on developing value chains for conserving local biodiversity and improving diets

<sup>19</sup> **GP/2017/007** School Food Revolution: evaluating opportunities for further research

<sup>20</sup> **C2013/079** (Plant Biosecurity Cooperative Research Centre) Australia-Africa Plant Biosecurity Partnership (AAPBP)

<sup>21</sup> (Joint partnership with IDRC) Cultivate Africa's Future (CultiAF)



# GLOBAL PROGRAM

Funding	CGIAR (unrestricted)	Other*	Total
	A\$m		
2015-16 actual	18.30	1.51	19.81
2016-17 budget	18.30	0.94	19.24
2017-18 budget	16.00	1.59	17.59

\* Includes CABI, WorldVeg, SPC and APAARI contributions

## Medium-term strategy

### International Agricultural Research Centres (IARCs)

ACIAR's Global Program builds and manages ACIAR's multilateral partnerships with a range of international organisations, institutes and associations engaged in agricultural research. It supports the implementation of one of ACIAR's mandated roles of 'funding and supporting the International Agricultural Research Centres (IARCs)'. For the 2017-18 period, this will primarily be allocated in support of the multilateral IARC organisations, and a suite of co-funded project alliances with like-minded donors across multiple countries in eastern and southern Africa, as well as biosecurity capacity building.

The majority of the support is to CGIAR. CGIAR comprises 15 Research Centers which work in partnership under 12 thematically research programs and 3 platforms in close collaboration with hundreds of partner organisations, including national and regional research institutes, civil society organisations, academia and the private sector. It is the largest network of agricultural research organisations in the world. CGIAR research is dedicated to reducing rural poverty, increasing food and nutrition security for human health, and improving natural resource systems and ecosystem services.

In addition to CGIAR, the Global Program also engages with, and supports, a range of other organisations and associations and manages these relationships to ensure they remain effective and jointly beneficial. These include the African Union, the Asia-Pacific Association of Agricultural Research Institutions (APAARI), the Association of Southeast Asian Nations (ASEAN), the Australia Africa Universities Network (AAUN), the Centre for Agricultural Biosciences International (CABI), the Food and Agriculture Organization of the United Nations (FAO), the Forum for Agricultural Research in Africa (FARA), the Group of 20 (G20) Meeting of the Agricultural Chief Scientists (MACS), the Pacific Community (SPC), the World Bank and the World Vegetable Center (WorldVeg), among others. In recent years, support for many of these bodies has grown.

ACIAR's strategy under the Global Program is to be both a valued donor and a strong research partner in the international agricultural research arena. Through active working relationships with the IARCs and the provision of timely, reliable and consistent funding and strategic research and governance input, ACIAR continues to ensure that Australia is held in high esteem by international agricultural research sector and donor communities.

### New modalities—co-investment partnerships

ACIAR's Global Program also manages new modalities of procurement, primarily through co-investment partnerships. Under co-investment modalities, the design and management of the research is shared between donors. These partnerships signify strong trust and enable each partner to leverage complementary research strengths and to invest in more ambitious research than either could achieve through working alone. Three such successful partnerships are undergoing development of a second phase, which may result in different thematic focuses and/or geographies. These are described further below.

## CGIAR

There is no other agri-food research entity that is more connected with the international development agenda, governments, civil society and communities at the global, national, subnational and local levels than CGIAR. It has unparalleled capacity and presence on the ground in over 100 countries with a critical mass of world-class scientists conducting interdisciplinary research that combines biophysical and social sciences to deliver development impact at scale. Its beneficiaries include producer groups (smallholder farmers, forest users, pastoralists and fishers), poor urban and rural consumers, social groups, and processors and traders. The outcomes from CGIAR investment contribute to the United Nations Sustainable Development Goals and advance the interests of developed and developing countries alike.

CGIAR delivers significant economic and social returns on investment. Every dollar invested in CGIAR yields at least US\$17 worth of benefits. Benefits of CGIAR wheat research, for example, range from US\$2.2 billion to US\$3.1 billion per annum—up to a 100-fold return on investment. In 2016, crop bio-fortification work being undertaken by CGIAR was awarded the World Food Prize.

The Australian Government's aid program aims to promote prosperity, reduce poverty and enhance stability. CGIAR scientific and policy research have contributed both directly and indirectly the strategic goals of the Australian aid program, including the Department of Foreign Affairs and Trade's (DFAT's) 2015 *Strategy for Australia's aid investments in the agriculture, fisheries and water sectors*. ACIAR has been a regular funder and research partner to the CGIAR system since 1982 and Australian agriculture is a beneficiary of this research, reflecting the importance of some of the crops and agro-climatic conditions encompassed by CGIAR, as detailed in the Crawford Fund's 2013 report *Doing well by doing good*. For example, germplasm from IARCs—including the International Maize and Wheat Improvement Center (CIMMYT), the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and the International Center for Agricultural Research in the Dry Areas (ICARDA)—has helped to keep Australian farmers competitive in world markets by increasing yields and/or reducing costs. ICRISAT germplasm has been incorporated into, and greatly improved, the Australian sorghum breeding system. Similarly, chickpea genome decoding by an international consortium led by ICRISAT, which included scientists from Australia, has been a success story. Chickpea improvement in Australia has been heavily dependent on germplasm from ICRISAT in India and Syria. International research collaboration with the International Livestock Research Institute (ILRI) through exchange of livestock germplasm has led improvements in the productivity of Australia's livestock sector. In the areas of biosecurity and biodiversity, IARCs have also made contributions to Australia.

