



Australian Government

Australian Centre for  
International Agricultural Research

# ACIAR

## ANNUAL OPERATIONAL PLAN 2016–17



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### **ACIAR Annual Operational Plan 2016–17**

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Cover photo: Unloading fish in the port of Jepara in Central Java.

Source: Tony Bartlett, ACIAR

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# PREFACE

The Australian Centre for International Research (ACIAR) 2016–17 Annual Operational Plan (AOP) is the third developed within the timeframe of the Centre's Strategic Plan 2014–18. It has been developed within the context of the Australian Government's aid policy and performance framework, and under the guidance of the Commission for International Agricultural Research and ACIAR's Policy Advisory Council.

This AOP's development has been undertaken in an increasingly dynamic operating environment. Australia sits in the fastest growing region in the world. For example, our northern neighbour, Indonesia, is now a vibrant democracy of quarter of a billion people, with a growing middle class. Spectacular growth in Asia, with rapidly urbanising populations connected to the global marketplace and to each other, has created new opportunities for ACIAR collaborations in agribusiness and value-chain research, particularly with the private sector.

But the benefits of the regional transformation have not been shared by all, and ACIAR's partnerships give particular emphasis to benefiting the most disadvantaged and marginalised sectors of society. ACIAR targets economic growth in the agriculture sector because it is well known and well accepted that growth in this sector is far more effective at reducing poverty than growth in any other sector of the economy.

This AOP demonstrates how ACIAR's programs capitalise on the Australian Government's innovation and science agenda. ACIAR harnesses Australia's agricultural innovation system for the benefit of developing countries and Australia. ACIAR's partnerships generate jobs and growth, and promote innovation and enterprise.

The AOP is a key operational, management and accountability document for ACIAR. It provides a comprehensive catalogue of activity for the 2016–17 year. It describes annual deliverables, and identifies key outputs at project level, and outcomes at country level. These provide the basis for our subsequent annual report to Parliament. The programs detailed in the AOP are shaped by regular formal and informal consultations with developing-country and Australian stakeholders to identify priorities for research collaboration. The AOP outlines how ACIAR will progress these research priorities on a regional and country-by-country basis.

ACIAR continues to help strengthen people-to-people links in our region. The AOP describes our formal and informal capacity-building programs, and lays out the research partnerships that entail regular exchanges of researchers and industry stakeholders throughout our region.

ACIAR is wholly reliant on the capabilities and skills of its many Australian and international partners. In Australia, these include the Commonwealth Scientific and Industrial Research Organisation (CSIRO), state and federal government departments, universities, private-sector entities, Cooperative Research Centres, industry bodies and non-government organisations. We acknowledge their contribution.

ACIAR is on track to achieve the goals it set out in its Strategic Plan 2014–18. All of the specific actions outlined in the Strategic Plan have been, or are being, implemented. This AOP articulates how ACIAR intends to maintain and strengthen its proud track record of delivery and impact. The provisions of the AOP will be taken forward by the incoming Chief Executive Officer, who will take the Centre and its agenda forward from August 2016.

If more information is required about any aspects of ACIAR's activities, contact details are in the Corporate Directory at the end of the document. Our website <[aciar.gov.au](http://aciar.gov.au)> is also a key gateway to our operations.



**Dr Nick Austin**  
ACIAR Chief Executive Officer

A handwritten signature in black ink, appearing to read 'N. Austin'.



**Mr Don Heatley OAM**  
Chair ACIAR Commission

A handwritten signature in black ink, appearing to read 'D. Heatley'.

The Australian Centre for International Agricultural Research (ACIAR) is Australia's specialist international agricultural research for development (R4D) agency. It contributes to Australia's aid objectives for countries of the Indo-Pacific region through bilateral and multilateral research partnerships designed to improve the productivity and profitability of their agricultural systems and the capacity of their associated innovation systems. The main intended beneficiaries of these programs are farmers, rural poor, consumers, researchers and policymakers in developing countries. Australian farmers and researchers also benefit. This Annual Operational Plan (AOP) outlines the research programs in 2016–17, at global, regional and country levels, through which ACIAR will achieve these outcomes.

These programs are directly guided by the Australian Government's development policy<sup>1</sup>, ACIAR's Strategic Plan 2014–18<sup>2</sup> and ACIAR's Corporate Plan 2015–19.<sup>3</sup> The research programs align with key sectoral priorities outlined in the *Strategy for Australia's aid investments in agriculture, fisheries and water*.<sup>4</sup> At global, regional and country levels, the programs are adjusted on an annual basis in response to changing national and international priorities, issues and needs.

ACIAR remains committed to gender equity in the design, delivery and impact of all its activities. We strive to ensure our investments and partnerships bring sustained change to both women and to men. ACIAR's commitment mirrors the Australian Government's aid policy focus on gender equality and women's empowerment.

In addition to the research programs, this AOP highlights the activities to be supported by ACIAR in building capability related to R4D, and in improving institutional effectiveness and efficiency.

## Productivity, profitability and sustainability of agricultural systems

ACIAR supports research on productivity, profitability and sustainability of agricultural systems through research programs in four research clusters: crops; livestock and fisheries; natural resources and forestry; and socioeconomics and policy. In recognition of the growing challenges for poor rural producers flowing from increasingly globalised

agri-food chains—including pressures on environmental and livelihood sustainability, women's access to resources and unlocking the potential of private sector for the rural poor—multidisciplinary approaches linking these research clusters will be a feature of much of ACIAR's new work. This AOP highlights many projects targeted at addressing issues affecting farm-level productivity and the competitiveness of both traditional and emerging value chains to achieve access to domestic and international markets, which will continue to be a primary focus of the research programs. This includes support for enhancing and promoting agricultural competitiveness and sustainability, increased market access, and value-chain efficiencies and effectiveness as a growing priority across all regions. These research programs have a strong focus on empowerment of women and girls and on private-sector engagement.

The majority of research projects described in this AOP (especially in South Asia and East Asia) include priorities for collaboration established through regular consultation directly with each country and re-evaluated each year. In the Pacific region, however, priorities for collaboration are established regionally in consultation with the Pacific Community (SPC; formerly the Secretariat of the Pacific Community), recognising that many of the problems of agriculture, fisheries and forestry are common across countries in the Pacific region. In Eastern and Southern Africa, strong regional and subregional organisations exist which establish agricultural research agendas. ACIAR especially aligns with and supports the priorities developed by the Forum for Agricultural Research in Africa (FARA) through the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) and the Centre for Coordination of Agricultural Research and Development for Southern Africa (CCARDESA). In the Asia–Pacific region, ACIAR engages actively with the Asia–Pacific Association of Agricultural Research Institutions (APAARI).

ACIAR also supports research on the productivity, profitability and sustainability of agricultural systems through its global program, primarily targeted at the International Agricultural Research Centres (IARCs) but including other international multilateral institutes and associations, notably the Association of Southeast Asian Nations (ASEAN), CABI (an intergovernmental, not-for-profit organisation), the Food and Agriculture Organization of the United Nations (FAO), SPC, the United Nations, the World Bank, the G20 and the World Vegetable Center (AVRDC).

A review of the Australian International Food Security Research Centre (AIFSRC) was completed in July 2015. The strengths and themes of the AIFSRC have been mainstreamed into ACIAR's core programs, and future projects in Africa are being delivered under ACIAR's established brand.

<sup>1</sup> Development policy, *Australian aid: promoting prosperity, reducing poverty, enhancing stability*; and performance framework, *Making performance count: enhancing the accountability and effectiveness of Australian aid*; for summary, see <<http://dfat.gov.au/about-us/publications/Pages/australias-new-development-policy-and-performance-framework-a-summary.aspx>>

<sup>2</sup> <<http://aciarc.gov.au/publication/cp027>>

<sup>3</sup> <<http://aciarc.gov.au/publication/corporateplan2015>>

<sup>4</sup> <[dfat.gov.au/about-us/publications/Pages/strategy-for-australias-aid-investments-in-agriculture-fisheries-and-water.aspx](http://dfat.gov.au/about-us/publications/Pages/strategy-for-australias-aid-investments-in-agriculture-fisheries-and-water.aspx)>

Acknowledging that many issues in agricultural, fisheries and forestry research involve transboundary elements (such as cross-border trade and biosecurity) and that ACIAR's partner countries often have common challenges to overcome through agricultural research collaboration, a significant number of the projects in this AOP are regional (involving at least two countries). These are highlighted at the start of each regional section. The recent implementation of the ASEAN Economic Community is likely to provide new impetus for regional cooperation in research and development, technology transfer and capacity building from ASEAN countries.

## Capability

ACIAR will continue to support the development of young professionals, in Australia and our partner countries, through direct involvement in research projects and through early career positions for agricultural graduates at ACIAR and in the countries in which it works. In 2016–17, ACIAR will manage its capacity-building program through both formal and informal schemes. Scholarships and fellowships (John Allwright Fellowships and John Dillon Fellowships) and other courses will be included under the Australia Awards banner. As part of the Australia Awards program, ACIAR fellowships will benefit from wider alumni networks, and broader communication and support systems. ACIAR will also continue to support a postgraduate scholarship scheme at the University of the South Pacific and small research funding schemes in several countries (for example, the Lao Agricultural Research Fund).

The research listed in this AOP contributes to capability development at both individual and institutional levels through:

- research partnerships with national agricultural research systems (NARS) in developing countries that provide for collaborative activities in projects with Australian scientists, enabling both individual researchers and institutions to learn by doing
- the inclusion of extension and communication activities in projects to allow for information transfer to researchers and farmers in developing countries
- involvement of farmers in field trials, farmer schools and demonstrations, where possible, to achieve adoption by practical communication of technical information
- applied training schemes for both developing-country farmers and researchers, including short-term university and vocational courses in certain disciplines and subjects
- research focused at developing capability in policy analysis and formulation.

## Improving institutional effectiveness and efficiency

ACIAR will continue to strive to be a learning organisation. During 2016–17, the Centre will mainstream lessons learnt from completed projects and activities throughout its work. ACIAR remains committed to a highly innovative business systems transformation through the implementation of a new business system known as ACE (ACIAR Collaborative Environment). ACE will provide increased mobility and access, network and information security and the opportunity to collaborate with project partners in a shared environment. It will also provide effective reporting and automated workflows, allowing ACIAR to remain responsive to different requirements and deliver on Australian Government requirements. The 2016–17 period will see a focus on ACE testing, change management, user training and support, and ongoing system improvement.

In response to the need for ACIAR to highlight and communicate its research results, and to tell the ACIAR story in a compelling way to a wider audience, ACIAR will develop stronger relationships with our implementing partners in Australia and overseas, including through stronger institutional relationships, regular joint assessment of country strategies for research collaboration, direct collaboration with the broader Australian aid program at Australia's overseas missions and in Canberra and with the Crawford Fund.

ACIAR recognises and supports the need to demonstrate that Australian aid is efficient and effective. ACIAR is an active manager of risk through our approach to design and delivery of research partnerships, has a zero tolerance of fraud, and ensures value for money through a rigorous process that has been demonstrated to deliver a high level of impact. ACIAR has a recognised and longstanding emphasis on independently assessing the impacts of the research it funds for purposes of accountability to stakeholders and future funding decisions. These assessments include adoption and impact studies at program and project levels. The Impact Assessment Program is an important source of evidence for ACIAR to demonstrate and enhance the effectiveness of ACIAR's research projects. During the year, this program will improve ACIAR's understanding and assessment of the value of capacity building occurring among individuals and organisations in a project, and help research teams better understand the socioeconomic factors influencing adoption of agricultural innovations by smallholder farmers.

## Overview of expenditure and funding

	2014–15 actual A\$m	2015–16 budget estimate A\$m	2016–17 budget estimate A\$m
<b>EXPENDITURE</b>			
Research program <sup>a</sup>	81.33	82.02	89.17
Global program <sup>b</sup>	19.81	17.43	19.24
Education and training <sup>c</sup>	8.23	6.43	9.00
Communicating research results	0.63	0.55	0.59
<b>Total administered costs</b>	<b>110.00</b>	<b>106.43</b>	<b>118.00</b>
<b>Total departmental costs<sup>d</sup></b>	<b>11.47</b>	<b>11.87</b>	<b>11.61</b>
<b>Total</b>	<b>121.47</b>	<b>118.30</b>	<b>129.61</b>
<b>FUNDED BY</b>			
Administered			
Administered appropriation	86.19	81.63	93.99
Special accounts	23.81	24.80	24.01
<b>Total administered funding</b>	<b>110.00</b>	<b>106.43</b>	<b>118.00</b>
Departmental			
Departmental appropriation	9.80	9.65	9.49
s 74 Retained revenue receipts <sup>e</sup>	1.40	1.88	1.63
Expenses not requiring appropriation <sup>f</sup>	0.27	0.34	0.49
<b>Total departmental funding</b>	<b>11.47</b>	<b>11.87</b>	<b>11.61</b>
<b>Total</b>	<b>121.47</b>	<b>118.30</b>	<b>129.61</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 2016–17

Region and Country	Target appopriation budget estimates	ACIAR base appropriation	DFAT and other external funding	Total country funding A\$m		2016–17 total budget estimate
	%	A\$m	A\$m	Country	Regional	A\$m
<b>Pacific</b>	<b>20.0</b>	<b>13.30</b>	<b>7.30</b>	<b>14.70</b>	<b>5.90</b>	<b>20.60</b>
Fiji		2.80	0.10	1.10	1.80	2.90
Kiribati		0.20	0.40	0.30	0.30	0.60
Papua New Guinea		6.10	6.00	11.40	0.70	12.10
Samoa		0.85	0.05	0.25	0.65	0.90
Solomon Islands		1.55	0.15	0.85	0.85	1.70
Tonga		0.80		0.40	0.40	0.80
Tuvalu		0.10			0.10	0.10
Vanuatu		0.90	0.60	0.40	1.10	1.50
<b>East Asia</b>	<b>47.0</b>	<b>31.10</b>	<b>3.50</b>	<b>25.90</b>	<b>8.70</b>	<b>34.60</b>
Cambodia		3.10		1.40	1.70	3.10
China		0.90		0.40	0.50	0.90
Indonesia		6.20	2.00	7.40	0.80	8.20
Lao PDR		5.30		2.70	2.60	5.30
Mongolia <sup>a</sup>		0.30			0.30	0.30
Myanmar		2.50	1.50	3.10	0.90	4.00
Philippines		5.30		4.90	0.40	5.30
Thailand		0.60		0.50	0.10	0.60
Timor-Leste		1.90		1.80	0.10	1.90
Vietnam		5.00		3.70	1.30	5.00
<b>South and West Asia</b>	<b>16.0</b>	<b>10.50</b>	<b>6.90</b>	<b>8.30</b>	<b>9.10</b>	<b>17.40</b>
Afghanistan			2.90		2.90	2.90
Bangladesh		3.30	0.30	1.80	1.80	3.60
Bhutan		0.20		0.20		0.20
India		4.15	0.85	2.70	2.30	5.00
Nepal		1.15	0.35	0.90	0.60	1.50
Pakistan		1.70	2.50	2.70	1.50	4.20
<b>Eastern and Southern Africa</b>	<b>17.0</b>	<b>11.30</b>		<b>8.60</b>	<b>2.70</b>	<b>11.30</b>
Botswana		0.30			0.30	0.30
Burundi		0.30			0.30	0.30
Ethiopia		2.20		2.10	0.10	2.20
Kenya		1.40		1.10	0.30	1.40
Malawi		1.10		1.00	0.10	1.10
Mozambique		1.60		1.30	0.30	1.60
South Africa		0.60		0.10	0.50	0.60
Rwanda		0.10		0.10		0.10
Tanzania		2.00		1.70	0.30	2.00
Uganda		0.40		0.40		0.40
Zambia		0.70		0.60	0.10	0.70
Zimbabwe		0.60		0.20	0.40	0.60
<b>TOTAL</b>	<b>100.0</b>	<b>66.20</b>	<b>17.70</b>	<b>57.50</b>	<b>26.40</b>	<b>83.90</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

	2014–15 actual A\$m	2015–16 budget estimate A\$m	2016–17 budget estimate A\$m
<b>Pacific</b>	<b>2.28</b>	<b>7.30</b>	<b>7.30</b>
Papua New Guinea	0.58	5.83	6.00
Pacific island countries	1.70	1.47	1.30
<b>East Asia</b>	<b>6.68</b>	<b>8.77</b>	<b>3.50</b>
Cambodia	0.08		
Indonesia	0.50	4.26	2.00
Myanmar	3.00	2.92	1.50
Timor-Leste	3.10	1.59	
<b>South and West Asia</b>	<b>8.50</b>	<b>5.73</b>	<b>6.90</b>
Afghanistan	3.50	3.47	2.90
Pakistan	1.90	0.60	2.50
India	0.80	0.37	
Climate-resilient farming systems Eastern Gangetic Plains	2.30	1.29	1.50
<b>Eastern and Southern Africa</b>	<b>1.22</b>		
Africa	1.20		
Iraq	0.02		
<b>Other</b>	<b>5.13</b>	<b>3.00</b>	<b>6.31</b>
Postgraduate scholarships	4.60	3.00	
Department of Environment/CIFOR <sup>a</sup>	0.50		
Food System Innovation	0.03		
Funding under negotiation			6.31
<b>TOTAL</b>	<b>23.81</b>	<b>24.80</b>	<b>24.01</b>

<sup>a</sup> Center for International Forestry Research

## Capacity building and training – student numbers

	2012–13 (actual)	2013–14 (actual)	2014–15 (actual)	2015–16 (actual)	2016–17 (estimate)
John Allwright Fellows: total active in year	111	111	138	130	140
John Allwright Fellowships awarded in year	28	27	27	27	23
John Dillon Fellows: total active and awarded in year	10	10	10	10	10

The Australian Centre for International Agricultural Research (ACIAR) will provide funding in 2016–17 for bilateral and multilateral projects. Details of the proposed allocations are outlined in the relevant sections of this Annual Operational Plan. The bilateral activities comprise all projects involving Australian and developing-country research institutions in which an Australian organisation is commissioned to lead the project. In most cases, multilateral projects are led by the International Agricultural Research Centres (IARCs) under the umbrella of CGIAR. There are, however, other partnerships with non-CGIAR international research centres, including CABI and the World Vegetable Center (AVRDC).

Both bilateral and multilateral projects are operated by region and country, based on four regions:

- Pacific
- East Asia
- South and West Asia
- Eastern and Southern Africa

This regional division corresponds to the Australian Government Department of Foreign Affairs and Trade (DFAT) Australian aid program geographical structure. The focus in 2016–17 will remain in the Asia–Pacific region but with selected programs in eastern and southern Africa.

In all cases, the priorities for research and development (R&D) collaboration are presented at the country level, and project proposals are designed to address the partner-country national priorities together with Australian research capabilities. This approach, comprising collaborative undertakings between Australian and developing-country scientists, facilitates joint ownership, research harmonisation and collaborative management of results. This is in accordance with the key principles necessary for aid effectiveness.

In 2016–17, ACIAR will further enhance its role and performance in this respect through continued formal and informal consultations with partner countries and multilateral agencies on both priority-setting and project-selection processes, as well as suitable adoption and extension pathways to deliver outcomes and impact.

## Cross-cutting themes

ACIAR's country programs acknowledge the need to work with individual countries where there are unique or distinct aspects to the issues being considered, for example, in relation to climate or soils, availability of natural resources, institutional capacity, infrastructure, or potential for economic growth. At the same time there are many challenges in common that are best tackled through regional cooperation, such as plant and animal biosecurity, water use efficiency, and combatting climate change through research for development.

The Australian Government's aid policy has two principal strategic goals for recipient countries: private-sector development and human development. The two are intimately interlinked. ACIAR has a long track record working with the private sector in agricultural research. The public and private sectors have complementary and interactive roles to play in advancing research and innovation, including adoption and extension of technical, economic and agronomic information. With innovative private sector partnerships, agriculture, fisheries and forestry can be the driving forces behind a comprehensive economic transformation that delivers more equitable and sustainable growth.

ACIAR's policy places gender equity centrally in its activities. ACIAR assesses gender equity issues during project design, implementation and impact assessment to bring sustained change to women and men by influencing policies and laws, increasing access to services, and changing attitudes and beliefs about women's and men's roles in our agricultural research projects. By working to better understand access to—and decision-making power over—productive resources, such as land, livestock, agricultural equipment, extension knowledge and credit, ACIAR is better able to guide research on agricultural interventions so that benefits are accessible to women, men, girls and boys.

## Current country focus by research program

Country and Region	Economics and social sciences cluster			Crops cluster			Natural resources management cluster			Livestock and fisheries cluster		
	ADP	ASEM	AGB	CIM	CSE	HORT	LWR	SMCN	FST	AH	LPS	FIS
<b>PACIFIC</b>												
Papua New Guinea		●				●		●	●	●		●
Pacific island countries			●	●		●		●	●	●	●	●
<b>EAST ASIA</b>												
Cambodia		●			●	●		●	●	●		●
China	●		●							●	●	
Indonesia	●		●			●		●	●	●	●	●
Lao PDR	●	●			●	●	●	●	●	●		●
Myanmar		●	●	●			●	●		●		●
Philippines		●	●			●		●		●		●
Thailand					●	●		●	●	●		●
Timor-Leste				●						●	●	●
Vietnam	●		●					●	●	●	●	●
<b>SOUTH AND WEST ASIA</b>												
Afghanistan				●			●			●		
Bangladesh	●			●	●		●					
Bhutan						●						
India	●			●	●		●			●		
Nepal				●	●		●		●	●		
Pakistan	●			●		●	●				●	
<b>EASTERN AND SOUTHERN AFRICA</b>												
Eastern and Southern Africa				●	●	●	●		●	●	●	

