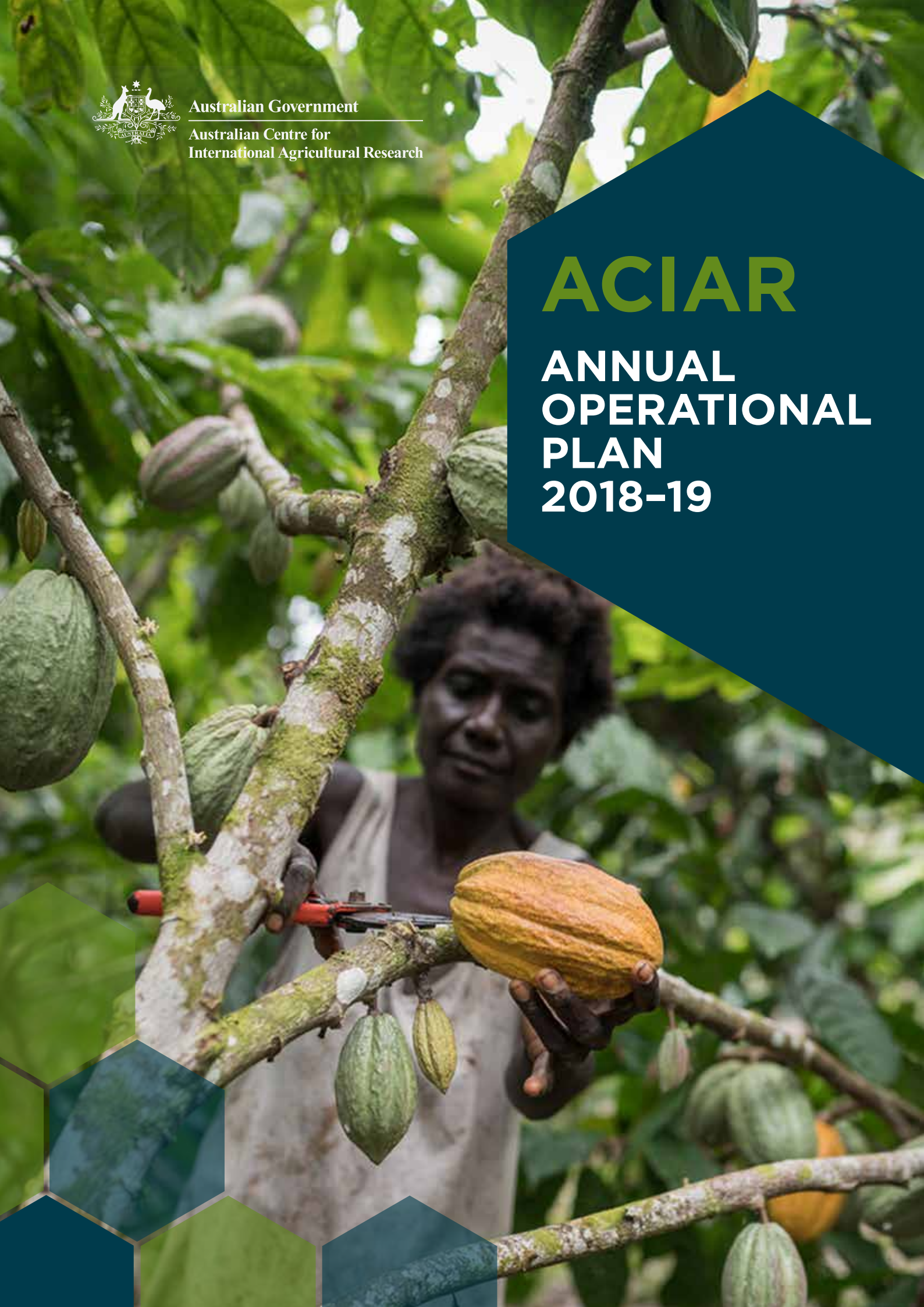





Australian Government  
Australian Centre for  
International Agricultural Research

# ACIAR

ANNUAL  
OPERATIONAL  
PLAN  
2018-19





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Cover photo: The Transformative Agriculture and Enterprise Development Program (TADEP) is a multidisciplinary research program with the objective of improving the livelihoods of rural Papua New Guineans. Five component research projects collectively aim to foster private sector-led development in agriculture, increase agricultural productive capacity, and improve access to markets for farmers, particularly women farmers. Image: ACIAR/Conor Ashleigh

**ACIAR**

**ANNUAL  
OPERATIONAL  
PLAN  
2018-19**



**ACIAR**

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# About ACIAR

## Research that works for developing countries and Australia

The Australian Centre for International Agricultural Research (ACIAR) is the Australian Government specialist agricultural research-for-development agency, within the Australian aid program.

**250 agricultural**  
research-for-development projects

**35 partner countries**  
throughout the Indo-Pacific

**25 significant partnerships**  
in multilateral programs and  
co-investment alliances

## 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.

## Mission

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

## Governance

ACIAR has an executive management governance structure headed by the Chief Executive Officer.

## Responsible minister

ACIAR is part of the Australian Government's Foreign Affairs and Trade portfolio, and is accountable to the Minister for Foreign Affairs, the Hon. Marise Payne MP.

## Enabling legislation

ACIAR is established by the *Australian Centre for International Agricultural Research Act 1982*, as amended. Also established under the Act are the Commission for International Agricultural Research, and the Policy Advisory Council.



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# Preface

**As Australia's specialist international agricultural research-for-development agency, ACIAR's mission is to achieve more productive, resilient and sustainable agriculture, in low- and middle-income countries in our region, through local and international partnerships.**

Established by the *Australian Centre for International Agricultural Research Act 1982*, ACIAR is a small agency that achieves outstanding results throughout the Indo-Pacific region. A dedicated staff of 78 in Australia and overseas works with partner countries to address the complex and intersecting challenges of how to grow more and healthier food and reduce poverty, using less land, water, energy and fewer nutrients per unit of output, in changing climates.

Independent evaluations of ACIAR projects and programs have consistently found high returns on investment, reflecting the quality of Australian agricultural science and our partnership model, which ensures a high level of engagement with in-country partners and a high level of take-up of research results.

The findings of these evaluations are consistent with USAID studies in 2017, which unequivocally concluded that lifting agricultural productivity in ways that help smallholders to access higher value markets, is among the most effective forms of international development for reducing poverty and catalysing economic growth.

While global aggregate food supply has matched population growth over recent decades, there is no room for complacency. The Food and Agricultural Organization (FAO) of the United Nations estimates that the world needs to increase overall food production by around 50% by 2050. As productivity growth is flattening in the major staple crops, this is a big task. Moreover, the need is not evenly distributed: Sub-Saharan Africa and South Asia need to lift production by around 112% by 2050, compared with an average of 34% elsewhere.

Food security, however, cannot be considered in isolation from water security, energy security or biosecurity. These 'converging insecurities' are all amplified by climate change, the ultimate risk multiplier. ACIAR's 10-year Strategy 2018-2027 sets out six high-level objectives to guide our organisation to address these challenges, and 2018-19 will be the first full year of ACIAR working to the strategy.

The objectives of the 10-year strategy provide a framework for planning research projects within our research portfolio; which was consolidated from 13 to 10 programs in 2018. To report on performance and results against the 10-year strategy, a new Research Impact, Monitoring and Evaluation Strategy is under development.

Partnerships with countries and organisations in our region are at the heart of our successful business model. In the coming year, we intend to develop new long-term 'compacts' with Cambodia, Myanmar, Pakistan, Papua New Guinea, Vietnam and a regional strategy for eastern and southern Africa.

This Annual Operational Plan outlines in detail ACIAR's work for the 2018-19 year. It explains the context and priorities of our program areas, and describes our partnerships and projects ranging from our support and governance role with our largest partner, the CGIAR system and its 15 international research centres, to our brokering and management role of around 250 individual bilateral projects.

In line with the 10-year strategy, ACIAR will also develop and foster co-investment partnerships with development donors and the private sector, particularly around issues where our research is ready to be implemented at scale. Co-investment partnerships will complement our well-established traditional bilateral partnerships and our long-term commitment to multilateral international research.

Australia's security and economic interests remain inter-linked with the countries of the four regions in which ACIAR operates: Pacific, East and South-East Asia, South Asia and Eastern and Southern Africa. Investment by the Australian Government in agricultural development, through ACIAR, provides support for regional processes for promoting peace and economic growth, ensuring Australia is a trusted science partner and leader in the agriculture and natural resources sectors.

ACIAR-funded research, while primarily helping smallholder farmers and rural communities in developing countries, also continues to deliver benefits to Australian agriculture through new production technologies, access to improved crop varieties, protection from pests and diseases, and increased skills and knowledge of Australian researchers.

This Annual Operational Plan is a comprehensive outline of the investment of around 2.5% of Australia's aid budget, which will be managed by ACIAR, during 2018-19. I commend it to you.



**Andrew Campbell**  
Chief Executive Officer  
ACIAR



Image: ACIAR/Conor Ashleigh





1

# Overview

# Overview

**As a research-for-development agency, the Australian Centre for International Agricultural Research (ACIAR) faces the intersecting and complex challenges of how to grow more food, improve human nutrition and reduce poverty using less land, water and energy.**

One component of addressing this challenge is to lift the productivity, profitability and sustainability of agriculture, forestry and fisheries sectors in developing countries. Australia has outstanding capabilities in these fields. But technological advances are only part of the solution—advances also must be accessible and equitable to all people in the countries in which we work.

ACIAR works with partner countries to identify research priorities, and then to broker research partnerships and commission research projects. After a project is established, ACIAR monitors progress and outcomes throughout the project cycle to maximise impact and return on investment.

By facilitating collaborative international partnerships between public and private research institutions, ACIAR provides a vehicle for Australia to strategically contribute to poverty reduction and improved livelihoods in developing countries throughout the Indo-Pacific.

Australia's national interests are supported by ACIAR's activity in the region, through contributions to sustainable economic growth and enhanced regional stability, with a particular focus on economic diplomacy and women's economic empowerment.

ACIAR's work aligns closely with Australia's development assistance program, supporting research collaboration, while emphasising human capacity building and private sector-led development that is targeted at agriculture, forestry and fisheries.

In many instances, the outcomes of ACIAR-supported research-for-development programs—such as new technologies and better practices—are mutually beneficial to farmers and primary industries in Australia, as well as in partner countries.

## A new strategic approach

The 2018–19 year of operation will be the first full year that ACIAR is guided by its 10-year Strategy 2018–2027. The strategy provides clear objectives for all areas in which ACIAR operates.

ACIAR's vision is a world where poverty has been reduced and the livelihoods of many have been improved through more productive and sustainable agriculture emerging from collaborative international research.

With this vision in mind, ACIAR operates according to six strategic objectives addressing:

- » food security and poverty reduction
- » natural resources and climate change
- » human health and nutrition
- » gender equity and women's empowerment
- » inclusive value chains
- » capacity building.

These objectives are consistent with ACIAR's purpose under its enabling legislation. They reflect the Australian Government's policy imperatives articulated in the Australian Overseas Development Assistance policy framework, the United Nations' Agenda 2030 Sustainable Development Goals and the Paris Agreement under the United Nations' Convention on Climate Change.

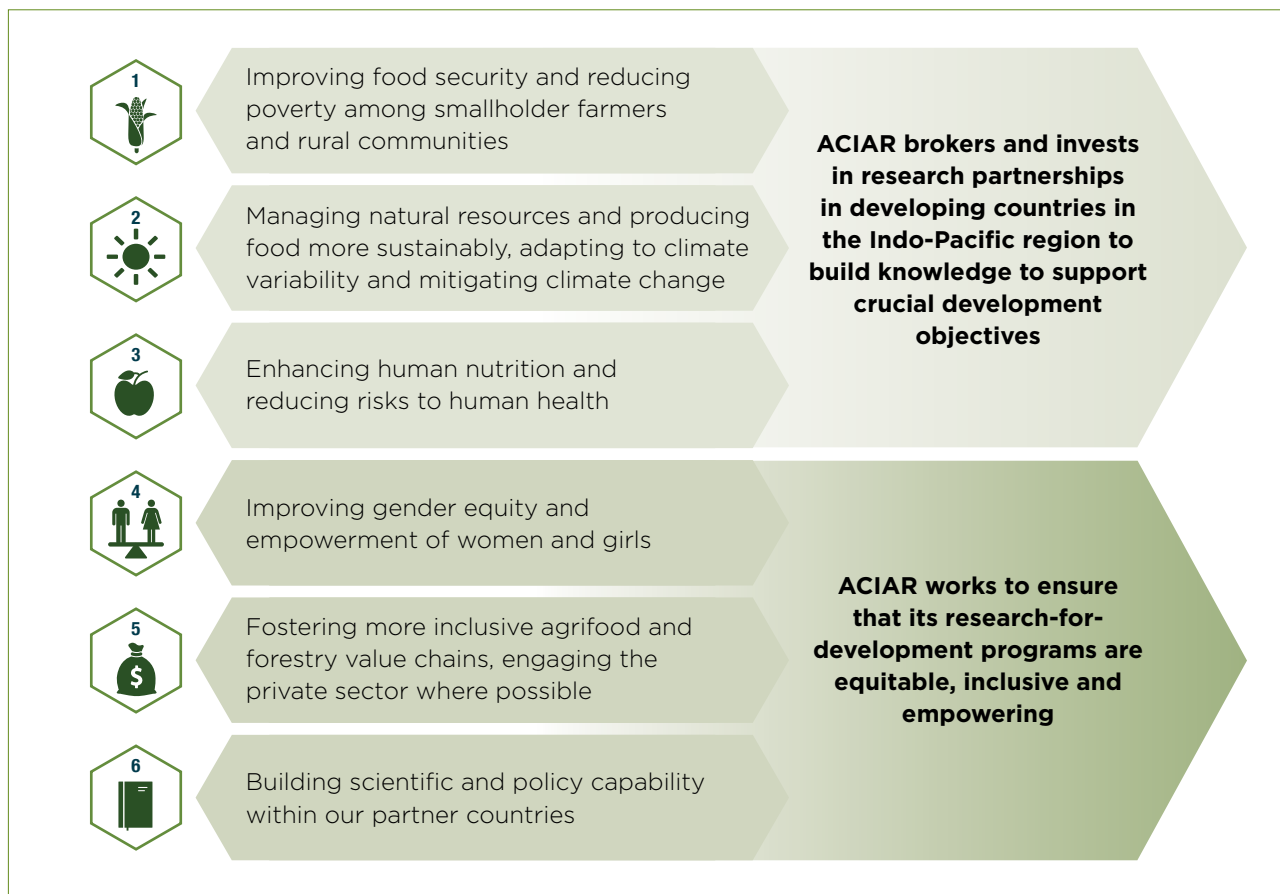
## Results through partnerships

ACIAR generates and establishes research partnerships through the three pathways of:

- » bilateral country partnerships
- » multilateral research collaborations
- » co-investment alliances with development partners.

Each of the partnership models have their own procurement pathways, governance frameworks, quality assurance and risk management.

## ACIAR's strategic objectives



Bilateral partnerships will encompass much of ACIAR's research program in 2018-19, where ACIAR commissions primarily Australian scientists (from universities, CSIRO, state government agencies or private firms) to undertake research projects consistent with jointly agreed priorities informed by regular consultations between ACIAR and partner countries. The Aid Investment Plans of Australia's overseas missions continue to inform ACIAR's bilateral and regional research partnerships. ACIAR intends to invest almost A\$77 million in research projects during 2018-19.

ACIAR investments in multilateral collaborations complement ACIAR's bilateral partnerships. Chief among these global initiatives supported by ACIAR is CGIAR (formerly known as the Consultative Group for International Agricultural Research). ACIAR manages Australia's contribution to CGIAR, which, in 2018-19, will be almost A\$30 million of restricted and unrestricted funding.

Australia's expertise in and commitment to international agricultural research is reflected in ACIAR staff being involved in the highest levels of governance of the CGIAR system. Chapter 2 'Global Program' presents a more detailed description of multilateral partnerships.