ACIAR provides both unrestricted (or core) and restricted project funds to the CGIAR Trust Fund. A new fund was established in 2017 and is managed by the World Bank as Trustee. Approximately half of the funding support ACIAR contributes to CGIAR is provided at a system or research program level. The remaining funding is delivered through specific research partnerships between ACIAR researchers and individual centres. ACIAR's annual contributions to the CGIAR system and other IARCs are shown in the table below. These allocations are reviewed and recalibrated annually.

Australia's funding to the CGIAR system is as follows:

CGIAR funding	Unrestricted	Project specific	Total
	A\$m		
2015-16 actual	18.30	17.38	37.19
2016-17 budget	18.30	14.10	32.40
2017-18 budget	16.00	12.93	28.93

In 2016, a new CGIAR System Organisation was established. Under the new governing instrument—the Partnership Framework—ACIAR will continue to actively engage in supporting CGIAR governance through membership on the System Council and its Standing Committees. Considerable work is now being undertaken to design an improved results-based performance management system for CGIAR Research to strengthen the evidence base for future funding allocation. In recognition of the downward pressure on traditional donor budgets, ACIAR will also support the resource mobilisation activities being explored by CGIAR, including the development of innovative finance mechanisms to attract new types of investors. Utilising the existing national forums of the International Agricultural Coordination Group and the CGIAR Australian Leadership Group (CALG), ACIAR will also ensure Australian agencies and participants in CGIAR are consulted and a coordinated view for engagement is promoted.

To ensure the quality and value for money of Australia's ongoing contributions to CGIAR, in 2017-18, ACIAR will:

- lead the development of a coordinated Australian engagement with CGIAR, including consultation with DFAT and other Australian agencies, primarily through the International Agricultural Coordination Group and CALG, which ACIAR established in 2015
- participate in the governance of the CGIAR system through membership on the CGIAR System Council and its Standing Committees
- support the Independent Science and Partnership Council (ISPC) and Independent Evaluation Arrangement (IEA) and other activities of the System bodies
- collaborate with donors through participation in the activities of the Fund Effectiveness Working Group
- support the development of innovative finance mechanisms for CGIAR
- ensure involvement of ACIAR Research Program Managers in the technical oversight of CGIAR Research Programs.

## Support for IARCs and networks

ACIAR makes contributions to IARCs that are not affiliated with CGIAR. During 2017-18, ACIAR will continue to work with and support CABI and WorldVeg. ACIAR also contributes to regional network organisations that support collaborations in science and research, and broader issues of social and economic development. In 2017-18, ACIAR will work with, and continue to support, SPC, APAARI and AAUN. ACIAR's collective contribution to these

organisations has grown substantially over the past 10 years. The 2017–18 financial year sees almost A\$1.6 million budgeted for support to these five entities.

## Centre for Agricultural Biosciences International (CABI)

CABI is an intergovernmental, not-for-profit organisation established by a United Nations treaty, of which Australia is a member country. With its headquarters in the United Kingdom, CABI has a network of offices throughout Europe, the United States of America, Africa, South America and Asia. CABI addresses issues of global concern, such as food security, through science, information and communication. The main CABI activities are international development and research, publishing and microbial services. CABI works to improve global food security, combat threats to agriculture and the environment from pests and diseases, protect biodiversity from invasive species, and improve access to agricultural and environmental knowledge.

Australia's investments in CABI have contributed to improved agricultural outcomes for developing countries, and delivered benefits back to Australian agriculture. During 2017–18, ACIAR will work with CABI and support the continued growth of the award-winning CABI-led Plantwise program, as well as other CABI initiatives. ACIAR will also contribute to and partner with CABI through specific ACIAR research projects.

## World Vegetable Centre (WorldVeg)

WorldVeg is an international non-profit research and development institute committed to alleviating poverty and malnutrition in the developing world through the increased production and consumption of vegetables. WorldVeg disseminates improved varieties of vegetable crops and promotes improved production methods to help farmers, in developing and developed countries alike, to increase vegetable harvests, raise incomes, create jobs and provide healthier, more nutritious diets. Investment in WorldVeg is an investment in research into the nexus between agriculture, livelihoods, nutrition and health. ACIAR provides funding to WorldVeg that is both unrestricted and through specific research programs that are led by or implemented in partnerships that include WorldVeg. Among these projects is a 4-year, A\$2 million project on the establishment of the International Mungbean Improvement Network through ACIAR's Crop Improvement and Management (CIM) Research Program. Mungbean research by WorldVeg is an example of significant benefits that WorldVeg has brought to Australian agriculture as the mungbean varieties being grown across much of tropical Queensland and northern Australia for many years are derived from the WorldVeg breeding program. WorldVeg also holds breeds of tomato with

genetic resistance to tomato yellow leaf curl virus. This virus poses an ongoing threat to the Australian tomato industry.