ADP = Agricultural Development Policy

AGB = Agribusiness

AH = Animal Health

ASEM = Agricultural Systems Management

CIM = Crop Improvement and Management

CSE = Cropping Systems Economics

FIS = Fisheries

FST = Forestry

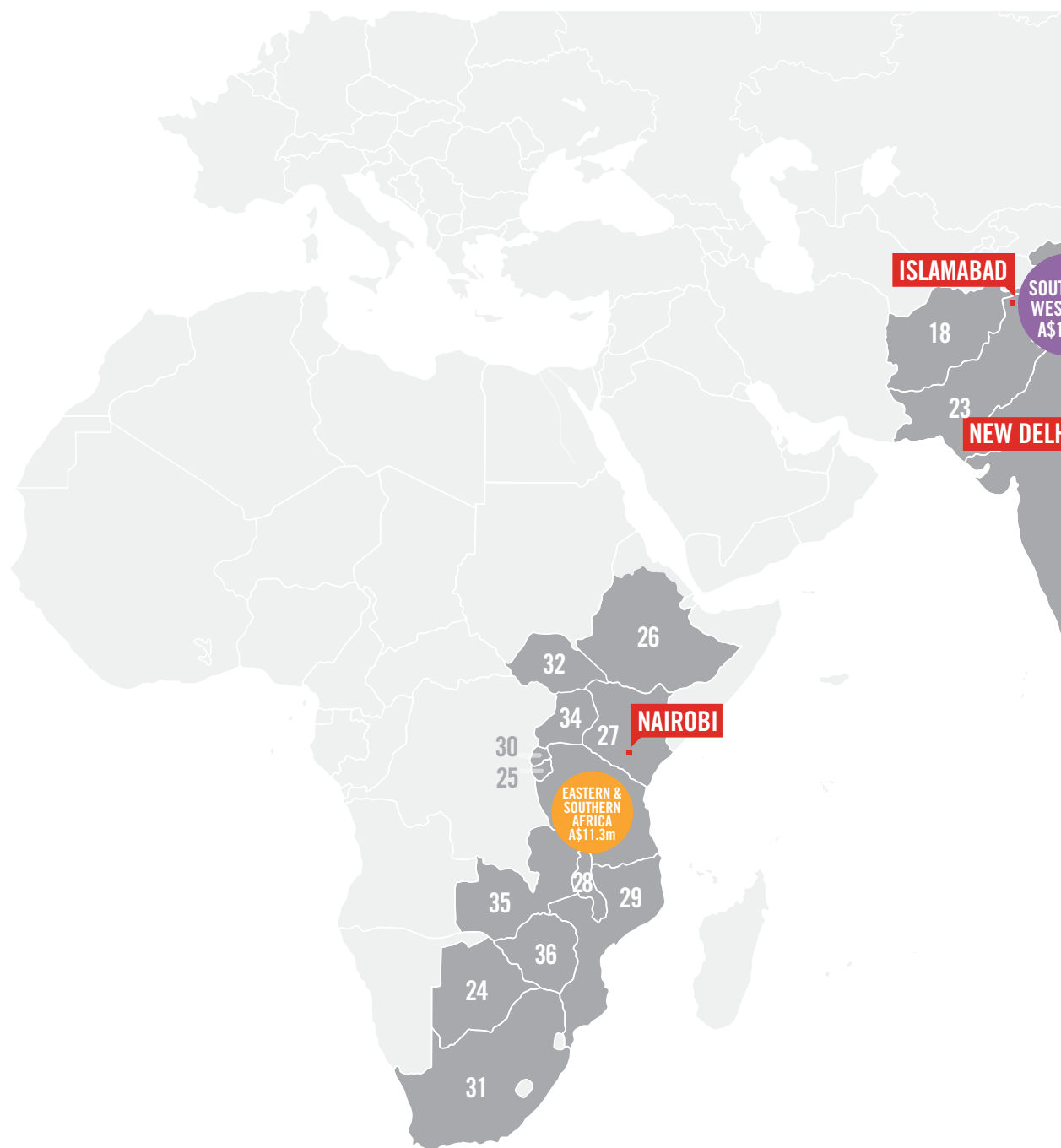
HORT = Horticulture

LPS = Livestock Production Systems

LWR = Land and Water Resources

SMCN = Soil Management and Crop Nutrition

## 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

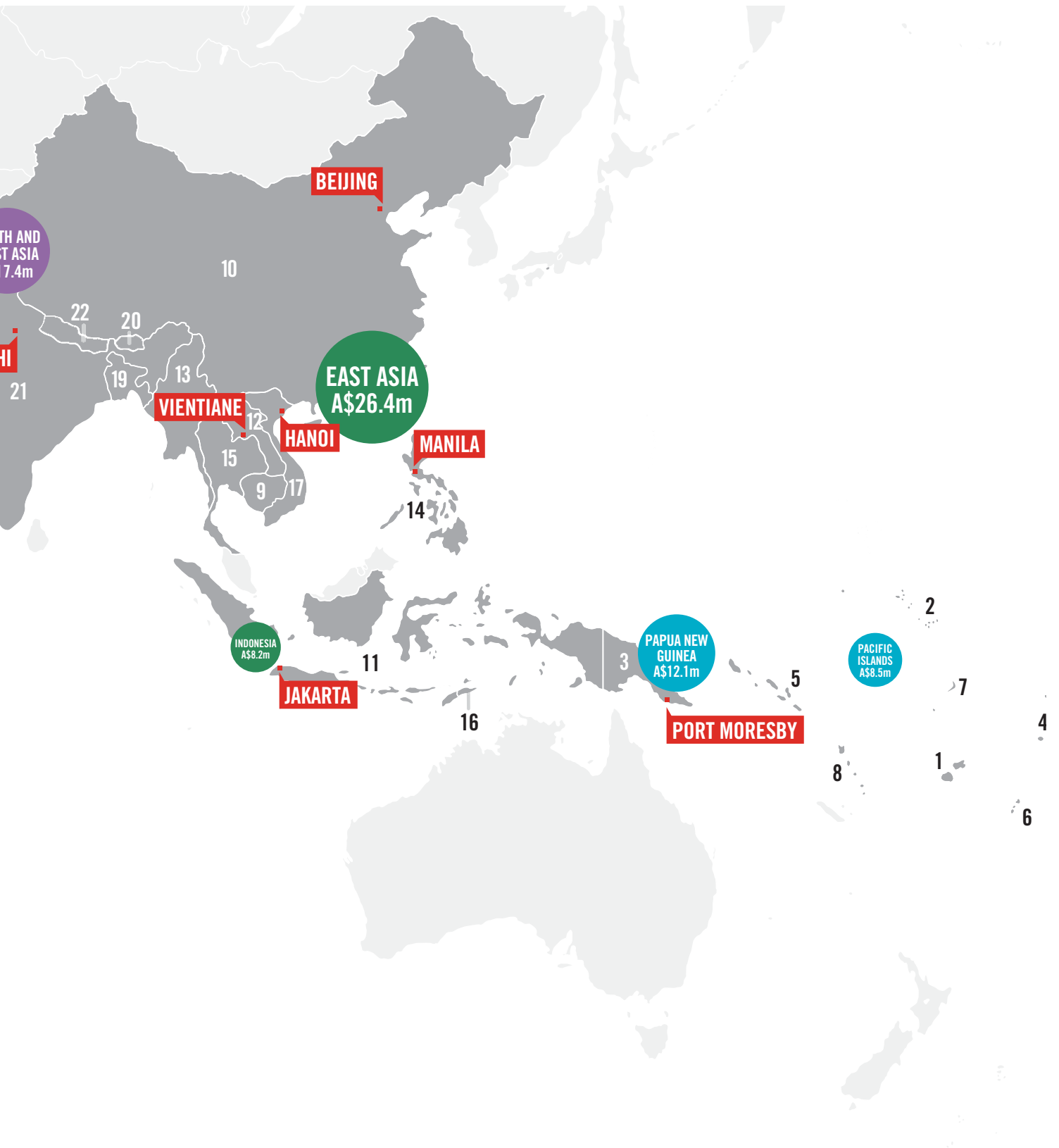
- 9 Cambodia
- 10 China
- 11 Indonesia
- 12 Lao PDR
- 13 Myanmar
- 14 Phillipines
- 15 Thailand
- 16 Timor-Leste
- 17 Vietnam

#### 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

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. As a result, the ACIAR medium-term strategy for the Pacific, while acknowledging individual country-partner needs and research and development (R&D) priorities, has a strong regional dimension.

It is recognised that the Pacific countries have particular research and adoption challenges related to the size of the country, 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.

This regional approach is evident through multicountry projects in fisheries (e.g. sea cucumber and community-based marine fisheries management), forestry (e.g. production of *Canarium* (galip) nuts, agroforestry products and coconut timber products), crops (e.g. sweetpotato, traditional vegetables, commercial vegetables, tropical fruits and cocoa) and fully integrated regional programs, such as the new phase of the Pacific Agribusiness Research for Development Initiative (PARDI), which will now consist of a cluster of projects with a cross-disciplinary unifying mechanism. 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.

These 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 the WorldFish Center; the World Vegetable Center (AVRDC); and bilateral research and extension agencies.

The projects (also listed in the country chapters) that each involve more than one country in the Pacific region are:

**AGB/2014/057** Identifying and sustaining pro-poor agribusiness opportunities for Pacific island countries—PARDI II agribusiness umbrella

**AGB/2015/014** Evaluation of livelihood impacts from agribusiness development opportunities in the Pacific (PARDI II)

**ASEM/2016/101** Climate-smart landscapes for promoting sustainability of agricultural systems

**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

**FIS/2012/074** (*multilateral, WorldFish*) Community-based fisheries management in Pacific island countries

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

**FIS/2009/057** Pearl industry development in the western Pacific

**FIS/2014/060** Developing pearl industry-based livelihoods in the western Pacific

**FIS/2015/031** Fish in national development: contrasting case studies in the Indo-Pacific region

**FST/2014/067** Enhancing value-added products and environmental benefits from agroforestry systems in the Papua New Guinea and the Pacific

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

**FST/2016/200** Developing DNA-based chain-of-custody systems for legally sourced teak

**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/2010/090** Strengthening integrated crop management research in the Pacific islands in support of sustainable intensification of high-value crop production

**HORT/2012/011** Understanding the responses of taro and cassava to climate change

**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

**HORT/2014/080** Integrating protected cropping systems into high-value vegetable supply chains in the Pacific and Australia

**LPS/2016/145** Small ruminant value chains and production systems in the Pacific island countries

**SMCN/2016/252** Soil management for adaptation to environmental change in Pacific island countries





# PACIFIC ISLAND

# COUNTRIES

Key statistics <sup>a</sup>	GDP per capita (US\$)	Population (million)
Fiji	5,112.3	0.89
Kiribati	1,509.5	0.11
Samoa	4,172.2	0.19
Solomon Islands	2,024.2	0.57
Tonga	4,114.0	0.10
Tuvalu	3,826.9	0.01
Vanuatu	3,148.0	0.26
Funding		A\$m
2014–15 actual		7.09
2015–16 budget		6.03
2016–17 budget		8.50

<sup>a</sup> Data for 2014 GDP and population from <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.**

*Aid Investment Plan, Pacific Regional, 2015–16 to 2018–19, DFAT*

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 assist 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 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 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 major international markets. In addition, erosion of tariff preferences, population and urban growth, migration of skilled labour, resource depletion and degradation, risks from climate change, high and 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. Agriculture, 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; tree crop production; and the 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.

Areas of southern and central Vanuatu were severely impacted by Cyclone Pam in March 2015, resulting in deaths, destruction of houses and damage to agricultural, fisheries and forestry systems. ACIAR has contributed to the rebuilding of research and development (R&D) infrastructure in forestry, fisheries and horticulture in the affected areas.

### Rationale for ACIAR approach

ACIAR recognises that PICs have many problems in common and that individual national 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 the unique characteristics warrants 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 support to 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

second 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 agriculture, the program will focus on identification and management of constraints to productivity, and on market understanding and engagement in high-value crops and livestock. It will assist in identifying suitable markets and developing new high-value horticultural crops (fruits, vegetables and ornamentals) and products derived from them for domestic, regional and international markets. 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 focuses on managing sustainable production from oceanic and inshore fisheries, developing alternative livelihood opportunities through aquaculture, and increasing economic returns through improved product quality and better market linkages. The forestry program promotes the development of value-adding forest industries, whereby landowners will derive benefits from both timber and non-timber forest products. There will be increased attention 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 is being strengthened to provide scholarships and 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 PICs in 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.

ACIAR is providing support to Vanuatu to assist with replacement and repair of horticulture, fisheries and forestry research facilities that were damaged or destroyed by Cyclone Pam.

Fiji's aquaculture suffered considerable damage in Tropical Cyclone Winston. A new multispecies hatchery at Rakiraki, including indoor facilities, outdoor tanks and broodstock brought in from other centres that were destroyed.

The damage to forests caused by the cyclone, the number of people affected and the breadth of locations is massive. Plantations in north-eastern and western Viti Levu are the most affected; some community pine plantations may have up to 70% of trees damaged. Tree ages are 11–37 years and the local people are working on salvaging most of these to be used in the rebuilding of houses in the area. A teak plantation in north-eastern Viti Levu sustained significant damage.

## 2016–17 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 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 supports the development of capacity to undertake ICM R&D work on a regional basis at SPC and with relevant member countries.<sup>1</sup> It 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. A second project focuses on managing plant protection problems in sweetpotato and yams, focusing on weevil pests in the former crop and viruses that prevent germplasm dissemination in the latter.<sup>2</sup>

Another project is exploring how cropping systems of key Pacific staple crops (taro and cassava) can be better managed to increase their resilience to climate change.<sup>3</sup> The physiological responses of these crops are currently little understood, so this project will use simulation modelling to investigate some of the likely impacts of climate change on their productivity. 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>4</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 production.

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, two projects on pearl culture in Tonga and Fiji are improving husbandry techniques along the entire production line, as well opening up new opportunities via segmentation of the pearl industry.<sup>5,6</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. A separate small research activity is assisting with initial investigations on the suitability of pearl-farming long-line systems to facilitate nursery culture of juvenile of giant clams<sup>7</sup>, which some farmers are interested in to support their diversification aspirations.

Development of the seaweed industry is the focus of a project operating in Fiji, Samoa and Kiribati.<sup>8</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, pharmaceutical products).

Aquaculture research on the freshwater fish, tilapia, is being undertaken in Fiji, Samoa and Vanuatu in conjunction with the aquaculture section of SPC.<sup>9</sup> The research focuses 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 Fiji and 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>10</sup> Another builds on an SPC initiative (*A new song for coastal fisheries*) and involves research on the role of fish in meeting nutritional needs of PICs over the next 20 years.<sup>11</sup> A third project is undertaking research on harvesting and processing of wild-caught sea cucumbers, specifically with the intent of improving processing quality and thus getting better returns for fishing communities.<sup>12</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 that will focus on improving Pacific livelihoods and making them more resilient through strategic, sustainable and inclusive agribusiness development.<sup>13</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. The project will develop, apply and test livelihood criteria and frameworks to identify agribusiness development

opportunities and measure the success of research outcomes.<sup>14</sup> 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. 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 (BSR), caused by the fungus *Ganoderma boninense*, poses a major threat to the industry, with BSR incidence increasing with each successive planting.<sup>15</sup>

## Horticulture

Within the framework of the new agribusiness initiative, a new project will strengthen cocoa value chains in the Pacific islands (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>16</sup>

Building on two promising activities initiated under the previous agribusiness initiative, a new full-scale project will develop 'protected cropping' as a means to improve the supply of high-value vegetables to domestic tourism and hospitality markets in Fiji and Samoa. In addition to trialling technical innovations, the project will help farmers to better organise themselves to produce and sell into these demanding markets.<sup>17</sup>

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 Pacific islands but mainly for local markets. Building on previous work with specific tree crops (papaya, breadfruit) and on the PARDI whole-of-value-chain approach to targeting interventions, a broadly based project is being launched to support the growth of this sector over several years.<sup>18</sup>

Two of these projects include research that specifically tackles resilience of farming systems in the face of climate change and extreme weather events. The cocoa project<sup>16</sup> will evaluate 'cyclone-resistant' cocoa production systems through trellising approaches to cocoa farming. It will also develop a regional genetic resource exchange strategy, principally to ensure that irreplaceable genetic resources are not lost to severe weather or geophysical events. 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>18</sup> includes activities to build tree crop resilience through improved management and dwarfing varieties, focusing on breadfruit (the most wind-impacted species).

### Livestock

Livestock research aims to increase productivity and improve 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>19</sup>

A proposed 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>20</sup>

### Forestry

The forestry projects relate to the development of locally appropriate systems for growing plantation trees such as teak, whitewood and other high-value native trees, as well as research into value-adding opportunities for the timber products. A project in Vanuatu aims to improve returns to landowners through enhancing the management and utilisation of whitewood-based plantation and agroforestry systems.<sup>21</sup>

In Solomon Islands, 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 Western, Malaita and Guadalcanal provinces, two projects are undertaking integrated research to enhance economic opportunities from teak-based agroforestry systems and secondary forest management systems<sup>22</sup> as well as the production of high-quality timber using chainsaw mills and solar drying.<sup>23</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>24</sup> This should contribute to greater resilience for local communities following cyclones, by providing income sources that will help them recover after such events. The project also aims to develop catchment revegetation systems linked to markets, such as tourism, that could fund these activities.

## 5-year country outcomes

- 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 smallholders growing teak or other timber species, such as whitewood
- Contribution to the development of land-use policies suited to transitioning to sustainable agroforestry sectors in Fiji and Vanuatu
- Increased understanding of the economic and social benefits of catchment rehabilitation and remediation strategies in Fiji and Vanuatu

## 2016–17 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
- Catchment rehabilitation trials established in three locations in Fiji and Vanuatu
- Report prepared on performance of, and benefits from, drying teak timber in solar kilns
- Consolidated report collated on elements and approaches for enhanced collaboration and increased engagement of smallholders in Vanuatu's whitewood forest industry

- 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

### Key Program Managers

Dr Chris Barlow, Fisheries

Mr Tony Bartlett, Forestry

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

Dr Werner Stür, Livestock Production

## Current and proposed projects

- [HORT/2010/090](#) Strengthening integrated crop management research in the Pacific islands in support of sustainable intensification of high-value crop production
- [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/2012/011](#) Understanding the responses of taro and cassava to climate change
- [SMCN/2014/089](#) Improving soil health, agricultural productivity and food security on atolls
- [FIS/2009/057](#) Pearl industry development in the western Pacific
- [FIS/2014/060](#) Developing pearl industry-based livelihoods in the western Pacific
- [FIS/2015/028](#) Investigating the long-line nursery system for giant clam (*Tridacna* sp.) farming in Savusavu Bay, Fiji
- [FIS/2010/098](#) Diversification of seaweed industries in Pacific island countries
- [FIS/2012/076](#) Improving community-based aquaculture in Fiji, Kiribati, Samoa and Vanuatu
- [FIS/2012/074](#) (*multilateral, WorldFish*) Community-based fisheries management in Pacific island countries
- [FIS/2015/031](#) Fish in national development: contrasting case studies in the Indo-Pacific region
- [FIS/2010/096](#) Improving postharvest processing and supply chains of sea cucumbers in Kiribati, Tonga and Fiji
- [AGB/2014/057](#) Identifying and sustaining pro-poor agribusiness opportunities for PNG and Pacific island countries—PARDI II umbrella
- [AGB/2015/014](#) Evaluation of livelihood impacts from agribusiness development opportunities in the Pacific (PARDI II)
- [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
- [HORT/2014/078](#) Aligning genetic resources, production and postharvest systems to market opportunities for Pacific island cocoa
- [HORT/2014/080](#) Integrating protected cropping systems into high-value vegetable supply chains in the Pacific and Australia
- [HORT/2014/077](#) Enhanced fruit production and postharvest handling systems for Fiji, Samoa, Tonga and Vanuatu
- [LPS/2014/037](#) Increasing the productivity and market participation of smallholder beef cattle farmers in Vanuatu
- [AH/2014/042](#) Improving the bee industry in Fiji, Papua New Guinea and Solomon Islands (proposed)
- [FST/2012/042](#) Enhancing management and processing systems for value-adding in plantation-grown whitewood in Vanuatu
- [FST/2012/043](#) Enhancing economic opportunities offered by community and smallholder forestry in Solomon Islands
- [FST/2014/066](#) Improving returns from community teak plantings in Solomon Islands
- [FST/2014/067](#) Enhancing value-added products and environmental benefits from agroforestry systems in Papua New Guinea and the Pacific

Additional projects due to begin in 2016–17:

[ASEM/2016/101](#) Climate-smart landscapes for promoting sustainability of agricultural systems

[FST/2016/158](#) Domestication and breeding of sandalwood in Fiji and Tonga

[FST/2016/200](#) Developing DNA-based chain-of-custody systems for legally sourced teak

[LPS/2016/145](#) Small ruminant value chains and production systems in the Pacific island countries

[SMCN/2016/252](#) Soil management for adaptation to environmental change in Pacific island countries

# PAPUA NEW GUINEA

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

GDP per capita (US\$)	2,268.0
Population (million)	7.50

Funding	A\$m
2014–15 actual	5.84
2015–16 budget	9.75
2016–17 budget	12.10

<sup>a</sup> Data for 2014 GDP and population from <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.**

*Aid Investment Plan, Papua New Guinea, 2015–16 to 2017–18, DFAT*

In 2015, the PNG Government released its Medium Term Development Plan 2 (MTDP2), 2016–2017, which describes the intentions, priorities and activities towards achieving its 'Vision 2050' aspirational long-term strategy. The overarching goals are for PNG to improve its Human Development Index ranking—aiming to be in the top 50 by 2050—through responsible, sustainable development. The National Agriculture Development Plan also aligns with Vision 2050 and MTDP2, and aims to enhance agricultural productivity, scale of production, market access and income generation through smart partnerships and innovative, sustainable and entrepreneurial farming systems and agro-industry.

Nearly two-thirds of PNG is forest and 97% of these forests are owned by customary landowners. The PNG Development Strategic Plan 2010–2030 includes a target to increase the proportion of harvested logs processed in PNG from the current level of 20% to 80% by 2030, to achieve a forestry sector that is sustainable, profitable and which enhances regional economies in PNG.

Australian aid funding aligns with both the PNG and Australian governments' priorities and is increasingly assisting PNG to use its own resources to effectively deliver services and grow the economy. A key focus of this program is enabling economic growth.

Increasing agricultural productivity and supply-chain efficiency for both domestic and export crops is essential to promote economic growth in the rural sector. ACIAR's PNG program recognises the many production, marketing and capacity-

building challenges to agricultural development in the country. ACIAR's research aims to help secure improvements in food supply, food access and incomes for rural communities through increased productivity and enhanced access to markets and services.

A key component of Australia's involvement with the agriculture sector in PNG is the ACIAR – Department of Foreign Affairs and Trade (DFAT) economic development program, in which DFAT co-invests in ACIAR-managed activities. The program—Transformative Agriculture and Enterprise Development Program (TADEP)—has five new impact-focused research for development (R4D) projects centred on economic development opportunities. The partnership focuses on opportunities to scale up successful ACIAR innovations, with full private-sector involvement, over larger areas and for more people. This will achieve economic benefits, especially increased employment and incomes in rural areas, and enhanced rural–urban supply chains. It will work in the sectors of greatest benefit to rural communities, and have a particular focus on the empowerment of women and commodities that can be brought to market.

In line with the increased emphasis on gender and youth in government policy, and because of the experience in many commodity projects with male-dominated farmers' groups, new skills are needed to engage with men, women and youth in communities, to support and build their contribution to their families and their community. A cross-commodity project focuses specifically on empowering women to engage in a range of economic activities.

## 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, while the fisheries and forestry programs have been informed by formal consultations in February–March 2016.

ACIAR's key research priorities in PNG, aiming to improve livelihoods by enhancing incomes and market access, are:

- 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
- enhancing germplasm quality for high-value tree species, improving community forestry and agroforestry systems and 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
- enhancing 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.

A program of discrete but interrelated projects has been developed against each of these seven priority research areas. Details of the research program and the existing projects are provided below. Projects focus on achieving measurable impacts that contribute to the development goals agreed between the Australian and PNG governments to achieve improvements in food supply, food access and rural incomes for smallholders through increased productivity and enhanced access to markets and services.

Several new projects are proposed to commence in 2016–17, some of which have a strong focus on private-sector engagement to facilitate greater market access for smallholder agricultural products. A country consultation to reassess priorities is planned for 2017.

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.

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.

## 2016–17 research program

This 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 farming communities. Research aims to help understand the factors affecting innovation, and to respond to socioeconomic and human factors 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.

### Social, cultural and policy constraints to impact

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. A proposed project will examine opportunities and constraints for women in making the transition from subsistence farming to cash and commercial enterprises.<sup>1</sup>



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. Their cocoa production is also threatened by the devastating cocoa pod borer (*Conopomorpha cramerella*). One project aims to understand the problems faced by these communities, and to design interventions to help them adapt and strengthen their livelihoods.<sup>2</sup>

### Vegetables and starchy staples

The production and sale of vegetables and starchy staples provide opportunities to increase and diversify household income. The ACIAR program in PNG aims to capitalise on these opportunities, with a particular emphasis on engaging women<sup>3</sup>, families and community groups in markets.

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 and proposed projects will further refine soil-management practices<sup>4</sup> and develop new options for managing weevils.<sup>5</sup> Both projects will provide technical support for a larger project, under the TADEP program, seeking to strengthen the entire value chain for sustainable and market-oriented sweetpotato-based production systems in the highlands.<sup>6</sup> The proposed work on weevils will be closely linked with a region-wide project that is developing options for the management of the same two weevil species in the Pacific islands.<sup>7</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 integrated crop management (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>8</sup>

This work in turn feeds into two new projects under TADEP, in Bougainville<sup>9</sup> and other major producing areas<sup>10</sup>, that will strengthen the value chain for cocoa and support related enterprise development, through the provision of better planting material, intensified production techniques and 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 proposed project linked to the TADEP cocoa projects.<sup>11</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>12</sup> The project is using molecular markers to identify and exclude the most susceptible clones from future oil palm plantings.

A new project aimed at aligning genetic resources, production and postharvest systems to market opportunities for Pacific island cocoa will draw on expertise from PNG and work collaboratively across PNG, Fiji, Samoa, Solomon Islands and Vanuatu.<sup>13</sup>

### Forestry and agroforestry, and value-adding processing

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

In Eastern Highlands, the Ramu–Markham valley and the Madang regions, research is focusing on enhancing livelihoods from community management of native and planted forests through scaling up and sustainable management of forests and plantations by traditional resource owners.<sup>14</sup> Two projects will focus 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>15,16</sup>

One project will enhance the availability of improved genetic resources to underpin emerging teak and sandalwood plantation industries.<sup>17</sup> Teak clonal seed orchards have been established in East New Britain, and sandalwood seed stands will be planted at three locations in Central and Gulf provinces. Another project aims to improve processing efficiency and foster market development for high-value *Canarium* (galip) nut products.<sup>18</sup>

## Fisheries and aquaculture

Fisheries and aquaculture products generate smallholder income, underpin food security and provide the potential for economic development. The ACIAR program 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>19</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 is 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>20</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>21,22</sup>

Other research assists the development of locally based coastal sportfishing ventures in PNG to enhance community livelihoods.<sup>23</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 capacity building across fisheries research, business and tourism. Another project aims to work with PNG scientists to characterise the shark and ray resource of PNG, and thereafter develop a framework for managing the fishery on a sustainable basis.<sup>24</sup>

ACIAR is assisting the National Fisheries Authority in developing the proficiency of fisheries research staff in PNG.<sup>25</sup> The project's aim is to understand the mechanisms, processes and functionality of an integrated capacity-building program to increase research and project-management skills underpinning aquaculture and fisheries projects in PNG, and to embed these skills within appropriate institutions.

## 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. The program 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 under the TADEP program.<sup>26</sup>

A proposed project aims to improve the production and marketing of honey in PNG, Solomon Islands and Fiji.<sup>27</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.