Co-investment alliances with development partners will continue to be an emerging partnership pathway for ACIAR, whereby ACIAR co-invests in jointly managed initiatives alongside other donors, such as the Department of Foreign Affairs and Trade (DFAT), the Canadian International Development Research Centre (IDRC), the Syngenta Foundation for Sustainable Agriculture, the Bill and Melinda Gates Foundation and the private sector. These initiatives might be in a single country, across several countries or in a region. This mode of investment is potentially the most suitable for work with the private sector, enabling ACIAR to respond quickly to partnership opportunities.

## Research program redesigned

The full implementation of ACIAR's redefined research program coincides with the first full year of operation under the 10-year strategy. During 2017-18, ACIAR consolidated its research portfolio to 10 programs. From July 2018, the program encompasses:

- » key agriculture sectors—crops, fisheries, forestry, horticulture and livestock
- » science and disciplines supporting the sectors—agribusiness, social sciences, soil and land management, water and climate
- » assessment of achievements to guide future investment—impact evaluation.

During 2018-19, the ACIAR research program will support almost 250 bilateral projects. The projects and partnerships will operate in 35 countries in the Indo-Pacific region, as well as in Australia. ACIAR's operations are—to a large extent, but certainly not exclusively—planned and managed on a regional basis. The four regions of operation are:

- » Pacific
- » East and South-East Asia
- » South Asia
- » Eastern and Southern Africa.

The focus of the research program in each country and region is determined through various processes, consultations and forums, which are managed and coordinated by ACIAR's Country Programs. As a result of this process, the research program is designed to address the specific challenges and opportunities arising in the local environment, as well as building on established relationships.

For example, in the Pacific region in 2018-19 there will be individual country or issue-based projects in the Pacific islands as well as a fully integrated regional program—the second phase of the Pacific Agribusiness Research for Development Initiative (PARDI 2)—which consists of a cluster of projects with a crossdisciplinary unifying mechanism. For the Pacific islands, this program will improve rural livelihoods, and make them more resilient through more targeted, sustainable and inclusive agribusiness development.

In contrast, the research program in East and South-East Asia, which is the largest of the four ACIAR regions, has a relatively small investment in regional projects, reflecting the strong bilateral relationships that ACIAR has with individual countries in that region.

Chapter 3 'Research Program' presents regional priorities for 2018-19, and describes current and proposed projects for each region and country.

## Evaluating our investment

With more than A\$100 million budgeted for investment in research-for-development programs in the Indo-Pacific region during 2018-19, it is essential that outcomes and benefits are identified and articulated.

ACIAR undertakes and values a vigorous and independent system of impact assessments of its investments, not only for accountability, but importantly, for learning. Understanding the impact of ACIAR investment is critical to improving the efficiency and effectiveness of current and future research-for-development programs. Chapter 4 'Impact Evaluation Program' outlines impact evaluation in detail.

During 2018-19, ACIAR will build on its strong project-level impact evaluation process, to design a more sophisticated portfolio-level monitoring and evaluation system. This will enable better analysis and reporting against our six high-level objectives, and better measurement of our performance against criteria and targets set out in the annual Corporate Plan. The monitoring and evaluation system will also inform portfolio management and outreach.





## ACIAR's research structure



## Investing in our partners

Building capacity in partner countries is a key priority for ACIAR to extend and maximise the adoption of new knowledge and technologies. During 2018-19, ACIAR is renewing its activities to have a greater focus on leadership and career development through various short and medium-term programs. Our focus on postgraduate training will continue as new initiatives are developed and implemented.

Chapter 5 'Capacity Building Program' presents the work of the Capacity Building Program in 2018-19.

## Communicating our efforts

Through its Outreach Program, ACIAR will continue its efforts to increase understanding within Australia of the impact of Australia's aid investment through ACIAR, and ensure that more audiences in Australia and in our partner countries can access, understand and use our research findings. We will do this through various activities, including launching phase 2 of the redesigned ACIAR website, increasing social media following through strategic and informative content, and partnerships with leading media agencies to produce high-exposure content.

Chapter 6 'Outreach Program' outlines this year's plan for communication and outreach.

## Supporting our efforts

To be successful in its core business, an organisation needs to have its own house in order. Through the key programs of Finance, Human Resources and Business Systems, ACIAR underpins effective and efficient project development and management, which are integral to managing a diverse portfolio of operations across partner countries. In the 10 overseas ACIAR offices—mostly located at Australian diplomatic posts—country office staff play a key role in managing stakeholder relations and ensuring that partner-country priorities are reflected in ACIAR's work.

Chapter 7 'Corporate Programs' presents the priorities of corporate management in 2018-19.

### ACIAR's Gender Equity Policy and Strategy 2017-2022

Promoting gender equity and the empowerment of women and girls is an ongoing priority for ACIAR, and one of our six high-level objectives.

In line with the Australian Government's aid policy, ACIAR is committed to gender equity in the design, delivery and impact of all our activities, to bring sustained change to both women and men.

In parallel with, and complementing the development of, the 10-year Strategy 2018-2027, during 2017-18, ACIAR developed its Gender Equity Policy and Strategy 2017-2022, which was endorsed by the Commission for International Research in December 2017 and approved by the ACIAR Executive in February 2018.

From the outset, the document was framed around both internal (ACIAR as an organisation) and external (ACIAR's funded research programs) objectives. It takes a long-term, principles-based approach to gender equity that applies to the commissioning and management of research, as well as our capacity-building programs and internal people management.

As a clear demonstration of our commitment to gender equity, during 2017-18, gender balance at all levels within ACIAR improved substantially. The proportion of women in senior roles rose from 11% in 2016 to 38% in 2018.

ACIAR will remain committed to gender equity and the empowerment of women and girls in all of its endeavours in 2018-19. Many projects described in Chapter 3 'Research Program' clearly demonstrate this commitment.

## Funding and expenditure

**Table 1.1: Overview of planned funding and expenditure, 2016-17 to 2018-19**

	2016-17 (actual)	2017-18 (estimated actual)	2018-19 (budget estimate)
A\$ million			
<b>Funding</b>			
<b>Administered</b>			
Administered appropriation	93.48	96.88	97.96
Special accounts	17.80	15.55	19.67
Total administered funding	111.28	112.43	117.63
<b>Departmental</b>			
Departmental appropriation	9.49	9.36	9.30
s74 retained revenue receipts <sup>(a)</sup>	1.36	0.55	2.27
Expenses not requiring appropriation <sup>(b)</sup>	0.27	0.44	0.38
Total departmental funding	11.12	10.35	11.95
<b>Total funding</b>	<b>122.40</b>	<b>122.78</b>	<b>129.58</b>
<b>Expenditure</b>			
<b>Administered</b>			
Bilateral partnerships and co-investment alliances and partnerships <sup>(c)</sup>	82.96	82.10	87.02
Multilateral partnerships <sup>(d)</sup>	19.90	20.71	19.11
Capacity Building Program <sup>(e)</sup>	7.81	8.30	9.00
Outreach Program	0.61	1.32	2.50
Total administered costs	111.28	112.43	117.63
<b>Departmental</b>			
Total departmental costs <sup>(f)</sup>	11.12	10.35	11.95
<b>Total expenditure</b>	<b>122.40</b>	<b>122.78</b>	<b>129.58</b>

(a) Revenue from external sources.

(b) Depreciation, amortisation and audit fees.

(c) Includes program support and impact evaluation.

(d) Unrestricted funding to international centres.

(e) Does not include training and communication activity within projects.

(f) Includes salaries, executive, Commission, Policy Advisory Council and corporate support.

**Table 1.2: Planned project expenditure, by country, 2018-19**

Region and country	Target appropriation budget allocations	ACIAR base appropriation	DFAT and other external funding	2018-19 total allocation
	(%)		A\$ million	
<b>Pacific</b>	<b>24</b>	<b>14.93</b>	<b>4.17</b>	<b>19.10</b>
Papua New Guinea	—	5.36	2.81	8.17
Fiji	—	3.62	—	3.62
Kiribati	—	0.48	0.47	0.95
Samoa	—	1.08	—	1.08
Solomon Islands	—	1.26	0.48	1.74
Tonga	—	1.18	—	1.18
Tuvalu	—	0.19	—	0.19
Vanuatu	—	1.76	0.41	2.17
<b>East and South-East Asia</b>	<b>49</b>	<b>31.45</b>	<b>3.77</b>	<b>35.22</b>
Cambodia	—	2.95	—	2.95
China	—	0.79	—	0.79
Indonesia	—	6.73	3.34	10.07
Lao PDR	—	4.34	0.43	4.77
Mongolia	—	0.19	—	0.19
Myanmar	—	4.36	—	4.36
Philippines	—	4.09	—	4.09
Thailand	—	0.02	—	0.02
Timor-Leste	—	2.39	—	2.39
Vietnam	—	5.59	—	5.59
<b>South Asia</b>	<b>13</b>	<b>8.49</b>	<b>5.09</b>	<b>13.58</b>
Afghanistan	—	—	0.09	0.09
Bangladesh	—	2.96	0.85	3.81
India	—	1.52	1.60	3.12
Nepal	—	0.92	0.80	1.72
Pakistan	—	2.96	1.75	4.71
Sri Lanka	—	0.13	—	0.13
<b>Eastern and Southern Africa</b>	<b>14</b>	<b>8.93</b>	<b>0.00</b>	<b>8.93</b>
Burundi	—	0.15	—	0.15
Ethiopia	—	1.38	—	1.38
Kenya	—	1.39	—	1.39
Malawi	—	0.57	—	0.57
Mozambique	—	0.54	—	0.54
Republic of South Africa	—	0.86	—	0.86
Rwanda	—	0.63	—	0.63
Tanzania	—	1.28	—	1.28
Uganda	—	0.77	—	0.77
Zambia	—	0.41	—	0.41
Zimbabwe	—	0.65	—	0.65
Other	—	0.30	—	0.30
<b>Total project expenditure</b>	<b>100</b>	<b>63.80</b>	<b>13.03</b>	<b>76.83</b>



**Table 1.3: External funding expenditure, by country, 2016-17 to 2018-19**

	2016-17 (actual)	2017-18 (estimated actual)	2018-19 (budget estimate)
A\$ million			
<b>Pacific</b>			
Papua New Guinea	5.94	3.91	2.81
Pacific island countries	1.39	1.39	1.36
<b>East and South-East Asia</b>			
Indonesia	0.24	1.73	3.34
Lao PDR	—	0.11	0.43
Myanmar	0.52	0.26	—
Timor-Leste	0.02	—	—
Vietnam	—	0.01	—
<b>South Asia</b>			
Afghanistan	3.10	0.48	0.09
Bangladesh	0.43	0.54	0.85
India	1.09	1.27	1.60
Nepal	0.51	0.63	0.80
Pakistan	1.02	1.47	1.75
<b>Other</b>			
Postgraduate scholarships	3.54	3.71	3.45
FAO regional consultation on biotechnologies in sustainable food systems and nutrition	—	0.04	—
Funding under negotiation			3.19
<b>Total</b>	<b>17.80</b>	<b>15.55</b>	<b>19.67</b>

Note: There is no external funding expenditure on projects and programs in Africa.

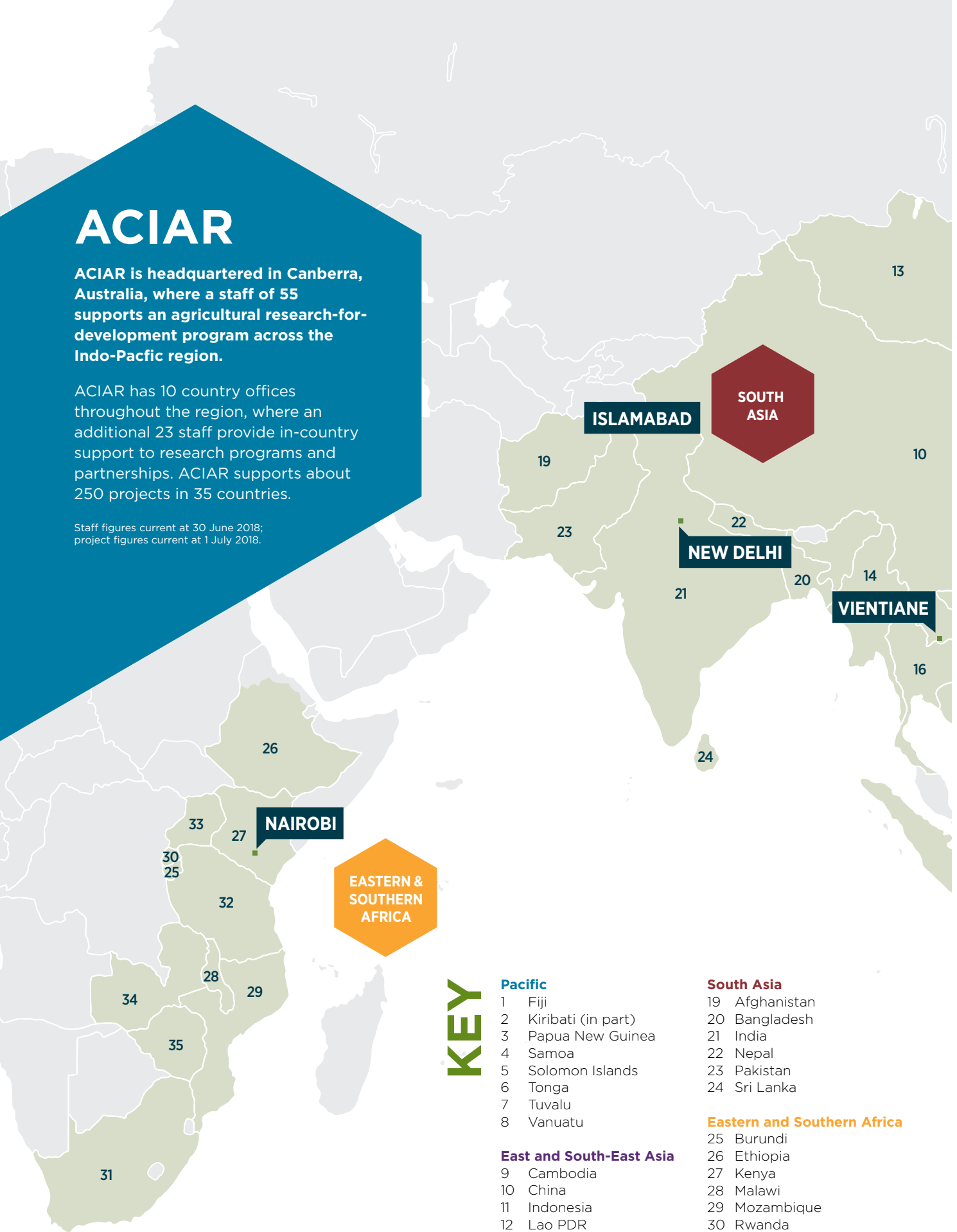


# ACIAR

ACIAR is headquartered in Canberra, Australia, where a staff of 55 supports an agricultural research-for-development program across the Indo-Pacific region.

ACIAR has 10 country offices throughout the region, where an additional 23 staff provide in-country support to research programs and partnerships. ACIAR supports about 250 projects in 35 countries.

Staff figures current at 30 June 2018;  
project figures current at 1 July 2018.



## KEY

### Pacific

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

### East and South-East Asia

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

### South Asia

- 19 Afghanistan
- 20 Bangladesh
- 21 India
- 22 Nepal
- 23 Pakistan
- 24 Sri Lanka

### Eastern and Southern Africa

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

# 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.

# Mission

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



Current at July 2018



Image: ACIAR/Conor Ashleigh





2

# Global Program

# Global Program

**Through the Global Program, ACIAR fosters and maintains active working relationships with international agricultural research centres, and provides timely, reliable and consistent funding, as well as strategic research and governance advice.**

The Global Program builds and manages partnerships between ACIAR and various international organisations, institutes and associations engaged in agricultural research and in the delivery of global public goods. As well as being a strong, innovative research partner in international agricultural research, the Global Program aims to ensure Australia is a valued and engaged donor, and, through ACIAR, continues to be held in high esteem by the international agricultural research sector and donor communities.