## Pacific Community (SPC)

The Pacific Community (SPC; previously known as the Secretariat of the Pacific Community) is the principal scientific and technical organisation in the Pacific region, working to support development since 1947. SPC is an international development organisation, owned and governed by its 26 country and territory participants. SPC works in seven key areas pertinent to development in the Pacific region, including climate change, disasters, non-communicable diseases, gender equality, youth employment, food and water security and biosecurity for trade. The strategic direction of SPC is set out in its Pacific Community Strategic Plan 2016–2020. SPC is a key partner for DFAT in the delivery of Australia's wider strategies to support strong benefits from the region's fisheries sector in particular. ACIAR works directly with two divisions of SPC: Land Resources Division (LRD) and Fisheries, Aquaculture and Marine Ecosystems (FAME). A recent external review highlighted that LRD provides important services in the region that are largely unfunded; namely, coordinating activities, catalysing priority setting and enabling dialogue across the partner states. These are valuable services for ACIAR as well, helping us target our investments in the region. ACIAR is committed to supporting SPC to maintain the institutional capacity to sustain these capabilities. For that reason, in 2016, ACIAR began providing targeted core funding to LRD and FAME for 3 years. A partnership agreement is in preparation that will outline how SPC will monitor and report on how this funding is helping sustain FAME and LRD's regional strategic roles and build a stronger strategic partnership with SPC.

## Asia-Pacific Association of Agricultural Research Institutions (APAARI)

APAARI promotes and coordinates the national agricultural research institutes in the Asia-Pacific region, through inter-regional and inter-institutional cooperation. APAARI has released its Strategic Plan 2017–2022: *Pathways to strengthened agri-food research and innovation systems in Asia and the Pacific*. The strategic priorities laid out in this plan are used as input by ACIAR into its wider regional consultation process.

ACIAR provides annual, unrestricted funding to APAARI for research communication, advocacy for agricultural biotechnology, support for training programs and participation in expert consultations with national agricultural research system (NARS) leaders in the region. In addition, starting from

July 2017, the Global Program is funding a 2-year A\$1 million project, led by the International Food Policy Research Institute (IFPRI), to collect the Agricultural Science and Technology Indicators (ASTI) for South-East Asia. The aim of the project is to reduce the knowledge and information gap on the inputs, performance and outcomes of agricultural research systems in the region and to build a solid foundation for the long-term monitoring of agricultural research investment and capacity.

## Australia Africa Universities Network (AAUN)

Launched in 2012, the Australia Africa Universities Network (AAUN) is a group of leading universities in Australia and Africa that connects researchers and academics through institutional partnerships, to address challenges facing both continents. Led by the University of Sydney and the University of Pretoria, the network fosters a growing relationship between Australia and Africa by building on current educational and research links. Since it began, AAUN has established several intercontinental, multidisciplinary research programs that address mutual challenges in the areas of food and nutrition security, climate and environment, and higher education related to these areas. Australian universities in AAUN include the Australian National University, the University of Adelaide, Curtin University, Flinders University, the University of Melbourne, the University of New England, the University of Sydney and others. From Africa, the network includes the University of Pretoria in South Africa, the University of Nairobi in Kenya, Makerere University in Uganda and Eudardo Mondlane University in Mozambique, among others. ACIAR will be supporting its ongoing successes in research into food security, agriculture, nutrition and public health.

## 2017–18 research program

### Co-investment partnerships

In addition to multilateral partner support and management, 2017–18 will also see the Global Program manage a number of co-investment programs. Co-investment programs allow ACIAR to: harness the complementary skills of the partners; leverage ACIAR funds; and engage in larger and more ambitious programs than could be afforded if ACIAR funded them alone. Over the last year, ACIAR has been consolidating the achievements and planning future phases of three of these co-investment partnerships. Together they have leveraged additional funds of A\$8.2 million (87%) beyond ACIAR's investment, highlighting the confidence held in ACIAR as a co-investment and research partner. These three co-investment partnerships are described below.

## CultiAF—Cultivating Africa's Future, Phase 2

In 2017–18, ACIAR will continue a very successful partnership with the Canadian International Development Research Centre (IDRC). The 4 years from 2013 to 2016 saw ACIAR and IDRC implement a jointly funded competitive grants facility—CultiAF. The facility supported eight projects across five countries in eastern and southern Africa, in areas including postharvest management, food processing, nutrition, and business opportunities and value chains. Following a positive external evaluation of the program and the IDRC–ACIAR partnership, it was agreed to initiate a 10-year second phase of the partnership and 2017–18 will see arrangements for developing this second phase and the first 5 years of its funding get underway.<sup>1</sup>

## Alliance for Agricultural R&D for Food Security

The Alliance for Agricultural R&D for Food Security is a joint initiative between ACIAR, the Crawford Fund and the Syngenta Foundation for Sustainable Agriculture (SFSA). The Alliance established a collaborative relationship under which partners explore innovative collaborations and approaches to research for development activities and project delivery by utilising joint funding and the unique, diverse strengths and expertise of the parties to better promote and achieve food security. The first of these co-investments was in a highly successful project entitled *Demand-led plant variety design for emerging markets in Africa*. The purpose of the project was to contribute to the transformation of African agriculture by enabling small-scale farmers to better participate in markets, by increasing the availability of high-performing plant varieties that meet market demands. The project developed a guide for how to conduct consultations for demand-led plant breeding; tools for how to develop business cases for investments in improved breeding; and teaching aids and materials. The project has engaged extensively with the plant-breeding and university sectors in many countries, towards having a truly comprehensive and transformative effect on plant breeding, small-scale agriculture and food security in Africa. A small research project is planned to provide wider access for plant breeders to the outcomes from this research.<sup>2</sup>

## Africa–Australia Plant Biosecurity Partnership (AAPBP)

AAPBP aims to improve national and regional quarantine and plant protection capacity through creating a regional network of experts to increase crop yields, enable regional trade, expand international market access and secure greater food security for the region. In recognition of the world-class strength and experience of Australia's



biosecurity agencies, biosecurity scientists and private-sector partners from Burundi, Ethiopia, Kenya, Malawi, Mozambique, Rwanda, Tanzania, Uganda, Zambia and Zimbabwe have been working with the Plant Biosecurity Cooperative Research Centre, the Crawford Fund and Australian agencies in knowledge sharing and capacity development. The project has been implemented in partnership with CABI.