Another project is looking at the production, marketing and consumption of traditional vegetables, for nutritional benefits and as an alternative income source, particularly for women.<sup>28</sup>

## 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 recently launched project in plant health research seeks to improve understanding of Bogia coconut syndrome, a lethal disease of coconuts.<sup>29</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 new project aims to develop a delivery system to provide functional animal health and production services that meet the needs of smallholder farmers.<sup>30</sup>

## 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

## 2016–17 project outputs

- Report and extension leaflets published on silvicultural systems to improve returns from smallholder teak and sandalwood plantings
- New methods developed for small-scale value-added processing of *Canarium* (galip) nut that support development of new small businesses
- Best-bet market options identified for engineered wood products from PNG and Australia
- 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
- Collaborative research sites established for a program of sweetpotato-system research targeting sustainable production, diversification, value-chain development, value-adding and processing
- Evaluation sites established for the dissemination of improved cocoa varieties and integrated production technologies in at least three major cocoa-producing provinces
- Partnerships established to commence a project on enhancing smallholder livestock services
- Partnerships established to commence a project to improve the production and marketing of honey in PNG, Solomon Islands and Fiji

### Key Program Managers

Dr Chris Barlow, Fisheries  
 Mr Tony Bartlett, Forestry  
 Dr Jayne Curnow, Agricultural Systems Management  
 Dr Robert Edis, Soil Management and Crop Nutrition  
 Dr Eric Huttner, Crop Improvement and Management  
 Dr Richard Markham, Horticulture  
 Dr Mike Nunn, Animal Health

### Country Manager

Ms Emily Flowers

## Current and proposed projects

- <sup>1</sup> **ASEM/2014/054** Examining opportunities and constraints for Papua New Guinea women smallholders in the transition from subsistence farming to cash and commercial enterprises (proposed)
- <sup>2</sup> **ASEM/2012/072** Strengthening livelihoods for food security among cocoa and oil palm farming communities in Papua New Guinea
- <sup>3</sup> **ASEM/2014/095** Improving opportunities for economic development for women smallholders in rural Papua New Guinea
- <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 pest management options in support of intensification of sweetpotato production in Papua New Guinea (proposed)
- <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/2012/026** Developing more-effective management strategies for cocoa pod borer in new outbreak areas of Papua New Guinea
- <sup>9</sup> **HORT/2014/094** Developing the cocoa value chain in Bougainville
- <sup>10</sup> **HORT/2014/096** Enterprise-driven transformation of familycocoa production in East Sepik, Madang, New Ireland and Chimbu provinces of Papua New Guinea
- <sup>11</sup> **SMCN/2014/048** Improving soil fertility and health in Papua New Guinea integrated cocoa farming systems (proposed)
- <sup>12</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>13</sup> [HORT/2014/078](#) Aligning genetic resources, production and postharvest systems to market opportunities for Pacific island cocoa
- <sup>14</sup> [FST/2011/057](#) Enhancing the implementation of community forestry approaches in Papua New Guinea
- <sup>15</sup> [FST/2012/092](#) Enhancing value-added wood processing in Papua New Guinea
- <sup>16</sup> [FST/2014/065](#) Development of durable engineered wood products in Papua New Guinea and Australia
- <sup>17</sup> [FST/2014/069](#) Improvement and management of teak and sandalwood in Papua New Guinea and Australia
- <sup>18</sup> [FST/2014/067](#) Enhancing value-added products and environmental benefits from agroforestry systems in Papua New Guinea and the Pacific
- <sup>19</sup> [FIS/2014/062](#) Improving technologies for inland aquaculture in Papua New Guinea
- <sup>20</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>21</sup> [FIS/2009/057](#) Pearl industry development in the western Pacific
- <sup>22</sup> [FIS/2014/060](#) Developing pearl industry-based livelihoods in the western Pacific
- <sup>23</sup> [FIS/2013/015](#) Sustainable management of sport fisheries for communities in Papua New Guinea
- <sup>24</sup> [FIS/2012/102](#) Sustainable management of the shark resources of Papua New Guinea: socioeconomic and biological characteristics of the fishery
- <sup>25</sup> [FIS/2010/055](#) Building research and project management skills in fisheries staff in Papua New Guinea
- <sup>26</sup> [FST/2014/099](#) Enhancing private industry-led development of the *Canarium* nut industry in Papua New Guinea
- <sup>27</sup> [AH/2014/042](#) Improving the bee industry in Fiji, Papua New Guinea and Solomon Islands (proposed)
- <sup>28</sup> [ASEM/2012/084](#) Promoting traditional vegetable production and consumption for improved livelihoods in Papua New Guinea and northern Australia
- <sup>29</sup> [HORT/2012/087](#) Bogia coconut syndrome in Papua New Guinea: developing biological knowledge and a risk-management strategy
- <sup>30</sup> [AH/2012/032](#) Enabling smallholder livestock services in Papua New Guinea

Additional project due to begin in 2016–17:

[FST/2016/200](#) Developing DNA-based chain-of-custody systems for legally sourced teak







# **EAST ASIA**

# REGIONAL PROGRAM SUMMARY

The East Asia region is experiencing the fastest rates of economic growth in the world. Between 2000 and 2006, on average 1 million people were lifted out of poverty every week in this region. This was largely due to the decisions of the better-performing countries to invest in people, capital and institutional change, including an increasing role of markets.

Despite the continuing strong economic performance of some countries in the region, other countries (e.g. Lao PDR and Timor-Leste) continue to experience high rates of rural poverty. Furthermore, large areas of rural poverty still exist in the better-performing countries. Many Indonesians who have emerged from poverty remain just above the poverty line. In 2013, around 28 million Indonesians lived on less than rupiah (Rp) 293,000 (roughly A\$25) per month. An additional 68 million made do with not much more.

According to the World Bank in 2014, although it is considered a member of the 20 largest economies in the world, one-quarter of Indonesia's population was still vulnerable to falling back into poverty at any time. Small shocks, such as illness, disasters or job loss, can easily drive them back into poverty. The trend towards increasing urbanisation, population growth and expansion of domestic markets for agricultural products is creating both opportunities and challenges for farmers and the rural poor.

The Association of Southeast Asian Nations (ASEAN) is in the process of creating a single market and production base, called the ASEAN Economic Community, which will allow 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 countries in East Asia. 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: for example, a new project on grasslands management being developed with China and Mongolia; a climate change adjustment project progressing with China and Vietnam; and the deployment of biosecurity expertise and approaches, previously developed in Thailand, to Cambodia, Laos and Myanmar.
- 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 and proposed regional projects (also listed in the following country chapters) include:

**ADP/2011/039** Assessing farmer responses to climate change adjustment policy options

**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/2012/078** Innovative agribusiness opportunities for profitable and sustainable cassava value chains in South-East Asia

**AGB/2014/035** Improving livelihoods in Myanmar and Vietnam through sustainable and inclusive vegetable value chains (proposed)

**AGB/2015/006** Enhancing information access and research capacity for mango in Asia-Pacific (proposed)

**AGB/2015/007** Benefits of annual mango market and trade analysis in Asia-Pacific (proposed)

**AGB/2015/008** Opportunities and strategies to improve biosecurity, market access and trade for selected mango markets (proposed)

**AGB/2015/009** The economic potential and pilot options for enhancing mango customer quality in selected market chains (proposed)



**AGB/2015/010** Priority opportunities in tropical fruit processing in selected mango markets (proposed)

**AGB/2015/015** Analysis of mango markets, trade and strategic research issues in the Asia-Pacific

**AGB/2016/159** Beef trade model for South-East and China

**AGB/2016/196** Sustainable and inclusive cattle and beef industry development in South-East Asia and China

**AGB/2016/225** Evaluation of infrastructure and policy scenarios for reducing transport costs and improving market: case studies of smallholder agri-food value chain in Indonesia, Lao PDR and Vietnam

**AH/2010/045** Research support for the development of improved livestock biosecurity in the Mekong region (proposed)

**AH/2012/065** A regional approach to enhance smallholder pig systems in Timor-Leste and eastern Indonesia

**AH/2014/056** Improving small ruminant health, production and regional trade in Myanmar (proposed)

**ASEM/2012/081** Improving market engagement, postharvest management and productivity of Cambodian and Lao PDR vegetable industries

**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

**FIS/2010/042** Expansion and diversification of production and management systems for sea cucumbers in the Philippines, Vietnam and northern Australia

**FIS/2012/101** Development of mariculture technology for giant grouper in the Philippines, Vietnam and Australia

**FST/2012/091** Biological control of insect pests of plantations in the Mekong region

**FST/2014/064** Maximising productivity and profitability of Eucalypts and Acacias in Indonesia and Vietnam

**FST/2014/068** Management strategies for Acacia plantation diseases in Indonesia and Vietnam

**FST/2016/200** Developing DNA-based chain-of-custody systems for legally sourced teak

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

**SMAR/2008/025** Improved seaweed culture and postharvest waste utilisation in South-East Asia

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

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

# CAMBODIA

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

GDP per capita (US\$)	1,094.6
Population (million)	15.33

## Funding A\$m

2014–15 actual	2.85
2015–16 budget	2.92
2016–17 budget	3.10

<sup>a</sup> Data for 2014 GDP and population from <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 remains overwhelmingly rural, with 80% of the population living in the rural areas and agriculture employing 65% of the country’s labour force. Crop cultivation, along with livestock and poultry raising, are the most important agricultural activities supporting livelihoods and providing income to rural households. Fishing and aquaculture remain supplementary economic activities. However, while agriculture employs the majority of Cambodians, it contributes only around 30% of its gross domestic product (GDP).

Most poverty reduction has taken place in Cambodia’s rural areas, with more than 60% of the poverty reduction attributed to positive developments in the agriculture sector (e.g. higher rice prices stimulated the larger rice production that increased farm wages). Yet, rural Cambodia is where poverty remains overwhelmingly concentrated. In 2004, 89% of poor households lived in rural areas. By 2011, this increased to 91%.

The 2013 Agriculture Census showed that most rural households rely on temporary crops (crops that take less than a year to mature), given that 92% of plots are planted with these. Only 4% are being used to grow crops that take a year or more. According to the Food and Agriculture Organization of the United Nations (FAO), this makes the agriculture sector particularly vulnerable. Also, the productivity of most small farms remains low. Although these farms

increased their income over the years, it was achieved through higher rice prices and from wages earned outside of their own farms. With the exception of rice, the agro-processing industry has played a limited role in agricultural growth. Almost all crops exported to neighbouring countries were unprocessed, indicating major weaknesses in the value chain, particularly in the postharvest system of supply-chain management.

With agricultural growth slowing to below 2% in 2013–2014, World Bank experts have highlighted that at least 5% agricultural growth over the next 15 years is needed to keep real farm incomes growing and poverty reduction sustained. Given that most households that got out of poverty are actually just above the poverty line and thus remain vulnerable, the impressive gains in poverty reduction can be easily reversed.

Gender and poverty are also closely linked in Cambodia. In 2012, 22% of all households were headed by women. In 2011, the difference in income poverty rates between households headed by women and those headed by men appeared very small but once household composition is taken into account, female-headed households with more than two children and no adult males are much more likely to be poor and the girls more likely to be working.

The Royal Government of Cambodia is currently implementing its National Strategic Development Plan 2014–18, wherein enhancement of agriculture sector is a key foundation for the growth of the economy, including rural economy, equity and food security. The strategy involves: improving agricultural productivity and diversification; land reform and de-mining; fisheries reform; and forestry reform.

Australia has a long history of bilateral relationship with Cambodia and its development assistance is closely aligned to national priorities on economic growth and poverty reduction. Since resuming bilateral aid to Cambodia in April 1992, Australia has supported national development by implementing a complementary set of foreign, trade and aid policies. Based on Australia's current Aid Investment Plan (AIP) 2015–2018, there are three key objectives that guide its development assistance: (1) improving access to infrastructure; (2) increasing agricultural productivity; and (3) better health and education. Based on the 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, and improve the incomes of thousands of farmers.

## Country priorities

Australian support for Cambodia's agricultural development delivered by ACIAR aligns well with the AIP and the overall purpose of the aid program—to promote Australia's national interest by contributing to sustainable growth and poverty reduction. ACIAR's investment is important for the Royal Government of Cambodia since there is strong alignment with its development priorities. The priorities for collaboration with ACIAR are:

- 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 emphasises on product quality, postharvest handling and market-chain participation
- increased animal productivity through improved 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.

## 2016–17 research program

ACIAR supports research to address the five Cambodian priorities through the following two subprograms.

### 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.

Proposed 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 are also being analysed, with the aim of optimising the use of both water and fertiliser and enhancing the skill base at scientific, extension and community levels.<sup>2</sup> Other current research is examining issues related to soil conditions, water management, and non-rice grain and forage crop diversification through the dry season.<sup>3</sup> Labour shortages and soaring wage rates are stimulating the use of machines, such as combine harvesters and seed drills, and the links between field mechanisation and grain dryers to crop diversification are being investigated with the aim of improving smallholders' farming efficiency and profitability.<sup>4</sup>

### Improving diversification options for smallholders

#### Non-rice cropping systems

This project cluster largely focuses on improvement of farming systems for upland non-rice field crops and integration of new marketing arrangements that assist smallholder farmers. For example, one project is examining the potential role of livestock within maize and legume systems in north-western Cambodia.<sup>5</sup>

Plant biosecurity is being strengthened through a project, in combination with Laos and Thailand, aiming to develop biosecurity research and development (R&D) and technical diagnostic skills, to underpin development of potential international market opportunities for Mekong horticultural products.<sup>6</sup> This project will build on previous work in Thailand to develop a 'centre of excellence' that can act as a capacity-building and technical resource for the Mekong countries.

Establishment of fruit and vegetable supply chains for markets is also 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, Kandal and Kampot provinces.<sup>7</sup> The focus of this work will be on food safety, out-of-season production, supply chains for domestic markets and postharvest handling. Options for soil and water management in vegetable production will be analysed in both Cambodia and Laos.<sup>8</sup>

Another project aims to improve mango production 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>9</sup> This project is identifying and remedying production and fruit-quality constraints, and postharvest handling and storage problems, along the value chain. 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>10</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 R&D in Cambodia has a special focus on ruminants. Research is examining animal health and production constraints associated with market chains linking smallholder cattle production in Cambodia with domestic markets in Phnom Penh and Siem Reap, and international markets such as Ho Chi Minh City in Vietnam.<sup>11</sup> A current project aims to develop village-based biosecurity to improve management of livestock disease risks.<sup>12</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>13</sup>

Another focal point of research is to improve year-round availability of feedstuffs for cattle in rice-based farming systems, and also roll out an earlier International Center for Tropical Agriculture (CIAT) activity that developed forage banks in the wet season. A regional project is proposed to identify and promote promising management practices for increasing the overall productivity of crop–livestock systems while sustaining natural resources.<sup>14</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>15</sup> The research in Cambodia is a component of a regional project involving Laos, with some related work in Thailand and Vietnam.

### Fisheries

Fish are 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.

Fisheries research is focused on culture-based fisheries development, which involves the stocking of reservoirs and lakes with hatchery-bred juvenile fish.<sup>16</sup> The objective is to consolidate the benefits gained from adoption of culture-based practices through community group organisations, and to ensure appropriate application of broodstock management plans for indigenous species.

## 5-year country outcomes

- Demonstrated farm models with greater resilience and capacity of crop and animal production systems
- 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

## 2016–17 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
- Early uptake demonstrated by fisheries-dependent communities in Laos and Cambodia of reservoir management procedures that enhance fisheries production and community livelihoods

- 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 regional research program for improving production and marketing of vegetables commenced
- Partnerships established to commence a project to improve proven livestock biosecurity in the Mekong region

#### Key Program Managers

Dr Chris Barlow, Fisheries

Mr Tony Bartlett, Forestry

Dr Jayne Curnow, Agricultural Systems Management

Dr John Dixon, Cropping Systems and Economics

Dr Robert Edis, Soil Management and Crop Nutrition

Dr Richard Markham, Horticulture

Dr Mike Nunn, Animal Health

#### Regional Manager East Asia

Ms Dulce Carandang Simmanivong

## Current and proposed projects

- CSE/2015/044** Sustainable intensification and diversification in lowland rice systems of north-western Cambodia (proposed)
- LWR/2009/046** Improved irrigation-water management to increase rice productivity in Cambodia (Mekong – South Asia Food Security Research Program: Component 4)
- SMCN/2012/071** Improving water and nutrient management to enable double cropping in the rice growing lowlands of Lao PDR and Cambodia
- CSE/2012/077** Mechanisation and value-adding for diversification of lowland farming systems in Lao PDR and Cambodia
- ASEM/2010/049** Market-focused integrated crop and livestock enterprises for north-western Cambodia
- HORT/2010/069** Enabling improved plant biosecurity practices in Cambodia, Lao PDR and Thailand
- ASEM/2012/081** Improving market engagement, postharvest management and productivity of Cambodian and Lao PDR vegetable industries
- SMCN/2014/088** Integrated resource management for vegetable production in Lao PDR and Cambodia
- HORT/2012/003** Building a resilient mango industry in Cambodia and Australia through improved production and supply-chain practices
- ASEM/2014/053** Developing cassava production and marketing systems to enhance smallholder livelihoods in Cambodia and Lao PDR
- AH/2010/046** Domestic and international market development for high-value cattle and beef in south-eastern Cambodia
- AH/2011/014** Village-based biosecurity for livestock disease risk management in Cambodia
- AH/2010/045** Research support for the development of improved livestock biosecurity in the Mekong region (proposed)
- SMCN/2012/075** Management practices for profitable crop–livestock systems for Cambodia and Lao PDR
- FST/2012/091** Biological control of insect pests of plantations in the Mekong region
- FIS/2011/013** Culture-based fisheries development in Lao PDR and Cambodia

Additional projects due to begin in 2016–17:

**AGB/2016/207** Sri Lankan cassava mosaic disease in Cambodia

**CSE/2016/161** Economic characterisation of farm types to inform strategic planning and investment in agricultural research and development and trade in Cambodia

**SMCN/2016/260** Integrated nutrient management in Cambodia—analysis of knowledge gaps impacting on prosperity

# CHINA



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

GDP per capita (US\$)	7,590.0
Population (million)	1,364.00

Funding	A\$m
2014–15 actual	0.69
2015–16 budget	0.98
2016–17 budget	0.90

<sup>a</sup> Data for 2014 GDP and population from [data.worldbank.org/country](http://data.worldbank.org/country)

## Country context

After decades of rapid economic growth, China's gross domestic product (GDP) growth dropped to 6.9% in 2015, the slowest in the past 25 years. 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 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. The government attaches great importance on agriculture and this is demonstrated by the fact that for 13 consecutive years, China's No. 1 Central Government Document has always been on agriculture (the No. 1 document is the first document China's central government releases every year).

The 2016 No. 1 Central Government Document, which was released in January 2016, focuses mainly on: (1) improving efficiency and profitability of agricultural production; (2) strengthening resources protection and ecological rehabilitation; (3) promoting integration in the rural sector and increasing farmers' incomes; and (4) improving coordinated development in urban and rural areas.

It is stated in this document that China will roll out measures to address imbalance between supply and demand of agricultural produce. The document also says that China will strengthen its cooperation with countries and regions in agricultural investment and trade, science and technology research, and quarantine of animals and plants with countries and regions under the One Belt, One Road initiative.

Poverty elimination remains one of the top priorities for the Chinese government. Through the development of its economy, China has successfully lifted 660 million people out of poverty over the past decades. However, at the end of 2014, there were still 70 million people who lived below

the poverty line (China Statistics Yearbook 2015). Despite the economic slowdown, in late 2015, the Chinese government announced that it would end poverty by the end of 2020. China is now drafting the 13th Five-Year Plan (2016–2020), and it is expected that poverty elimination will be an important part of this plan.

The China–Australia Free Trade Agreement entered into force in December 2015 and this will bring opportunities as well as challenges to China's agriculture.

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 forthcoming 13th Five-Year Plan. The priorities for ACIAR's China program in the medium term are:

- selection of technologies for improved water use efficiency, with an emphasis on dryland agriculture
- development of policies and institutions for improved land and water use and associated climate change influences
- integration of crop-livestock system, grassland restoration in favourable areas of TAR and Qinghai Province, and the rangelands of north-western China.

## 2016–17 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 by lowering grazing pressure. Research is providing evidence and grassland management options to help guide Chinese research and development (R&D) agencies on how to improve household incomes from livestock production while reducing grazing pressures.<sup>1</sup>

Building on this research, a new project will use an interdisciplinary approach to study the ways of strengthening incentives for managing grasslands in China and Mongolia.<sup>2</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.

Animal biosecurity research aims to 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 proposed 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>4</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 nutrition requirements and genetic suitability of local and improved livestock breeds for dairy and meat production, and piloting promising interventions with farmers.<sup>5</sup>

A new 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>6</sup> Another project is assessing farmer responses to policy options on climate change adjustment.<sup>7</sup>

## 5-year program outcomes

- Established regional agricultural research interventions jointly funded by Australia, China and third-country collaborators
- Mutually beneficial scientific and policy research programs addressing national and regional climate change scenarios
- Improved smallholder access to cropping and livestock techniques in TAR to alleviate poverty
- Economically efficient and environmentally sustainable grassland management policies and programs

## 2016–17 project outputs

- A new research partnership designed for climate policy on a regional basis
- Recommendations published for efficient and environmentally sustainable grassland management options
- Farmers' acceptability of novel livestock techniques and barriers to adoption in TAR identified

### *Key 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 and proposed projects

- <sup>1</sup> **LPS/2008/048** Sustainable livestock grazing systems on Chinese temperate grasslands
- <sup>2</sup> **ADP/2012/107** Strengthening incentives for improved grassland management in China and Mongolia
- <sup>3</sup> **AH/2010/045** Research support for the development of improved livestock biosecurity in the Mekong region (proposed)
- <sup>4</sup> **AH/2014/056** Improving small ruminant health, production and regional trade in Myanmar (proposed)
- <sup>5</sup> **LPS/2014/036** Developing profitable dairy and sheep meat production systems in central Tibet – China
- <sup>6</sup> **ADP/2014/043** Policy and institutional reforms to improve horticultural markets in Pakistan
- <sup>7</sup> **ADP/2011/039** Assessing farmer responses to climate change adjustment policy options

Additional projects due to begin in 2016–17:

**AGB/2016/159** Beef trade model for South-East and China

**AGB/2016/196** Sustainable and inclusive cattle and beef industry development in South-East Asia and China





# INDONESIA

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

GDP per capita (US\$)	3,492.0
Population (million)	254.50

## Funding A\$m

2014–15 actual	6.76
2015–16 budget	9.75
2016–17 budget	8.20

<sup>a</sup> Data for 2014 GDP and population from <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.**

*Aid Investment Plan, Indonesia, 2015–16 to 2018–19, DFAT*

Being the fourth most populous country in the world, Indonesia has a very strategic part to play in the region. Not only is Indonesia's political and economic stability important for Australia, it also offers the opportunity in a wide range of sectors to work in partnership for the benefit of both countries.

Indonesia is an archipelago comprising 13,466 islands. This geographical landscape has made agriculture and use of maritime resources key and strategic sectors for the Indonesian Government. Around 11.3% of its population still live below the poverty line of around US\$1.25 per day, and 49% live on less than US\$2.00 per day. Therefore, strengthening agriculture, including the crop, livestock, forestry, marine fisheries and aquaculture sectors, is critical for poverty reduction and equitable development across Indonesia. In this regard, Australia is in an excellent position to provide expertise in tackling with common problems through agricultural research partnership.

The Indonesian Government has identified nine priority areas for development across all sectors. The five main ones comprise: (1) ensuring food security 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 also important sectors. Increasing the welfare of farmers and fishers, innovation and technology dissemination, and climate change adaptation and mitigation, as well as fire management are also included in the Indonesian Government's priority areas.

ACIAR has been supporting Indonesia for more than 30 years, with substantial benefits flowing to farmers and the agriculture sector as a whole through the development of technologies and innovations.

The geographical focus of this program includes some of the poorest regions (e.g. Aceh and five provinces in eastern Indonesia) as well as the more developed provinces of Java, Bali and Sumatra. This diversity gives the program flexibility in improving livelihoods using alternative approaches, including ensuring food and nutritional security through enhanced productivity and quality, as well as developing improved market linkages for high-value products sourced from smallholder production systems.

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.

In the Annual Strategy Discussion in November 2015, Indonesian partners agreed that the existing country priorities are still valid. However, there is a need to further discuss new specific research activities to reflect the dynamics in each sector. The forestry strategy refresh was conducted March 2016 in collaboration with the Forestry and Environment Research, Development and Innovation Agency (FOERDIA).

## 2016–17 research program

ACIAR supports research to address the six Indonesian priorities through the following five 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. One project is contributing to understanding lifetime productivity of Bali cattle by developing strategies for reduced turn-off age and increased calf output.<sup>1</sup> Another project is working regionally to assist in meeting the rising demand for animal protein through pig husbandry<sup>2</sup>, while another is investigating the factors that determine smallholder use of purchased fodders and the performance of fodder markets, including actor roles, incentives and price–quality relationships.<sup>3</sup>

A current project is investigating the integration of herbaceous tropical legumes into grain cropping systems in East Nusa Tenggara province.<sup>4</sup> It will examine the benefits of legume-based cropping systems both for subsequent crops and associated livestock. A proposed 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>5</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 new projects are starting as part of a 6-year beef research program that will investigate the health and production of smallholder beef cattle and the marketing of beef in Indonesia, to improve both beef supply and the livelihoods of smallholder beef producers.<sup>6,7</sup> The projects will focus on two beef value chains to increase beef production efficiency (i.e. kilograms calf weaned/cow/year), beef output (i.e. kilograms liveweight or carcass weight sold/year) and total net household income from beef, each by 30%, and improve key livelihood indicators (e.g. labour productivity).