Through multilateral partnerships, the Global Program implements one of ACIAR's mandated roles of funding and supporting the international agricultural research centres. The largest component of support is provided to CGIAR—a network of 15 research centres dedicated to reducing rural poverty, increasing food and nutrition security for human health and improving natural resource systems and ecosystem services. CGIAR operates on an annual budget of about US\$1 billion.

Additionally, the Global Program engages with and manages many co-investment alliances and partnerships. Co-investment relationships are mutually beneficial, and characterised by strong trust, enabling each partner to leverage complementary research strengths, and invest in more ambitious research than either could achieve by working alone.

During 2018-19, the Global Program will manage three co-funded project alliances with like-minded donors across several countries in eastern and southern Africa. The largest is with ACIAR's closest international relative, Canada's IDRC. Co-investment alliances will leverage an additional 100% of funding, on top of that provided by ACIAR.

The Global Program will also manage several regional research programs across three ACIAR regions—Eastern and Southern Africa, East and South-East Asia and the Pacific. An example is the innovative Plant Biosecurity Capacity Building Program in the Pacific region.

During 2018-19, ACIAR will provide effective governance and funding support on behalf of Australia to the more than 25 partnerships within its Global Program. The most significant is CGIAR, through ACIAR's membership of the System Council and its Strategic Impact Assessment Monitoring and Evaluation Committee, System Reference Group and the System Management Board.

## Multilateral partnerships

### CGIAR

ACIAR's key multilateral partnership is with CGIAR, whose network of 15 independent and non-profit research centres delivers an unrivalled mix of knowledge, skills and research facilities able to respond to emerging food and nutrition security challenges and the sustainable development goals.

**Table 2.1: ACIAR funding to the Global Program, 2016-17 to 2018-19**

Year	International agricultural research centres	Other research organisations and programs(a)	Total
A\$ million			
2016-17 (actual)	19.9	2.1	<b>22.0</b>
2017-18 (estimated actual)	20.7	2.4	<b>23.1</b>
2018-19 (budget)	19.1	4.3	<b>23.7</b>

(a) Includes the Pacific Community (SPC), the Australia Africa Universities Network (AAUN) and the Asia-Pacific Association of Agricultural Research Institutions (APAARI) contributions, as well as research funding. These figures are included in the 'Bilateral partnerships and co-investment alliances' figure in Table 1.1.

With a local presence in more than 70 countries, and a deep knowledge of customs, values and market operations in developing countries, the CGIAR research centres work in close collaboration with more than 3,000 partner organisations, which include national governments, global policy bodies, non-government organisations, academic institutions and the private sector. Home to more than 8,000 scientists, researchers, technicians and staff, CGIAR research centres work to create a better future for the world's poor. Each centre has its own charter, board of trustees, director general, and staff.

CGIAR research centres are responsible for hands-on research programs and operations guided by policies and research directions set by the System Management Board. During 2018-19, some centres will be exploring the effectiveness of creating formal alliances and/or mergers between centres, with one board and one director general, to capitalise on program-wide, strategic and costefficiency drivers.

Through its endeavour to reduce rural poverty, increase food and nutrition security, and improve natural resource systems and ecosystem services, CGIAR is more connected with the international development agenda, governments, civil society and communities at the global, national, subnational and local levels than any other agrifood research entity.

Its critical mass of world-class scientists conducts interdisciplinary research that combines biophysical and social sciences to deliver development impact at scale. Its beneficiaries include producer groups (smallholder farmers, forest users, pastoralists and fishers), poor urban and rural consumers, social groups and processors and traders.

CGIAR research is guided by its Strategy and Results Framework, harnessing knowledge, tools and policies to address the complex challenge of ensuring that the world consumes the right amount and types of food without an unsustainable cost to natural resources, the environment and human health. From 2019, the CGIAR research program will be implemented through the new 2019-2022 Business Plan.

The outcomes of CGIAR investment contribute to the Sustainable Development Goals of the United Nations 2030 Agenda for Sustainable Development, and advance the interests of developed and developing countries alike. CGIAR delivers significant economic and social returns on investment. Every US dollar invested in CGIAR yields at least US\$17 of benefits. Benefits of CGIAR wheat research, for example, range from US\$2.2 billion to US\$3.1 billion per year—up to a 100-fold return on investment.

ACIAR has been a regular funder and research partner to the CGIAR system since 1982. Australian agricultural industries have benefited from this partnership, with research outputs helping to keep Australian farmers competitive in world markets, by increasing yields and/or reducing costs.

ACIAR provides both unrestricted (core) and restricted project funds to the CGIAR Fund. About half of ACIAR's funding is unrestricted at a system or research program level. The remainder (restricted) is delivered through specific research projects between ACIAR programs and individual centres. ACIAR's annual contributions to the CGIAR system (and research centres in the CGIAR system) are shown in Table 2.2. The unrestricted allocations are reviewed annually, and have remained consistent over recent years.

**Table 2.2: Australia's funding, through ACIAR, to the CGIAR system, 2016-17 to 2018-19**

Year	Unrestricted	Project specific (restricted)	Total
A\$ million			
2016-17 (actual)	18.30	16.16	<b>34.46</b>
2017-18 (estimated actual)	19.10 <sup>(a)</sup>	15.51	<b>34.62</b>
2018-19 (budget)	17.50	11.75	<b>29.25</b>

(a) Includes an advance payment of \$0.8 million for 2018-19.



## Centres of the CGIAR system

1. Africa Rice Center—AfricaRice
2. Bioversity International—Bioversity
3. Center for International Forestry Research—CIFOR
4. International Center for Agricultural Research in the Dry Areas—ICARDA
5. International Center for Tropical Agriculture—CIAT
6. International Crops Research Institute for the Semi-Arid Tropics—ICRISAT
7. International Food Policy Research Institute—IFPRI
8. International Institute of Tropical Agriculture—IITA
9. International Livestock Research Institute—ILRI
10. International Maize and Wheat Improvement Center—CIMMYT
11. International Potato Center—CIP
12. International Rice Research Institute—IRRI
13. International Water Management Institute—IWMI
14. World Agroforestry Centre—ICRAF
15. WorldFish

To ensure the quality and value for money of Australia's ongoing contributions to CGIAR, during 2018-19, ACIAR will:

- » participate in the highest level of governance of the CGIAR system through active membership and leadership on the CGIAR System Council, the Strategic Impact Monitoring and Evaluation Standing Committee, and the new System Reference Group
- » participate as an active observer on the CGIAR System Management Board with a focus on developing the new 2019-2021 Business Plan
- » collaborate with key donors through participation in multifunder activities, where they align with the ACIAR strategy and Australian interests, including the Crops to End Hunger initiative and exploring a Livestock initiative
- » lead the development of a coordinated Australian engagement with CGIAR, including consultation with DFAT and other Australian agencies, primarily through the International Agricultural Coordination Group and CGIAR Australian Leadership Group, which ACIAR established in 2015
- » ensure involvement of ACIAR Research Program Managers in the technical oversight of CGIAR Research Programs.





## Other international research organisations

Through its Global Program, ACIAR also contributes to five international agricultural research centres and networks that are not part of the CGIAR system. These organisations are:

- » Asia-Pacific Association of Agricultural Research Institutions (APAARI)
- » Australia Africa Universities Network (AAUN)
- » Centre for Agricultural Biosciences International (CABI)
- » Pacific Community (SPC)
- » World Vegetable Centre (WorldVeg).

ACIAR's contribution to these five organisations has grown substantially over the past 10 years, and almost A\$1.6 million is budgeted for support in 2018-19. By the end of 2018, renewed partnership arrangements will be in place between ACIAR and each international agricultural research centre.

### Asia-Pacific Association of Agricultural Research Institutions

APAARI promotes and coordinates the national agricultural research institutes in the Asia-Pacific region, through inter-regional and inter-institutional cooperation.

APAARI's Strategic Plan 2017-2022—*Pathways to strengthened agri-food research and innovation systems in Asia and the Pacific*—identifies strategic priorities, which are used to inform ACIAR's input into its wider regional consultation process.

ACIAR provides annual, unrestricted funding to APAARI for research communication, knowledge management, advocacy for agricultural biotechnology, support for capacity building and participation in expert consultations with national agricultural research system leaders in the region.

During 2018-19, APAARI will continue to host and build capacity to become the long-term coordinating agency for the Agricultural Science and Technology Indicators (ASTI) for the South-East Asia project.

### Australia Africa Universities Network

Launched in 2012, AAUN is a group of leading universities in Australia and Africa that connect researchers and academics through institutional partnerships, to address challenges facing both continents.

Led by the University of Sydney and the University of Pretoria, the network fosters a growing relationship between Australia and Africa by building on current educational and research links.

Since it began, AAUN has established several intercontinental, multidisciplinary research programs that address mutual challenges in the areas of food and nutrition security, climate and environment, and higher education related to these areas.

Australian universities in AAUN are:

- » Murdoch University
- » The University of Melbourne
- » University of Newcastle
- » University of New South Wales
- » The University of Sydney
- » University of Technology Sydney
- » University of Western Australia
- » Western Sydney University.

The African universities in AAUN are:

- » Makerere University (Uganda)
- » University of Cape Town (South Africa)
- » University of Ghana (Ghana)
- » University of Ibadan (Nigeria)
- » University of Malawi (Malawi)
- » University of Mauritius (Mauritius)
- » University of Nairobi (Kenya)
- » University of Pretoria (South Africa)
- » University of Zambia (Zambia)
- » Addis Ababa University (Ethiopia).

During 2018-19, ACIAR will manage its four-year strategic partnership arrangement to support research into food security, agriculture, nutrition and public health.



## Centre for Agricultural Biosciences International

The Centre for Agricultural Biosciences International (CABI) is an intergovernmental, not-for-profit organisation established by a United Nations treaty, of which Australia is a member country. With its headquarters in the United Kingdom, CABI has a network of offices throughout Europe, the United States of America, Africa, South America and Asia.

CABI addresses issues of global concern through science, information and communication through its main activities of international development and research, publishing and microbial services.

CABI works to improve global food security, combat threats to agriculture and the environment from pests and diseases, protect biodiversity from invasive species, and improve access to agricultural and environmental knowledge.

Australia's investment in CABI has contributed to improved agricultural outcomes for developing countries and delivered benefits to Australian agriculture. CABI has been an instrumental partner in fostering a partnership between ACIAR's Australia Africa Plant Biosecurity Partnership and Common Market for Eastern and Southern Africa, to support the sustainability of the African Plant Biosecurity Network, through an ACIAR-funded coordinator placement in Common Market for Eastern and Southern Africa, which will continue into 2018-19.

During 2018-19, ACIAR will work with CABI to finalise a partnership arrangement and support the continued growth of the award-winning CABI-led Plantwise Program, as well as other CABI initiatives.

## Pacific Community

SPC (previously known as the Secretariat of the Pacific Community) is the principal scientific and technical organisation working to support development in the Pacific region, which it has been doing since 1947.

Owned and governed by its 26 country and territory participants, SPC is an international development organisation. It works in seven key areas pertinent to development in the Pacific region, including climate change, disasters, non-communicable diseases, gender equality, youth employment, food and water security and biosecurity for trade.

SPC is a key partner for ACIAR and DFAT in the delivery of Australia's wider strategies to support strong benefits from the region's fisheries, agriculture, forestry and biosecurity sectors.

ACIAR works directly with two divisions of SPC—Land Resources Division and Fisheries, Aquaculture and Marine Ecosystems. A recent external review highlighted that Land Resources Division provides important services in the region that are largely unfunded—namely, coordinating activities, catalysing priority setting and enabling dialogue across the partner states. These are valuable services for ACIAR as well, helping us target our investments in the region.

ACIAR is committed to supporting SPC to maintain the institutional capacity to sustain these capabilities. For that reason, in 2016, ACIAR began providing targeted core funding to both divisions. A Strategic Partnership Arrangement between ACIAR and SPC was signed in March 2018. During 2018-19, the Global Program will continue to manage and grow this partnership, and engage SPC in regional initiatives, including to the Pacific Plant Biosecurity Capacity Building Program.

## World Vegetable Centre

The World Vegetable Centre, commonly known as WorldVeg, is an international non-profit research and development institute committed to alleviating poverty and malnutrition in the developing world through increased production and consumption of vegetables.

WorldVeg disseminates improved varieties of vegetable crops and promotes improved production methods. This helps farmers in developing and developed countries by increasing vegetable harvests, raising incomes, creating jobs and providing healthier, more nutritious diets.

Investment in WorldVeg is an investment in research into the nexus between agriculture, livelihoods, nutrition and health. ACIAR provides WorldVeg with both unrestricted funding and project-specific funding for research led by or implemented in partnerships that include WorldVeg.

WorldVeg has brought significant benefits to Australian agriculture through its mungbean breeding program, which has provided the varieties being grown across much of northern Australia for many years. WorldVeg also holds breeds of tomato with genetic resistance to tomato yellow leaf curl virus. This virus poses an ongoing threat to the Australian tomato industry. Through its extensive networks and research partnerships within the region, WorldVeg will provide research support towards traditional vegetable production, marketing and consumption for the east African leafy vegetables project.

During 2018-19, ACIAR will work with WorldVeg to finalise a four-year partnership arrangement, and work together on the Executive Council of APAARI.

## Co-investment alliances and partnerships

In addition to multilateral partnerships, the Global Program manages many co-investment alliances and partnerships. ACIAR's co-investment programs take the form of:

- » alliances, where the design and management of research programs are shared between all contributing donors
- » partnerships, where a donor will co-fund an ACIAR project, and ACIAR is responsible for the management of the project, such as projects managed by ACIAR under the DFAT-ACIAR Record of Understanding.

Co-investment programs enable ACIAR to harness the complementary skills of partners, leverage ACIAR funds, and engage in larger and more ambitious programs than it could fund alone. Over the past year, ACIAR has consolidated the achievements of three of co-investment alliances and developed the following second phases.



## Cultivate Africa's Future phase 2

During 2018–19, ACIAR will continue the successful Cultivate Africa's Future (CultiAF) partnership with the Canadian IDRC.

The first phase of CultiAF began in 2013 and a jointly funded competitive grants facility was implemented. Phase 1 supported eight projects across five countries in eastern and southern Africa, addressing:

- » postharvest management
- » food processing
- » nutrition
- » business opportunities
- » value chains.

During 2018–19, five projects will be selected under the second competitive funding round and prepared for implementation. The second phase of the partnership (C2016/367), referred to as CultiAF2, will invest more than \$20 million (over five years) in high-quality applied research that addresses food and nutrition insecurity in Africa. Since 2013, the ACIAR-IDRC partnership has to date jointly invested US\$40 million.

## Food Futures Research Program

During 2018–19, ACIAR and IDRC will start collaborating on a Food Futures Research Program, to canvas and support strategic agricultural research that will have a potential transformative impact on global food security in developing countries.

ACIAR and IDRC have jointly committed \$5 million to this program, and agreed that the coinvestment will be led and managed by ACIAR on behalf of the partnership. The program will start with a forecast phase, to understand prevailing macro and sector trends, and identify major obstacles and the issues that lie ahead. It will seek to identify the key gaps and new strategic and innovative research that is needed to address these obstacles.

## Alliance for Agricultural Research and Development for Food Security

The Alliance for Agricultural Research and Development for Food Security is a joint initiative between ACIAR, the Crawford Fund and the Syngenta Foundation for Sustainable Agriculture. Alliance partners explore innovative approaches and co-investments to research-for-development activities and project delivery by using joint funding and the unique, diverse strengths and expertise of the parties to better promote and achieve food security.

The first of these co-investments was in a highly successful project titled *Demand-led plant variety design for emerging markets in Africa* (FSC/2013/019). The project increased the availability of highperforming plant varieties that meet market demands. Using private sector best practice, the project developed:

- » protocols for demand-led plant breeding
- » tools for developing business cases for investments in improved breeding
- » teaching aids and a text book.

The project has engaged extensively with the plant-breeding and university sectors in many countries, towards having a truly comprehensive and transformative effect on plant breeding, smallscale agriculture and food security in Africa.

During 2018–19, phase 2 of this project, *Demand-led plant breeding and accelerating new variety adoption in Sub-Saharan Africa* (GP/2018/108), will build on research outcomes from phase 1 and provide wider access to plant breeders through an implementation phase. Phase 2 will focus on implementation of best practice in demand-led plant breeding programs, using two crops—beans (*Phaseolus* sp.) in eastern and central Africa and tomatoes in western Africa—to demonstrate best practice.