ACIAR and partners are now working to ensure the sustainability of the regional network and community of practice that has been built around plant disease protection, surveillance and diagnosis over the last 2 years. The Common Market for Eastern and Southern Africa (COMESA) trade group is committed to supporting the AAPBP Network into the future as it is well aligned to contribute to the delivery of COMESA's priorities and obligations. The private sector sees value in, and is keen to build on, its partnerships with the National Plant Protection Organisations (NPPOs) through the network. ACIAR will provide funding for a Network Coordinator to be hosted in COMESA during 2017-18 and the Crawford Fund will provide support for an Australia-based mentor who would work alongside and assist the coordinator.<sup>3</sup> ACIAR is currently exploring the feasibility of developing a similar program in the Pacific region in partnership with other Australian Government agencies active in biosecurity capacity development in this region.

## Other research

ACIAR's Global Program is funding an International Food Policy Research Institute (IFPRI)-led project on Agricultural Science and Technology Indicators (ASTI) for South-East Asia which will build capacity in APAARI as the long-term coordinating agency. ASTI provide open-source data on agricultural research systems across the developing world. ASTI are generated by a large network of national collaborators who collect, compile and disseminate information on the financial, human and institutional resources at both country and regional levels across government, higher education, non-profit and, where possible, private-for-profit agricultural research agencies. The 2-year project (mid-2017 to mid-2019) will reduce the knowledge and information gap on the inputs, performance and outcomes of agricultural research systems in the South-East Asian region and build a solid foundation for the long-term monitoring of agricultural research investment and capacity.<sup>4</sup> These outputs will play an important role in guiding agricultural research investment decisions, including those of ACIAR, which invests significantly in research projects in the region.

Much success and evidence from around the world demonstrates the benefits of feeding children at school for nutrition, educational outcomes, employment and enhanced national economic growth. Locally sourced school meals promote economic opportunities for the surrounding smallholder farming

systems and can also integrate a diverse range of underutilised and highly nutritious foods, which also supports local biodiversity. ACIAR will continue funding research into opportunities to include highly nutritious vegetables into school feeding programs and other public procurement. A small research project will be conducted during 2017, implemented by Bioversity International, the Kenya Agricultural and Livestock Research Organization (KALRO) and the Sustainable Income Generating Investment Group (SINGI) (a Kenyan non-government organisation). The initial research investigated the potential for the increased production of African leafy vegetables by smallholder farmers in Busia, Kenya, and their subsequent integration into institutional school feeding programs. The project successfully raised awareness of the biodiversity, nutrition and local market development opportunities afforded by local, underutilised and highly nutritious indigenous plants and follow-up work will support a scale-up phase of this pilot.<sup>5</sup>

## 2017-18 key performance indicators

The Global Program key performance indicators for 2017-18 are:

- Effective participation by ACIAR in the CGIAR strategic governance, research oversight and timely support as a member of the System Council, with Australian perspectives and contributions valued by the System
- Successful development of an ambitious new 10-year research program and continuation of a vigorous partnership with IDRC
- The AAPBP Network is embedded into an African regional institution as an active and well-supported network for eastern and southern Africa

### *General Manager, Global Program*

Ms Mellissa Wood

## Current and proposed projects

<sup>1</sup> *(Joint partnership with IDRC) Cultivate Africa's Future (CultiAF)*

<sup>2</sup> **GP/2017/011** SFSA Alliance demand-led plant breeding—consolidation—phase 2 (proposed)

<sup>3</sup> **C2013/079** (Plant Biosecurity Cooperative Research Centre) Australia–Africa Plant Biosecurity Partnership (AAPBP)

<sup>4</sup> **GP/2016/093** Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific

<sup>5</sup> **GP/2017/007** School Food Revolution: evaluating opportunities for further research

# CAPACITY BUILDING: EDUCATION AND TRAINING

Formal training	A\$m
2015-16 actual	8.08
2016-17 budget allocation	9.00
2017-18 budget	8.18

## 2017-18 priorities

Building capacity in partner countries is a key priority for ACIAR. In the second half of 2016-17, ACIAR conducted a review of its capacity building program with a view to launching a suite of new activities in 2018-19.

The 2017-18 year will be one of transition for the capacity-building program, with current programs continuing while work is completed on designing the new, enhanced program and implementing the necessary arrangements needed for delivery.

Depending on the outcome of the review, ACIAR is considering broadening the program to add activities that may include a range of short courses as well as capacity-building programs targeting specific areas, and developing skills in Australian researchers when key gaps are identified.

The new program is likely to approach capacity building from individual, organisational, national/system and regional levels.

## Postgraduate training

During 2017-18, ACIAR will continue to provide John Allwright Fellowships. They are awarded to partner-country scientists involved in ACIAR-supported collaborative research projects to undertake postgraduate training, usually at Masters or PhD level, at Australian universities. Studies focus on areas related to the topic or theme of the ACIAR project in which the awardee is engaged.