### 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. One small project is examining regional mango markets and studying trade flow in Asia and the Pacific region with a view to expanding this work to form the platform for a regional mango program.<sup>8</sup>

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>9</sup>

In line with the incoming Indonesian Government's emphasis on self-sufficiency in major agricultural commodities, a recently launched project will focus 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>

For vegetables, the primary focus is on sustainably improving the productivity of allium (chilli and garlic) and solanaceous crops (especially chilli). A major project is working to increase the profitability of Indonesian rice/chilli/shallot production in Java by improving seed quality and availability, reducing plant disease incidence and improving crop nutrition.<sup>11</sup>

ACIAR's research to increase the overall productivity of farming systems in tsunami-affected regions in Aceh is based on previous work undertaken by the Centre—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 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. The current project in this theme of work focuses on improving the research capacity for assessing and managing tuna fisheries by filling key information gaps, with particular reference to yellowfin and bigeye tuna.<sup>13</sup>

Aquaculture is an important industry for both coastal and inland communities in Indonesia. One project aims to improve finfish health and production in marine aquaculture.<sup>14</sup> Currently, half of the fish stocked in sea cages will die before they are harvested. This project will decrease this mortality rate by identifying key diseases and trialling interventions, developing and testing improved management protocols for hatcheries and grow-out farms, and building capacity in fish-health management. Another 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>15</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>16</sup>

A regional project is investigating, among other things, the role of fisheries and mariculture as a source of food, income and livelihoods for coastal communities. In the Indian Ocean region, it will analyse livelihood benefits and costs, with a view to improving decision-making around mariculture development.<sup>17</sup>

### Forestry products and services

Government priorities for forestry in Indonesia include community forestry, improved land management options for fire-free villages, rehabilitation of degraded peatland forests, climate change mitigation, enhanced 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. A new 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 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> A new project continues important forest health research that aims to reduce the impacts of two very damaging diseases (*Ganoderma* and *Ceratocystis*) that are affecting acacia plantations in South-East Asia.<sup>20</sup>

Another research priority is focusing on agroforestry and community forestry systems involving both timber and non-wood products. A project centred in Java and in East and West Nusa Tenggara is focusing on enhancing integration of timber and non-timber products in agroforestry systems and strengthening value chains for these products to ensure that smallholders achieve better returns from agroforestry.<sup>21</sup>

Other research is investigating systems for enabling payments to smallholders for carbon sequestration by natural forests.<sup>22</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.

### 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. New 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>23</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>24</sup>

The final phase of a marine industry project in Indonesia and the Philippines is increasing seaweed productivity by identifying new strains and building capacity through a network of seed distribution laboratories.<sup>25</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 research in Indonesia and Vietnam 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>26</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>27</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>28</sup>

## 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

## 2016–17 project outputs

- Training program for women on improving plantation productivity developed and piloted
- Policy options for enhancing implementation of REDD+ (reducing emissions from deforestation and forest degradation) documented and presented to national and subnational policy stakeholders
- Extension manual published detailing effective practices for integrated management and value-adding of timber and non-timber forest products
- A new program of research on community-based beef production systems commenced, aimed at significantly improving both beef supply and the livelihoods of smallholders and other participants in beef value chains
- The effect (importance) of cow nutrition during pregnancy and lactation on post-weaning performance determined and reported
- Benefits of growing herbaceous legumes as a nitrogen source for subsequent maize crops quantified

- Actual and potential benefits from improving fruitfly management in selected mango value chains evaluated
- Recommendations to enhance farmer participation in Indonesia's citrus, shallot, chilli and mango value chains developed
- Evidence gathered about the effectiveness of certification schemes for coffee to provide farm-level environmental and livelihood benefits in Indonesia
- 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 available for marine species grown in hatcheries and farms
- Data available 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
- Research on improving dryland agriculture in Aceh fully implemented

#### Key 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

#### Country Manager

Ms Mirah Nuryati

## Current and proposed projects

- LPS/2013/017** Improving nutrition during pregnancy and lactation to achieve production targets for Bali cattle
- AH/2012/065** A regional approach to enhance smallholder pig systems in Timor-Leste and eastern Indonesia
- LPS/2015/017** Fodder markets in East Java: identifying interventions to improve market performance and quality
- LPS/2012/064** Integrating herbaceous forage legumes into crop and livestock systems in East Nusa Tenggara, Indonesia
- LPS/2013/021** Profitable supplementary feeding strategies for fattening smallholder cattle in Indonesia (proposed)
- AH/2015/047** Improving smallholder beef value chains in rain-fed cropping systems
- LPS/2015/048** Integration of smallholder cattle breeding enterprises with oil palm plantation systems
- AGB/2015/015** Analysis of mango markets, trade and strategic research issues in the Asia-Pacific
- HORT/2015/042** Development of area-wide management approaches for fruit flies in mango for Indonesia, Australia and the Asia-Pacific region
- HORT/2012/083** Management of sugarcane streak mosaic in Indonesia and Australia
- HORT/2009/056** Sustainable productivity improvements in allium and solanaceous vegetable crops in Indonesia and subtropical Australia
- SMCN/2012/103** More-profitable and resilient farming systems in Aceh Darussalam and New South Wales
- FIS/2009/059** Developing research capacity for management of Indonesia's pelagic fisheries resources
- FIS/2010/101** Improving fish-health management and production protocols in marine finfish aquaculture in Indonesia and Australia
- FIS/2014/059** Expanding spiny lobster aquaculture in Indonesia
- FIS/2015/038** Improving seaweed production and processing opportunities in Indonesia
- FIS/2015/031** Fish in national development: contrasting case studies in the Indo-Pacific region
- FST/2015/040** Enhancing community-based commercial forestry in Indonesia
- FST/2014/064** Maximising productivity and profitability of eucalypts and acacias in Indonesia and Vietnam
- FST/2014/068** Management strategies for acacia plantation diseases in Indonesia and Vietnam
- FST/2012/039** (*multilateral, CIFOR/ICRAF*) Development of timber and non-timber forest products' production and marketing strategies to improve smallholders' livelihoods in Indonesia
- FST/2012/040** Enhancing smallholder benefits from reduced emissions from deforestation and forest degradation in Indonesia
- AGB/2009/060** Improved market integration for high-value fruit and vegetable production systems in Indonesia

<sup>24</sup> **AGB/2010/099** Evaluating smallholder livelihoods and sustainability in Indonesian coffee and cocoa value chains

<sup>25</sup> **SMAR/2008/025** Improved seaweed culture and postharvest waste utilisation in South-East Asia

<sup>26</sup> **AGB/2012/078** Innovative agribusiness opportunities for profitable and sustainable cassava value chains in South-East Asia

<sup>27</sup> **AGB/2012/099** Improving milk supply, competitiveness and livelihoods in smallholder dairy chains in Indonesia

<sup>28</sup> **ADP/2015/043** Policy research to support sustainable intensification in Indonesia's upland landscapes

Additional projects due to begin in 2016–17:

**AGB/2016/225** Evaluation of infrastructure and policy scenarios for reducing transport costs and improving market: case studies of smallholder agri-food value chain in Indonesia, Lao PDR and Vietnam

**FST/2016/141** Diversifying market-based integrated agroforestry systems in Indonesia

**FST/2016/146** Scoping of research to underpin fire-free villages in Indonesia

**FST/2016/166** Understanding constraints to development of sandalwood plantations in Central Java

**FST/2016/200** Developing DNA-based chain-of-custody systems for legally sourced teak

**SMCN/2016/261** Soil management for peat management—opportunities in Indonesia



# LAO PDR

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

GDP per capita (US\$)	1,793.5
Population (million)	6.69

Funding	A\$m
2014–15 actual	5.44
2015–16 budget	5.36
2016–17 budget	5.30

<sup>a</sup> Data for 2014 GDP and population from <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.**

*Aid Investment Plan, Laos, 2015–16 to 2019–20, DFAT*

Laos is a land-locked country which is still predominantly rural, with more than 70% of the 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% grew rice or engaged in rice-based farming. The agriculture–forestry sector employs more than 70% of the total labour force, and accounted for 24.8% of gross domestic product (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.

Over the past 20 years, Laos achieved good progress in poverty reduction, with recent estimates showing a decline in the national poverty headcount from 46% in 1992–93 to 23% in 2012–13. However, poverty remains highest and declines more slowly in rural Laos. Agricultural households (and those headed by an unemployed person) have the highest poverty rates. The World Bank also fears that there is a risk that people now categorised as non-poor will fall back into poverty, likely due in part to losses in welfare driven by agricultural shocks (e.g. food price changes and loss of land) or ruinous health expenditures.

The Government of Laos is poised to launch its 8th National Socio Economic Development Plan 2016–2020 which is focused on aspirations to graduate from the Least Developed Countries list by 2020. It also recently endorsed a new Agricultural Development Strategy 2025 and Vision 2030, wherein 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 economy’. With this vision, the emphasis will be on: ensuring food and nutritional security and food safety; commercialisation of agricultural products with high value addition; and the sustainable use and management of natural resources.

Australia and Laos are commemorating 64 years of strong diplomatic relationship (from 1952 to 2016). Australia has the distinction of having the longest unbroken diplomatic relationship with Laos and this is underpinned by deepening economic ties, community links and development cooperation. Its 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, 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. Given this, Australia's support through ACIAR

in agricultural research plays an increasingly important role as Laos works towards its goals in agriculture development, poverty reduction and inclusive economic growth.

## Country priorities

ACAR's medium-term research strategy and priorities in Laos are reviewed every 4–5 years through consultations with key research coordinating agencies, universities, farmer organisations and private-sector stakeholders. The current strategy (2012–16) was agreed in June 2012 as part of the development of a whole-of-government strategy for Laos.

ACIAR's priorities in Laos include:

- 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 research on infrastructure which facilitates fish to pass weirs and other barriers, as part of the overall program of habitat restoration and protection of fish migration routes
- 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.

## 2016–17 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 Lao PDR 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>

Proposed regional research will aim 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 they can make better-informed decisions.<sup>6</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>7</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>8</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>9</sup> Other research is investigating ways of enhancing district delivery and management of agricultural extension.<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>, while another is examining critical factors for self-sustaining farmer organisations in northern Laos.<sup>12</sup> A further project will research ways of enhancing the resilience and productivity of predominantly rainfed systems in Laos through sustainable groundwater use.<sup>13</sup>



## Improved profitability of lowland 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>14</sup>

## Rice-based lowland 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.<sup>15</sup> There is another project that is identifying research issues related to grain and forage crop diversification, soil fertility and management, with the main aim being to improve production in both rice and non-rice crops.<sup>16</sup> Crop water requirements to satisfy diversified agricultural production, and water and nutrient use, at the farm level are being investigated 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>17</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>18</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>19</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.

ACIAR-funded research 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>20</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>21</sup> The work is focused on generating win–win outcomes, ensuring development can occur with minimal impact on capture fisheries. Work will be increasingly focused on determining the benefit:cost ratio of these activities and ensuring rapid return 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, as well as payments for environmental services associated with forests and forest industries, 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>22</sup> Current value-chain research aims to improve livelihoods for farmers and processing workers, and increase the international competitiveness of Lao wood industries, through improved efficiency of the planted-wood value chain.<sup>23</sup> It includes research on grower groups, forest certification, primary processing and furniture manufacturing, and will develop a strategy for the marketing

and development of wood products. 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>24</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>25</sup> The project will focus on Laos, with some related work in Vietnam, Thailand and Cambodia. Another project that aims to provide public policy options for plantations that meet national objectives for smallholder production will contribute to community and industry development and environmental sustainability in Laos.<sup>26</sup>

## 5-year country outcomes

- Reduced incidence of animal and human (zoonotic) diseases through better knowledge of farm household practices
- Wider awareness of environmental policy options and community opportunities to manage threats to resources and biodiversity, including alternative cultivation and agroforestry options
- 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

## 2016–17 project outputs

- New fish-passage technology introduced in the Lower Mekong Basin
- Report produced on the costs and returns from agroforestry systems and improved management of teak plantations
- Documentation completed on the benefits arising from enhanced wood processing and manufacturing, including collaboration under the industry cluster groups
- Results and lessons from implementation of payments for environmental services schemes assessed and reported

- Strategies for improving provincial-level extension commenced
- Integrated portfolio of ACIAR-supported projects on livestock health and production developed
- Partnerships established to commence a project to improve proven livestock biosecurity in the Mekong region
- Awareness achieved of forest policies and programs
- A program to improve farming systems on sloping lands commenced

### Key Program Managers

Dr Chris Barlow, Fisheries  
 Mr Tony Bartlett, Forestry  
 Dr Evan Christen, Land and Water Resources  
 Dr Jayne Curnow, Agricultural Systems Management  
 Dr John Dixon, Cropping Systems and Economics  
 Dr Robert Edis, Soil Management and Crop Nutrition  
 Dr Richard Markham, Horticulture  
 Dr Mike Nunn, Animal Health  
 Dr Ejaz Qureshi, Agricultural Development Policy

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## Current and proposed projects

- <sup>1</sup> **AH/2012/068** Development of a biosecure market-driven beef production system in Lao PDR
- <sup>2</sup> **AH/2012/067** Enhancing transboundary livestock disease risk management in Lao PDR
- <sup>3</sup> **AH/2014/055** Public-private interventions to mitigate disease risk and add value to cross-border pig trade between Lao PDR, Vietnam and China (proposed)
- <sup>4</sup> **AH/2010/045** Research support for the development of improved livestock biosecurity in the Mekong region (proposed)
- <sup>5</sup> **SMCN/2012/075** Management practices for profitable crop-livestock systems for Cambodia and Lao PDR
- <sup>6</sup> **AH/2014/056** Improving small ruminant health, production and regional trade in Myanmar (proposed)
- <sup>7</sup> **ASEM/2014/007** Lao PDR Agricultural Research Fund 3
- <sup>8</sup> **SMCN/2014/049** Improving maize-based farming systems on sloping lands in Vietnam and Lao PDR (proposed)
- <sup>9</sup> **ASEM/2012/073** Improving food security in northern uplands of Lao PDR through the promotion of market participation

- 10 **ASEM/2011/075** Enhancing district delivery and management of agriculture extension in Lao PDR
- 11 **ASEM/2014/052** Smallholder farmer decision-making and technology adoption in southern Lao PDR: opportunities and constraints
- 12 **ASEM/2014/102** Critical factors for self-sustaining farmer organisations in northern Lao PDR
- 13 **LWR/2010/081** Enhancing the resilience and productivity of rainfed-dominated systems in Lao PDR through sustainable groundwater use
- 14 **ASEM/2014/053** Developing cassava production and marketing systems to enhance smallholder livelihoods in Cambodia and Lao PDR
- 15 **CSE/2012/077** Mechanisation and value-adding for diversification of lowland farming systems in Lao PDR and Cambodia
- 16 **SMCN/2012/071** Improving water and nutrient management to enable double cropping in the rice growing lowlands of Lao PDR and Cambodia
- 17 **ASEM/2012/081** Improving market engagement, postharvest management and productivity of Cambodian and Lao PDR vegetable industries
- 18 **SMCN/2014/088** Integrated resource management for vegetable production in Lao PDR and Cambodia
- 19 **HORT/2010/069** Enabling improved plant biosecurity practices in Cambodia, Lao PDR and Thailand
- 20 **FIS/2014/041** Quantifying biophysical and community impacts of improved fish passage in Lao PDR
- 21 **FIS/2012/100** Improving the design of irrigation infrastructure to increase fisheries production in floodplain wetlands of the Lower Mekong and Murray–Darling basins
- 22 **FST/2012/041** Teak-based agroforestry systems to enhance and diversify smallholder livelihoods in Luang Prabang province of Lao PDR
- 23 **FST/2010/012** Enhancing key elements of value chains for plantation-grown wood in Lao PDR
- 24 **FST/2011/003** Effective implementation of payments for environmental services in Lao PDR
- 25 **FST/2012/091** Biological control of insect pests of plantations in the Mekong region
- 26 **ADP/2014/047** Improving policies for forest plantations to meet smallholder, industry and environmental needs in Lao PDR and Vietnam

Additional projects due to begin in 2016–17:

- AGB/2016/225** Evaluation of infrastructure and policy scenarios for reducing transport costs and improving market: case studies of smallholder agri-food value chain in Indonesia, Lao PDR and Vietnam
- CSE/2016/248** Crop–livestock systems platform for capacity building, testing practices, commercialisation and community learning
- FST/2016/151** Enhancing advanced wood manufacturing industries in Lao PDR
- FST/2016/200** Developing DNA-based chain-of-custody systems for legally sourced teak
- LWR/2016/138** Poverty alleviation and livelihood enhancement through gender-sensitive agricultural water management research in Lao PDR

# MYANMAR

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

GDP per capita (US\$)	1,203.8
Population (million)	53.40

Funding	A\$m
2014–15 actual	3.26
2015–16 budget	4.87
2016–17 budget	4.00

<sup>a</sup> Data for 2014 GDP and population from <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 2014, the World Bank classified Myanmar as a lower middle income economy based on its gross national income per capita of US\$1,270. This positive development is attributed to economic reforms that reinforced consumer and investor confidence. In 2015, Myanmar's economy grew at 8.5% and agriculture growth picked up and contributed 31% to gross domestic product (GDP) after 2 years of lethargic performance. However, overall growth is expected to temper at 6.5% mostly due to the impact of the July 2015 floods on agriculture.

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. Myanmar is also the largest producer and exporter of beans and pulses within the Association of South-East Asian (ASEAN) region. However, despite its potential for growth, the agriculture sector persistently experiences insufficient investment in research, extension, technology transfer, infrastructure development,

value-chain upgrading and marketing. Moreover, farmers typically do not receive the right remuneration for their products which causes declining rural incomes.

It is ironic though that in a resource-rich country like Myanmar, there is a strong link between agriculture and poverty. Poverty is twice as high in rural areas than in urban areas, with nearly 85% of the poor living in rural areas. The rural poor typically consists of the landless, farmers with access to small and marginal landholdings (usually less than 2 hectares each) and ethnic groups. Rural women are among Myanmar's most marginalised groups, with high vulnerability to food insecurity and poverty.

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.

Acknowledging agriculture's significant contribution to Myanmar's GDP, the newly elected Government of Myanmar is expected to adopt economic objectives that give paramount importance to the sector. The purported

economic strategy will focus on five pillars: fiscal prudence; lean and efficient government; revitalising agriculture; monetary and fiscal stability; and functioning infrastructure. The third pillar covers an overhaul of the agriculture sector with a focus on improving rural productivity. The major objectives for the sector, of which crops are the major contributors, are to achieve food security, 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 the latter's rapid reform process, Australia's growing engagement with the Government of Myanmar, and the 2015–16 Federal Budget. The 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.

The main focus of ACIAR's program in Myanmar is to secure improvements in food security and rural incomes for smallholders through increased production and enhanced access to markets and services.

ACIAR's aim is to continue to work predominantly with international organisations and non-government organisations (NGOs), including Australian-accredited organisations. Promising results have been achieved in a multilateral ACIAR project led by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) on improving the productivity of legumes in the central dry zone of Myanmar. The current program is based on the achievements of these projects and on scoping missions to identify research gaps and needs.

## Country priorities

A multidisciplinary program has been developed by ACIAR in collaboration with the Department of Foreign Affairs and Trade (DFAT) and in consultation with Myanmar counterparts, donors and potential research providers. To support the Government of Myanmar's goals on agricultural development and consistent with Australia's strategic objective on inclusive economic growth, ACIAR research priorities focus on:

- increasing net production of food and cash incomes of rural households in the central dry zone and Ayeyarwady Delta through improvements in, and adoption of, production and postharvest technologies in agriculture, including livestock and fisheries
- building capacity in agriculture, livestock and fisheries research, development and extension through program activities, and postgraduate and short-term training

- providing technical assistance and advice to relevant Government of Myanmar departments for policy strengthening.

The program is targeting the immediate needs of the generally vulnerable people of Myanmar through research, development and extension. 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
- further collaboration for improvement in the productivity of grain legumes through expansion to include mungbean breeding
- 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 improved management of the Ayeyarwady 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 Ayeyarwady Delta regions.

## 2016–17 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 is looking at constraints to the acceptability and adoption of promising technologies in the central dry zone and Ayeyarwady Delta regions.<sup>1</sup> The project aims to strengthen institutional capacity and extension services in Myanmar to improve adoption rates.

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> Another proposed project will aim to improve the health, production and regional trade of sheep and goats in Myanmar.<sup>4</sup>

The International Mungbean Improvement Network, led by the World Vegetable Center (AVRDC), is supporting the participation of Myanmar's national mungbean breeding program in an international network comprising Australia, Bangladesh and India.<sup>5</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.

Fisheries management and aquaculture development are the intent of two related projects that aim to improve the capacity for management of Myanmar's estuarine and inland capture and culture fisheries<sup>6</sup>, and facilitate the emergence of fisheries co-management and small-scale aquaculture as cornerstones of rural food security and livelihoods.<sup>7</sup>

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 Ayeyarwady Delta.<sup>8</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 second project aims to increase the productivity of pulse and oilseed legumes, which are the most important crops in Myanmar after rice.<sup>9</sup> This work builds on the outcomes of previous ACIAR-funded research and is based in the central dry zone.

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>10</sup> This work builds on the lessons and achievements of vegetable research and market development in Moc Chau district, Vietnam.

Research 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>11</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 new project in the central dry zone of Myanmar will develop locally relevant land evaluation methods, including soil surveying and land suitability assessment, and use of the

information for participatory land-use planning.<sup>12</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.

Following the successful development of the Agribusiness Master Class (AMC) in Vietnam, a new project will adapt and deliver the AMC in Myanmar and develop a sustainable business model for upscaling the program in South-East Asia and the Pacific.<sup>13</sup>

## 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

## 2016–17 project outputs

- A multidisciplinary program progressed to improve productivity in the crop, fisheries and livestock sectors
- A research program developed to advance land evaluation methods that enable better planning and management of agricultural development in the central dry zone
- Knowledge increased on management of fisheries resources, and research capacity built within government fisheries agencies, through a series of fisheries mini projects
- Myanmar's participation in the International Mungbean Improvement Network providing phenotypic data from the analysis of the mungbean core collection
- 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
- Partnerships established to commence a project to improve proven livestock biosecurity in the Mekong region

#### Key Program Managers

Dr Chris Barlow, Fisheries  
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 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

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## Current and proposed projects

- <sup>1</sup> **ASEM/2011/043** Strengthening institutional capacity, extension services and rural livelihoods in the central dry zone and Ayeyarwady 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** Research support for the development of improved livestock biosecurity in the Mekong region (proposed)
- <sup>4</sup> **AH/2014/056** Improving small ruminant health, production and regional trade in Myanmar (proposed)
- <sup>5</sup> **CIM/2014/079** Establishing the International Mungbean Improvement Network
- <sup>6</sup> **FIS/2011/052** Improving research and development of Myanmar's inland and coastal fisheries
- <sup>7</sup> **FIS/2015/046** Improving governance of Myanmar's inland and coastal fisheries
- <sup>8</sup> **SMCN/2011/046** (*multilateral, IRRI*) Diversification and intensification of rice-based systems in lower Myanmar
- <sup>9</sup> **SMCN/2011/047** Increasing productivity of legume-based farming systems in the central dry zone of Myanmar
- <sup>10</sup> **AGB/2014/035** Improving livelihoods in Myanmar and Vietnam through sustainable and inclusive vegetable value chains (proposed)
- <sup>11</sup> **SMCN/2014/044** Management of nutrients for improved profitability and sustainability of crop production in central Myanmar

<sup>12</sup> **LWR/2014/075** Land resource evaluation for productive and resilient landscapes in the central dry zone of Myanmar

<sup>13</sup> **AGB/2015/030** Developing a sustainable model for upscaling the Agribusiness Master Class

Additional projects due to begin in 2016–17:

**AGB/2016/159** Beef trade model for South-East and China

**AGB/2016/196** Sustainable and inclusive cattle and beef industry development in South-East Asia and China

**FST/2016/200** Developing DNA-based chain-of-custody systems for legally sourced teak

# PHILIPPINES

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

GDP per capita (US\$)	2,872.5
Population (million)	99.14

## Funding A\$m

2014–15 actual	4.82
2015–16 budget	4.87
2016–17 budget	5.30

<sup>a</sup> Data for 2014 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.**

*Aid Investment Plan, Philippines, 2015–16 to 2017–18, DFAT*

The Philippine Development Plan 2011–2016 midterm update estimated the country's long-term economic growth rate to be 4% per annum, but 'given a high population growth rate averaging 2.11 percent annually from 1990 to 2010, [the] per capita growth rate only stands at 1.89 percent. This low growth implies that it will take at least 37 years before incomes double. It is no wonder, then, that poverty reduction has been painfully slow.'

The update also notes: 'The agriculture and fisheries sector is central to addressing the country's employment and poverty problems. Nearly a third of the country's labor force is employed in agriculture and 60 percent of them are considered vulnerable. Moreover, the sector has been observed to be shedding jobs too quickly, more than can be explained by productivity increases, and certainly more than can be absorbed by the growing industry and services sectors.' The Philippine Government's strategies for the agriculture and fisheries sector aim to: increase productivity; increase forward linkage with the industry and services sectors; and improve resilience to risks, including climate change.