It will also build capacity within plant breeding programs on demand-led variety design by strengthening education and training programs for plant breeders across Africa. This will include new curriculum development and professional development courses on demand-led plant variety design, which have been based on private sector best practice.



## **Pacific Plant Biosecurity Capacity Building Program 2018–21**

Following a year of consultation and design, during 2018–19, the Pacific Plant Biosecurity Capacity Building Program will begin, to boost capacity and cooperation among plant biosecurity stakeholders throughout the Pacific region. The program is based on the format and approach used between 2014 and 2017 in the successful delivery of a plant biosecurity capacity-building program in eastern and southern Africa, funded by ACIAR.

Biosecurity is an important program of work for Australia and the Pacific region, as plant pest and diseases affect food production and can limit trade and market access opportunities for plant products.

Despite previous biosecurity capacity-building efforts, many Pacific island and country territories biosecurity agencies continue to be challenged in effectively managing existing and emerging plant pest and diseases.

By employing a multi-pronged approach targeting regional, national/institutional and individual needs, complemented by placements in Australia, mentoring, and the development of a long-term network, the program aims to deliver successful outcomes.

The program goals are improved:

- » performance and capacity of biosecurity agencies in the Pacific, in surveillance, diagnostics, pest risk analysis, import border controls, export inspection and trade negotiation
- » supply chain compliance by the private sector, targeted at meeting the biosecurity requirements of export markets
- » value chains for selected commodities, by addressing plant biosecurity impediments to production and market access
- » food security and livelihoods across the region.

Under the program, specialists from Pacific plant biosecurity agencies are awarded short-term placements with Australian and New Zealand biosecurity institutions, to share expertise, research skills and address a key challenge to their national biosecurity system. This leads to ongoing relationships between Pacific island protection officials and Australian experts.

Capacity building will focus on developing specific technical skills that the region needs, as well as specialist communication, engagement and advocacy training. This is critical for the advancement of plant biosecurity programs across the region and in the international market access arena. It will link Australian and New Zealand providers with regional and specific country needs to date, and will receive co-investment for the placements from Australian Government agencies, Department of Agriculture and Water Resources and DFAT.

### **Co-investments with other government agencies**

Agreements to undertake research for development between ACIAR and other government agencies are governed by a Record of Understanding (ROU).


ACIAR's largest and most important partnership is with its portfolio partner, DFAT. The partnership agreement between ACIAR and DFAT is captured in ROU 14376, signed in 2006. It is a commitment to work together towards common objectives against a principle of equal partnership, underpinned by mutual respect, professionalism, honesty, open communication and cooperation.

The roles and responsibilities of each agency are included. Each activity that DFAT and ACIAR agree to partner on under this ROU is documented in a separate activity schedule. During 2018–19, ACIAR and DFAT will update and sign a new ROU, under which ACIAR will manage 16 activities.

### **Regional research programs**

The Global Program supports several regional research programs that vary in nature and in the regions that benefit from the work.

The Global Program funds a project led by IFPRI on ASTI for South-East Asia and some Pacific countries (Papua New Guinea and Fiji), and hosted and coordinated by APAARI. The project is worth \$1 million over the two-year period of 2017–19. The project provides open-source data on agricultural research systems across the developing world. The indicators are generated by a large network of national collaborators, who collect, compile and disseminate information on the financial, human and institutional resources at both country and regional levels across government, higher education, non-profit and, where possible, private-for-profit agricultural research agencies.



The project is reducing the gaps in knowledge and information on the inputs, performance and outcomes of agricultural research systems in South-East Asia. It is building a foundation for the long-term monitoring of agricultural research investment and capacity. These outputs will play an important role in guiding agricultural research investment decisions, including those of ACIAR. This project leverages off the donor investments in the ASTI program in Africa, South Asia and South America (GP/2016/093).

Building on the School Food Revolution project (GP/2017/007) in western Kenya, a new project is seeking to increase the consumption of nutritious indigenous produce, including African leafy vegetables, to a greater number of school children in poverty-stricken regions. It does so using schools as a platform to increase dietary diversity, improve nutrition and improve livelihoods and environmental sustainability in Ethiopia, Kenya, Tanzania and Uganda (GP/2018/101). The first trial was a successful farm-to-school trial at small scale, and showed that smallholder farmers, school children and marginalised community members benefited economically and nutritionally from increased local production and consumption of the local vegetables. This project optimised the existing local procurement and school-feeding model, and established broader partnerships to address research gaps and development issues relating to strengthening the model and scaling out to other countries in the region.

The achievements of the project contribute to combating malnutrition (SDG2), and promote equitable quality education, lifelong learning opportunities (SDG4) and sustainable procurement practices (SDG12).

Access to coconut genetic diversity is important to sustaining the livelihoods of millions of smallholders and their communities around the world, and particularly in the Asia-Pacific region. Grown in more than 90 tropical countries, on more than 12 million hectares, coconut is important to millions of smallholder households. The future of coconut production and livelihoods are threatened by senile plantings, which are facing further declines from key pests and diseases, climate change and poor genetic resources conservation and management.

ACIAR and DFAT are collaborating on a program of global coconut reinvigoration (GP/2018/193), which focuses on reviving the Global Coconut Genetic Resources Network (COGENT) and reinvigorating planning for better coconut science through a global coconut strategy to address these major challenges. This program will include collaborating with other organisations to ensure a viable COGENT Secretariat, including supporting its transition from Bioversity International to the International Coconut Community.

The Crop Research Program and Global Program are co-investing with a private company—Davren Global Pty Ltd—on the project *Protection of stored grains against insect pests in developing countries* (CIM/2017/031). The project is using the innovative agricultural technology of synthetic amorphous silica—a form of synthetic silica activated to dehydrate insect pests. Following a successful proof of concept against common storage pests in Timor-Leste and Tanzania, the project will deploy the technology package in Tanzania, and develop a business model that effectively delivers the package to smallholder female and male farmers. This project contributes to reducing losses and increasing agricultural productivity, improving food security and incomes (SDGs 1 and 2). It also creates an opportunity for women, small businesses, private operators and development organisations to deliver the technology through collaborative partnerships (SDGs 5, 8 and 17).

## 2018-19 program outputs

The key program outputs of the Global Program during 2018-19 are to:

- » effectively participate in CGIAR strategic governance, research oversight and timely support as a member of the System Council and System Management Board, with Australian perspectives and contributions valued by the system
- » successfully develop and initiate an ambitious five-year research program, and continue a vigorous partnership with IDRC, including a second phase of Cultivate Africa's Future and the new Future of Food Research Program
- » establish strategic partnership arrangements for all ACIAR-funded international agricultural research centres

- » establish an effective and well-supported network of biosecurity experts for eastern and southern Africa, working together at a regional and national level, and hosted by the Common Market for Eastern and Southern Africa
- » have well-managed DFAT-ACIAR co-investment agreements, ensuring timely delivery of revenue and expenditure and appropriate levels of risk mitigation
- » effectively build capacity through targeted placements of Pacific biosecurity professionals in Australian and New Zealand plant biosecurity institutions under the Plant Biosecurity Capacity Building Program
- » implement best-practice protocols by African plant breeders for demand-led plant breeding developed under phase 1
- » complete national-level agricultural and science technology data collection, and initiate analysis to inform policy and decision-making in the South-East Asia and Pacific regions
- » re-invigorate COGENT to safeguard coconut genetic resources and better address disease threats through new leadership by the International Coconut Committee
- » increase consumption of nutritious indigenous produce, including African leafy vegetables, to a greater number of school children in poverty-stricken regions of western Kenya.

### General Manager, Global Program

Ms Mellissa Wood

Contact details are provided in Appendix 2

## Current and proposed projects

1. **C2016/367** Cultivate Africa's Future (CultiAF), phase 2—scaling up results from CultiAF, phase 1
2. **FSC/2013/019** Demand-led plant variety design for emerging markets in Africa
3. **GP/2016/093** Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific
4. **GP/2017/007** School Food Revolution: evaluating opportunities for further research
5. **GP/2018/101** Schools as platforms to increase dietary diversity, improve nutrition and enhance livelihoods and environmental sustainability in Kenya, Ethiopia, Tanzania and Uganda
6. **GP/2018/103** Pacific Plant Biosecurity Capacity Building Program
7. **GP/2018/108** Demand-led plant breeding and accelerating new variety adoption in Sub-Sahara Africa
8. **GP/2018/109** Improving plant biosecurity in the Pacific islands
9. **GP/2018/193** Maintaining the coconut genetic resources network (COGENT)









3

# Research Program

# Research Program

**ACIAR is a broker and investor in international agricultural research partnerships that address major challenges facing the people and environment of the Indo-Pacific region. At the core of ACIAR operations are research programs and projects that strive for more productive and sustainable agricultural systems, for the benefit of developing countries and Australia.**

Effective use of funds for research for development requires a clear pathway to impact. During 2017-18, ACIAR consolidated its research portfolio from 13 to 10 programs, which was fully implemented at the start of 2018-19.

The research programs cover key agriculture sectors (crops, livestock, horticulture, fisheries and forestry), as well as the science needed to sustain the resource base (water and climate, and soil and land management) and generate social and economic benefit (agribusiness and social sciences). An impact evaluation program assesses achievements and guides future investment.

The overall research program works towards objectives set out in the ACIAR 10-year Strategy 2018-2027, and contributes to 12 of the Sustainable Development Goals of the United Nations 2030 Agenda for Sustainable Development.

During 2018-19, there will be approximately 250 ACIAR-brokered projects led by approximately 60 commissioned organisations. Individual projects address a specific issue of science, development of technology or adoption of technology in a partner country. The outputs of the project have the potential to be applied to communities and districts throughout the partner country, and often throughout neighbouring countries in the region.







The partnerships that ACIAR establishes are varied and designed on a case-by-case basis. Many partnerships are bilateral arrangements between an Australian-based commissioned organisation and one or several in-country organisations. The organisations engaged in the research are generally universities, research agencies and extension agencies. A project may be undertaken at sites in one or several countries.

ACIAR also works in several research collaborations as a partner or supporter of an organisation with an international focus, such as the CGIAR system. Some of ACIAR's research is developed through programs where ACIAR is a co-investor with other development partners. These collaborations and partnerships are discussed in Chapter 2 'Global Program'.

Current and proposed projects for 2018-19 that are established as bilateral partnerships are presented in this chapter's regional and country sections, which are divided into the four regions where ACIAR plans and coordinates its operations:

- » Pacific
- » East and South-East Asia
- » South Asia
- » Eastern and Southern Africa.

Each regional section describes the overall research objectives and plans for the region, with subsequent sections providing brief detail for the research program within each country in that region.

Individual codes are assigned to ACIAR projects, and these are used for reference in this report. Because of the development of the research program and its refinement from 13 to 10 programs, projects implemented in past years may no longer have a direct program or Research Program Manager. These projects are managed by one of the programs within the new suite of research programs.

**Table 3.1: Codes used for former and new ACIAR research program names**

Project codes used in this report	Former research program	Research program in 2018–19
ADP	Agricultural development policy	Projects dispersed to several programs
AGB	Agribusiness	Agribusiness
AH	Animal Health	Livestock Systems
ASEM	Agricultural Systems and Management	Social Sciences
CIM	Crop Improvement and Management	Crops
CRP	—	Crops
CSE	Cropping Systems and Economics	Crops
FIS	Fisheries	Fisheries
FST	Forestry	Forestry
HORT	Horticulture	Horticulture
IAP	Impact Assessment	Impact Evaluation
LPS	Livestock Production Systems	Livestock Systems
LS	—	Livestock Systems
LWR	Land and Water Resources	Water and Climate
SLaM	—	Soil and Land Management
SMCN	Soil Management and Crop Nutrition	Soil and Land Management
SSS	—	Social Sciences
WAC	—	Water and Climate

Note: The code-GP-is also used in this chapter and denotes projects managed by the Global Program.





## 3.1 Pacific





## Regional program summary

The Pacific research program currently operates across eight countries in the Pacific region:

- » Fiji
- » Kiribati
- » Papua New Guinea (PNG)
- » Samoa
- » Solomon Islands
- » Tonga
- » Tuvalu
- » Vanuatu.

The livelihoods, agricultural commodities and production systems in these countries are closely bound by:

- » culture
- » geography, agroecology and climate
- » focus commodities and industries
- » production and/or industry development issues and constraints.

While acknowledging individual country-partner needs and research and development priorities, ACIAR's medium-term strategy for the Pacific continues to have a strong regional focus. 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 regional agriculture and fisheries strategies of the SPC. Regional research programs and projects are implemented in collaboration with regional agencies, including SPC and the University of the South Pacific, CGIAR centres, such as WorldFish, WorldVeg, and bilateral research and extension agencies.

ACIAR recognises that the Pacific islands have particular research and adoption challenges related to the size of the countries, institutional and other capacities, and remoteness from markets. ACIAR's regional programs and projects in the Pacific are designed to address these limiting factors, including a strong emphasis on capacity building and adoption pathways.

A feature of this regional approach is the cross-learning that country results can provide to other Pacific island countries, either directly or with suitable adaptation. This regional approach includes a fully integrated regional program—the second phase of PARDI—which now consists of a cluster of projects with a cross-disciplinary unifying mechanism. For the Pacific islands, this program will improve rural livelihoods, and make them more resilient through increased targeted, sustainable and inclusive agribusiness development. It will:

- » increase understanding and measurement of livelihood improvement and agribusiness performance
- » develop models to achieve impacts at scale through strategic collaboration with projects focused on agribusiness
- » develop a 'community of practice' to build agribusiness research capacity, and increase the success and sustainability of agribusiness developments
- » identify and prioritise new opportunities for agribusiness development.

Multicountry projects are also in place in:

- » fisheries (pathways to change in Pacific coastal fisheries in Kiribati, Solomon Islands and Vanuatu)
- » forestry (domestication and breeding of sandalwood, agroforestry and catchment rehabilitation)
- » crops (sweetpotato, indigenous vegetables, commercial vegetables, tropical fruits and cocoa)
- » soil information and soil health.



## ACIAR-supported projects in the Pacific region

The list starting on page 32 contains all current and proposed ACIAR-supported projects in the Pacific region during 2018-19. Some of these operate at one or more sites in a single country, but many have sites at several countries in the region. In some instances, projects in this region are part of a large research program, conducted across more than one of the four regions in which ACIAR operates.

ACIAR assigns an identification code to each project, which appears at the start of each project listed, and indicates the research program under which the project is managed. This code is also used to identify projects in other reports and publications.

In the subsequent country sections of this chapter, each project underway in that country is described briefly, and expected activities, outputs and outcomes of the ACIAR research program in that country are presented.