ACIAR also provides scholarships for up to 16 (usually around 12) candidates each year to undertake postgraduate diploma and Master of Science degree studies at the University of the South Pacific (USP). Citizens of seven Pacific island countries (Fiji, Kiribati, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu) are eligible and Masters students undertake their thesis-related research in close collaboration with an ACIAR-funded project in the region, on a topic of high priority to one of ACIAR's Pacific partner countries. Since 2016, an Australian university with a strong research interest in the Pacific region has entered

into a 'twinning scheme' with USP to strengthen and support the further development of the scholarship program. Each year, A\$500,000 goes to USP for scholarships and its management of the scheme and A\$150,000/year goes to the Australian university that will provide the 'twinning' (i.e. mentoring).

## Research management training

During 2017-18, ACIAR will offer 10 John Dillon Fellowships to provide career development opportunities in Australia for outstanding mid-career agricultural scientists and economists from ACIAR partner countries. The aim is to develop the leadership skills of Fellows in the areas of agricultural research management, agricultural policy and/or extension technologies through exposure to Australian agriculture across a range of best-practice organisations involved in research, extension and/or policymaking. ACIAR has awarded over 100 fellowships since the program's inception in 2002, with approximately 10 fellowships offered annually.

## ACIAR alumni

ACIAR maintains links with John Allwright and John Dillon fellows after they return to their home countries. Alumni continue their interaction with ACIAR in various ways, including leadership roles in ACIAR projects, and delivery and tutoring roles in in-country training courses. Alumni are also invited to in-country functions, including country consultations, training activities and impact assessment meetings. They are also potentially involved in ACIAR's programs as project partners and leaders. They regularly receive ACIAR corporate documents, the *Partners in research for development* magazine and technical publications.

In 2017-18, ACIAR will refresh its strategy for engaging with alumni in line with the recommendations of the review of the capacity-building program, and design and implementation of the new program.

## Cross-program training

ACIAR supports training activities of the Crawford Fund ([www.crawfordfund.org](http://www.crawfordfund.org)), which offers short technical training workshops in partner countries and placements for developing-country scientists in Australia. Practical, highly focused instruction is given to trainees who are selected from, and return to, ongoing research and development (R&D) projects in countries in which Australian firms, institutions or

agencies are already playing a role. Training can be either individual, through a training award, or in a group through training courses.

The Crawford Fund Master Classes program identifies new areas of knowledge that are changing the way research is conducted, particularly in developing countries. Master Classes are primarily aimed at mid-career agricultural scientists, senior administrators, senior academic personnel, decision-makers and public servants in developing countries. Each class consists of 12–20 participants, with a desired aim of equal participation of men and women.

## 2017–18 key performance indicators

- At least 15 students to have successfully completed postgraduate awards in 2017–18
- Size and management of the John Allwright Fellowship program is within budget allocation
- The John Dillon Fellowship program receives overall positive feedback from participants in post-program evaluation activity
- The new ACIAR capacity-building program is finalised and arrangements put in place for delivery from 2018–19

### *Program management*

A committee of senior staff under the chairmanship of ACIAR's General Manager Outreach and Capacity Building, Ms Eleanor Dean, provides guidance on training priorities and awards.

The Project Officer, Capacity Building, currently Mr Geoff O'Keefe, is the contact point for John Allwright (postgraduate) and John Dillon Memorial (research management) fellowships.

# RESEARCH PROGRAM IMPACT ASSESSMENT

Impact assessments	A\$m
2015-16 actual	0.43
2016-17 budget allocation	0.60
2017-18 budget	0.53

## Position

ACIAR has a long history of assessing the impacts of its research investments on smallholders and communities in our partner countries and Australia over time after project completion. These assessments of impacts, or progress towards impact, have contributed as evidence in accounting for ACIAR investments to stakeholders in demonstrating the net benefits from ACIAR projects. The impact assessment findings and lessons identified from them also contribute to ACIAR priority setting and the design and management of new ACIAR programs and projects. These ex-post assessments ensure ACIAR continues to engage with research partners and project participants, further developing their skills and understanding of research for development (R4D) investments, beyond the formal life of the research projects themselves.

The Impact Assessment Program commissions two broad types of finished project assessments. The first are published in ACIAR's Impact Assessment Series and consist of economic impact assessments which are usually undertaken by independent assessors with special expertise in measuring the impact of agriculture, fisheries and forestry-related research. Increasingly, assessments are undertaken by multidisciplinary teams to capture and measure economic, social and environmental impacts and capacity building arising from the project(s). They involve returning to projects after project completion, typically 5 years or more, and undertaking an in-depth analysis of the adoption and impact of project outputs in the partner countries and Australia. While a robust approach to impact assessment has been developed with a focus on economic assessment, this is supported, where appropriate, with various methods to capture and describe environmental, social and capacity-building outcomes and impacts. A focus on 'impact pathways' is now included, in which the path from a body of research to impact is articulated. This approach provides an in-depth analysis of the contextual environment, key stakeholders, pathway linkages, any changes that have occurred and actions that could be undertaken to increase the likelihood of the ultimate goals being reached.

The second type of finished project evaluations are Adoption Studies, which are undertaken by the Australian or partner-country project leader 3-4 years after completion of the project, and provide ACIAR with information on the difference the project has made at scientific and community levels in the partner countries and Australia. They are designed to provide ACIAR and its project partners with a greater understanding of the adoption pathways for outputs and outcomes of research that have evolved during and after the project has been completed in the targeted communities. If uptake of the project results has not occurred, the reasons why are sought, and these findings contribute to a better understanding of the contextual environments in which ACIAR and its partners operate.