With the above-mentioned national development landscape, the Philippine agriculture and fisheries sector should be positioned strategically in terms of research and development (R&D). Innovative and focused R&D priorities of the agriculture sector must be forged to meet the national and global realities.

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

aligns with the aid program focus on agriculture, fisheries and water as one of its eight priority areas.

There is relatively little new land in the Philippines suitable for expanding production areas, and productivity growth in existing areas in recent years has been low. In addition, if the population continues to grow at greater than 2% per annum, it is expected to rise to about 110 million in 2020. While rice production remains a dominant national focus, there is increasing pressure to diversify and produce a range of other food, livestock and fisheries products, as well as other income-producing crops, on increasingly marginal land in the uplands.

ACIAR's support focuses on increasing productivity, marketability and international competitiveness for agricultural products, and the priority aimed at reducing 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.

ACIAR will continue to support research for development to improve market competitiveness of products from aquaculture, horticulture and livestock enterprises. The emphasis on higher-value products and market competitiveness aims to improve food security by supporting research that would provide smallholder farmers and traders with increased cash income, enabling the purchase of staple foods.

The Philippines is currently one of the largest importers of rice in the world, at around 2 million tonnes in 2014. Part of ACIAR's contribution to research in the Philippines involves providing core funding to the International Rice Research Institute (IRRI) (which is headquartered in Los Baños in the



Philippines) and supporting additional IRRI initiatives aimed at maintaining rice productivity. The Australian Government, through ACIAR, provided funds to IRRI for the construction of the Lloyd T. Evans Plant Growth Facility. The facility with its controlled environment rooms will monitor the properties and growth of a large numbers of plants in a reliable and systematic way. It will enable scientists to undertake studies of the impact of climate change on rice production.

## Country priorities

ACIAR's medium-term research strategy and geographical priorities in the Philippines are reviewed every 4–5 years through consultations with key research coordinating agencies, universities, farmer organisations and private-sector stakeholders. In February 2016, ACIAR conducted the first ACIAR–Philippines Strategy Discussion in Manila. This forum was warmly received by the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD) and other national partner agencies and will be continued annually. The forum endorsed our current set of priorities as being still valid but noting that there may need to be some reallocation of resources between the priorities in the future (noting that collaboration on climate change research was seen as increasingly important).

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 remedying adoption constraints and extension.

## 2016–17 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 agricultural productivity does not come at the expense of land degradation, particularly in light of the strong cyclones and earthquakes frequenting the country.

## Increasing market competitiveness of horticultural products

Major horticultural initiatives involving researchers, government, non-government organisations (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 will achieve 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, 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. A new project is focusing on smallholder-inclusive value chains of target vegetables (tomato, eggplant, bell pepper and leafy vegetables) and mango across four study regions.<sup>1</sup> Mango market production and profitability opportunities are being researched in the southern Philippines, aiming to increase domestic and international market competitiveness through the development of integrated crop management (ICM), and postharvest and other value-chain interventions.<sup>2</sup> Similarly, research on durian and jackfruit production is looking at the development of ICM and reduction of postharvest losses of these fruits.<sup>3</sup>

Further postharvest research is assessing ways to reduce losses in the product volume and quality of selected fruits and vegetables.<sup>4</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. Another project is building on previous vegetable research to integrate developed technologies with new practices and additional best-practice systems, to implement holistic crop management systems for selected vegetables.<sup>5</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'.

Improved management of diseases in banana and papaya is the focus of additional research. *Fusarium* wilt 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. Based on previous ACIAR-funded work in Indonesia, a new project is working with farmers to develop practical, integrated management strategies for *Fusarium* wilt, concentrating on the use of

groundcover plants that encourage biological suppression of this soil-borne disease.<sup>6</sup> Bacterial crown rot of papaya is also being addressed through integrated management approaches in another 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.

## 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 on sea cucumber complements the Philippine government funded program titled "Development of commercial production system for high value tropical sea cucumber, *Holothuria scabra*". Production of release-size juveniles has recently increased with the adoption of a low-cost ocean nursery system which has reduced the hatchery-rearing period from six months to two months. The project team is currently assisting local government units and communities to produce *H. scabra* using the developed culture technology, recognising the critical nature of adapting grow-out systems to the social, institutional and biophysical settings in participating communities. 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>9</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>10</sup>

## 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. Using a systems approach, one project aims to improve the rehabilitation of critical watersheds by identifying and piloting the key technical, socioeconomic and policy drivers needed to enable successful rehabilitation<sup>11</sup>, as measured by improved watershed health, increased livelihood opportunities for the rural upland poor and decreased poverty. Research to help prevent further degradation of vulnerable sloping land, and to identify suitable agricultural enterprises in upland watersheds is being conducted, developing tools for improved planning of agricultural development at village and municipal scales.<sup>12</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>13</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 climate change. Smallholder farmers and fishers need access to evidence-based options for managing the effects of climate change. As part of a larger complement of projects (including PCARRD's 'Smarter approaches to reinvigorate agriculture as an industry (SARAI) program), ACIAR is supporting research on 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>14</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>15</sup> This project is comprehensively testing and evaluating these improved extension methods with respect to conflict-affected areas in the southern and western Philippines. New research is identifying constraints and opportunities for improving crop nutrition to enhance cost-effective vegetable production; and for developing integrated soil, crop and nutrient management practices best suited to local conditions.<sup>16</sup>

## 5-year country outcomes

- Greater self-reliance of rural communities through better access to, and sustained use of, improved agricultural and fisheries technologies
- Improved 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

## 2016–17 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
- Disease management options for bacterial crown rot of papaya developed and tested on farms in the southern Philippines
- 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
- At least five new communities engaged in sea-ranching of sea cucumbers based on previous collaborative research
- Techniques available for mass coral spawning and settlement onto degraded coral reefs
- Information available for breeding giant grouper for mariculture purposes in the Philippines and Vietnam
- Strategies for rapid assessment of land suitability applied to land-use planning in two municipalities of the southern Philippines
- Technologies for adding value to jackfruit by processing into products with a longer shelf life evaluated in the Philippines

### Key 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 Richard Markham, Horticulture

Dr Mike Nunn, Animal Health

### 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/2012/019** Integrated crop management to enhance mango production 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/2012/098** 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
- 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
- FIS/2010/042** Expansion and diversification of production and management systems for sea cucumbers in the Philippines, Vietnam and northern Australia
- FIS/2012/101** Development of mariculture technology for giant grouper in the Philippines, Vietnam and Australia
- FIS/2014/063** Restoring damaged coral reefs using mass coral larval reseeded
- ASEM/2010/050** Improving watershed rehabilitation outcomes in the Philippines using a systems approach
- SMCN/2009/031** Watershed evaluation for sustainable use of sloping agricultural land in the southern Philippines
- AH/2012/066** Improving the production and competitiveness of Australian and Philippines pig production through better health and disease control.
- ASEM/2014/051** Action-ready climate knowledge to improve disaster risk management for smallholder farmers in the Philippines
- ASEM/2012/063** Improving the methods and impacts of agricultural extension in conflict areas of Mindanao, Philippines
- SMCN/2012/029** Strategies for improving crop nutrition for cost-effective production of vegetables in the southern Philippines

Additional projects due to begin in 2016–17:

**ASEM/2016/103** Enhancing food security and livelihoods through forest landscape restoration

**SMCN/2016/257** Is incorporating rubber into small farms in southern Philippines viable?



# THAILAND

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

GDP per capita (US\$)	5,977.4
Population (million)	67.73

Funding	A\$m
2014–15 actual	0.28
2015–16 budget	0.29
2016–17 budget	0.60

<sup>a</sup> Data for 2014 GDP and population from <[data.worldbank.org/country](http://data.worldbank.org/country)>

## Country context

In 2011, Thailand was classified as an upper-middle income economy given its substantial social and economic progress. The Thai economy is mainly rallied by the international trade sector which accounts for over 70% of the country's gross domestic product (GDP). The export of rice remains a main contributor to the national income. In 2014, Thailand was the world's top rice exporter with a volume of around 11 million tonnes.

Poverty steadily declined over the last 30 years—from 67% in 1986 to 10.5% in 2014. Poverty reduction was mainly the result of economic growth, targeted social programs and improved earnings from farm production, aided by rural infrastructure improvements and price support programs. However, entrenched poverty still persists and it is largely a rural phenomenon. In 2013, over 80% of Thailand's 7.3 million poor people lived in rural areas. Moreover, even though income inequality (as measured by the Gini coefficient) has fallen the past years, it remains consistently high above 0.45.

Given Thailand's heightened economic status, many donors have redefined their relationship with the nation by moving away from the traditional donor–recipient relationship 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.

Thailand holds an important position in the Mekong region. As its economic and research capacities have increased, the ACIAR–Thai relationship has shifted from donor–recipient towards co-investment in the partnership.

In line with the Memorandum of Understanding signed in July 2007, ACIAR will continue to foster opportunities for partnering with Thailand to support the other countries in the region. Emphasis is placed on improving regional research programs, with particular attention to Cambodia, Laos, Myanmar and Vietnam. Australia and Thailand are active participants in a range of International Agricultural Research Centres (IARCs) and other multilateral research and assistance agencies, several of which are located in Thailand. This will continue to provide a suitable platform to engage in wider regional research initiatives with both Australian and Thai involvement.

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

Despite the market volatility facing the rice industry, the Government of Thailand remains committed to remaining the top rice exporter in terms of volume and value. This goal is closely accompanied by an objective to develop Thai rice in a sustainable manner to strengthen farmer livelihoods and self-sustainability within the fair market and trade system. The Government of Thailand unveiled new investment promotion strategies with the aim of increasing Thailand's competitiveness in the world market. These include strengthening value chains and logistics, and preparing for scaled-up trade and investment with other Association of Southeast Asian Nations (ASEAN) members.

Given Australia's geographical proximity and active engagement with South-East Asian countries, it has a clear national interest in a prosperous and peaceful

South-East Asia. Therefore, Australia pursues a regional economic cooperation and inclusive growth agenda out of its embassy in Thailand. As the region implements the ASEAN Economic Community, Australia uses its South-East Asia regional aid program to support the ASEAN regional economic integration agenda.

Australian support to regional economic growth is also delivered through ACIAR's strategic research interventions. In 2016–17, ACIAR's research efforts will retain an emphasis on the following priorities:

- plant biosecurity, including biosecurity- and quarantine-related research and development (R&D), molecular identification of quarantine pests and technical capacity building
- livestock biosecurity, with an emphasis on improving vaccination and disease management
- with non-government organisation (NGO) collaboration, working with poor communities to improve rice production on poor soils in north-eastern Thailand
- continued work to effectively implement the results from earlier research projects as well as manage collaboration of projects with Thai partners, particularly Laos and Myanmar.

## 2016–17 research program

There is a project currently underway that aims to develop plant biosecurity R&D and technical diagnostic skills in Thailand, Laos and Cambodia, to underpin development of potential international market opportunities for Mekong horticultural products. This 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>

There are several new projects with a Mekong regional focus. 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.

Animal biosecurity research aims to 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>

## 5-year country outcome

- Progressed collaboration with Thai partners to extend joint research initiatives with wider regional programs

### Key Program Managers

Mr Tony Bartlett, Forestry  
Dr Richard Markham, Horticulture  
Dr Mike Nunn, Animal Health

### Regional Manager East Asia

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 insect pests of plantations in the Mekong region
- <sup>3</sup> **AH/2010/045** Research support for the development of improved livestock biosecurity in the Mekong region (proposed)

Additional project due to begin in 2016–17:

**FST/2016/200** Developing DNA-based chain-of-custody systems for legally sourced teak



# TIMOR-LESTE

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

GDP per capita (US\$)	1,169.0
Population (million)	1.2

Funding	A\$m
2014–15 actual	4.61
2015–16 budget	3.41
2016–17 budget	1.90

<sup>a</sup> Data for 2014 GDP and population from <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.**

*Aid Investment Plan, Timor-Leste, 2015–16 to 2018–19, DFAT*

Timor-Leste is largely an agrarian society. Agriculture value added (% of gross domestic product; GDP) in Timor-Leste is 19.2% and is the fourth biggest 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 edge of the cash economy, producing a median value of US\$378 of farm products/ person/household/year, but only selling US\$41/household/year.

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 lives. 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 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 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.

Timor-Leste is well endowed with marine fisheries resources in its 200-nautical-mile (370 km) exclusive fishing zone but lacks a coherent policy framework and investment strategy to optimise opportunities and minimise threats. Weaknesses in policy, as well as limited capacity to manage, monitor and protect its fisheries resources, expose the country to illegal fishing by foreign fleets that threaten to deplete fish stocks. There is also considerable scope to better integrate freshwater aquaculture with agriculture to reduce food security risks through more-diversified livelihoods.

## 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 (R&D) capacity in the Ministry of Agriculture and Fisheries and University of Timor-Lorosa'e.

## 2016–17 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 integration of cropping systems

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.

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

ACIAR supports a medium-term livestock research for development (R4D) 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).

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>2</sup>

Research will focus 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>3</sup>

Timor-Leste has considerable potential to improve food security through sustainable fisheries and increased aquaculture production but lacks a coherent policy framework and investment strategy to optimise opportunities and minimise threats. A strategic approach to fisheries and aquaculture development is required to best serve its aspirations and avoid the pitfalls of ad hoc initiatives. Research has developed a National Plan of Action for Aquaculture and mapped fisheries and aquaculture potential and dependence in Timor-Leste.<sup>4</sup> It has also initiated the development of an inshore fisheries strategy to guide investments in fisheries management and production.

## 5-year country outcomes

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

## 2016–17 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
- At least two beef systems development groups established that received training in forage and cattle production, business management and marketing of beef cattle

### Key Program Managers

Dr Chris Barlow, Fisheries  
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

## Current and proposed projects

- <sup>1</sup> **CIM/2014/082** Community-based agricultural innovation for intensified and sustainable farming systems in Timor-Leste
- <sup>2</sup> **LPS/2014/038** Smallholder cattle enterprise development in Timor-Leste
- <sup>3</sup> **AH/2012/065** A regional approach to enhance smallholder pig-production systems in Timor-Leste and eastern Indonesia
- <sup>4</sup> **FIS/2010/097** (*multilateral, WorldFish*) Exploring options for improving livelihoods and resource management in Timor-Leste's coastal communities

Additional project due to begin in 2016–17:

**CIM/2015/009** Protecting grains against insect pests



# VIETNAM

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

GDP per capita (US\$)	2,052.3
Population (million)	90.70

Funding	A\$m
2014–15 actual	4.99
2015–16 budget	4.39
2016–17 budget	5.00

<sup>a</sup> Data for 2014 GDP and population from <data.worldbank.org/country>

## Country context

**Vietnam experienced remarkably rapid economic growth in the two decades following the Doi Moi reforms of the 1980s, 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 15 million people continue to live below the national poverty line. Gender disparities still exist in access to and ownership of economic assets and women are poorly represented in leadership roles. Ethnic minorities have still not benefitted equally from economic growth— although they comprise just 15 per cent of the population, they account for around half of those living in poverty.**

*Aid Investment Plan, Vietnam, 2015–16 to 2019–20, DFAT*

In September 2015, Australia’s mission in Vietnam developed a strategic framework for the Australian Government’s agriculture engagement in Vietnam. It has four key objectives: (1) opening the market for Australian and Vietnamese products, investments and services in agriculture; (2) promoting more sustainable inclusive agriculture in Vietnam for economic growth, poverty reduction and food security; (3) building resilience for vulnerable communities and agribusinesses in response to external shocks, e.g. disasters, climate change, price fluctuation, crisis; and (4) ensuring a secure region through being prepared to deal with major crisis in food, agribusiness or trade. ACIAR plays a key role in contributing to objectives 2, 3 and 4.

The biggest challenges identified by the Ministry of Agriculture and Rural Development (MARD) are: competition for resources (land, water and labour) with other industries and services; food safety; severe competitiveness of commodities in domestic, regional and international markets (as Vietnam is entering a deeper trade and economic integration and almost all tariff lines will be zero in 2020); climate change and sea level rise; increasing disease and pest issues in crops and livestock; agricultural resource degradation; declining marine (wild) fish stocks; and, as well, most of the poor are ethnic

minority groups located in remote and mountainous areas and are engaged in agriculture. The Vietnamese Government is providing greater focus on programs to assist these groups. ACIAR’s program is designed to contribute in some of these major areas where Australian expertise has the ability to deliver benefits. ACIAR’s program in Vietnam supports technical, agribusiness and enabling policy research to enhance smallholder incomes from selected areas of high-value agriculture, aquaculture and forestry. In recent years, the program has focused most on three geographical regions where poverty has persisted and where there are threats to sustaining the agricultural natural resource base:

- Mekong Delta, which is particularly vulnerable to the impacts of climate variability and change. A program focusing on climate change adaptation and mitigation in rice systems in this region has been developed. The emphasis on intervention at the farm-scale complements catchment-level and whole-of-Mekong-Basin programs on water and climate change supported by the Australian Government and other donors. A rice–shrimp climate change adaptation policy for rice farmers is currently in place and a tropical fruit project is in the process of being developed

- south-central coast, where research is ongoing to underpin profitable but sustainable crop cultivation and livestock production systems in challenging environments (poor, sandy soils under water-limiting conditions), and the development of sustainable mariculture systems for high-value species
- north-western highlands, where opportunities exist for selected horticultural products (high-value temperate fruits and vegetables), sustainable production of cash crops (maize), and livestock and forestry products. Parallel research will focus on improving supply chains from smallholder farmers to more-valuable markets.

Links to the programs of Australian agencies and other donors working in these regions are regularly identified and supported. ACIAR's projects are increasingly multidisciplinary and there will be a particular focus on linking central research institutes with provincially based research and extension departments.

## Country priorities

ACIAR has a program of annual consultations with major partner organisations in Vietnam to discuss program strategies and new projects. An ACIAR–Vietnam Strategy Discussion held in May 2015 in Hanoi, involving leaders of partner research institutes and universities, non-government organisations (NGOs) and key government representatives yielded valuable insights to improve the collaboration.

Forestry research priorities were reviewed and a new statement of priorities agreed in 2013. A new process of annually reviewing this strategy and the projects that are underpinning it is being developed in Vietnam, with potential to be rolled out across other major country programs. The following key areas have been identified by ACIAR as medium-term research priorities for Vietnam:

- 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
- technical and policy support for higher-value plantation forestry products
- advice on climate-related impact and adaptation policy for future agriculture.

## 2016–17 research program

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

### Resilience of rice-based farming systems to, and policy on, 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 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 the Mekong Delta 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.

Other research aims to develop policy options in response to climate change.<sup>2</sup> The project will examine farmers' responses and adaptation to, and improve formulation of policy focused on, climate change.

### 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>3</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 forestry plantations that meet national objectives for smallholder production and contribute to community and industry development and environmental sustainability in Vietnam.<sup>4</sup>

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

Many smallholder farmers in the north-western highlands have not seen the same livelihood benefits 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 in this subprogram will investigate production of, and market opportunities for, fruits and vegetables. One 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>5</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>6</sup> A new vegetable project will build on earlier research and market development in Moc Chau district, Vietnam, and focus on upscaling safe, off-season vegetable production systems in both Vietnam and Myanmar into urban, wholesale and retail markets.<sup>7</sup>

A new project will focus on identifying and scaling out profitable market-oriented maize-based farming systems that are sustainable for the sloping uplands in Vietnam, Laos and Myanmar.<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 the mountainous region of north-western Vietnam aims to improve the income of smallholder cattle producers through intensification of beef cattle production and increased market linkages.<sup>9</sup>

Focusing on agroforestry to improve the performance of smallholder farming systems in Son La, Dien Bien and Yen Bai provinces, one project aims to develop best-practice agroforestry systems, introducing improved germplasm and enhancing market access for value-added products, such as Son Tra fruit.<sup>10</sup>

Finally, rapid growth and diversification of cassava-based processing and product markets have 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>11</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 were initiated in 2014. One project is building production capacity in bivalves (oysters, clams) in northern Vietnam to underpin industry development.<sup>12</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>13</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>14</sup>

### Towards higher-value plantation forestry products

Vietnam has nearly 1 million hectares of Australian acacia and eucalypt 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>15</sup> The project will focus on Laos, with some related work in Thailand, Cambodia and Vietnam.

A new 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>16</sup> Another new project will engage Vietnam in important forest health research that aims to reduce the impacts of two very damaging diseases (*Ganoderma* and *Ceratocystis*) that are affecting acacia plantations in South-East Asia.<sup>17</sup>

## Other projects

Other research in Vietnam is concerned mainly with smallholder pork and beef production. For example, one project is focusing on food safety aspects of pork production.<sup>18</sup> Pork contains high levels of pathogens and there is growing concern among consumers and national policymakers alike about food safety and animal disease. This project is using a risk-based approach to improve pork value-chain performance and reduce risks to animal and human health. 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>19</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. New research is focusing on improving farm productivity and market integration for smallholder beef producers in three provinces in central Vietnam.<sup>20</sup>

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 new research includes opportunities for market integration, inclusive industry development and value-adding.<sup>21</sup> A study is also being undertaken on regional mango markets and trade flows in Asia and the Pacific region, with a view to understanding the potential implications, constraints and opportunities for smallholders.<sup>22</sup>

## 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

## 2016–17 project outputs

- A new research partnership designed for climate policy on a regional basis
- 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
- Socioeconomic and biophysical benefits of best-practice agroforestry systems for north-western Vietnam evaluated and reported
- 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 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
- Food safety risks in smallholder pork value chains assessed and identified risk management strategies reported
- Guidelines for managing forage production on sandy soils in central Vietnam published
- Beef value chain access for smallholders in central Vietnam characterised and improved

### Key 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

### Country Manager

Ms Nguyen Thi Thanh An

## Current and proposed projects

- 1 **SMCN/2010/083** Adaptation to climate change in rice–aquaculture farming systems in the Mekong Delta
- 2 **ADP/2011/039** Assessing farmer responses to climate change adjustment policy options
- 3 **SMCN/2012/069** Potential sources and availability of water for agriculture in the south-central coast of Vietnam
- 4 **ADP/2014/047** Improving policies for forest plantations to meet community, industry and environmental needs in Lao PDR and Vietnam
- 5 **AGB/2012/060** Increasing competitiveness and market access of smallholders in north-western Vietnam to regional temperate-fruit markets
- 6 **AGB/2012/059** Towards more-profitable and sustainable vegetable production systems in north-western Vietnam and Australia
- 7 **AGB/2014/035** Improving livelihoods in Myanmar and Vietnam through sustainable and inclusive vegetable value chains (proposed)
- 8 **SMCN/2014/049** Improving maize-based farming systems on sloping lands in Vietnam and Lao PDR (proposed)
- 9 **LPS/2015/037** Intensification of beef cattle production in upland cropping systems in north-western Vietnam (proposed)
- 10 **FST/2010/034** (*multilateral, World Agroforestry Centre*) Agroforestry to improve livelihoods of smallholder farmers in north-western Vietnam
- 11 **AGB/2012/078** Innovative agribusiness opportunities for profitable and sustainable cassava value chains in South-East Asia
- 12 **FIS/2010/100** Enhancing mollusc production in northern Vietnam and Australia
- 13 **FIS/2010/042** Expansion and diversification of production and management systems for sea cucumbers in the Philippines, Vietnam and northern Australia
- 14 **FIS/2012/101** Development of mariculture technology for giant grouper in the Philippines, Vietnam and Australia
- 15 **FST/2012/091** Biological control of insect pests of plantations in the Mekong region
- 16 **FST/2014/064** Maximising productivity of eucalypt and acacia plantations for growers in Indonesia and Vietnam
- 17 **FST/2014/068** Management strategies for acacia plantation diseases in Indonesia and Vietnam
- 18 **LPS/2010/047** (*multilateral, ILRI*) Reducing disease risks and improving food safety in smallholder pig value chains in Vietnam
- 19 **AH/2010/045** Research support for the development of improved livestock biosecurity in the Mekong region (proposed)
- 20 **LPS/2012/062** Developing productive, sustainable and profitable smallholder beef enterprises in central Vietnam
- 21 **AGB/2012/061** Improving farmer competitiveness and returns in selected tropical fruit value chains in southern Vietnam (proposed)
- 22 **AGB/2015/015** Analysis of mango markets, trade and strategic research issues in the Asia–Pacific

Additional projects due to begin in 2016–17:

**ADP/2016/140** Food safety, economics and policy in Vietnam

**AGB/2016/159** Beef trade model for South-East and China

**AGB/2016/196** Sustainable and inclusive cattle and beef industry development in South-East Asia and China

**AGB/2016/225** Evaluation of infrastructure and policy scenarios for reducing transport costs and improving market: case studies of smallholder agri-food value chain in Indonesia, Lao PDR and Vietnam

**AH/2016/133** Improving dairy cattle health and production in Vietnam

**FST/2016/152** Enhancing market-based agroforestry systems and rehabilitation of degraded forests in north-western Vietnam

**LPS/2016/269** Assessing opportunities for pig production in maize-based cropping systems in north-western Vietnam

**SMCN/2016/268** Soil research needs for cultivating upland crops on Vietnamese deltas



**SOUTH AND  
WEST ASIA**

# REGIONAL PROGRAM SUMMARY

The South and West Asia region comprises a set of Indian Ocean Rim countries—Afghanistan, Bangladesh, Bhutan, India, Nepal and Pakistan—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 depend on agriculture for their livelihoods.