## Current and proposed projects in the Pacific region

### Agricultural Development Policy

**ADP/2018/131**—Policy drivers for public-private partnerships in Pacific organics: improving extension policy through an evidence-based approach

### Agribusiness

**AGB/2014/057**—Pacific Agribusiness Research in Development Initiative, phase 2 (PARDI 2)

### Crops

**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

### Fisheries

**FIS/2010/055**—Building research and project management skills in fisheries staff in Papua New Guinea

**FIS/2013/015**—Sustainable management of sport fisheries for communities in Papua New Guinea

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

**FIS/2014/061**—Improving technical and institutional capacity to support development of mariculture-based livelihoods and industry in New Ireland, Papua New Guinea

**FIS/2014/062**—Improving technologies for inland aquaculture in Papua New Guinea

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

**FIS/2016/128**—Reef colonisation and socioeconomic impacts from trochus translocations to Samoa

**FIS/2016/300**—Strengthening and scaling community-based approaches to Pacific coastal fisheries management in support of the New Song

### Forestry

**FST/2012/092**—Enhancing value-added wood processing in Papua New Guinea

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

**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

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

**FST/2014/099**—Enhancing private sector-led development of the canarium industry in Papua New Guinea

**FST/2016/025**—Developing DNA-based chain of custody systems for legally-sourced teak

**FST/2016/054**—Enhancing the formation of heartwood in sandalwood in Vanuatu

**FST/2016/147**—Promoting sustainable community-based agro-ecological intensification on sloping land in Fiji

**FST/2016/153**—Enabling community forestry in Papua New Guinea

**FST/2016/154**—Enhancing returns from high-value agroforestry species in Vanuatu

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

**FST/2017/038**—Enhancing private sector-led development of the canarium industry in Papua New Guinea, phase 2

### Global Program

**GP/2016/093**—Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific

**GP/2018/103**—Pacific Plant Biosecurity Capacity Building Program

### Horticulture

**HORT/2012/087**—Bogia coconut syndrome in Papua New Guinea: developing biological knowledge and a risk-management strategy

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



**HORT/2014/078**—Aligning genetic resources, production and postharvest systems to market opportunities for Pacific island and Australian cocoa

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

**HORT/2014/083**—Developing improved crop protection options in support of intensification of sweetpotato production in Papua New Guinea

**HORT/2014/094**—Developing the cocoa value chain in Bougainville

**HORT/2014/096**—Enterprise-driven transformation of family cocoa production in East Sepik, Madang, New Ireland and Chimbu provinces of Papua New Guinea

**HORT/2014/097**—Supporting commercial sweetpotato production and marketing in the Papua New Guinea highlands

**HORT/2017/025**—Conserving and deploying coconut genetic resources for the Pacific islands

### Livestock Systems

**LPS/2014/037**—Increasing the productivity and market options of smallholder beef cattle farmers in Vanuatu

**LPS/2016/021**—Assessment of markets and production constraints to small ruminant farming in the Pacific island countries

**LS/2014/042**—Improving the bee industry in Fiji, Papua New Guinea and Solomon Islands

**LS/2017/033**—Improving the efficiency of small ruminant value chains and production systems in Fiji and Samoa

**LS/2017/100**—Novel approaches for increasing participation in the honeybee industries of the Pacific

**LS/2018/102**—Research opportunities for smallholder beef cattle systems in Pacific island countries

### Social Sciences

**ASEM/2012/072**—Strengthening livelihoods for food security among cocoa and oil palm farming communities in Papua New Guinea

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

**ASEM/2014/054**—Identifying opportunities and constraints for rural women's engagement in small-scale agricultural enterprises in Papua New Guinea

**ASEM/2014/095**—Improving opportunities for economic development for women smallholders in rural Papua New Guinea

**ASEM/2016/100**—Improving livelihoods of smallholder coffee communities in Papua New Guinea

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

**ASEM/2017/026**—Climate-smart agriculture opportunities for enhanced food production in Papua New Guinea

### Soil and Land Management

**SMCN/2012/105**—Sustaining soil fertility in support of intensification of sweetpotato cropping systems

**SMCN/2014/048**—Optimising soil management and health in Papua New Guinea integrated cocoa farming systems

**SMCN/2014/089**—Improving soil health, agricultural productivity and food security on atolls

**SMCN/2016/111**—Soil management in Pacific islands: investigating nutrient cycling and development of the soils portal

### Water and Climate

**LWR/2017/029**—Emission-reduction options for nationally determined contributions (NDCs) in the Asia-Pacific region, Fiji and Vietnam

# Pacific island countries

**Table 3.2: Pacific island countries, key statistics, 2017**

Country	GDP per capita (US\$)	Population (million)
Fiji	5,589	0.91
Kiribati	1,685	0.12
Samoa	4,360	0.28
Solomon Islands	2,132	0.61
Tonga	3,944	0.11
Tuvalu	3,550	0.01
Vanuatu	3,123	0.28

Source: [data.worldbank.org/indicator](https://data.worldbank.org/indicator).

**Table 3.3: ACIAR funding to Pacific island countries, 2016-17 to 2018-19**

Year	A\$ million
2016-17 (actual)	8.4
2017-18 (estimated actual)	9.3
2018-19 (budget)	10.9



## Regional context

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**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 per day—is rare in the Pacific, poverty remains a big challenge for many countries. More than 20% 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 due to economic and environmental shocks. The region is particularly prone to disasters, including cyclones, severe storms, flooding, droughts and earthquakes.**

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

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ACIAR's program of collaboration with the Pacific island countries has a strong regional focus (rather than bilateral), as most Pacific island countries have limited research capacity, and have common problems and opportunities. This is unlikely to change, though a few unique issues are emerging that also need to be addressed bilaterally. These issues are mostly communicated directly as requests by countries to DFAT or the ACIAR Pacific Office.

Climate change remains a key focus of all the seven Pacific island countries. Developing climatesmart agricultural production systems that are also resilient, is paramount. The report *Climate change and Pacific island food systems*, for which SPC and ACIAR were contributors, noted more resilient food systems will have to be created, but more research is needed before these adaptations can be applied effectively. This approach will enable governments of Pacific island countries to create options for adaptation. These might include, for example:

- » reducing dependence on imported rice and wheat by increasing production of local staple crops resilient to climate change
- » persuading people to eat tuna rather than coral reef fish
- » developing the freshwater aquaculture systems that are expected to be favoured by warmer temperatures and higher rainfall.

The report recommended strengthening food systems research for the region by:

- » creating effective partnerships between national research and extension agencies, farmers' networks, non-governmental organisations and advanced scientific institutions to improve national capacity to carry out research
- » mentoring national research and extension staff and farmers to document results of field trials, and share research data and results with counterparts in neighbouring countries
- » implementing innovative approaches to overcome constraints to sharing knowledge with farmers and fishing communities in other countries and regions
- » improving the understanding of the factors that influence uptake of technology providing farmers and fishing communities with climate services to guide their investments and activities.

With limited national capacity within the region for research collaboration, it is essential that donors in the research space achieve as much coordination as possible, especially when working with common partners.

The discovery of coconut rhinoceros beetle (Guam biotype) and Bogia coconut syndrome in PNG is posing a threat to the coconut industry throughout the region. There is an urgent need for coordinated support to minimise crop loss, and control these threats, which ACIAR will contribute to through a new four-year coconut livelihood project (HORT/2017/025). The SPC plays an important role in coordinating research and development activities, catalysing priority setting, and facilitating dialogue across the partner states. ACIAR is committed to supporting SPC to maintain these roles, and, in 2016, started providing targeted core funding of A\$427,000 per year for three years.

Building and sustaining research capacity is an especially difficult challenge in the Pacific region, with many small island states with low populations. Australia, through ACIAR, has a special role to play, and provides long-term support to the University of the South Pacific through the university's scholarships program.

## Implications for ACIAR

Given the strong focus on the need for climate change responsiveness in the Pacific, ACIAR has included Fiji in its new project *Emission reduction options for nationally determined contributions NDCs in the Asia-Pacific region* (LWR/2017/029). The findings of this project will pave the way for developing future projects that address climate change resilience and sustainability through climate-smart agricultural production systems. We also need to explore possibilities for research collaboration and co-investment with New Zealand in climate change, as this is a focus and geography of high importance for both countries.

The opening of the ACIAR Pacific Office within the Australian High Commission in Fiji is proving to be the bridge between DFAT and ACIAR activities of common interest in the Pacific—for example, DFAT's Pacific Horticultural and Agricultural Market Access Program and Market Development Facility. Partnership with the FAO is also being explored to achieve greater impact, especially on agricultural production systems and climate change adaptations.

The ACIAR Pacific postgraduate scholarship scheme is proving to be a success, with many graduates taking up senior positions in the agriculture, fisheries and forestry sectors.

The co-location of ACIAR Pacific Office at the Narere campus of SPC is expected to strengthen the SPC-ACIAR relationship. The new regional coconut project led by SPC will, to some extent, measure the success of new SPC-ACIAR arrangements, and provide solution to some of the key issues affecting the coconut industry.

## Regional priorities

Priorities for ACIAR in the Pacific island countries are reviewed and updated in regular consultation with relevant government, community and private-sector stakeholders. 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 closer alignment of ACIAR's priorities and those of SPC.

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

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





## 2018–19 research program

ACIAR supports 30 projects in Pacific island countries, 18 of which are specific to one or more of the Pacific island countries, and the remainder are part of regional projects. The projects address ACIAR's high-level objectives, as outlined in the 10-year Strategy 2018–2027, and engage with nine of ACIAR's research programs.

The following sections briefly describe ACIAR-supported projects in Pacific island countries, for each research program. Each project description is referenced in a list at the end of this section, which provides the ACIAR project code and title.

### Agricultural Development Policy

A new small research activity will address the need to develop a better understanding about policy incentives and regulation on extension provision for emerging markets such as the organic sector. This project aims to understand how government and non-government actors can work together to deliver extension so that farmers can capitalise on export demand, using the burgeoning organic sector in Fiji and Vanuatu as a model.<sup>1</sup>

### Agribusiness

The Pacific Agribusiness Research for Development Initiative, phase 2 (PARDI 2) aims to identify and understand how agribusiness development opportunities can improve economic growth and livelihoods in the Pacific region. It builds on PARDI 1, which aimed to improve marketing opportunities and boost agribusiness.

PARDI 2 will focus on the representative Pacific island countries of Fiji, Tonga and Vanuatu. The initiative will study agribusiness developments to understand how and why they have succeeded, document the benefits to community livelihoods, and investigate how to extend and make economic benefits more inclusive and sustainable. It will identify and overcome constraints and bottlenecks in value and supply chains for primary products. As well as strengthen PARDI's engagement with other ACIAR projects, the initiative will link to other Pacific donor programs, such as the Pacific Horticultural and Agricultural Market Access program and the Market Development Facility.<sup>2</sup>

### Crops

Oil palm is a long-term, perennial crop of great economic importance in South-East Asia and the Pacific (PNG and Solomon Islands). It is economically important to both large plantations and smallholders. Basal stem rot, caused by the fungus *Ganoderma boninense*, poses a major threat to the oil palm industry, with the incidence of basal stem rot increasing with each successive planting.

In Solomon Islands and PNG, research looking at the long-term management of basal stem rot in oil palm trees, by establishing a plantation of diverse breeding lines, and regularly screening for disease symptoms. The plantation has been in place for seven years, and susceptible lines are now starting to die. The screening will continue for the next three years, in the hope of identifying resistant planting material and the genetic basis for the resistance.<sup>3</sup>

### Fisheries

ACIAR's fisheries program works with its partners in developing countries to build their fishery research capabilities, and to improve people's livelihoods and wellbeing. The program of research includes improving the management of fisheries, as well as developing suitable opportunities from fisheries and aquaculture to increase household income and/or to improve food security and nutrition.

Pearl culture provides opportunities for generating income at the community level in several Pacific countries. Communities and individuals may be involved at several stages along the pearl farming supply chain—in capture of spat (baby oysters) on ocean-based longlines, for on-growing of juvenile oysters, and for seeding and production half-pearls (mabé pearls). A project in Fiji, Tonga and PNG is increasing the resilience, productivity, community engagement and livelihood opportunities from pearl farming. In Fiji, community-based collection of oyster spat is expanding rapidly and generates regular income for several Fijian villages.

Communities are using the income to diversify their economic opportunities, through setting up general stores and buying outboard motors, enabling wider trade of fisheries products.<sup>4</sup> Another project is supporting further development of community-based pearl farming in Tonga, and investigating the potential of similar development in Vietnam, with a particular focus on the production of cultured half-pearls.<sup>5</sup>

Trochus is an economically important marine snail in the Asia-Pacific region, as its thick shell and inner layer of nacre (mother of pearl) is sold for button and inlay decoration. Starting in 2003, ACIAR-supported work established trochus foundation stocks on Samoan reefs, which have subsequently bred and colonised surrounding reefs. A current project is evaluating the extent to which new populations have established, and the socioeconomic impacts of these translocations. These data will inform policies for managing the fishery, and decisions about exporting trochus through better understanding of trochus stocks, fishers and fishing activities.<sup>6</sup>

An ACIAR-supported project is working with communities across the Pacific to help them restore and better manage their near-shore coastal fisheries. The project brings communities and fisheries agencies together to develop suitable co-management practices that take into account the complex social and ecological systems that influence fisheries sustainability. Such community-based approaches promise to play a central role in securing the benefits to Pacific coastal communities that flow from coastal resources. This project builds on past ACIAR work that delivered substantial knowledge about effective and scalable community-based approaches. The research highlighted the complexity of community-based fisheries management, and the need for fit-for-purpose approaches. The current follow-on project is focused on adoption and scale-out of community-based fisheries management across the Pacific, with particular effort focused on Vanuatu, Solomon Islands and Kiribati. By engaging with and directly responding to the Pacific Commission's 2015 'New Song' policy to strengthen coastal fisheries governance, the project has positioned itself as a key provider of critical knowledge to inform the implementation of community-based fisheries management.<sup>7</sup>

## Forestry

ACIAR-supported forestry projects in the Pacific island countries strive to develop technologies and opportunities to improve returns from timber plantations throughout the region. As a result, these projects contribute to greater resilience for local communities and the environment.

Transporting large round logs to wood yards, where the timber is prepared for export, is very difficult for community timber growers. A project exploring the possibilities of milling and drying teak in plantations is nearing completion, and a cost-benefit analysis will be done to determine the level of profitability to the grower, as well as the commercial viability of a contract harvesting and milling operation.<sup>8</sup>

A project in Fiji, Solomon Islands, PNG and Vanuatu is researching processing techniques and new markets for value-added fruit and nut produce grown in agroforestry systems. 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 in communities to operate businesses that market these products. The project will also develop catchment revegetation systems linked to markets, such as tourism, that could fund these activities.<sup>9</sup>

Teak is one of the most commercially important timbers in the world, due to its durability and water resistance. Illegally logged timber products, including teak, enter markets by being mixed with legitimate supply chains, with associated document fraud. Building on previous research activity that developed DNA markers for teak timber, and studied teak chains of custody in Indonesia and Myanmar, similar work continues in Laos, Indonesia, Solomon Islands and PNG.<sup>10</sup>

A small project in Vanuatu is conducting research on strategies to induce the formation of heartwood in sandalwood timber to reduce the time needed for these trees to produce the highvalue sandalwood oil.<sup>11</sup>

In Fiji and Tonga, native sandalwood is commercially valuable, and the species has been overexploited in the wild, resulting in fragmentation and local extinction of natural populations. A short project is improving the understanding of the species to increase the conservation status in Fiji and Tonga and develop strategies to improve the quality and availability of germplasm.<sup>14</sup>

Most land in Fiji is relatively steep, and large areas are deforested, underused and typically degraded. Previous field trials have demonstrated that appropriately designed and managed agroforestry systems on sloping land can be productive and sustainable. But there has been insufficient socioeconomic evaluation and government policies to promote this form of land use. A new project is underway to develop policy, institutional and governance frameworks to encourage adoption of crop-livestock-tree agroforestry systems on sloping land in Fiji.

The project will also aim to provide information that help decisions by government agencies, landholder communities and individual farmers on system design and expected financial and economic performance.<sup>12</sup>

A large project aims to advance the Vanuatu agroforestry sector by improving the availability of improved tree germplasm, and support wider smallholder adoption of three high-value forestry species—canarium (*Canarium indicum*) nut, sandalwood (*Santalum austrocaledonicum*) and whitewood (*Endospermum medullosum*), which could be produced to yield nuts, oil and timber, respectively.<sup>13</sup>

### Global Program

Work continues on collecting detailed institutional, financial, human resource and research output data from agricultural research agencies to be included in the ASTI database, and on supporting stakeholder access to such information, analysis and support for future policy, through various online tools and publications. ASTI provides open-access data and analysis on agricultural research systems in developing countries. This project will be implemented by IFPRI and APAARI, in close collaboration with the main national agricultural research institutes of the region.<sup>15</sup>

Following the successful delivery of a plant biosecurity capacity-building program in eastern and southern Africa, ACIAR is extending the program to the Pacific region. The program is important to Australia and the Pacific region, as plant pest and diseases affect food production, and can limit trade and market access opportunities for plant products. The goals of the program are to improve:

- » performance and capacity of biosecurity agencies in the Pacific region
- » supply chain compliance by the private sector
- » value chains, by addressing plant biosecurity impediments
- » food security and livelihoods across the region.<sup>16</sup>

### Horticulture

As part of the PARDI 2 initiative, a project will support the development of resilient value chains in Fiji, Samoa and Tonga for five regionally-significant fruit crops: papaya, pineapple, mango, breadfruit and citrus. The aim of the project is to increase the resilience of selected tropical fruit value-chains in the face of economic stress and natural disaster.