ACIAR continually refines and adapts the impact assessment methods applied to ensure that their outputs meet the needs of stakeholders, including the Australian Government and partner-country institutions. As an illustration, ACIAR recently published an impact assessment that adapted, refined and tested a framework that links research with policy outcomes to analyse how and to what extent research-derived knowledge flows have occurred among different actors in development contexts. The framework was applied to ACIAR-funded aflatoxin-reducing projects in Indonesia with the finding that subsequent scientific outputs led to tangible intermediary impacts on social networks and policy developments. The resulting capacity and knowledge flows meant the ACIAR projects have had longer term development impacts, influencing policies, knowledge flows and associated research, government and industry networks. Qualitative and quantitative approaches such as these are vital to ACIAR's increasingly complex research projects and programs.

The Impact Assessment Program supports the capacity of research partners in assessing impacts from R4D activities. In 2017-18, joint impact activities with key research partners in the Pacific region and the Philippines will be undertaken to explore and apply mixed-method approaches to assess environmental, social and economic impacts of previous ACIAR research projects. In addition, the smallholder adoption tool, ADOPT (Adoption and Diffusion Outcome Prediction Tool), is being made available for use by project teams to better understand, and plan for, adoption of appropriate research outcomes by smallholders and their communities among our partner countries.



## 2017–18 priorities

### Evaluation for accountability and lessons learned

- Assess the impacts of ACIAR’s research, with an emphasis on measuring the impact of agricultural research on productivity and economic engagement of smallholders and capacity building among research and extension partners
- Undertake an ex-ante impact assessment of the ‘Sustainable intensification of maize–legume cropping systems for food security in eastern and southern Africa’ (SIMLESA) Program
- Complete the 2017 project leader Adoption Studies report for a set of projects concluded in 2012–13

### Capacity building

- Undertake joint impact assessments with Philippines country partners as a co-learning activity for participants exploring alternative approaches to assessing impacts of environmental and social impacts from agricultural research investments

## 2017–18 key performance indicators

- At least four reports are completed in the Impact Assessment Series
- Annual project leader Adoption Studies report is completed
- Impact assessments from ACIAR investments are completed using mixed-method approaches to include environmental and social impacts alongside economic impacts—assessments to include smallholder mariculture of giant clams in the Pacific region and the Philippines, and the SIMLESA Program
- Training courses are undertaken for project teams and partner-country organisations in impact pathway analysis and impact assessment

### *Program management*

Dr Andrew Alford, Impact Assessment

# OUTREACH PROGRAM

Communicating research results	A\$m
2015-16 actual	0.63
2016-17 budget allocation	0.59
2017-18 budget	1.50

## Communicating our work

ACIAR is renewing its communication program with a greater focus on raising the profile of the organisation.

A key activity in 2017-18 will be the completion of ACIAR's website redevelopment project. The new website will appeal to a broader audience and include a greater use of photographic imagery and infographics. An interactive map will allow users to find projects in the countries where ACIAR works. By clicking on the map, information on the projects will appear. Significantly upgraded search functionality will allow users to search for information by key themes as well as technical terms. The website content will be in plain English with links to research reports. Video content will be present throughout the site.

ACIAR's flagship publication, *Partners in research for development*, will continue to be produced in hard copy and widely distributed in Australia and overseas. A greater number of research reports, adoption studies and other technical publications will be published online only. Tailored communication activities will be implemented to ensure that key audiences and stakeholders are aware of these documents and able to access them easily.

Social media is a key mechanism to communicate both overseas and in Australia. In 2017-18, ACIAR will focus on building its social media following by continuing to publish engaging content with a greater use of video. On a regular basis, posts will be sponsored to ensure they reach a larger audience than the people already following ACIAR.

Working closely with the Crawford Fund, ACIAR is actively working to generate positive media coverage of its work. Story ideas will be regularly pitched to media outlets, including those in regional Australia. ACIAR is looking to develop long-term partnerships with the media to communicate to Australian audiences about the value of international agricultural research both domestically and internationally.

ACIAR is exploring opportunities to work in partnership with free-to-air television networks to reach a greater number of Australians with awareness-raising messages about the organisation.

Video is taking a greater role in ACIAR's communication program, with a suite of new videos scheduled for production. These will tell the stories behind ACIAR's projects in an easy-to-digest format and be distributed through social media, on our website and played at conferences and other events.

ACIAR is exploring the feasibility of employing communication experts in its country offices and in 2017-18 will trial this concept. Subject to the outcome of the trial, we will look to expand this approach in the future.

The benefits to Australia from ACIAR's work will be the subject of a dedicated communication and stakeholder engagement campaign. This campaign will target key decision-makers and opinion leaders. It will seek to raise awareness of ACIAR and the benefits of agricultural research both overseas and in Australia. Political leaders, agriculture peak bodies and associations and the university and research community are the focus for this campaign.

Following the success of the inaugural ACIAR photography competition, a second competition will be launched in 2017-18 with an invitation to the broad ACIAR community to submit high-quality photographs demonstrating the benefits of ACIAR projects. The best photographs will be incorporated into a portable exhibition, along with information about ACIAR. This will be on show at key agricultural events, such as field days and royal shows.

ACIAR will publish its annual report, corporate plan and other key operational documents which will be available via our website and in limited numbers of hard copies.