South and West Asian countries have relatively low levels 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 main organisation for economic and political cooperation in the region. However, subregional cooperations like the Bangladesh, Bhutan, India, Nepal (BBIN) Initiative have been 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.

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 Asian 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. Seven ACIAR research programs are engaged in the region. The regional strategy is focused on three ecosystems which are common to the Eastern Region of the Ganges basin which involves India, Bangladesh and Nepal: hills and highlands; Eastern Gangetic Plains; and the coastal zone.

There are similar constraints 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

**ADP/2015/032** Climate stress, structural change and farm and non-farm enterprise uptake by farmers in India and Bangladesh

**ADP/2016/003** Linkages and impacts of cross-border informal trade in agricultural inputs in eastern South Asia

**ADP/2016/167** Sustainable and resilient farming systems intensification policies and regulations in South Asia

**AH/2014/039** A one health approach to establish effective surveillance strategies for Japanese encephalitis in India and Nepal (proposed)

**CIM/2014/079** Establishing the International Mungbean Improvement Network (India, Bangladesh, Myanmar and Australia)

**CIM/2014/081** Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa

**CSE/2011/077** (*multilateral, CIMMYT*) Sustainable and resilient farming systems intensification in the Eastern Gangetic Plains (SRFSI)

**CSE/2012/108** (*multilateral, IFPRI*) Enhanced farm household management decision making in the Eastern Gangetic Plains

**CSE/2014/086** Using ICTs to enhance adoption of new agricultural technologies and innovations (extension)

**CSE/2016/112** Targeting and micro-entrepreneurship for sustainable diversification in Eastern Gangetic Plains

**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

**LWR/2014/071** Empowering women farmers and developing agency through engaged agricultural systems research

**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\$)	622.4
Population (million)	31.63

Funding	A\$m
2014–15 actual	3.44
2015–16 budget	3.40
2016–17 budget	2.90

<sup>a</sup> Data for 2014 GDP and population from <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.**

*Aid Investment Plan, Afghanistan, 2015–16 to 2018–19, DFAT*

Afghanistan ranks 171 of 188 countries on 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 aim to strengthen rural populations' access to economic opportunities and to protect their livelihoods against shocks. Gender-based violence 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 continues to be of concern, with attacks increasing on foreign establishments and convoys. Increasingly the Afghan Government and media institutions are being targeted. The three ACIAR projects in Afghanistan are fully funded by the Department of Foreign Affairs (DFAT) and implemented by the International Center for Agricultural Research in the Dry Areas (ICARDA) 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 Australian scientists is limited due to poor security and political uncertainty.

ACIAR's collaboration with Afghanistan started 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 Afghan Government 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.

## 2016–17 research program

ACIAR has three research for development (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 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
- Acceptance of capacity-building schemes for community watershed management systems

## 2016–17 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
- Six demonstration watershed sites developed using a mix of water-retention structures and perennial trees and forage crops
- Improved crop varieties demonstrated in four provinces
- Line sowing and minimum-tillage wheat crop establishment demonstrated at three hubs
- One thousand wheat lines from the Afghanistan gene bank phenotyped and genotyped
- Ten promising forage species identified and evaluated on-farm
- Improved agronomic practices developed to increase forage supply in cropping systems

### Key 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 and proposed 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\$)	1,086.8
Population (million)	159.10

Funding	A\$m
2014–15 actual	1.84
2015–16 budget	2.43
2016–17 budget	3.60

<sup>a</sup> Data for 2014 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 or 48 per cent of the labour force 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 sea ports, opens up opportunities for further economic progress through regional integration, especially for landlocked countries like Nepal and Bhutan, and for 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. In addition, Bangladesh faces the problem of inadequate nutrition, derived from multiple factors including differing consumption practices and variations in international markets and institutional effectiveness. The National Strategy for Accelerated Poverty Reduction (2011–15) articulated the Bangladeshi

Government's vision for growth through sustainable technologies that are profitable, job-creating and ecologically adaptable. It identified the need for diversifying both crop and non-crop systems and developing agribusiness services.

The Australian aid program helps promote stability in Bangladesh and provides the opportunity to engage Bangladesh as a partner on 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. Within the context of the Australia–Bangladesh country strategy, ACIAR's focus on winter fallows or 'Rabi' (winter season) crops such as pulses, wheat and maize is shifting towards a farming systems approach supporting broader improved food security. This 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.

A new project, co-funded by the Krishi Gobeshona Foundation, will work on the intensification of cropping systems in the salt-affected coastal zone of southern Bangladesh. Millions of people living in this zone are disadvantaged by poverty, food insecurity, environmental vulnerability and limited livelihood opportunities. In these low-lying intertidal areas, where saline water intrusion and monsoonal flooding are great problems, the project will seek to understand the opportunities for improved crop, soil, water and salt management to increase incomes and improve livelihoods.

## 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 Bangladeshi Government.

Key areas identified as ACIAR research priorities include:

- intensification and diversification of climate-resilient farming systems
- progress of ACIAR's multicountry climate change adaptation initiative
- conservation agriculture approaches to soil and water management
- management of soil salinity in the coastal zone
- empowerment of women and marginalised communities
- cropping systems intensification in the rice–wheat system
- improvement in smallholder livelihoods and human nutrition through diversification into legumes, such as mungbean.

## 2016–17 research program

The Bangladeshi 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 World Vegetable Center

(AVRDC).<sup>1</sup> Building on the results of the short-duration pulses project which finished in 2015–16, a new project will explore options for dry-season cropping in the southern region, with an emphasis on the management of salinity and the testing of recently developed Australian salt-tolerant wheat lines.<sup>2</sup>

Another project is focusing on adaptation of current conservation agriculture approaches and their adoption in both rainfed areas and those with supplementary irrigation<sup>3</sup>, to ensure that farmers benefit from cost-saving crop production technologies and sustainable resources management.

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>4</sup>, building on the success of past projects in north-western India and Bangladesh. A second project is examining climate change and poverty in South Asia—the macro- and micro-level impacts and policy options for enhancing resilience.<sup>5</sup> 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>6</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>7</sup>

A new project will work with women farmers in India and north-western Bangladesh to diversify their farming systems to improve family nutrition and incomes.<sup>8</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 impacts on resource use efficiency and livelihoods, including gender dimensions of those impacts.<sup>9</sup>

A new 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>10</sup>

A proposed 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 they can make better-informed decisions.<sup>11</sup>

A new project is working on the intensification of cropping systems in the salt-affected coastal zone of southern Bangladesh.<sup>12</sup>

## 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

## 2016–17 project outputs

- A portfolio of projects initiated that consider social inclusivity and sustainability in water, land and salinity management in India and Bangladesh
- Bangladesh's participation in the International Mungbean Improvement Network providing phenotypic data from the analysis of the mungbean core collection
- Breeding Management System implemented by the Bangladeshi mungbean breeding team to manage workflow and data
- First dry-season trials of pulses, wheat or forages in the southern region completed and analysed
- Widespread demonstrations undertaken of minimum-till practices based on two-wheel tractor systems, including unpuddled and minimum tillage manual and machine transplanting of rice
- Options developed for dealing with increased water scarcity via crop diversification and improved water management
- 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

### Key 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> **CIM/2014/079** Establishing the International Mungbean Improvement Network
- <sup>2</sup> **CIM/2014/076** Improved dry-season cropping in southern Bangladesh: pulses and salinity tolerant wheat
- <sup>3</sup> **LWR/2010/080** Overcoming agronomic and mechanisation constraints to development and adoption of conservation agriculture in diversified rice-based cropping in Bangladesh
- <sup>4</sup> **CSE/2011/077** (*multilateral, CIMMYT*) Sustainable and resilient farming systems intensification in the Eastern Gangetic Plains (SRFSI)
- <sup>5</sup> **ADP/2015/032** Climate stress, structural change, and farm and non-farm enterprise uptake by farmers in India and Bangladesh
- <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> **CSE/2012/108** (*multilateral, IFPRI*) Enhanced farm household management decision making in the Eastern Gangetic Plains
- <sup>8</sup> **LWR/2014/071** Empowering women farmers and developing agency through engaged agricultural systems research
- <sup>9</sup> **ADP/2016/003** Linkages and impacts of cross-border informal trade in agricultural inputs in eastern South Asia
- <sup>10</sup> **LWR/2014/072** Promoting socially inclusive and sustainable agricultural intensification in West Bengal and Bangladesh
- <sup>11</sup> **AH/2014/056** Improving small ruminant health, production and regional trade in Myanmar (proposed)
- <sup>12</sup> **LWR/2014/073** Sustainable cropping systems intensification through integrated soil, water and crop management in the salt-affected coastal zones of southern Bangladesh and West Bengal, India

Additional projects due to begin in 2016–17:

**CIM/2016/170** Response to wheat blast disease

**CIM/2016/272** Protecting chickpea from insect pests

**CSE/2014/086** Using ICTs to enhance adoption of new agricultural technologies and innovations (extension)

**CSE/2016/112** Targeting and micro-entrepreneurship for sustainable diversification in Eastern Gangetic Plains

# BHUTAN

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

GDP per capita (US\$)	2,560.5
Population (million)	0.77

Funding	A\$m
2014–15 actual	0.32
2015–16 budget	0.19
2016–17 budget	0.20

<sup>a</sup> Data for 2014 GDP and population from <data.worldbank.org/country>

## Country context

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 ranks 132 out of 188 countries in terms of 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 market and India is Bhutan's main trade, investment and development assistance partner. Agriculture and forestry dominate Bhutan's domestic economy.

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 and compete for Bhutanese Government and commercial resource support. Bhutan has limited capacity for agricultural research which is the key reason that the ACIAR program will remain small. Earlier ACIAR work in Bhutan focused on disease control of chickens, ruminants and citrus.

## Country priorities

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

## 2016–17 research program

A major initiative on improvement of citrus production (Bhutan's largest horticultural export industry) through improved planting material and ICM is underway.<sup>1</sup> This project builds on earlier work designed to develop on-farm best management practices for citrus production. Previous research identified citrus greening, powdery mildew and irrigation management as key constraints to be evaluated. In this project, integrated crop production management programs to mitigate these major constraints will be developed and adopted by growers, with a major focus on the districts of Chukha, Tsirang, Punakha, Sarpang and Dagana and eventual rollout to all major production areas.

## 5-year country outcome

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

## 2016–17 project output

- At least three members of the national citrus research and development (R&D) team undertaking or having completed relevant postgraduate training in Australia

### Key Program Managers

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\$)	1,581.5
Population (million)	1,295.00

Funding	A\$m
2014–15 actual	3.95
2015–16 budget	3.77
2016–17 budget	5.00

<sup>a</sup> Data for 2014 GDP and population from <[data.worldbank.org/country](http://data.worldbank.org/country)>

## Country context

**South Asia has the highest [number] 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. Its strategic focus has traditionally been on its immediate neighbourhood although it has sought to broaden this focus, notably towards East and South-East Asia. It 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.

The goals of agricultural development in India are to intensify and diversify the production systems in a sustainable manner with a focus on irrigation and water management, increased agricultural mechanisation, agricultural insurance, national agricultural markets, and rural infrastructure of roads and power supplies.

Australia’s bilateral relationship with India was elevated to a strategic partnership in 2014. Australia is seeking to deepen its trade and investment links through the Australia–India

Comprehensive Economic Cooperation Agreement. ACIAR has supported collaborative agricultural research between Australia, India and other South Asian countries since 1983. The large and well-developed national agricultural research system led by the Indian Council of Agricultural Research (ICAR) is a cornerstone of the Indian program and has great potential to underpin cooperative activities in the region.

ACIAR’s research activities have been increasingly linked to the food security problems of other South Asian states 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. 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

Based on formal in-country consultations convened in India by ICAR and ACIAR during 2011 and followed by consultations with stakeholders every year, ACIAR is focusing its efforts towards regional research in cooperation with India, Bangladesh and Nepal. Discussions with partners, and surveys and evaluations in the adjacent areas of the eastern Terai of Nepal and north-western Bangladesh, have indicated that a regional approach offers potentially transformative advantages through knowledge sharing.

The medium-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, sorghum and mungbean
- assisted policy development in relation to agricultural adjustment and climate change.

## 2016–17 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 for 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 new project in Bihar will undertake 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, current 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 monsoon 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 new regional (India–Bangladesh) project focuses on marginal landholders, the landless, tribal people and those who rely on ecosystem services. These marginalised communities are often left behind or harmed by agricultural development. This project aims to discover research and development (R&D) approaches that can enhance more-equitable and less-risky development pathways for these marginalised communities.<sup>4</sup> It is using the research in the embankments as one of a number of case study areas. It will also undertake research in the plains region of West Bengal using sites from the small-scale water supplies project (above) and the East India Plateau project (below) as case studies of development of marginalised communities.

In the East India Plateau, research is focusing on women farmers and water harvesting through improved cropping systems that make better use of rainfall and the limited groundwater. The adoption of new crop-growing options, such as direct seeding rather than transplanting rice and sowing dry-season crops following rice, is being achieved by working with NGOs in a participatory approach that is focused on increasing women's sense of agency. Following from this success, a new project will work with women farmers in India and north-western Bangladesh to diversify their farming systems to improve family nutrition and incomes.<sup>5</sup>

### Cropping systems

Current research is being conducted on improving sustainable management of rice and wheat cropping systems to increase cereal rotation and yields of other high-value crops, and increasing the efficiencies of water, nutrient and other input use. The research also builds 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 (AVRDC) and comprising Australia, Bangladesh, Myanmar and India.<sup>6</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 of Nepal.<sup>7</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 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.<sup>8</sup>

In addition, research continues to improve post-rainy varieties of sorghum to meet the growing demand for grain and fodder for ruminants in India.<sup>9</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. The first phase of IAP-MAWB covered faster breeding, information technology (IT) systems and data management, rust resistance, water use efficiency through root architecture and crop establishment, waterlogging, micronutrient stresses, sodic (high-sodium) soils and end-use processing quality. The program has been extended in time and focused to fewer areas of mutual interest. The extension will consolidate and continue to upgrade India's capability in DNA-based technologies for wheat cultivar development.

Enhanced management of genetic information to increase breeding efficiency in north-western and north-eastern India will allow the application of genomic selection for increased yield and disease resistance in new varieties.<sup>10</sup> The project will incorporate into new wheat varieties the results of the previous project on rust resistance. Extending the IAP-MAWB's reach to central India, where rainfed wheat predominates, another project is looking at root and establishment traits for greater water use efficiency in wheat.<sup>11</sup> This project has introduced new wheat root architecture for better water extraction from the soil, as well as semi-dwarf wheat varieties with long coleoptiles (protective sheaths enclosing the shoot tips) for better emergence and crop establishment.

Following the successful completion of the wheat stem rust project, a new regional project on yellow rust, addressing this growing threat in South Asia, is supporting the research teams of India, Pakistan, Nepal and Ethiopia.<sup>12</sup>

The multipronged India–Australia 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. The current ACIAR partnership is assessing the scope for phased deregulation and market reform options. One 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>13</sup>

As India moves towards domestic reform, its capacity to engage in more-open domestic and international markets is expected to increase, with consequent productivity and income opportunities for Indian farmers. In the broader environmental context, agricultural offsets are emerging as a key element of potential future greenhouse gas abatement policy in many countries.

In India and Australia, there is increasing interest in policy and program mixes targeted at exploitation of cost-effective abatement schemes as new opportunities for farmers. A current project is examining climate change and poverty in South Asia—the macro- and micro-level impacts and policy options for enhancing resilience.<sup>14</sup> It will help better understanding of the key factors that affect farmers' decisions to take up entrepreneurial ventures and how climate change–related resource scarcity and shocks influence decision-making.

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

## 2016–17 project outputs

- A portfolio of projects established that considers social inclusivity and sustainability in water, land and salinity management in India and Bangladesh

- Initial testing and assessment carried out of sustainable and resilient farming systems intensification in eastern India
  - Priority research and scaling-out challenges assessed for intensification and diversification of sustainable and resilient farming systems in eastern India, Bangladesh and Nepal
  - Australia–India collaborative research into policies and market options for greenhouse gas mitigation progressed
  - The Breeding Management System provided by the Integrated Breeding Platform deployed in the main Indian wheat breeding program
  - Genetic mapping of deep-root and soil-shading wheat lines progressed for use in developing improved breeding material
  - Wheat yellow rust resistance collaboration established
  - Trials of multiple use of groundwater for irrigation and aquaculture established in the Eastern Gangetic Plains
  - A project to better manage soil and water in the embankments of the coastal zone established
  - More-equitable approaches to agricultural development assessed
  - 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
  - Initial assessment of socially inclusive approaches to agricultural development provided in India and Bangladesh

#### Key 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** Sustainable cropping systems intensification through integrated soil, water and crop management in the salt-affected coastal zones of southern 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> **LWR/2014/071** Empowering women farmers and developing agency through engaged agricultural systems research
- <sup>6</sup> **CIM/2014/079** Establishing the International Mungbean Improvement Network
- <sup>7</sup> **CSE/2011/077** (*multilateral, CIMMYT*) Sustainable and resilient farming systems intensification in the Eastern Gangetic Plains (SRFSI)
- <sup>8</sup> **CSE/2012/108** (*multilateral, IFPRI*) Enhanced farm household management decision making in the Eastern Gangetic Plains
- <sup>9</sup> **CIM/2007/120** (*multilateral, ICRISAT*) Improving post-rainy sorghum varieties to meet the growing grain and fodder demand in India
- <sup>10</sup> **CIM/2013/009** Molecular marker technologies for faster wheat breeding in India
- <sup>11</sup> **CIM/2013/011** Indo–Australian project on root and establishment traits for greater water use efficiency in wheat 2
- <sup>12</sup> **CIM/2014/081** Mitigating the effects of stripe rust on wheat and production in South Asia and eastern Africa
- <sup>13</sup> **ADP/2016/003** Linkages and impacts of cross-border informal trade in agricultural inputs in eastern South Asia
- <sup>14</sup> **ADP/2015/032** Climate stress, structural change, and farm and non-farm enterprise uptake by farmers in India and Bangladesh
- <sup>15</sup> **AH/2014/039** A one health approach to establish effective surveillance strategies for Japanese encephalitis in India and Nepal (proposed)

Additional projects due to begin in 2016–17:

**CSE/2014/086** Using ICTs to enhance adoption of new agricultural technologies and innovations (extension)

**CSE/2016/112** Targeting and micro-entrepreneurship for sustainable diversification in Eastern Gangetic Plains

# NEPAL

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

GDP per capita (US\$)	701.7
Population (million)	28.20

Funding	A\$m
2014–15 actual	1.41
2015–16 budget	1.07
2016–17 budget	1.50

<sup>a</sup> Data for 2014 GDP and population from <data.worldbank.org/country>

## Country context

**To maximise the efficiency of the aid budget, the Australian aid program will focus on two objectives: basic education and micro-enterprise development. Supporting quality education and domestic job creation, specifically for women and girls, are central to ensuring long-term and inclusive economic growth in Nepal. Complementing these objectives will be a focus on resilience and making the most of opportunities afforded by the earthquakes, including ‘building back better’.**

*Aid Investment Plan Nepal: 2015–16, DFAT*

Nepal is undergoing a prolonged political transition and recovering from the earthquake in April 2015—one of the worst disasters in its history. There have been moves towards finalising a new constitution, although this process has been slow due to delays and violent protests.

While Nepal has made progress in reducing poverty rates over the past 20 years, the country remains the poorest in South Asia and among the poorest in the world. In 2015, it was ranked 145 out of 188 countries on the Human Development Index. Nepal continues to struggle with huge disparities and inequalities between regions and social groups with discriminatory practices based on gender, caste and ethnicity that trap people in poverty.

Agriculture is one of the major sectors of Nepal's economy, as it provides the livelihood of 66% of the population and contributes 33% to total gross domestic product (GDP). The Ministry of Agricultural Development (MOAD) bears overall responsibility for the growth and development of this sector. The Government of Nepal assigns a high priority to sustainable development, improved food and nutrition security, and the reduction of poverty. MOAD's priorities for 2016–17 emphasise productive land use and labour efficiency; the link between climate and agricultural models; agribusiness promotion and mechanisation; and a focus on empowerment of women farmers to ensure food and nutrition security.

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.

## 2016–17 research program

ACIAR has several subregional research projects underway or proposed which involve Nepal. Two such projects on climate-resilient farming systems intensification include 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>

Another subregional project is looking at the constraints and opportunities of supplemental irrigation with small-scale water supplies to improve smallholder livelihoods.<sup>3</sup> A forestry project in the Middle Hills region is focusing on improved productivity in both mixed crop–tree–livestock farming systems and community forests.<sup>4</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 will examine approaches to scaling up timber utilisation from community forests to assist with the rebuilding program following the earthquake.

A regional project involving India, Pakistan and Ethiopia is addressing the threat of wheat yellow rust as part of a regional network.<sup>5</sup>

A new small project has commenced which is designed to 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>6</sup>

Another new project proposed 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>7</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 (R&D)
- Definition and communication of improved alternatives for water, forestry and farmland use

## 2016–17 project outputs

- Initial testing and assessment of sustainable and resilient farming systems intensification in south-eastern Nepal achieved
- Key institutional constraints to use of groundwater for irrigation and aquaculture identified and approaches to overcome these trialled
- Trials of multiple groundwater use through combined aquaculture and irrigated cropping initiated
- A report and policy brief prepared on interactions and options for improving links between community forestry planning and local level planning
- Wheat yellow rust resistance collaboration established
- Partnerships established to commence a project to establish effective surveillance strategies for Japanese encephalitis in India and Nepal

### *Key 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 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 (SRFSI)
- <sup>2</sup> **CSE/2012/108** (*multilateral, IFPRI*) Enhanced farm household management decision making in the Eastern Gangetic Plains
- <sup>3</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>4</sup> **FST/2011/076** Enhancing livelihoods and food security from agroforestry and community forestry in Nepal
- <sup>5</sup> **CIM/2014/081** Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa
- <sup>6</sup> **ADP/2016/003** Linkages and impacts of cross-border informal trade in agricultural inputs in eastern South Asia
- <sup>7</sup> **AH/2014/039** A one health approach to establish effective surveillance strategies for Japanese encephalitis in India and Nepal (proposed)

Additional projects due to begin in 2016–17:

**CSE/2014/086** Using ICTs to enhance adoption of new agricultural technologies and innovations (extension)

**CSE/2016/112** Targeting and micro-entrepreneurship for sustainable diversification in Eastern Gangetic Plains



# PAKISTAN

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

GDP per capita (US\$)	1,316.6
Population (million)	185.00

## Funding A\$m

2014–15 actual	2.13
2015–16 budget	1.75
2016–17 budget	4.20

<sup>a</sup> Data for 2014 GDP and population from <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.**

*Aid Investment Plan, Pakistan, 2015–16 to 2018–19, DFAT*

While Pakistan is ranked as 147th of 188 countries in the 2015 Human Development Index, the Government of Pakistan is making strong efforts to strengthen its economy, and gross domestic product (GDP) growth was estimated at 4.5% in 2015–16. 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 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 (a) opportunities to enhance development, adoption and growth of best-practice technologies, and (b) 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 issues requiring research include surface and groundwater water availability and their 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. Poor 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 Program (AVCCR) in Pakistan, 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 which will make a real difference to livelihoods by reducing poverty and help to achieve the outcomes of Government of Pakistan 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, have resulted in the identification of high-priority agriculture value chains are both valuable and feasible targets for further consideration for the AVCCR new program.

Food and water security are among the most pressing challenges for Pakistan, and are exacerbated by a growing population. Pakistan has placed food, water and energy security as key aspects of its future development in Pakistan Vision 2025. Australia is committed through its aid program to helping Pakistan meet these challenges and has such has developed a portfolio of projects.

Soil salinity has been on rise in Pakistan. In the past, ACIAR has worked on Pakistani salinity management projects, and it is again being highlighted as a potential area of collaboration. The ACIAR Country Office in collaboration with the International Center for Agricultural Research in the Dry Areas (ICARDA) recently conducted two stakeholder

consultations to gauge the depth of this issue. A report is being prepared by ICARDA which will be shared with the Planning Commission and relevant Ministry in Pakistan for a possible donor search.

Policy research is required to identify and support technical 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 (IMT) often failing to materialise.

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

- improvements in horticultural crop management and value-chain practices, particularly in high-value crops such as citrus, mango and vegetables
- improvements to dairy and beef production and marketing, including genetic aspects, animal nutrition, disease control, effective extension support and capacity building of researchers
- assessment of productivity issues and disease risk in wheat and smallholder diversification into other crops such as legumes (chickpea, lentil and peanuts)
- management of land and water resources to sustain productive enterprises
- input into policy development, including investigation of social policy and capacity constraints and issues in agriculture markets and water.