This will be achieved through:

- » more efficient value chains
- » improved climatic resilience of breadfruit
- » targeted capacity building of private sector and government extension services
- » increased engagement of smallholder farmers and communities in functional supply chains.<sup>17</sup>

Cocoa is an important agricultural export of South Pacific countries for more than 50,000 households in PNG, Solomon Islands and Vanuatu. Significant domestic and potentially useful export industries also exist in Samoa and Fiji. Although the volumes of cocoa produced are small by global standards, ACIAR scoping studies suggest that Pacific island cocoa is well placed to successfully compete in high-value, low-volume markets. An ACIAR-supported project is strengthening cocoa value chains in the Pacific island countries of Fiji, Samoa, Solomon Islands and Vanuatu, as well as in Australia, taking a whole-of-value-chain approach.<sup>18</sup>



Vegetable production in the Pacific islands does not match local demand, and vegetables are imported to meet the demand of high-value hospitality and food service markets. A project is underway to develop ‘protected cropping’ to improve the supply of high-value vegetables to domestic tourism and hospitality markets in Fiji, Samoa and Tonga. In addition to trialling technical innovations, the project will help farmers better organise themselves to produce and sell into these demanding markets.<sup>19</sup>

While coconut enterprises in the Pacific island countries face economic and environmental challenges, diversifying coconut-based livelihoods—for example, by producing new coconut products, such as virgin coconut oil, cosmetics and nutraceuticals—could offer a path out of poverty towards more resilient livelihoods. A new project aims to support the rejuvenation of coconut-based livelihoods in the Pacific islands, by strengthening the conservation and use of genetic diversity in coconuts, and by addressing threats posed by the rhinoceros beetle and the Bogia coconut syndrome disease.<sup>20</sup>

## Livestock Systems

The Government of the Republic of Vanuatu has identified increased smallholder cattle productivity, linkages with the commercial cattle sector, and income from cattle sales as priority strategies to:


- » increase national beef production
- » meet expanding market opportunities
- » improve the livelihoods of smallholder households.

A project in the ACIAR Livestock Research Program is supporting this position, by working to increase the productivity and marketing options of smallholder cattle farmers through various social, business and production participatory research, demonstration and training activities.<sup>21</sup>

A small research activity is assessing production systems and value chains for small ruminants (goats and sheep) in Pacific island countries to find ways of better aligning production with market requirements, improving smallholder participation in value chains and increasing the contribution of ruminant production to the livelihoods of small-scale producers.<sup>22</sup>







Following on from this work, a four-year project is working to address the constraints identified in the small research activity. The project aims to improve the production efficiency of breeding and weaner animals from smallholder and semi-commercial sheep and goat production systems in Fiji and Samoa, to better supply local markets and benefit all stakeholders.<sup>24</sup>

Beef cattle are important to livelihoods and economies in many Pacific island countries but have been the subject of few contemporary research and development initiatives. A small research activity is developing recommendations on the potential scope, scale and partners for future beef cattle research in the short to medium term.<sup>26</sup>

Beekeeping in tropical and subtropical regions of the Pacific and South-East Asia faces several threats to the viability of the industry and to pollination services, creating a biosecurity issue for the Australian beekeeping industry. A small research activity is underway to determine the resources and partnerships required to undertake a full research project.<sup>25</sup> Following on from this work, a project will address the constraints identified in the small research activity.<sup>23</sup>

### Social Science

A large proportion of the population in Fiji and Tonga rely on services from the landscape to support their livelihoods, so they are acutely vulnerable to the impacts of climate change and variability. A project will look at ways to increase or protect environmental livelihood security under a variable or changing climate through community-driven management of agricultural landscapes.<sup>27</sup>

### Soil and Land Management

Pacific island atolls are among the most vulnerable communities on this planet in the face of climate change. It is already difficult to produce food on the atolls for environmental and cultural reasons. A project aims to improve the livelihoods of the people of coral atolls—Kiribati and Tuvalu in particular—through increased and diversified agricultural production.<sup>28</sup>

The majority of food within the Pacific is produced on very small farms, and it is now recognised that agricultural sustainability is threatened by nutrient imbalances, erosion, declining stores of carbon and soil sealing. Across five Pacific nations, a project will develop a soil information system, and find appropriate technologies for efficient water and nutrient use. The results will be used to provide farmers, farm advisers and other stakeholders with spatially explicit guidance on how to achieve sustainable soil management, and secure resilience to climate change.<sup>29</sup>

### Water and Climate

A new project is assessing ways to reduce agricultural emissions in the Asia-Pacific region, and offset methods appropriate to developing countries (using Fiji and Vietnam as pilot examples). The project leverages the success of Australian emissions accounting, carbon farming offset methods and emission-reduction research in the agricultural and land sectors. It will develop a governance checklist enabling user countries to identify, adopt and manage locally appropriate emission-reduction options. It will also provide a detailed analysis of potential cobenefits to food security, and existing capacity gaps to using carbon farming methods or emission-reduction options in Fiji and Vietnam, in delivering their commitments under the Paris Agreement (COP21).<sup>30</sup>

### 2018–19 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.
- » A report produced on business models for teak sawing and drying enterprises in Solomon Islands.
- » First generation *Canarium* seed orchards established in Efate and Santo.
- » Women's groups in Fiji and Vanuatu provided with information on income-generating activities from agroforestry crops.

- » Financial and growth estimates provided for various commodities.
- » Needs and priorities agreed upon for strengthening extension services relating to tropical fruit value chains in at least two Pacific island countries.
- » Research started on operationalising a landscape approach to managing natural resources and livelihood activities under increasing climate stressors in Fiji and Tonga.
- » Pearl production contributes 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 start a project to improve the production and marketing of honey in PNG, Solomon Islands and Fiji.
- » Oil palm nursery in Solomon Islands screened for symptomatic *Ganoderma*-infected plants.
- » Assessment of small ruminant production and marketing systems in Fiji, Samoa and Vanuatu completed.
- » Assessment of research opportunities for smallholder cattle production in the Pacific island countries completed.
- » On-farm cattle production data systems established (using MAD) at project sites in Vanuatu.
- » Existing regional data on soil resources collated and digitised.
- » A regional project on overcoming soil constraints started.
- » The use of digital data collection applications explored in Vanuatu.
- » Completion of molecular characterisation of *Ganoderma* isolates from infected oil palms.
- » Increased adoption of sustainable cropping and aquaculture by small-scale producers.
- » Development of new technologies and practices in natural resource management for the forestry and fisheries sectors.
- » Development of a 'community of practice' in agribusiness research for development.
- » Demonstrated opportunities for sustainable and inclusive agribusiness development to improve livelihoods and community resilience.
- » Achievement of wider market access for smallholders, aligning farm production to meet quality and nutritional requirements, and for those growing teak or other timber species, such as whitewood.
- » Contribution to the development of land-use policies suited to transitioning to sustainable agroforestry sector in Fiji and Vanuatu.
- » Increased understanding of the economic and social benefits of catchment rehabilitation and remediation strategies in Fiji and Vanuatu.

## Five-year region outcomes

- » Agricultural communities given access to seasonal climate information and adaptive options for greater resilience to climate stressors in Fiji and Tonga.
- » Development of a Pacific Soil Portal supporting improved land management and resilience to changes in climate and other conditions.
- » Development, testing and adoption by vegetable growers in Kiribati of nutrient management strategies tailored to atolls.

### Country Manager, Pacific island countries

To be appointed

### Research Program Managers

To be appointed, Agribusiness

Dr Eric Huttner, Crops

Dr Ann Fleming, Fisheries

Dr Norah Devoe, Forestry

Ms Mellissa Wood, Global Program

Dr Irene Kernot, Horticulture

Dr Werner Stur/Dr Anna Okello,

Livestock Systems

Dr Jayne Curnow, Social Sciences

Dr Robert Edis, Soil and Land Management

Dr Robyn Johnston, Water and Climate

Contact details are provided in Appendix 2



## Current and proposed projects

1. **ADP/2018/131**—Policy drivers for public–private partnerships in Pacific organics: improving extension policy through an evidence-based approach
2. **AGB/2014/057**—Pacific Agribusiness Research in Development Initiative, phase 2 (PARDI 2)
3. **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
4. **FIS/2014/060**—Developing pearl industry-based livelihoods in the western Pacific
5. **FIS/2016/126**—Half-pearl industry development in Tonga and Vietnam
6. **FIS/2016/128**—Reef colonisation and socioeconomic impacts from trochus translocations to Samoa
7. **FIS/2016/300**—Strengthening and scaling community-based approaches to Pacific coastal fisheries management in support of the New Song
8. **FST/2014/066**—Improving returns from community teak plantings in Solomon Islands
9. **FST/2014/067**—Enhancing value-added products and environmental benefits from agroforestry systems in Papua New Guinea and the Pacific
10. **FST/2016/025**—Developing DNA-based chain of custody systems for legally-sourced teak
11. **FST/2016/054**—Enhancing the formation of heartwood in sandalwood in Vanuatu
12. **FST/2016/147**—Promoting sustainable community-based agroecological intensification on sloping land in Fiji
13. **FST/2016/154**—Enhancing returns from high-value agroforestry species in Vanuatu
14. **FST/2016/158**—Domestication and breeding of sandalwood in Fiji and Tonga
15. **GP/2016/093**—Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific
16. **GP/2018/103** Pacific Plant Biosecurity Capacity Building Program
17. **HORT/2014/077**—Enhanced fruit production and postharvest handling systems for Fiji, Samoa and Tonga
18. **HORT/2014/078**—Aligning genetic resources, production and postharvest systems to market opportunities for Pacific island and Australian cocoa
19. **HORT/2014/080**—Integrating protected cropping systems into high-value vegetable value chains in the Pacific and Australia
20. **HORT/2017/025**—Conserving and deploying coconut genetic resources for the Pacific islands
21. **LPS/2014/037**—Increasing the productivity and market options of smallholder beef cattle farmers in Vanuatu
22. **LPS/2016/021**—Assessment of markets and production constraints to small ruminant farming in the Pacific island countries
23. **LS/2014/042**—Improving the bee industry in Fiji, Papua New Guinea and Solomon Islands
24. **LS/2017/033**—Improving the efficiency of small ruminant value chains and production systems in Fiji and Samoa
25. **LS/2017/100**—Novel approaches for increasing participation in the honeybee industries of the Pacific
26. **LS/2018/102**—Research opportunities for smallholder beef cattle systems in Pacific island countries
27. **ASEM/2016/101**—Climate-smart landscapes for promoting sustainability of Pacific island agricultural systems
28. **SMCN/2014/089**—Improving soil health, agricultural productivity and food security on atolls
29. **SMCN/2016/111**—Soil management in Pacific islands: investigating nutrient cycling and development of the soils portal
30. **LWR/2017/029**—Emission-reduction options for nationally determined contributions (NDCs) in the Asia-Pacific region, Fiji and Vietnam

# Papua New Guinea

**Table 3.4: Papua New Guinea, key statistics, 2017**

Country	GDP per capita (US\$)	Population (million)
Papua New Guinea	2,556	8.25

Source: data.worldbank.org/indicator.

**Table 3.5: ACIAR funding to Papua New Guinea, 2016-17 to 2018-19**

Year	A\$ million
2016-17 (actual)	12.8
2017-18 (estimated actual)	10.5
2018-19 (budget)	8.2



Image: ACIAR/Conor Asheigh



## Country context

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**Papua New Guinea 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 2018-19 (DFAT)

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The population of Papua New Guinea is growing rapidly and in 2011 was anticipated to double every 22 years if the growth rates at that time continued. To foster economic growth, the Papua New Guinea Government seeks to pursue economic opportunities from sustainable agriculture, fisheries and forestry sectors.

Small-scale agriculture has historically been the mainstay of PNG, and this is still true for many people today. But an increasingly urban environment presents challenges for the PNG Government. There is a need to develop better systems to mobilise land, organise farmers, improve crop productivity, increase efficiency and encourage entrepreneurship and development of small to medium enterprises.

Under its Medium Term Development Plan 2, the Papua New Guinea Government states that sustainable management of the forestry and fisheries sectors remains an important priority for driving economic growth and generating income for a large rural population.

The forestry sector is significant to PNG—the rural population depends largely on the timber and non-timber products for income, and on its role as a buffer against climate change. The fisheries sector has been a source of revenue for the PNG Government through the exports of processed and unprocessed fisheries products.

With the national development landscape, PNG will remain a commodity-exporting economy, vulnerable to the boom and bust cycle. Despite these challenges, PNG remains focused on its aspiration to graduate to middle-income status by 2050.

Papua's New Guinea's National Research Agenda places a spotlight on the role of science and research in creating wealth. Under this framework, the priority is on research that will:

- » improve quality and productivity
- » add value to existing products
- » promote research and innovation to improve agricultural systems
- » promote natural resource management approaches
- » improve markets and market access for farmers
- » increase livelihoods resilience.

With shared history and shared geography, Australia values its long-standing ties with PNG. As its nearest neighbour and close regional partner, a stable and prosperous PNG is in Australia's interest. Australia's relationship with PNG has evolved to reflect a more mature, focused and innovative response to PNG's development priorities.

Institutional capacity building remains a critical part of Australia's support, reflecting Australia interest and priorities, but its development cooperation today is more targeted, precise and reflective of genuine partnerships with PNG. Australia's partnership with PNG is aimed at improving the environment for investment and enabling sustainable economic growth and better social outcomes.

Australia's support to agricultural research, through ACIAR, plays a significant role, as PNG works toward its goals on sustainable agriculture, fisheries, forestry development, and inclusive economic growth. A key component of Australia's contribution toward promoting economic growth is through the DFAT and ACIAR co-funded Transformative Agriculture and Enterprise Development Program, valued at a \$23 million over six years. The program takes on innovations generated by previous ACIAR research that are ready to scale out, to foster private sector-led development.

These innovations include:

- » integrated pest and disease management for cocoa
- » new genetic resources for cocoa (virus-free planting material)
- » improved crop management for sweetpotato
- » improved processing and value-chain development for galip nut
- » increased business acumen of women, leading to women-led enterprise development.

These five projects within the Transformative Agriculture and Enterprise Development Program collectively aim to foster private sector-led development in agriculture, increase agricultural productive capacity, and improve access to markets for farmers, particularly women farmers. The program is further supported by aligned projects developing nutrient soil and plant health management strategies. Training priorities will be addressed through targeted activities within the projects, although support for postgraduate degrees in Australia is also a significant contributor to capacity development.

## Country priorities

A country consultation to reassess priorities was held in February 2018. The key research priority of ACIAR's program of collaborative research with PNG is to improve livelihoods by increasing incomes and market access, by:

- » 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
- » improving germplasm quality for high-value tree species
- » improving community forestry and agroforestry systems
- » developing markets
- » adding value to wood and non-wood products, by working with private sector partners and farmers to scale up the adoption of promising agricultural technologies
- » improving livelihoods from smallholder coastal fisheries, and both inland and marine aquaculture
- » increasing household income through enterprise diversification
- » increasing the sustainability and resilience of production systems, including livestock health and production
- » increasing research and project management skills in fisheries and forestry staff.

Key principles in designing and executing the research program include:

- » building capacity at both research and institutional levels
- » engaging with the private sector, industry bodies and non-government organisations, in partnership with government, to conduct research and implement research results that directly contribute to economic development
- » conducting research that helps smallholder farmers and landowners increase their incomes through better 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
- » maintaining close linkages between ACIAR-funded programs in PNG and Pacific island countries, where relevant
- » promoting 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.

## 2018–19 research program

ACIAR supports 32 projects in PNG, 25 of which are specific to this country, and the remainder are part of regional projects. The projects address ACIAR's high-level objectives, as outlined in the 10-year Strategy 2018–2027, and engage with seven of ACIAR's research programs.

The following sections briefly describe ACIAR-supported projects in PNG, for each research program. Each project description is referenced in a list at the end of this section, which provides the ACIAR project code and title.