## 2017-18 key performance indicators

- The new ACIAR website is completed and launched publicly
- Social media following increases by 500 people per month across the platforms
- At least one mainstream media story mentioning ACIAR is published/broadcast per month
- Three issues of *Partners in research and development* are published
- ACIAR photography competition is implemented and exhibited in a minimum of five locations
- Research publications are produced in a timely manner, with accompanying communication and distribution strategies
- A minimum of 18 new videos are produced and promoted
- All statutory and legislative reporting and information requests are met in an efficient and timely manner

### Program management

Ms Eleanor Dean, General Manager, Outreach and Capacity Building

# CORPORATE PROGRAMS

Corporate programs	A\$m
2015-16 actual	11.34
2016-17 budget allocation	11.61
2017-18 budget	10.91

## Position

Corporate programs underpin the effective and efficient project development and management of the Centre and are integral to managing a diverse portfolio across partner countries. There are the nine overseas offices, mostly at Australian diplomatic posts, where country office staff play a key role in managing stakeholder relations and ensuring that partner-country priorities are reflected in ACIAR's work. The corporate area also supports these officers at post.

There are three key components of corporate management within ACIAR:

- Finance, Procurement and Legal
- Human Resources
- Business Systems.

The Finance, Procurement and Legal team is responsible for delivery of key finance, procurement and legal functions.

Human Resources influence the culture and wellbeing of the agency through developing policy and implementing practical solutions on all human resource matters, including recruitment, induction, learning and development, performance management, work health and safety, and workplace diversity. The Human Resources area is also responsible for the management of workplace relations and the implementation of the ACIAR Enterprise Agreement.

The Business Systems unit works with people, processes and technology to provide access to ACIAR's information and knowledge for staff and external stakeholders, and is responsible for the provision of information technology (IT) services, including design and delivery of information and communication technology management and systems. The unit also manages compliance in the areas of records and information management, web accessibility, freedom of information, privacy and the Information Publication Scheme.

## 2017-18 priorities

### Finance, Procurement and Legal

- Provide high-quality financial management for ACIAR, and report both internally and externally in an accurate, legally compliant and timely manner
- Contribute to business and strategic planning initiatives in ACIAR, including policy and procedure development
- Provide an effective legal and intellectual property framework and high-quality advice for ACIAR's research programs and corporate activity, including assistance in the negotiation of related international and domestic agreements
- Manage and provide advice on ACIAR's tendering and procurement (including travel) functions, ensuring adherence to government procurement rules and requirements
- Support the Audit Committee in both its operational and strategic agendas
- Contribute to the management, maintenance and development needs of ACIAR's business systems, and work to integrate key agency financial information systems to better meet business and user needs
- Manage ACIAR's property arrangements, in Australia and overseas.

### Human Resources

- Manage workplace relations and implementation of ACIAR's Enterprise Agreement and other agreements for staff engaged overseas, in accordance with current Australian Government policy
- Ensure that work health and safety legislation is appropriately incorporated into the ACIAR policies and procurement framework, including training in, and awareness of, individual responsibilities under the legislation
- Ensure that staff have an awareness of ACIAR's values and encourage senior management to be champions and role models for appropriate behaviours
- Ensure the integration and development of both our locally engaged staff and those who work remotely
- Maintain ACIAR's workforce planning framework, ensuring that strategies are in place for the right people to be in the right job at the right time

## Business Systems

- Maintain the current business systems to deliver on core business requirements
- Contribute to the development and implementation of new business systems to ensure that infrastructure, information and records management, and technology issues are taken into account with new system implementation
- Manage records and information management practices consistent with Australian Government standards, and support a compliant information environment
- Manage the maintenance and development, and provide helpdesk services, for ACIAR's Bbusiness systems environment, including project management requirements, records management, and internal and external communication requirements, and work to meet business and user needs
- Further improve the whole-of-agency's remote access capabilities, utilisation of web conferencing and other communication applications within the constraints allowed by a secure environment and overseas telecommunications facilities

## 2017-18 key performance indicators

- Departmental and administered costs are maintained within agreed budget parameters
- All legislative, reporting and information requirements and requests are met in an efficient and timely manner
- Business systems meet the needs of ACIAR and the Australian Government in a secure, efficient and effective manner
- A safe and productive workforce is supported with appropriate policies and procedures

### *Corporate manager*

Mr Albert Blair, Chief Finance Officer



# Appendixes

# APPENDIX 1: ACIAR'S SENIOR MANAGEMENT

ACIAR's **Chief Executive Officer** (CEO) is responsible to the Minister for Foreign Affairs and is assisted by an advisory body—the Senior Management Team (SMT)—to achieve good governance of the agency, with particular emphasis on performance and accountability. Performance relates to the agency's overall results, including the successful delivery of programs. Accountability relates to the visibility of results to the Australian Government, the Parliament and the community; and conformity with applicable legislative and policy requirements as well as public expectations of openness, transparency and integrity.

Along with the CEO, SMT members are listed below, along with their key responsibilities.

The **General Manager, Country Programs** (GMCP) is responsible for overseeing the bilateral research activities across the Indo-Pacific region. The GMCP leads the development of country strategies and prepares country/regional budget proposals for approval by the CEO. This work is done in collaboration with the **Research Program Managers** (RPMs) to:

- manage strategic planning and budgeting
- ensure effective project development, reports and reviews
- manage stakeholder liaison
- oversee key country stakeholder relationships.