## 2016–17 research program

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

### Horticulture marketing and production systems

The horticulture sector in Pakistan is significant, both domestically and for export production. 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, further work on strengthening selected horticultural value chains is planned under AVCCR.<sup>1</sup> The choice of localities and crops to be included is based on the potential of various horticulture value chains to deliver broad-based livelihood benefits.

A study is also being undertaken on regional mango markets and trade flows in Asia and the Pacific region, with a view to understanding the potential implications, constraints and opportunities for smallholders.<sup>2</sup>

### **Dairy and beef production and marketing**

Dairy is the largest livestock sector in Pakistan, with demand for milk and milk products growing at about 8% per annum. Pakistan is one of the world's largest milk producers, with approximately half of that production coming from dairy cattle, sourced mostly 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.

### **Policy, capacity building and social sciences**

One proposed project in this area aims to support the assessment and development of rural policy advice, legislation and codes of practice within Pakistan, through capacity training, technical exchanges of staff and R&D interventions aimed at specific policy issues.<sup>4</sup> Most of the work will be conducted in Islamabad and the capitals of Sindh and Punjab provinces, in association with appropriate collaborating Pakistani agencies.

Research that aims to identify and support agriculture water reform pathways and establish water institutions in South Asia will help ensure that water and related resources are appropriately managed.<sup>5</sup> A further project aims to attempt agricultural market reform in order to enhance growth, employment and productivity.<sup>6</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>7</sup> A project under development aims to expanding 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>8</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. 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-basin surface and groundwater modelling, ACIAR has developed a portfolio of complementary projects. Two of these are related to groundwater management and use. Following up a previous groundwater modelling project, there is a short project to embed the groundwater models and econometric modelling tools with Pakistani Government and academic partners.<sup>9</sup> Groundwater use is extensive in Pakistan, with some areas being completely reliant on groundwater (Balochistan), while others (Punjab) use it in conjunction with surface water to increase cropping intensity. In Sindh, large areas are affected by waterlogging, which could potentially be reduced by greater use of groundwater than occurs at present. A new project aims to identify approaches for farmers/communities and managers/policymakers to manage both groundwater quantity and quality while enhancing agricultural productivity.<sup>10</sup> This work will have strong engagement with communities to develop groundwater management options coupled with data collection and modelling to provide assessment of these options and provide feedback to the community on groundwater quantity (depth) and quality trends.

A key issue in irrigation in Pakistan is poor irrigation efficiency and associated impacts on productivity. How and when water is delivered to farms is being investigated in the DFAT–CSIRO project. However, another key component is on-farm water use. A new project will work with farmers to develop tools to improve their skills in this area. 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 learning either as a commercial service or facilitated by an extension service and NGOs.<sup>11</sup>



## 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
- Improved surface and groundwater management for increased productivity, sustainability and livelihoods

## 2016–17 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
- Wheat yellow rust resistance collaboration established
- Participatory analysis of the pulses situation in six districts completed and applied to design of farm trials
- A portfolio of projects in the water sector researching groundwater and surface water management, on-farm irrigation productivity and socioeconomic outcomes for men, women and youth established
- Groundwater model of the Rechna Doab and associated econometric models embedded within the Punjab irrigation department
- Water policy research undertaken to assist with improving water management institutions in India and Pakistan

### Key Program Managers

Dr Evan Christen, Land and Water Resources  
 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/2015/015** Analysis of mango markets, trade and strategic research issues in the Asia–Pacific
- <sup>3</sup> **LPS/2016/011** Increasing farm incomes through improved dairy and beef production and marketing (proposed)
- <sup>4</sup> **ADP/2010/091** Enabling agricultural policies for benefiting smallholders in dairy, citrus and mango industries in Pakistan
- <sup>5</sup> **ADP/2014/045** Efficient participatory irrigation institutions to support productive and sustainable agriculture in South Asia
- <sup>6</sup> **ADP/2014/043** Policy and institutional reforms to improve horticultural markets in Pakistan
- <sup>7</sup> **CIM/2014/081** Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa
- <sup>8</sup> **CIM/2015/041** Increasing legume production and profitability in legume cropping systems in Pakistan
- <sup>9</sup> **LWR/2015/011** Handover and training of surface-groundwater and econometric models to end users in Pakistan
- <sup>10</sup> **LWR/2015/036** Improving groundwater management to enhance agriculture and farming livelihoods in Pakistan
- <sup>11</sup> **LWR/2014/074** New approaches and tools to facilitate farmer learning of irrigation skills in Pakistan

Additional project due to begin in 2016–17:

**ADP/2016/165** Impact of farm characteristics on profitability in Pakistan





**EASTERN AND  
SOUTHERN AFRICA**

At 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 contains a greater proportion of poor people than any other global region, and features high levels of food insecurity and a very low Human Development Index.

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) and the 2014 Malabo Declaration. ACIAR also aligns and consults with the Forum for Agricultural Research in Africa (FARA) and subregional organisations, the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) and the Centre for Coordination of Agricultural Research and Development for Southern Africa (CCARDESA). Our research priorities consider the requirements of Regional Economic Commissions, the Common Market for Eastern and Southern Africa (COMESA) and the Southern Africa Development Community (SADC). ACIAR has regular informal consultations with the Department of Foreign Affairs and Trade (DFAT) for current and prospective African projects and programs to ensure the best possible synergies. We will involve regional agricultural research nodes in projects 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 and ACIAR has invested in training and supporting

key personnel in 10 different countries. 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:

(A joint partnership with IDRC) Cultivate Africa's Future (CultiAF)

**C2013/079** (Plant Biosecurity Cooperative Research Centre) Australia–Africa Plant Biosecurity Partnership (AAPBP)

**CSE/2013/008** (*multilateral, CIMMYT*) Sustainable intensification of maize–legume cropping systems for food security in eastern and southern Africa II (SIMLESA II)

**FSC/2012/014** (FST-managed) (*multilateral, ICRAF*) Improving sustainable productivity in farming systems and enhanced livelihoods through adoption of evergreen agriculture in eastern Africa

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

**FSC/2012/047** (CSE-managed) (*multilateral, CIMMYT*) Farm mechanisation and conservation agriculture for sustainable intensification

**FSC/2012/111** (HORT-managed) (*multilateral, AVRDC*) Improving income and nutrition in eastern and southern Africa by enhancing vegetable-based farming and food systems in peri-urban corridors

**FSC/2013/006** (LWR-managed) Increasing irrigation water productivity in Mozambique, Tanzania and Zimbabwe through on-farm monitoring, adaptive management and agricultural innovation platforms

**FSC/2013/019** (CIM-managed) Demand-led plant variety design for emerging markets in Africa

**FST/2014/093** Developing value-chain innovation platforms to improve food security in east and southern Africa

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

# EASTERN AND SOUTHERN AFRICA



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

Country	GDP per capita (US\$)	Population (million)
Botswana	7,123.3	2.05
Burundi	286.0	10.82
Ethiopia	573.6	96.96
Kenya	1,358.3	44.86
Malawi	255.0	16.70
Mozambique	585.6	27.22
Rwanda	695.7	54.00
South Africa	6,482.8	11.34
South Sudan	1,115.1	11.91
Tanzania	955.1	48.06
Uganda	714.6	37.78
Zambia	1,721.6	15.72
Zimbabwe	931.2	15.25

## Funding

A\$m

2014–15 actual	15.41
2015–16 budget	13.39
2016–17 budget	11.30

<sup>a</sup> Data for 2014 GDP and population from <data.worldbank.org/country>

## Regional context and priorities

**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**

*Aid Investment Plan, Sub-Saharan Africa, 2015–2019, DFAT*

Africa has an increasing rural population and agricultural livelihoods play a major role in gross domestic product (GDP) and food security. While African economies are growing (sustained at around 5–6%), according to the World Food Program, Sub-Saharan Africa is the region with the highest prevalence (percentage of population) of hunger.

Agriculture employs over 60% of the labour force and accounts for 30% of GDP in many African countries. Great strides are being made by many African countries to enhance farm productivity through more effective operation of agricultural markets and trade.

ACIAR's focus countries are Botswana, Burundi, Ethiopia, Kenya, Malawi, Mozambique, Rwanda, South Africa, South Sudan, Tanzania, Uganda, Zambia and Zimbabwe. While Australia has a keen national interest in the security, stability and prosperity of Sub-Saharan Africa, some key constraints to delivering on economic growth exist. These include skills shortages, food insecurity and low agricultural productivity. Skill shortages are particularly acute at the professional levels and hinder the capacity of governments to deliver services. The low levels of female participation in formal employment and leadership roles also constrain economic growth.

ACIAR will align its work in the region with the Aid Investment Plan's Objective 2 to 'enhance agriculture's contribution to sustainable and inclusive economic growth and food security' and will maintain a 15% funding budget allocation to the region.

The Eastern and Southern Africa research program will also concentrate on themes that have emerged from consultations with national and regional partners, and build on Australia's expertise in dryland farming systems management. One theme being addressed is developing appropriate agroforestry systems 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. Burundi, 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. Burundi, Ethiopia, Kenya, Rwanda, South Sudan, Tanzania and Uganda 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 food crops
- cropping systems resilience and management, including conservation agriculture
- ruminant and poultry disease management and production
- fisheries management
- agroforestry systems
- 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 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), and policy.

## 2016–17 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 primarily focuses on sustainable intensification of maize-legume-livestock farming systems, and on improved livestock production and value chains.

ACIAR's research is examining the capacity of agroforestry and crop farming systems to enhance food security in eastern Africa. It is also looking at constraints to technology adoption through econometric studies on barriers to smallholder farmer adoption. Complementing cropping intensification research, ACIAR supports a number of other research efforts in eastern and southern Africa, such as mechanisation, village poultry farming, peri-urban vegetable production, improving approaches to plant breeding and biosecurity capacity building.

The Cultivate Africa's Future (CultiAF) partnership is funding seven projects that focus on improving nutrition, value chains and food security while embedding women and youth into the research designs.

A project co-funded with the Syngenta Foundation for Sustainable Agriculture and the Crawford Fund is designing best-practice guides for plant breeders to ensure the breeding objectives of public-sector breeding programs are aligned with market demands.

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 five countries that depend on maize as their staple food—Ethiopia, Kenya, Malawi, Mozambique and Tanzania. The SIMLESA program is a backbone on which other projects can build fieldwork, with 15 or more research sites in the 5 countries. Linked to SIMLESA is another project in Zimbabwe that aims to provide increased crop–livestock integration and productivity, with scaling out by non-government organisations (NGOs).<sup>2</sup>

Farm power in Sub-Saharan countries is declining due to the collapse of most tractor-hire schemes, decreasing numbers of draught animals and decreasing human labour (e.g. stemming from rural–urban migration and pandemics). To sustainably intensify agriculture in this region, increased power through mechanisation and energy-saving practices such as conservation agriculture will be needed. A current project is looking at the potential for small-scale machines (two-wheel tractors) to improve farming practices in Ethiopia, Kenya, Tanzania and Zimbabwe, including planting, harvesting, milling and transport and is focused specifically on improved business models for delivering small-scale mechanisation to smallholders.<sup>3</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. Two small research projects<sup>4,5</sup> are testing novel methods for engaging with the private sector and rural women for scaling out sustainable intensification technologies. The projects are interlinked; sharing knowledge and practices.

In partnership with the Bill and Melinda Gates Foundation, ACIAR research aims to accelerate improvements in sorghum productivity in water-limited areas of Ethiopia.<sup>6</sup> This project is enabling the Ethiopian sorghum breeding program to adopt modern methods, comprising advanced plant physiology, molecular markers and information technology (IT) tools currently used in Australia. Yellow rust is a serious threat to Ethiopian wheat production. Ethiopia is joining the new regional (South Asia) project addressing the yellow rust threat, thereby developing links between Africa and South Asia.<sup>7</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 proposed 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>8</sup>

An important research theme for the livestock projects is improved linkages between farmers and the private agribusiness sector. A new project in South Africa aims to assist this small-scale and emerging sector to work with regional commercial partners to supply niche markets for pasture-finished cattle, including those using other types of non-grain systems.<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 under 5 years old. A project is exploring how to improve food and nutrition security by improving the quantity, quality, accessibility and utilisation of nutrient-rich food of plant and animal origin (e.g. traditional vegetables, eggs) that is available to households.<sup>10</sup> It aims to reduce childhood under-nutrition 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, irrigation in Africa has major difficulties in 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 profitability and prevent/reverse environmental degradation in current and newly irrigated lands. A regional project operating in Mozambique, Tanzania and Zimbabwe seeks to research the use of innovation platforms to overcome factors constraining development, and provide policy ideas for improved water governance across scales. This is coupled with participatory on-farm monitoring of water applied, soil water, nitrate, salt, watertables and groundwater depth as a basis for identifying locally relevant options for improving water use productivity.<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 and Tanzania seeks to develop a system of continual social and institutional learning directed towards improving the profitability and sustainability of irrigation farming.<sup>12</sup> The aim of the research is to increase the profitability for 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 established under the Australian International Food Security Research Centre (AIFSRC) has been conducting research on the development and scaling up of locally appropriate agroforestry systems in Ethiopia, Rwanda, Uganda and Burundi.<sup>13</sup> A new project will continue this research focus, by broadening the scientific knowledge on tree–crop interactions, overcoming identified constraints to adoption of agroforestry and studying the role of communities of practice in facilitating adoption and improved market access.<sup>14</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>15</sup>

## Improving high-value and nutritious crops

Malnutrition, poor diet diversity and youth migration to cities are widespread problems in eastern and southern Africa. The goal of one regional project is to improve nutrition as well as generate youth employment and income opportunities for peri-urban vegetable growers and their families in Ethiopia, Malawi, Mozambique and Tanzania.<sup>16</sup> It aims to improve indigenous and introduced vegetable variety and seed supply systems, enhance crop management practices and develop a more effective value chain. Research is assessing and promoting technologies and practices for increased and safer production of vegetables. It is evaluating and deploying improved varieties and high-quality seed for selected vegetables and assessing the feasibility of value adding and processing options, particularly postharvest storage. The project will operate via 'best-practice hubs' as centres to demonstrate crop trials, postharvest handling techniques and other interventions. These hubs will serve as an educational base for vegetable farmers, while also attracting traders and the wider public.

The Alliance for Agricultural R&D for Food Security, a partnership between ACIAR/AIFSRC, the Crawford Fund and Syngenta Foundation, is investigating the conundrum of 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%. A demand-led variety design project has the goal of using private-sector plant breeding approaches for training national plant breeders to produce high-performing plant varieties that meet market demands, thus enabling smallholder farmers to better participate in local and regional markets, by increasing the availability of their produce.<sup>17</sup> It focuses on the design and development of new varieties to provide compelling benefits to smallholder farmers, seed producers and distributors, processors, and the whole value chain through to consumers. Integrating demand into new variety design is expected to boost utilisation, encourage market creation and contribute to improved livelihoods for farmers. The project approach is to seek out and crowd-source the best African and international expertise and methods in modern variety design from both the private and public sectors.

## 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 2017. 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. Its cross-cutting focus on adoption of research technologies through private-sector partnership and women's empowerment will continue in 2016–17.

All the seven subprojects in this project<sup>18</sup> have strong private-sector involvement and the activities in 2016–17 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; reducing maize aflatoxin contamination and exposure in Zimbabwe; testing different communication and dissemination models for communicating science for impact; and expanding business opportunities for youth in agri-food systems.



## Increasing trade and biosecurity capacity

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 successful Australia–Africa Plant Biosecurity Partnership (AAPBP) will be expanded in 2016–17, extending the African Biosecurity Senior Fellows network to a larger group of public- and private-sector practitioners through technical and soft skills training, market access simulation and the use of Australian mentors and technical tools.<sup>19</sup>

The Australian placement program has represented an important step in the formation of a group of plant biosecurity specialists in Africa who can work together on the enhancement of plant biosecurity in their countries and across the region. It has built strong professional relationships which 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 will be further increased by the African placement in 2016–17.

## 5-year regional outcomes

- Reduced poverty and improved food security through increased availability of meat, grains, forestry and vegetable products in selected areas
- 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 plant biosecurity capacity
- Improved partnerships with like-minded organisations funding agricultural research

## 2016–17 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
- Value-chain constraints to the engagement of smallholders in the Botswana beef industry identified
- 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
- Wheat yellow rust resistance collaboration established
- Ethiopian sorghum breeding program routinely using digital data capture and data management
- Smallholders trained and employing 'best practices' to produce and supply high-value vegetables to urban markets at selected sites in at least three African countries
- Proof of concept obtained that small-scale farmers in South Africa are able to deliver cattle that meet the agreed high-quality specifications of supermarkets
- Achievements and benefits from activities to promote adoption of agroforestry systems by 30,000 farmers reported
- Local institution capacity strengthening and value-chain development strategies prepared to support innovation platforms at three sites in Uganda and Zambia
- Virtual irrigation academy established in Malawi and Tanzania to increase the skills in, and provide tools for, irrigation management
- Journal special edition published on 'The productivity and profitability of small-scale communal irrigation systems—case studies from south-eastern Africa', outlining technical, economic and social issues from farm to basin scale
- Innovative education module developed for teaching the best-practice plant variety design developed to form part of the syllabus for postgraduate degrees in plant breeding in the region

- African Biosecurity Senior Fellows network expanded to a larger group of public- and private-sector Associate Fellows through in-country training, market access simulation and use of Australian mentors and technical tools
- Regional action plans for Panama disease and a diagnostic network developed and monitored and plant biosecurity measures incorporated into commercial supply chains
- Pilot scaling of maize and legume intensification documented

#### Key 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 Melissa Wood, General Manager Global Programs

#### Regional Manager Africa

Ms Liz Ogutu

## Current and proposed projects

- CSE/2013/008** (*multilateral, CIMMYT*) Sustainable intensification of maize–legume cropping systems for food security in eastern and southern Africa II (SIMLESA II)
- CSE/2010/022** (*multilateral, ILRI*) Integrating crops and livestock for improved food security and livelihoods in rural Zimbabwe
- FSC/2012/047** (CSE-managed) (*multilateral, CIMMYT*) Farm mechanisation and conservation agriculture for sustainable intensification
- CSE/2015/025** Testing participatory entrepreneurship for enhancing private sector-led scaling out of innovations for crop intensification (Uganda)
- CSE/2015/026** (*multilateral, CIMMYT*) Supporting equitable benefits among men and women through agricultural innovation platforms in Rwanda
- CIM/2013/005** A targeted approach to sorghum improvement in Ethiopia
- CIM/2014/081** Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa
- AH/2010/061** (*multilateral, ILRI*) Improving the health and marketing of goats in Botswana (proposed)
- LPS/2005/128** High quality markets and value chains for small-scale and emerging beef cattle farmers in South Africa
- FSC/2012/023** Strengthening food and nutrition security through family poultry and crop integration in Tanzania and Zambia
- FSC/2013/006** (LWR-managed) Increasing irrigation water productivity in Mozambique, Tanzania and Zimbabwe through on-farm monitoring, adaptive management and agricultural innovation platforms
- LWR/2014/085** A virtual irrigation academy to improve water productivity in Malawi and Tanzania
- FSC/2012/014** (FST-managed) (*multilateral, ICRAF*) Improving sustainable productivity in farming systems and enhanced livelihoods through adoption of evergreen agriculture in eastern Africa
- FST/2015/039** Development and adoption of locally-appropriate agroforestry systems in eastern Africa
- FST/2014/093** Developing value chain innovation platforms to improve food security in east and southern Africa
- FSC/2012/111** (HORT-managed) (*multilateral, AVRDC*) Improving income and nutrition in eastern and southern Africa by enhancing vegetable-based farming and food systems in peri-urban corridors
- FSC/2013/019** (CIM-managed) Demand-led plant variety design for emerging markets in Africa
- (A joint partnership with IDRC) Cultivate Africa's Future (CultiAF)
- C2013/079** (Plant Biosecurity Cooperative Research Centre) Australia–Africa Plant Biosecurity Partnership (AAPBP)

Additional projects due to begin in 2016–17:

**CIM/2015/009** Protecting grains against insect pests (Tanzania)

**CSE/2016/255** Testing institutionalisation of gender-sensitive innovation platforms for sustainable intensification (Rwanda)

Funding	A\$m		
	CGIAR (unrestricted)	Other <sup>a</sup>	Total
2014–15 actual	18.30	1.51	19.81
2015–16 budget	16.50	0.93	17.43
2016–17 budget	18.30	0.94	19.24

<sup>a</sup> Includes CABI, AVRDC and APAARI contributions

## Medium-term strategy

ACIAR's Global Program manages the allocation of approximately 20% of the ACIAR research budget to multilateral organisations and the International Agricultural Research Centres (IARCs). This role aligns with one of the functions of ACIAR prescribed in the *ACIAR Act 1982*, to fund international agricultural research centres, and is primarily delivered through active engagement with, and core funding of, CGIAR. CGIAR is ACIAR's key research partner and the leading system for global, public-good agricultural research.

In addition, the Global Program engages with and supports a range of other international multilateral institutes and associations, including the Asia-Pacific Association of Agricultural Research Institutions (APAARI), the Association of Southeast Asian Nations (ASEAN), CABI (an intergovernmental, not-for-profit organisation), the Food and Agriculture Organization of the United Nations (FAO), the Pacific Community (SPC), the United Nations, the World Bank, the G20 and the World Vegetable Center (AVRDC).

ACIAR's strategy is to be both a valued donor and a research partner through establishing active working relationships and providing timely and consistent funding. It aims to ensure quality and value for money to developing countries and Australia from research conducted by the IARCs with Australian funds. ACIAR's contribution, together with other donors, allows it to leverage additional resources and pursue agreed priorities at a scale that would not be possible for ACIAR to achieve on its own.

## CGIAR

The Australian Government, through ACIAR, has been a regular funder and research partner of the CGIAR system since 1982. Over the years, Australian contributions to CGIAR have been significant, ranging from senior leadership roles in CGIAR Centres to annual funding to the CGIAR Fund. Support for CGIAR plays to an area of recognised comparative advantage for Australia. CGIAR aims to advance agri-food science and innovation to enable poor people, especially poor women, to enjoy increased agricultural

productivity, share in economic growth, feed themselves better and conserve natural resources in the face of climate change and other threats. The goals of CGIAR research are dedicated to reducing rural poverty, increasing food and nutrition security for human health, and improving natural resource systems and ecosystem services. The outcomes from CGIAR investment contribute significantly to the United Nations Sustainable Development Goals and advance the interests of developed and developing nations alike by ameliorating the fundamental causes of social instability in the world's trouble spots. CGIAR research is carried out by the 15 Centres in close collaboration with hundreds of partner organisations, including national and regional research institutes, civil society organisations, academia and the private sector. The valuable scientific partnerships with CGIAR have resulted in CGIAR contributing both directly and indirectly to Australia's agricultural sector and the strategic goals of the Australian aid program, with particular relevance to the Strategy framework for Australia's aid investments in the agriculture, fisheries and water sectors. CGIAR's focus on gender and inclusive growth aligns well with the framework's recognition that women's economic empowerment is integral to tackling poverty and maximising development outcomes. The scientific and policy research undertaken by CGIAR delivers against the framework's three priority areas of innovation in increasing productivity and sustainable resource use, strengthening markets for small-scale farmers, and promoting effective policy and governance.

CGIAR has identified seven pathways to a food-secure future. These are illustrated in the CGIAR Strategy and Results Framework 2016–2030 as: using advanced molecular techniques to craft new, high-yielding crops; developing safer and more-nutritious food; creating more-equitable links between producers and markets with greater opportunities for the poor; pursuing climate-smart agriculture along multiple lines; helping to put in place policies that foster the sustainable management of fisheries, land, forests and water and reduce food loss and waste; fostering gender equity to boost rural productivity; and furthering policy analysis and advocacy to ensure science and agriculture are fully leveraged to realise the Sustainable Development Goals.

## ACIAR's commitment to CGIAR

ACIAR funds the CGIAR system by providing unrestricted (or core) funds through the multidonor Trust Fund managed by the World Bank. This unrestricted funding is complemented by ACIAR project-specific funding, whereby direct research partnerships with individual CGIAR Centres are developed (see 'Current and proposed projects' below). Other Australian organisations, including the Australian Government Department of Foreign Affairs and Trade (DFAT) and the Grains Research and Development Corporation (GRDC), also periodically provide funding to CGIAR.

ACIAR's annual contributions to the CGIAR system are shown in the following table. A range of factors influence Australian funding to CGIAR, including alignment with the Australian aid program's priorities and budgets, Australian agricultural priorities, opportunities to leverage off previous work, scientific quality, performance levels and value for money. These allocations are reviewed and recalibrated annually.

Australian support to CGIAR is as follows:

CGIAR funding	A\$m		
	Unrestricted	Project-specific <sup>a</sup>	Total
2014–15 actual	18.30	23.00	41.30
2015–16 budget	16.50	10.00	26.50
2016–17 budget	18.30	14.10	32.40

<sup>a</sup> As detailed in the country chapters of this AOP

The Independent Review of ACIAR (2013) noted that ACIAR should continue its involvement at the highest level possible to assist transforming CGIAR, noting that the system had demonstrated effectiveness over many years. Building on the completion of the CGIAR Strategy and Results Framework 2016–2030, 2016–17 will see ACIAR continuing to contribute to the development and approval of the second round of CGIAR Research Programs (CRP II).