### Crops

Oil palm is a long-term, perennial crop of great economic importance in South-East Asia and the Pacific (PNG and Solomon Islands). It is economically important to both large plantations and smallholders. Basal stem rot, caused by the fungus *Ganoderma boninense*, poses a major threat to the oil palm industry, with the incidence of basal stem rot increasing with each successive planting.

In Solomon Islands and PNG, research is being undertaken for the long-term management of basal stem rot in oil palm trees, by establishing a plantation of diverse breeding lines, and regularly screening for disease symptoms. The plantation has been in place for seven years, and susceptible lines are now starting to die. The screening will continue for the next three years, to identify resistant planting material, and the genetic basis for the resistance.<sup>1</sup>

### Fisheries

The fisheries industries of PNG are central to the livelihoods of coastal and inland communities. A diverse range of products and services from these industries generate smallholder income, underpin food security, and provide the potential for economic development. The ACIAR Fisheries Research Program supports projects that build capacity of fisheries researchers, and contribute to the development of sustainable industries and livelihoods in remote areas of PNG.

An ACIAR-funded project worked with PNG's National Fisheries Authority to build research and project management capacity of its staff. An Australian tertiary-recognised course in research methods and management (graduate certificate level) was tailored and delivered to 42 research staff in Port Moresby.

The project offered a unique opportunity for the participants to gain essential skills without having to leave their jobs and families and travel to Australia. In the short term, this will improve the planning and delivery of fisheries science by National Fisheries Authority and its extension services to smallholders, and in the longer term strengthen the authority's institutional capacity.<sup>2</sup>

Sport-fishing ventures are a potential alternative income for coastal villagers in PNG. A project in its final stages examined the ecology and biology of the black bass, and developed management protocols to ensure sustainable industry viability. The project will determine potential livelihood costs and benefits, as well as the commercialisation pathways to establish and grow a sport-fishing industry in PNG.<sup>3</sup>

Pearl culture provides opportunities for generating income at the community level in several Pacific countries. Communities and individuals may be involved at several stages along the pearl farming supply chain—in capture of spat (baby oysters) on ocean-based long-lines, for on-growing of juvenile oysters, and for seeding and production half-pearls (mabé pearls). A project in Fiji, Tonga and PNG is increasing the resilience, productivity, community engagement and livelihood opportunities from pearl farming. Pearl handicraft training in PNG has enabled women to produce high-quality retail ready pearl shell jewellery and handicraft items. Basic business skills workshops are enabling product to be marketed locally, to tourists and overseas via the internet.<sup>4</sup>

Another project works with coastal communities in New Ireland to develop mariculture enterprises that will provide an alternative source of income for both men and women. Although the region enjoys healthy fish stocks that provide income and food security to coastal communities, the local sea cucumber fishery has collapsed from overharvesting, with the associated loss of an important income source for communities. The project is supporting staff at the Nago Island Marine Research Facility in Kavieng to develop their skills in hatchery production of sea cucumber (for ranching and stock enhancement enterprises) and ornamental fish, each offering potential new income sources through export to international markets.<sup>5</sup>

Freshwater or inland aquaculture—such as production of tilapia and carp using low-cost and farmer-friendly grow out methods—has the potential to significantly improve food and income security for smallholders.

Research in the Eastern Highlands province is targeting technical and husbandry improvements, and identifying the social benefits of increased fish production. To date, significant social and economic benefits have flowed from the many thousands of pond-based fish farms that have been installed—an estimated 50,000 fish ponds are now across PNG. The widespread expansion of earthen pond-based tilapia farming has improved food security and income for many inland communities. In Goroka, the research links fish farming to domestic security, by working with low-security prisoners as a rehabilitation strategy. These men gain skills that enable them to be reconciled with their community and contribute to community food security and income. There is also a ‘fish in schools’ element, which has promoted the uptake of aquaculture in PNG’s highland areas.<sup>6</sup>

## Forestry

Forestry in PNG has developed from a small domestic processing industry in the 1950s to a large log export-oriented industry. The PNG Government now seeks to generate additional opportunities for economic growth, employment and increased value-added processing of harvested logs from its forest resources.

The ACIAR Forestry Research Program focuses on the processing and value-adding of timber and nontimber products, increasing the availability of improved germplasm for tree growing and promoting community-based forestry.

A project that is almost complete has worked to:

- » increase the knowledge of wood properties and processing characteristics of PNG timbers
- » improve value-added processing systems
- » estimate the potential contribution and distribution of economic impacts to national and local economies from enhanced value-added wood processing
- » increase the capacity of government, institutional support bodies, industry partners and landowners to implement value-added wood processing policies, strategies and practices.<sup>7</sup>

Another project builds on this work, and, in collaboration with the private sector, will develop engineered wood products in both PNG and Australia. The project will also assess the feasibility of public-private partnerships to promote value-added wood processing in PNG.<sup>8</sup>

A project in Fiji, Solomon Islands, PNG and Vanuatu is researching processing techniques and new markets for value-added fruit and nut produce grown in agroforestry systems. Designed to help landowners 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. The project will also develop catchment revegetation systems linked to markets, such as tourism, that could fund these activities.<sup>9</sup>

Strong international demand for forest products has substantially depleted timber resources in lowland PNG. A project aims to develop germplasm sources and smallholder-friendly silviculture systems for teak (PNG) and sandalwood (PNG and Cape York Peninsula) to improve smallholder livelihoods in these regions.<sup>10</sup>

In East New Britain province, research has focused on new value-added processing technologies and options for developing markets for the anticipated large volume of galip nuts, produced by the canarium or galip tree (*Canarium indicum*), that will become available within five years. The project, which is almost complete, has provided interventions, such as market research, technical advice, capacity building, business mentoring and access to infrastructure for both private and public-sector stakeholders. It has also improved livelihoods and women’s empowerment in the region.<sup>11</sup> Phase 2 of the project will build on achievements of the first project and foster private sector-led development of the galip nut industry in PNG, increase the efficiency of galip nut value chains and establish commercially viable business prospects for private sector investment at different scales.<sup>14</sup>

Teak is one of the most commercially important timbers in the world, due to its durability and water resistance. Illegally logged timber products, including teak, enters markets by being mixed with legitimate supply chains, with associated document fraud. Building on previous research activity that developed DNA markers for teak timber, and studied teak chains of custody in Indonesia and Myanmar, similar work continues in Laos, Indonesia, Solomon Islands and PNG.<sup>12</sup>



Improving rural livelihoods through family-focused community reforestation and ecoforestry in community-owned natural forests in PNG is the aim of a project with activities in the Eastern Highlands province, the Ramu–Markham valleys and the Lae region. Research will focus on implementation of family-focused community reforestation activities, methods for scaling out community-based reforestation to landscape scale, and institutional arrangements and policy recommendations that improve access to formal timber markets.<sup>13</sup>

### Global Program

Work continues on collecting detailed institutional, financial, human resource and research output data from agricultural research agencies to be included in the ASTI database, and on supporting stakeholder access to such information, analysis and support for future policy, through various online tools and publications. ASTI provides open-access data and analysis on agricultural research systems in developing countries. This project will be implemented by IFPRI and APAARI, in close collaboration with the main national agricultural research institutes of the region.<sup>15</sup>

Following the successful delivery of a plant biosecurity capacity-building program in eastern and southern Africa, ACIAR is extending the program to the Pacific region. The program is important to Australia and the Pacific region, as plant pest and diseases affect food production, and can limit trade and market access opportunities for plant products.

The goals of the program are to improve:

- » performance and capacity of biosecurity agencies in the Pacific region
- » supply chain compliance by the private sector
- » value chains, by addressing plant biosecurity impediments
- » food security and livelihoods across the region.<sup>16</sup>

### Horticulture

The ACIAR Horticulture Research Program supports various projects to protect crop, develop genetic resources and develop production systems and value chains.

Bogia coconut syndrome is a plant disease that has killed hundreds of coconut palms in Madang Province, PNG. A related pathogen affects bananas in the same region. A project is describing the biology of Bogia coconut syndrome, and quantifying the risk of the disease to different crops, industry sectors, and smallholders. Based on these insights, the project will work to develop a containment and management strategy, which will provide the knowledge base to save the Pacific regional coconut gene bank, which is immediately threatened by the disease.<sup>17</sup>

While coconut enterprises in the Pacific island countries face economic and environmental challenges, diversification of coconut-based livelihoods—for example, by producing new coconut products, such as virgin coconut oil, cosmetics and nutraceuticals—could offer a path out of poverty towards more resilient livelihoods. A new project aims to support the rejuvenation of coconut-based livelihoods in the Pacific islands by strengthening the conservation and use of genetic diversity in coconuts, and by addressing threats posed by the rhinoceros beetle and Bogia coconut syndrome disease.<sup>22</sup>

About 90% of PNG's population consists of semi-subsistence smallholder farmers for whom sweetpotato is a major crop species. A project is supporting the intensification of sweetpotato production, and developing sustainable solutions to protect crops.<sup>18</sup>



Image: ACIAR/Conor Ashleigh

This project and a project on soil management and crop nutrition<sup>31</sup> provide technical support for a larger project, under the Transformative Agriculture and Enterprise Development Program, seeking to strengthen the entire value chain for sustainable and market-oriented sweetpotato-based production systems in the highlands.<sup>21</sup>

Cocoa is a profitable smallholder crop, and accounts for 18% of agricultural exports in PNG. While cocoa has the potential to drive rural development, production needs rejuvenation in some regions of PNG. Before the decade-long crisis that disrupted society and the economy, cocoa was a major contributor to the economy of the autonomous province of Bougainville. A project is working to improve the profitability and vitality of smallholder cocoa farming families and communities, by fostering and strengthening public and private sector partnerships, and helping to develop enterprises that increase productivity and access to premium markets.<sup>19</sup>

In PNG's East Sepik, Madang, New Ireland and Chimbu provinces, old cocoa plantings are overgrown, low yielding, underharvested, and susceptible to pests and disease. Another project is underway to support smallholder farmers adopt new varieties and plant management methods.<sup>20</sup>

### **Livestock Systems**

Beekeeping in tropical and subtropical regions of the Pacific and South-East Asia faces several threats to the viability of the industry and to pollination services, creating a biosecurity issue for the Australian beekeeping industry. A small research activity is underway to determine the resources and partnerships required to undertake a full research project.<sup>23</sup> Following on from this work is a project will address the constraints identified in the small research activity.<sup>24</sup>

### **Social Sciences**

A project in its final stages has studied socioeconomic and cultural factors that influence smallholder's farming and livelihood systems, and their capacity to adapt and respond to stress on cocoa and oil palm production systems. During 2018-19, the study will develop and refine interventions to relieve pressures on farming systems, and reduce smallholder's vulnerability to food and income insecurity.<sup>25</sup>

A project to be completed during 2018-19 sought to address the issue of energy dense but nutritionally poor store-bought foods replacing micronutrient-rich traditional garden foods in both rural and urban diets of PNG and northern Australia. The project developed communication tools and capacity to increase production and consumption of home-grown traditional vegetables.<sup>26</sup>

ACIAR-supported 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. One project in the Social Sciences Research Program is looking at opportunities and constraints for women in making the transition from subsistence farming to cash and commercial enterprises.<sup>27</sup> Another project, while also focused on economic opportunities for women, is looking at the effectiveness of the whole-of-family approach to farmer learning, across a broader range of commodities and geographies, to enable farming families to work more equitably and effectively, and improve their livelihoods.<sup>28</sup>

Coffee is economically important for rural livelihoods in PNG. But national production is declining, despite a rapidly growing population in the highland coffee growing areas, which account for 91% of national production. A project is determining how to increase returns to labour, particularly for women, through new technologies and farming practices that improve coffee quality and total production, while being compliant with the environmental criteria of the main certification organisations.<sup>29</sup>

Communities reliant on agriculture-based livelihood systems in PNG have been identified as being particularly at risk from climate variability and change. A project is underway to provide farming communities with knowledge and skills related to seasonal climate risk and adaptive management to help them reduce risk, and secure adaptive opportunities for food production.<sup>30</sup>

### **Soil and Land Management**

Intensifying food production systems is necessary to feed PNG's burgeoning population, which has doubled in the past 30 years. This puts unprecedented pressure on the limited land available for agricultural production.

Various projects are working to address the intensification of sweetpotato cropping systems in Eastern Highlands, Jiwaka, and Western Highlands. One project aims to identify soil and land management techniques to sustainably intensify the semi-commercial sweetpotato cropping system.<sup>31</sup> This project operates in parallel with another that is supporting the intensification of sweetpotato production by developing sustainable solutions for crop protection.<sup>18</sup>

Yields of cocoa could be increased with better soil fertility, lifting incomes, helping smallholder farmers to diversify crops, and resulting in healthier communities. The project will evaluate opportunities to use green waste from cocoa production to supply nutrients to the soil. It will also evaluate nutrient levels in cocoa produced in diversified cocoa farming systems. The project will develop region-specific soil management strategies for smallholdings.<sup>32</sup>

## 2018-19 project outputs

- » Report produced on benefits for women working in wood-processing companies as a result of project activities.
- » Working commercial model of a galip nut processing factory developed, including factory design, costs, equipment, products, market potential and financial analysis.
- » Recommendations made on best-bet value-added wood products for selected PNG timber species, based on wood properties and processing characteristics.
- » Report produced on the key constraints for communities practising ecoforestry to sell timber legally.
- » Women smallholders provided access to extension services and agri-business training.
- » More profitable replanting system developed for oil palm smallholders.
- » Social, economic and environmental constraints to industry development by smallholder farmers identified and documented, with case studies on crop, fisheries and gender research.
- » Research options designed and initiated to reduce gaps in agricultural productivity, and achieve diversified systems for crop, fisheries and poultry producers.
- » Partnerships established to begin a project to improve the production and marketing of honey in PNG.

- » Partnerships established to begin a program of sweetpotato-system research targeting sustainable production, diversification, value-chain development, value-adding and processing.
- » Partnerships and testing sites established to disseminate improved cocoa varieties and integrated production technologies in at least three major cocoa-producing provinces.
- » Nutrient supply options developed and tested for sweetpotato production in fully commercialised farms (fertiliser) and for semi-market-oriented producers (non-fertiliser options).
- » Capacity fisheries researchers built through in-country delivery of a formal, tertiary-recognised qualification.

## Five-year country outcomes

- » Improved fisheries research capacity.
- » Increased productivity and income growth, through better 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.
- » Better availability of economic opportunities for women smallholders.