The **General Manager, Global Program** (GMGP) is responsible for overseeing ACIAR's engagement with International Agricultural Research Centres (IARCs), which are primarily, but not exclusively, associated with CGIAR. This includes strategic interactions with the CGIAR Research Programs. The role also manages ACIAR's engagement with whole-of-government global and multilateral forums, such as the Group of Twenty (G20) and Food and Agriculture Organization of the United Nations (FAO).

The **Principal Adviser** (PA) position combines RPM responsibilities with a variety of strategic planning and budgeting activities. These include working directly with the CEO to identify future research directions, managing impact and research evaluations, and acting as a senior point of contact in a number of interagency and government relations activities. The position also supports the CEO in managing ACIAR's expanding multilateral research agenda.

The **Chief Financial Officer/Head of Corporate Services** (CFO) is responsible for the management of all corporate services for ACIAR, to meet its corporate objectives and discharge its responsibilities, including government and statutory reporting obligations.

Key components of the function include:

- human resources management
- information technology management
- business and financial management
- property and facilities management
- corporate reporting
- operational policy and procedures.

The **General Manager, Outreach and Capacity Building** (GMOCB) is responsible for the management of all ACIAR outreach and capacity-building activities, raising ACIAR's profile and contributing to government and statutory reporting obligations.

Key components of the function include:

- communications and stakeholder engagement
- capacity building (funded by Official Development Assistance)
- parliamentary and ministerial liaison.

This business model highlights the importance of an integrated approach to bilateral, regional and multilateral engagement underpinned by effective corporate functions. The model has the flexibility to accommodate adjustments and tasking to meet new whole-of-government issues and the Australian Government's aid program. It is also designed to work with an increased emphasis on innovative project delivery and varied approaches for engagement with national, regional and international agricultural research organisations.

The structure strengthens ACIAR's in-house technical and development expertise and the Centre's responsiveness to new demands from stakeholders. It is tailored for enhanced, on-the-ground research impacts and capacity-building research delivery.

## ACIAR staffing

	Australia FTE <sup>a</sup>	Overseas <sup>b</sup>
2014-15 (actual)	49	20
2015-16 (actual)	53.4	23
2016-17 (estimate)	54	25
2017-18 (estimate)	54	25

<sup>a</sup> FTE = full-time equivalents engaged under the *Public Service Act 1999*

<sup>b</sup> Actual staff positions on 30 June (includes full- and part-time positions)



# APPENDIX 2: ABBREVIATIONS

AAPBP	Africa–Australia Plant Biosecurity Partnership
AAUN	Australia Africa Universities Network
ACIAR	Australian Centre for International Agricultural Research
ADP <sup>a</sup>	Agricultural Development Policy
AGB <sup>a</sup>	Agribusiness
AH <sup>a</sup>	Animal Health
AIP	Aid Investment Plan (DFAT)
AOP	Annual Operational Plan
APAARI	Asia–Pacific Association of Agricultural Research Institutions
ASEAN	Association of Southeast Asian Nations
ASEM <sup>a</sup>	Agricultural Systems Management
ASLP	Agriculture Sector Linkages Program
AVCCR	Agriculture Value Chain Collaborative Research (Program)—Aik Saath
CABI	Centre for Agriculture and Biosciences International
CEO	Chief Executive Officer
CIM <sup>a</sup>	Crop Improvement and Management
CIMMYT	International Maize and Wheat Improvement Center (Mexico)
CSE <sup>a</sup>	Cropping Systems and Economics
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CultiAF	Cultivate Africa’s Future
DFAT	Australian Government Department of Foreign Affairs and Trade
FAO	Food and Agriculture Organization of the United Nations
FIS <sup>a</sup>	Fisheries
FSC	Food Security Centre (used in ACIAR project codes)
FST <sup>a</sup>	Forestry
GDP	gross domestic product
GMCP	General Manager, Country Programs (used in ACIAR project codes)
GP	Global Program (used in ACIAR project codes)
HORT <sup>a</sup>	Horticulture
IARCs	International Agricultural Research Centres
ICAR	Indian Council of Agricultural Research
ICARDA	International Center for Agricultural Research in the Dry Areas (Lebanon)

ICM	integrated crop management
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics (India)
IDRC	International Development Research Centre (Canada)
IFAD	International Fund for Agriculture Development (Italy)
IFPRI	International Food Policy Research Institute (USA)
ILRI	International Livestock Research Institute (Kenya)
IRRI	International Rice Research Institute (Philippines)
LPS <sup>a</sup>	Livestock Production Systems
LWR <sup>a</sup>	Land and Water Resources
NARS	national agricultural research systems
NGO	non-government organisation
PARDI	Pacific Agribusiness Research for Development Initiative
PCAARRD	Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development
PHAMA	Pacific Horticultural and Agricultural Market Access
PIC	Pacific island country
PNG	Papua New Guinea
R&D	research and development
R4D	research for development
RPM	Research Program Manager
SFSA	Syngenta Foundation for Sustainable Agriculture
SIMLESA	Sustainable intensification of maize–legume cropping systems for food security in eastern and southern Africa
SMCN <sup>a</sup>	Soil Management and Crop Nutrition
SPC	Pacific Community (previously Secretariat of the Pacific Community)
TADEP	Transformative Agriculture and Enterprise Development Program (Papua New Guinea and the Autonomous Region of Bougainville)
TAR	Tibet Autonomous Region
USP	University of the South Pacific
WorldVeg	World Vegetable Center

<sup>a</sup> ACIAR research program



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