In addition, ACIAR will remain actively engaged in supporting the development and transition of the governance and secretariat arrangements to a new System Organisation comprising a System Office and System Council. This new entity will be established under an international treaty agreement but will operate in accordance with a new governing instrument—the Partnership Framework. In recognition of the downward pressure on traditional donor budgets, ACIAR will support the resource mobilisation activities being explored by CGIAR, including the development of innovative finance mechanisms that serve as complementary mechanisms to attract new types of investors.

In 2016–17, ACIAR will ensure the quality and value for money of Australia's contributions to CGIAR through:

- leading the development of a coordinated Australian engagement with CGIAR, including consultation with DFAT and other Australian agencies
- representing the Pacific Donor Constituency on the CGIAR Fund Council and then the System Council when it is implemented in mid-2016, subject to Australia being allocated leadership of this constituency seat
- supporting the development of innovative finance mechanisms for CGIAR
- involvement of Research Program Managers in the governance of selected CGIAR Research Programs
- participation in the governance and approval of the second round of CGIAR Research Programs as a member of the Fund Council.

## Asia–Pacific Association of Agricultural Research Institutions (APAARI)

APAARI has as its mission the promotion and coordination of the national agricultural research institutes in the Asia–Pacific region through inter-regional and inter-institutional cooperation. APAARI also helps to establish regional agricultural research priorities and works with the Global Forum on Agricultural Research (GFAR) to ensure that these priorities are considered in wider global strategy settings, including CGIAR and the Global Conference on Agricultural Research for Development (GCARD) processes. APAARI priorities are also considered by ACIAR as part of its wider regional partnership process.

Australia, through ACIAR, is a member of APAARI and currently holds a position on the Executive Committee. ACIAR provides funding to APAARI annually that is used 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. ACIAR also partners directly with many APAARI members on agricultural research activities.

## CABI

CABI is an inter-governmental, not-for-profit organisation, established by a United Nations treaty, of which Australia is a member country. It has been in operation for over 100 years. CABI holds scientific research, international development, knowledge management and publishing at its core. It works to improve global food security through helping farmers grow more and lose less of what they produce, combating threats to agriculture and the environment from pests and diseases, protecting biodiversity from invasive species, and improving access to agricultural and environmental knowledge.

ACIAR provides funding to CABI annually that is being used to continue the growth of CABI's flagship program Plantwise, grow innovation in the mobile technologies program Direct2Farm in South Asia and Africa, and host the secretariat of the Open Data in Agriculture and Nutrition (GODAN) initiative. ACIAR funding is also being used to facilitate trade and market access for smallholder farmers, particularly in commodity crops such as coffee and cocoa, and to protect biodiversity through better management of invasive species, which represent a major threat to food security.

## AVRDC

The World Vegetable Center (AVRDC) 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 nutritious and health-promoting vegetables. It disseminates improved varieties and production methods in developing countries to help farmers increase vegetable harvests, raise incomes in poor rural and urban households, create jobs and provide healthier, more nutritious diets for families and communities. In recognition of AVRDC's contribution to improving livelihoods in the Indo-Pacific region and ACIAR's growing interest in the nexus between agriculture, nutrition and health, ACIAR was pleased to begin providing core funding to AVRDC in 2015–16. This complements funding that AVRDC receives as the leader of, or partner in, various ACIAR-funded projects, including as the commissioned organisation in two active projects on supporting a regional network for mungbean genetic resources and improvement, and another in enhancing peri-urban vegetable-based farming systems and value chains in four countries in eastern and southern Africa.

## Key performance indicators (2016–17)

- Effective participation by ACIAR in CGIAR reform implementation as a member of the Pacific Donor Constituency, with Australian perspectives and contributions valued by the Fund Council and Consortium Board
- Effective participation by ACIAR in the management and assessment of CGIAR Research Programs

### *Key Program Manager*

Ms Mellissa Wood, General Manager Global Program

Funding	A\$m
2014–15 actual	8.23
2015–16 budget	6.43
2016–17 budget	9.00

## 2016–17 priorities

Building capacity of agricultural research institutes in partner countries is one of ACIAR's key priorities. It is one of the principal means by which the Centre's research outputs are adopted. The main aim of the program is enhancement of the research capabilities of institutions and individuals involved in ACIAR projects.

Much of this is done in conjunction with individual projects through 'on-the-job' training, where either developing-country scientists visit Australia or Australian specialists visit partner countries to present a training program. Work experience in joint research ventures also contributes to this objective.

ACIAR offers several specialised training activities: John Allwright Fellowships for postgraduate training in Australia, with small grants available for fellowship returnees; John Dillon Memorial Fellowships for research management and leadership training in Australia; scholarships for postgraduate studies at the University of the South Pacific (USP), in association with ACIAR projects in Pacific island countries (PICs); and limited short-term 'cross-program' training courses through the Crawford Fund. ACIAR fellowships are part of the broader Australia Awards program that offers the next generation of global leaders an opportunity to undertake study, research and professional development in Australia, or in association with Australian researchers in our region, and for high-achieving Australians to do the same overseas.

### Postgraduate training

During 2016–17, ACIAR will provide 23 or more new 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 but do not directly form part of the project. Fellows are able to spend up to 50% of their project period on fieldwork in their home country. With increased recognition by the Australian aid program of the importance of capacity building to partner countries, and its impact on regional relationships, ACIAR will continue to support postgraduate training, maintaining 110–120 scholars in the fellowship program in 2016–17.

Those eligible to apply for John Allwright Fellowships in 2016–17 are citizens of Papua New Guinea, some PICs (Fiji, Kiribati, Samoa, Tonga, Solomon Islands, Vanuatu),

Indonesia, the Philippines, Vietnam, Laos, Cambodia, Myanmar, Timor-Leste, India, Pakistan, Bangladesh, Afghanistan, Bhutan, western China and some African countries (Botswana, Ethiopia, Egypt, Kenya, Malawi, Mozambique, Tanzania, Tunisia and Zimbabwe).

Small grants are also available for John Allwright Fellows after they complete postgraduate studies and return to relevant employment in their home countries. The follow-on funding scheme provides grants of up to A\$10,000 for an activity that continues, or is related to, the ACIAR research project and the fellow's associated postgraduate work. The funding is primarily for developing small-scale research projects in the returnee's institution, with the intention of catalysing longer-term support and ongoing international collaboration. Since 2000, almost 100 returnee grants have been awarded.

The Centre also provides scholarships for up to 16 (usually around 12) candidates each year to undertake postgraduate diploma and Master of Science degree studies at USP. Citizens of seven PICs (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 the Centre's South Pacific partner countries. From 2016, an Australian university with a strong research interest in the Pacific will enter into a 'twinning scheme' with USP to strengthen and support the further development of the scholarship program.

### Research management training

During 2016–17, ACIAR will offer 10 John Dillon Memorial 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.

### John Allwright and John Dillon fellows' Alumni Association

ACIAR maintains links with John Allwright and John Dillon fellows after they return to their home countries through an Alumni Association. Alumni continue their interaction with ACIAR in various ways, including leadership roles in ACIAR projects, and delivery and tutor 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 program as project partners and leaders. They

regularly receive ACIAR corporate documents, the *Partners in Research for Development* magazine and technical publications. In 2014–15, a new strategy, the Australia Awards Alumni Network, was introduced to establish a consistent Australian Government approach to alumni engagement.

### 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.

## Key performance indicators (2016–17)

- At least 15 students to have successfully completed postgraduate awards in 2016–17
- Size and management of the John Allwright Fellowship program effectively maintained and at least 20 new students to have commenced in 2016–17
- Continuation of the high quality of applicants for in-depth research management training in Australia (John Dillon Fellows), such that over 40 applications are received and at least 8 fellowships are awarded

### Program management

A committee of senior staff under the chairmanship of ACIAR's General Manager Corporate, Mr David Shearer, provides guidance on training priorities and awards.

A committee composed of ACIAR research program managers with projects in PICs and senior faculty members of USP oversees the operation of the postgraduate scholarship scheme at that university

The Project Officer Education and Training is the contact point for John Allwright (postgraduate) and John Dillon Memorial (research management) fellowships.

Funding	A\$m
2014–15 actual	0.50
2015–16 budget	0.60
2016–17 budget	0.60

## Position

An established focus for ACIAR has been understanding the impact of research on smallholders and communities in our partner countries and Australia resulting from the adoption by next users and final users of research outputs. Assessing these impacts has served as evidence in accounting for ACIAR investments to stakeholders, demonstrating the net benefits from ACIAR projects. Further, the impact assessment activities applied to projects and the subsequent findings and lessons learned contribute to ACIAR priority setting and the design and management of new ACIAR programs and projects. By undertaking these ex post assessments, ACIAR engages 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 currently commissions three types of finished project assessments. The first are primarily economic evaluations, which are published in ACIAR's Impact Assessment Series. Most of these assessments are undertaken by independent economists with special expertise in measuring the impact of agricultural research. 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 typically these studies provide estimates of the returns to particular investments, the multidimensional nature of R4D impacts within communities require various methods to capture and describe environmental, social and capacity-building outcomes and impacts. To date, there have been over 90 separate Impact Assessment Series studies.

The second type of finished project evaluations is the Adoption Studies which have been completed over the last 12 years. They 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 impact 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.

'Impact pathway analysis' is the third type of project evaluation, in which the path from a body of research to impact is articulated. Impact pathway studies provide an in-depth analysis of the contextual environment, key stakeholders, pathway linkages, any changes that have occurred and actions that could be undertaken within the project or program to increase the likelihood of the ultimate goals being reached.

ACIAR continually reviews and adapts its Impact Assessment Program and the methods applied to ensure that its outputs meet the needs of stakeholders including the Australian Government and partner-country institutions. For example, ACIAR has the opportunity to expand its partnering with the private sector in the delivery of agricultural R4D. ACIAR already offers to the private sector high-quality research and credibility along with access to established networks of researchers and policymakers in Australia and developing countries, while past and current private-sector partners offer to ACIAR technologies and innovation capacity pathways to greater scale-out and access to value-chain knowledge. To further build on private-sector partnerships, the Impact Assessment Program learnings will be used in 2016–17 to better target and manage ACIAR's private-sector partnerships, informing the monitoring of these engagements in projects and the leverage achieved to deliver benefits for smallholders and their communities, including women and youth.

Contributing to ACIAR's commitment to capacity building among research teams and partners, the Impact Assessment Program has supported the development and testing of methods and frameworks to better understand adoption by smallholder farmers. A smallholder adoption tool, the Adoption and Diffusion Outcome Prediction Tool (ADOPT), and information for use by project teams will be made available to help practitioners consider factors influencing adoption. A better understanding of these adoption factors, and planning for them in projects, will increase the effectiveness and efficiency of research to deliver benefits to smallholders and their communities among our partner countries.



## 2016–17 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
- Evaluate the benefits of private-sector partnerships in agricultural R4D in key projects
- Complete the 2016 project leader Adoption Studies report for the set of large projects concluded in 2011–12

### Private-sector partnerships

- Drawing from an evaluation of private-sector partnerships in research projects, contribute to the design of measurement and evaluation approaches of these private-sector partnerships across ACIAR projects

### Capacity building

- Enhance the specification and estimation of the impact of new projects by assisting project research groups during peer review of their proposals
- Familiarise ACIAR project leaders and develop capacity among project teams in planning for and assessing capacity building in research projects
- Make available to project teams and partners the ADOPT adoption tool for smallholders to better understand and plan for adoption of technologies by farmers

## Key performance indicators (2016–17)

- At least four reports published in the Impact Assessment Series
- Annual project leader Adoption Studies report completed
- Assessment undertaken of the impacts from capacity-building activities within ACIAR projects in Vietnam
- Training courses undertaken for project teams and partner country organisations in impact pathway analysis and impact assessment

### *Program management*

Dr Andrew Alford, Impact Assessment

Funding	A\$m
2014–15 actual	0.63
2015–16 budget	0.55
2016–17 budget	0.59

## Position

ACIAR is committed to communicating scientific and policy knowledge. We undertake a range of public awareness and stakeholder engagement activities, including training programs, print and online publications, and social media to promote agricultural research as part of Australia's aid program.

The Centre communicates the results and impacts of the research it funds in accordance with the *ACIAR Act 1982* and in close collaboration with its research partners.

ACIAR works to identify communications opportunities throughout the project life cycle—from design through implementation and following conclusion of the project. The program works to incorporate new information and communications (ICT) technology to support improved project communication and the dissemination of research results.

ACIAR's social media platforms—Twitter, blogs, Facebook, YouTube and Flickr—are used as a means of enhancing our communications impact.

Stakeholder Engagement and Communications provides support to ACIAR's senior leadership team, research program managers (RPMs), project leaders, project partners and the nine ACIAR Country Offices in key partner countries, including advice on strategic communications and communication tools, products and practitioners.

A suite of corporate publications complements the dissemination of research outcomes. *Partners in Research for Development* magazine is the flagship corporate publication, communicating the results and benefits of ACIAR's research to a wide range of audiences, highlighting ACIAR's partnership approach. Other corporate publications include the Strategic Plan, the Annual Operational Plan, ACIAR's Annual Report, and related blogs and brochures.

ACIAR's scientific publications present the outcomes of projects as monographs, proceedings and technical reports. Other publications that report research outcomes or impacts include Impact Assessment Series reports, Adoption Studies, project final reports and fact sheets. All ACIAR publications are available online at <aciarc.gov.au>. This includes the production of a wide range of reference and technical material and practical 'how-to' guides in both print and electronic form.

The program works with the Crawford Fund (<crawfordfund.org>) in a range of public awareness activities, such as the facilitation of media coverage in Australia and overseas. This includes support of journalist visits to ACIAR-supported projects, and communications training and Master Classes in a range of countries.

ACIAR's statutory and legislative reporting and information compliance requirements and requests are the responsibility of Stakeholder Engagement and Communications.

## 2016–17 priorities

- Provide high-quality support to the Ministers, ACIAR Commission, Policy Advisory Council, Chief Executive Officer (CEO) and key stakeholders
- Lead the delivery of ACIAR's focus on communicating the results and impacts of research, and promote better use of ACIAR knowledge to benefit our wider project partners
- Coordinate the delivery of all corporate communication and records management requirements against specific reporting frameworks, such as the ACIAR Commission, and Australian Government and Parliamentary reporting requirements
- Develop ACIAR's stakeholder engagement plan, ensuring that it is integrated with a whole-of-government approach on official development assistance
- Continually improve effective and efficient dissemination strategies for the communication of ACIAR-funded outputs, outcomes and impacts
- Provide guidance and support to ACIAR's senior leadership team on communications and stakeholder management, including within government, research partners and other key stakeholders involved in the delivery of ACIAR's mandate
- Ensure that all legislative, reporting and information requirements and requests are met in an efficient and timely manner
- Improve communication of ACIAR-funded outputs through systematic design and implementation phases of projects

## Key performance indicators (2016–17)

- Internal (such as ACIAR Commission, Policy Advisory Council, RPMs, Cluster Support Officers and Country Managers) and external (such as DFAT, research and private-sector partners, and industry bodies) stakeholders are effectively engaged through excellent communication approaches and products
- 12–16 new publications on ACIAR-funded outputs, outcomes and impacts commissioned
- Three issues of *Partners in Research for Development* magazine published
- ACIAR visible in six key events, supported by a range of materials, publications and media releases
- All statutory and legislative reporting and information requirements and requests are met in an efficient and timely manner

### *Program management*

Mr David Shearer, General Manager Corporate

Funding	A\$m
2014–15 actual	11.47
2015–16 budget	11.87
2016–17 budget	11.61

## Position

Sound corporate management underpins ACIAR's collaborative international project partnerships, requiring liaison with a diverse range of research providers, and government and other stakeholders. ACIAR's corporate team enables the Centre's work through ensuring effective and efficient project development, management and delivery of results in this complex environment as an Australian Government agency. The corporate programs also play a role in supporting ACIAR's engagement in a whole-of-government approach to the delivery of Australian aid. Integral to managing a diverse portfolio across partner countries are the nine overseas offices at Australian diplomatic posts, with Country Office staff playing key roles in managing stakeholder relations and ensuring that partner-country priorities are heard and responded to.

There are four key components of corporate management within ACIAR:

1. Communications and Stakeholder Engagement
2. Finance, Procurement and Legal
3. Human Resources
4. Business Systems.

The corporate management team of ACIAR plays a leading role in the design and implementation of ACIAR's new business system and delivers effective organisational change to ensure user adoption.

ACIAR's Communications and Stakeholder Engagement team plays an active role in engaging with the agency's external environment and ensures the successful delivery of its communication strategy. The team supports ACIAR's communications and stakeholder engagement activities, which include parliamentary liaison, publications, science communications and public affairs. The team is responsible for corporate reporting and governance and also oversees engagement with, and support for, the ACIAR Commission and the Policy Advisory Council.

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, process 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.

## 2016–17 priorities

### Communications and Stakeholder Engagement

See *Communicating research results* above.

### 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

## Human Resources

- Manage workplace relations and implementation of ACIAR's Enterprise Agreement, in accordance with current 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 the ACIAR Collaborative Environment (ACE) to ensure that infrastructure, information and records management, and technology issues are taken into account with new system implementation
- Improve 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 ACE, including project management requirements, records management, and internal and external communication requirements, and work to better 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

## Key performance indicators (2016–17)

- The ACIAR Collaborative Environment (ACE) is effectively designed and implemented, with a high degree of user acceptance
- All aspects of ACIAR's supported research, including design, implementation and delivery, are communicated effectively, as outlined in the Communicating research results section
- Stakeholders, internally and externally, are effectively engaged through excellent communication and knowledge management to improve understanding of ACIAR's operations, results and impact
- 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, including a new Enterprise Agreement

### *Corporate managers*

Mr David Shearer, General Manager Corporate

Mr Albert Blair, Chief Finance Officer

Ms Sharyn Turner, Manager Human Resources

Ms Joanna Hicks, Manager Business Systems Support



# 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—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, Senior Management Team members are:

The General Manager Country Programs (GMCP) who is responsible for overseeing the bilateral research activities across the Indo-Pacific. 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 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 G20 and the Food and Agriculture Organization of the United Nations (FAO).

The Principal Adviser position also 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 General Manager Corporate is responsible for managing all corporate services for ACIAR, meeting its corporate objectives and discharging its responsibilities, including government and statutory reporting obligations.

Key components of the function include:

- corporate communications
- parliamentary and ministerial liaison
- human resources management
- information technology management
- knowledge management
- business and financial management
- property and facilities management
- corporate reporting
- operational policy and procedures
- support services for the ACIAR Commission and the Policy Advisory Council.

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 government's expanding 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 enhances 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.

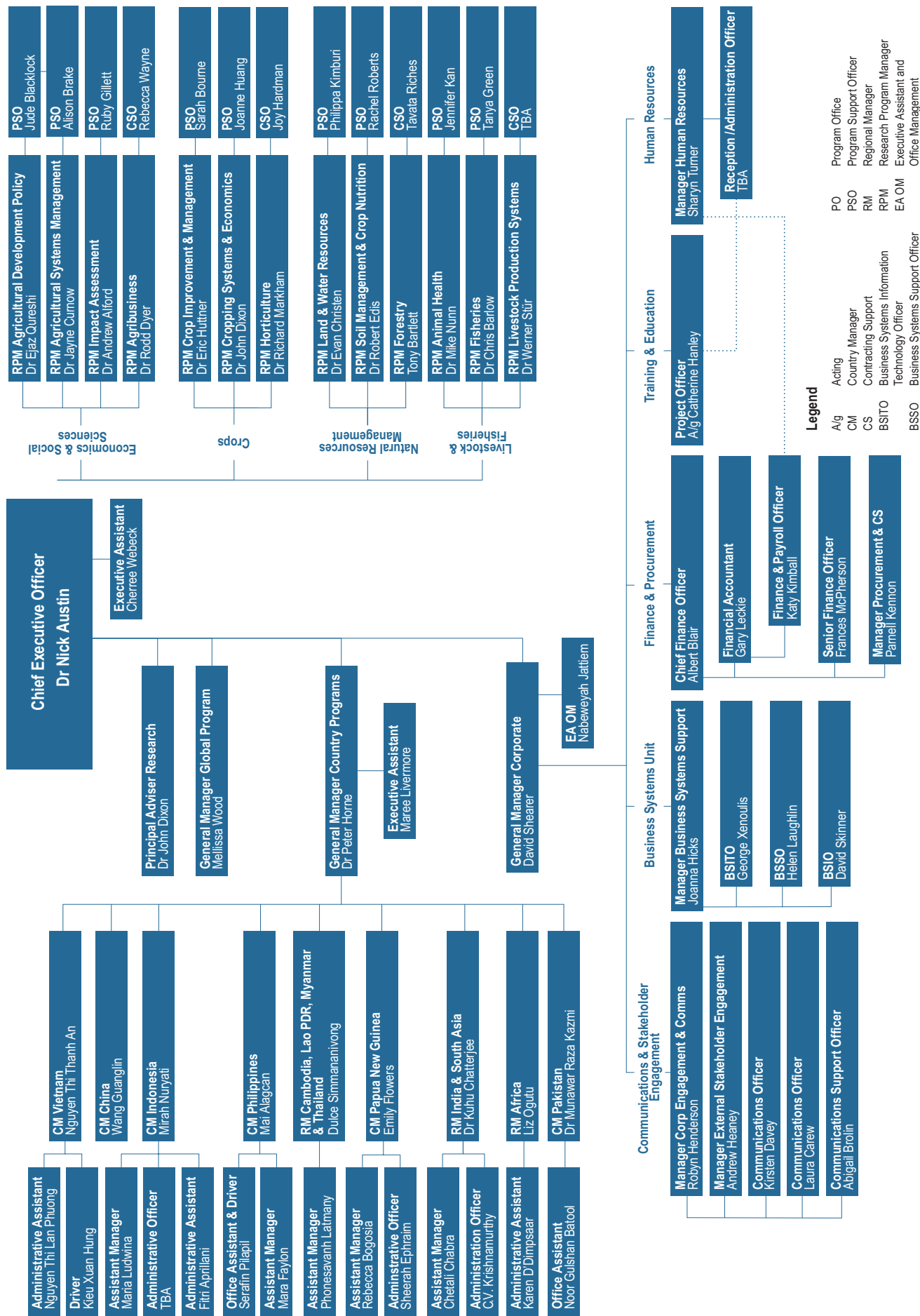
## ACIAR staffing

	Australia FTE <sup>a</sup>	Overseas <sup>b</sup>
2013–14 (actual)	48.5	19
2014–15 (actual)	49.4	18
2015–16 (estimate)	49	22
2016–17 (estimate)	49	22

<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

Abbreviation	Description
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
AIFSRC	Australian International Food Security Research Centre
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
AVRDC	World Vegetable Center
AVCCR	Agriculture Value Chain Collaborative Research (Program)
CEO	Chief Executive Officer
CIFOR	Center for International Forestry Research (Indonesia)
CIM <sup>a</sup>	Crop Improvement and Management
CIMMYT	International Maize and Wheat Improvement Center (Mexico)
CSE <sup>a</sup>	Cropping Systems and Economics
DFAT	Australian Government Department of Foreign Affairs and Trade
FIS <sup>a</sup>	Fisheries
FSC	Food Security Centre (used in ACIAR project codes)
FST <sup>a</sup>	Forestry
GDP	gross domestic product
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

Abbreviation	Description
ICRAF	World Agroforestry Centre (Kenya)
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
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
SIMLESA	Sustainable intensification of maize–legume cropping systems for food security in eastern and southern Africa
SMAR	Support for Market-driven Adaptive Research (used in ACIAR project codes)
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
TAR	Tibet Autonomous Region
USP	University of the South Pacific

<sup>a</sup> ACIAR research program

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## ACIAR's vision

ACIAR looks to a world where poverty has been reduced and the livelihoods of many improved through more-productive and sustainable agriculture emerging from collaborative international research.

## ACIAR's mission

To achieve more-productive and sustainable agricultural systems, for the benefit of developing countries and Australia, through international agricultural research partnerships.

The Australian Centre for International Agricultural Research (ACIAR) forms part of the Australian Government's overseas aid program and works towards its purpose of Australian aid—helping people by promoting economic growth and reducing poverty.

The Centre will participate in the implementation of the Government's economic diplomacy agenda under the four key objectives of trade, growth, investment and business. Agricultural research in partnership with developing-country partners will directly contribute to the country-specific goals that advance the four objectives. The Centre will concentrate its research and capacity-building efforts in the developing countries of Asia and the Pacific, while also engaging in high-payoff partnerships in other regions in support of Australia's foreign policy objectives.

ACIAR delivers sustainable productivity gains to improve incomes, food security, employment and enterprise opportunities for smallholders, and builds institutional and human capacity in agricultural science in developing countries. Through these outcomes, ACIAR contributes across the major objectives of the aid program.

ACIAR works collaboratively with the Department of Foreign Affairs and Trade (DFAT) in areas of mutual priority, with both organisations contributing to the whole-of-government emphases of the aid program.

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