### Regional Manager, Pacific

Ms Florence Rahiria

### Research Program Managers

Dr Eric Huttner, Crops

Dr Ann Fleming, Fisheries

Dr Nora Devoe, Forestry

Ms Mellissa Wood, Global Program

Dr Irene Kernot, Horticulture

Dr Werner Stur/Dr Anna Okello, Livestock Systems

Dr Jayne Curnow, Social Sciences

Dr Robert Edis, Soil and Land Management

Contact details are provided in Appendix 2



## Current and proposed projects

1. **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
2. **FIS/2010/055**—Building research and project management skills in fisheries staff in Papua New Guinea
3. **FIS/2013/015**—Sustainable management of sport fisheries for communities in Papua New Guinea
4. **FIS/2014/060**—Developing pearl industry-based livelihoods in the western Pacific
5. **FIS/2014/061**—Improving technical and institutional capacity to support development of mariculture-based livelihoods and industry in New Ireland, Papua New Guinea
6. **FIS/2014/062**—Improving technologies for inland aquaculture in Papua New Guinea
7. **FST/2012/092**—Enhancing value-added wood processing in Papua New Guinea
8. **FST/2014/065**—Development of durable engineered wood products in Papua New Guinea and Australia
9. **FST/2014/067**—Enhancing value-added products and environmental benefits from agroforestry systems in Papua New Guinea and the Pacific
10. **FST/2014/069**—Improvement and management of teak and sandalwood in Papua New Guinea and Australia
11. **FST/2014/099**—Enhancing private sector-led development of the canarium industry in Papua New Guinea
12. **FST/2016/025**—Developing DNA-based chain of custody systems for legally-sourced teak
13. **FST/2016/153**—Enabling community forestry in Papua New Guinea
14. **FST/2017/038**—Enhancing private sector-led development of the canarium industry in Papua New Guinea, phase 2
15. **GP/2016/093**—Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific
16. **GP/2018/103**—Pacific Plant Biosecurity Capacity Building
17. **HORT/2012/087**—Bogia coconut syndrome in Papua New Guinea: developing biological knowledge and a risk-management strategy
18. **HORT/2014/083**—Developing improved crop protection options in support of intensification of sweetpotato production in Papua New Guinea
19. **HORT/2014/094**—Developing the cocoa value chain in Bougainville
20. **HORT/2014/096**—Enterprise-driven transformation of family cocoa production in East Sepik, Madang, New Ireland and Chimbu provinces of Papua New Guinea
21. **HORT/2014/097**—Supporting commercial sweetpotato production and marketing in the Papua New Guinea highlands
22. **HORT/2017/025**—Conserving and deploying coconut genetic resources for the Pacific islands
23. **LS/2014/042**—Improving the bee industry in Fiji, Papua New Guinea and Solomon Islands
24. **LS/2017/100**—Novel approaches for increasing participation in the honeybee industries of the Pacific
25. **ASEM/2012/072**—Strengthening livelihoods for food security among cocoa and oil palm farming communities in Papua New Guinea
26. **ASEM/2012/084**—Promoting traditional vegetable production and consumption for improved livelihoods in Papua New Guinea and Northern Australia
27. **ASEM/2014/054**—Identifying opportunities and constraints for rural women’s engagement in small-scale agricultural enterprises in Papua New Guinea
28. **ASEM/2014/095**—Improving opportunities for economic development for women smallholders in rural Papua New Guinea
29. **ASEM/2016/100**—Improving livelihoods of smallholder coffee communities in Papua New Guinea
30. **ASEM/2017/026**—Climate-smart agriculture opportunities for enhanced food production in Papua New Guinea
31. **SMCN/2012/105**—Sustaining soil fertility in support of intensification of sweetpotato cropping systems
32. **SMCN/2014/048**—Optimising soil management and health in Papua New Guinea integrated cocoa farming systems



## 3.2 East and South-East Asia



## Regional program summary

Australia has long recognised the benefits of supporting regional processes to promote peace and economic growth in its region. Of Australia's official development assistance to South-East Asia, 46% is for agricultural purposes.

Australia's economic and security interests remain inextricably linked with the countries of SouthEast Asia. With a population of 620 million, and a combined GDP of about US\$2.5 trillion, the region remains an increasingly important partner for Australian trade and investment.

In 2017, total two-way trade between Australia and the Association of Southeast Asian Nations (ASEAN) countries amounted to more than A\$105 billion, which is greater than trade with Japan or the United States of America. Australia's exports to ASEAN countries in 2017 were worth almost A\$0.45 billion, and imports were worth A\$0.60 billion.

The single market and production base created by ASEAN, the ASEAN Economic Community, allows the free flow of goods, services, investments and skilled labour, and the less-impeded movement of capital, across the region. With more than 600 million people, ASEAN's potential market is larger than that of 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, who remains relatively young.

The ASEAN Economic Community is founded on the four basic initiatives of:

- » creating a single market and production base
- » increasing competitiveness
- » promoting equitable economic development
- » further integrating ASEAN with the global economy.

The trend towards increasing urbanisation, population growth and domestic markets for agricultural products are creating both opportunities and challenges for farmers and poor rural communities of East and South-East Asia.

Some countries in the region experience continuing strong economic performance, while other countries continue to experience high rates of rural poverty. Large areas of rural poverty still exist in the better-performing countries.

In Indonesia, for example, according to World Bank figures, the poverty rate was just below 10% in 2017, while a further 21% of the population remains vulnerable to falling into poverty. Despite this, Indonesia is a member of the Group of Twenty (G20)—the premier international forum for cooperation on global economic governance—and considered the world's 10th largest economy in terms of purchasing power parity.

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

- » Increasingly, expertise being developed in one country is being mobilised in other countries in the region—for example, spiny lobster development in Indonesia, following an earlier project in Vietnam.
- » Our work with some countries in the region (especially China and Thailand) is regional—for example, a project on grasslands management developed with China and Mongolia, and biosecurity expertise and approaches, previously developed in Thailand, deployed to Cambodia, Laos, Myanmar and Vietnam.
- » ACIAR is actively pursuing opportunities for trilateral projects targeted at agricultural research and development 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 (such as biosecurity and food safety).

## ACIAR-supported projects in the East and South-East Asia region

The list starting on page 56 contains all current and proposed ACIAR-supported projects in East and South-East Asia during 2018-19. Some of these operate at one or more sites in a single country, but many have sites at several countries in the region. In some instances, projects in this region are part of a large research program, conducted across more than one of the four regions in which ACIAR operates.

ACIAR assigns an identification code to each project, which appears at the start of each project listed, and indicates the research program under which the project is managed. This code is also used to identify projects in other reports and publications.

In the subsequent country sections of this chapter, each project underway in that country is described briefly, and expected activities, outputs and outcomes of the ACIAR research program in that country are presented.



## Current and proposed projects in the East and South-East Asia region

### Agricultural Development Policy

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

**ADP/2014/043**—Policy and institutional reforms to improve horticultural markets in Pakistan [Pakistan, China]

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

**ADP/2015/043**—Agricultural policy research to support natural resource management in Indonesia's upland landscapes

**ADP/2016/140**—Policy analysis of food safety and trade in Vietnam

**ADP/2017/024**—Facilitating inclusive rural regional transformation: sharing experiences and lessons in Bangladesh, China, Indonesia and Pakistan

**ADP/2018/120**—Evaluating and improving policies for attracting investment in the agricultural sector in Vietnam

### Agribusiness

**AGB/2009/060**—Improving market integration for high-value fruit and vegetable production systems in Indonesia

**AGB/2010/099**—Evaluating smallholder livelihoods and sustainability in Indonesian coffee and cocoa value chains

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

**AGB/2012/061**—Improving smallholder farmer incomes through strategic market development in mango supply chains in southern Vietnam

**AGB/2012/078**—Developing value-chain linkages to enhance the adoption of profitable and sustainable cassava production systems in Vietnam and Indonesia

**AGB/2012/099**—Improving milk supply, competitiveness and livelihoods in smallholder dairy chains in Indonesia

**AGB/2012/109**—Developing vegetable and fruit value chains and integrating them with community development in the southern Philippines

**AGB/2014/035**—Improving livelihoods in Myanmar and Vietnam through vegetable value chains

**AGB/2016/006**—Supporting access to mango research information, communication, collaboration and capacity development [Indonesia, Pakistan, Philippines, Vietnam]

**AGB/2016/007**—Challenges and opportunities for meeting requirements of China mango markets [Indonesia, Pakistan, Philippines, Vietnam]

**AGB/2016/008**—Opportunities and strategies to improve biosecurity, market access and trade for selected mango markets [Indonesia, Pakistan, Philippines, Vietnam]

**AGB/2016/009**—Enhancing mango fruit quality in Asian mango chains [Indonesia, Pakistan, Philippines, Vietnam]

**AGB/2016/010**—Priority opportunities in tropical fruit processing in selected mango markets [Indonesia, Pakistan, Philippines, Vietnam]

**AGB/2016/032**—Developing an emergency response and long-term management strategy for cassava mosaic virus in Cambodia and Vietnam

**AGB/2016/163**—Innovative and inclusive agriculture value-chain financing [Indonesia, Myanmar, Vietnam]

**AGB/2016/196**—Sustainable and inclusive development of the cattle and beef industry in South-East Asia and China [Myanmar, Vietnam]

**AGB/2017/008**—Integrating gender and social inclusion into agricultural value chain research in Vietnam

**AGB/2017/036**—Enhancing smallholder linkages to markets by optimising transport and logistics infrastructure [Indonesia, Vietnam]

**AGB/2017/039**—Developing vegetable and fruit value chains and integrating them with community development in the southern Philippines



## Crops

**CIM/2014/079**—Establishing the international mungbean improvement network [Bangladesh, Myanmar, India]

**CIM/2014/082**—Agricultural innovations for communities for intensified and sustainable farming systems in Timor-Leste (AI-Com)

**CIM/2016/046**—Breeding for low chalk in rice [Bangladesh, India, Indonesia, Myanmar, Philippines, Thailand, Vietnam]

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

**CIM/2018/113**—Understanding direct-seeded rice techniques and business models in southern Laos

**CSE/2012/077**—Mechanisation and value adding for diversification of lowland cropping systems in Lao PDR and Cambodia

**CSE/2015/044**—Sustainable intensification and diversification in the lowland rice system in north-western Cambodia

## Fisheries

**FIS/2010/100**—Enhancing bivalve production in northern Vietnam and Australia

**FIS/2012/100**—Improving the design of irrigation infrastructure to increase fisheries production in floodplain wetlands of the Lower Mekong and Murray-Darling basins

**FIS/2012/101**—Developing technologies for giant grouper (*Epinephelus lanceolatus*) aquaculture in Vietnam, the Philippines and Australia

**FIS/2014/041**—Quantifying biophysical and community impacts of improved fish passage in Lao PDR and Myanmar

**FIS/2014/059**—Research for development of lobster grow-out technology in Indonesia

**FIS/2014/063**—Restoring damaged coral reefs using mass coral larval reseedling

**FIS/2015/038**—Improving seaweed production and processing opportunities in Indonesia

**FIS/2015/046**—Improving fishery management in support of better governance of Myanmar's inland and delta fisheries

**FIS/2016/116**—Harvest strategies for Indonesian tropical tuna fisheries to increase sustainable benefits

**FIS/2016/122**—Increasing technical skills supporting community-based sea cucumber production in Vietnam and the Philippines

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

**FIS/2016/130**—Accelerating the development of finfish mariculture in Cambodia through south-south research cooperation with Indonesia

**FIS/2016/135**—Development of rice-fish systems in the Ayeyarwaddy Delta, Myanmar

**FIS/2017/032**—Improved food security nutrition outcomes from sustainable coastal fisheries development in Timor-Leste and Nusa Tenggara Timur Province, Indonesia

**FIS/2018/115**—Evaluating processes and outcomes in south-south research collaboration: finfish mariculture development in Cambodia through cooperation with Indonesia

**FIS/2018/116**—Extending capacity of fish identification skills for improved fisheries assessments

## Forestry

**FST/2012/041**—Teak-based agroforestry systems to enhance and diversify smallholder livelihoods in Luang Prabang province of Lao PDR

**FST/2012/091**—Biological control of galling insect pests of eucalypt plantations in the Mekong region [Cambodia, Lao PDR, Thailand, Vietnam]

**FST/2014/064**—Maximising productivity of eucalyptus and acacia plantations for growers in Indonesia and Vietnam

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

**FST/2015/040**—Enhancing community-based commercial forestry in Indonesia

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

**FST/2016/141**—Developing and promoting market-based agroforestry options and integrated landscape management for smallholder forestry in Indonesia (Kanoppi 2)

**FST/2016/144**—Improving community fire management and peatland restoration in Indonesia

**FST/2016/151**—Advancing enhanced wood manufacturing industries in Laos and Australia

**FST/2016/152**—Developing and promoting market-based agroforestry and forest rehabilitation options for north-western Vietnam

### Global Programs

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

### Horticulture

**HORT/2012/083**—Integrated disease management of sugarcane streak mosaic in Indonesia

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

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

### Impact Evaluation

**IAP/2017/010**—Development of mixed-method approaches to impact assessments of Philippines research projects

### Livestock Systems

**AH/2011/014**—Village-based biosecurity for livestock disease risk management [Cambodia]

**AH/2012/066**—Improving the production and competitiveness of Australian and Philippines pig production through better health and disease control

**AH/2012/067**—Enhancing transboundary livestock disease risk management in Lao PDR

**AH/2012/068**—Development of a market-driven biosecure beef production system in Lao PDR

**LPS/2012/064**—Integrating herbaceous forage legumes into crop and livestock systems in East Nusa Tenggara, Indonesia

**LPS/2013/021**—Profitable feeding strategies for smallholder cattle in Indonesia

**LPS/2014/036**—Developing profitable dairy and sheep meat production systems in China

**LPS/2014/038**—Smallholder cattle enterprise development in Timor-Leste

**LPS/2015/037**—Intensification of beef cattle production in upland cropping systems in north-western Vietnam

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

**LPS/2016/097**—Update of SoFT (selection of forages for the tropics) [Indonesia, Vietnam]

**LS/2012/065**—Investigating and improving pig health and husbandry in Timor-Leste

**LS/2014/056**—Improving farmer livelihoods by developing market-oriented small ruminant production systems in Myanmar

**LS/2015/047**—Improving cattle production and smallholder livelihoods in crop-based farming systems in Indonesia

**LS/2015/048**—Improving smallholder beef supply and livelihoods through cattle-palm system integration in Indonesia

**LS/2016/132**—Improving cattle production in the Dry Zone of central Myanmar through improved animal nutrition, health and management

**LS/2016/143**—Safe pork: market-based approaches to improving the safety of pork in Vietnam

**LS/2017/102**—Identifying husbandry options for smallholder pig farmers in Timor-Leste

**LS/2017/034**—Smallholder goats systems and marketing in Lao PDR and Vietnam

**LS/2018/100**—Establishing the project: improving cattle health and production in Myanmar

**LS/2018/106**—Diversifying rural poultry production in Myanmar: opportunities for small-scale farmers

### Social Sciences

**ASEM/2012/063**—Improving the methods and impacts of agricultural extension in western Mindanao, Philippines

**ASEM/2012/073**—Improving food security in the northern uplands of Lao PDR: identifying drivers and overcoming barriers

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

**ASEM/2013/003**—Uptake of agricultural technologies among farmers in Battambang and Pailin provinces, Cambodia

**ASEM/2014/051**—Action-ready climate knowledge to improve disaster risk management for smallholder farmers in the Philippines

**ASEM/2014/052**—Smallholder farmer decision-making and technology adoption in southern Lao PDR: opportunities and constraints

**ASEM/2014/053**—Developing cassava production and marketing systems to enhance smallholder livelihoods in Cambodia, Lao PDR and Myanmar

**ASEM/2016/103**—Enhancing livelihoods through forest and landscape restoration [The Philippines]

### Soil and Land Management

**SLaM/2017/041**—Mainstreaming research in Myanmar's agricultural and veterinary universities

**SLaM/2018/122**—Trial of eddy covariance flux towers and Chameleon sensors for evaluating peatland restoration in Indonesia

**SLaM/2018/123**—Assessment of biofertilisers for enhancing agriculture in Mekong region countries

**SLaM/2018/127**—Cross projects and synthesis in Cambodia

**SMCN/2009/056**—Increasing productivity of allium and solanaceous vegetable crops in Indonesia and subtropical Australia

**SMCN/2010/083**—Improving the sustainability of rice–shrimp farming systems in the Mekong Delta, Vietnam

**SMCN/2011/047**—Increasing productivity of legume-based farming systems in the Central Dry Zone of Myanmar

**SMCN/2012/029**—Soil and nutrient management strategies for sustainable vegetable production in southern Philippines

**SMCN/2012/069**—Integrated water, soil and nutrient management for sustainable farming systems in south-central coastal Vietnam and Australia

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

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

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

**SMCN/2014/044**—Management of nutrients for improved profitability and sustainability of crop production in Central Myanmar

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

**SMCN/2014/075**—Land resource evaluation for productive and resilient landscapes in the Central Dry Zone of Myanmar

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

**SMCN/2016/237**—Land suitability assessment and site-specific soil management for Cambodian uplands

### Water and Climate

**LWR/2017/029**—Emission-reduction options for nationally determined contributions (NDCs) in the Asia-Pacific region, Fiji and Vietnam

# Cambodia

**Table 3.6: Cambodia, key statistics, 2017**

Country	GDP per capita (US\$)	Population (million)
Cambodia	1,384	16.00

Source: data.worldbank.org/indicator.

**Table 3.7: ACIAR funding to Cambodia, 2016-17 to 2018-19**

Year	A\$ million
2016-17 (actual)	2.8
2017-18 (estimated actual)	2.7
2018-19 (budget)	3.0





## Country context

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**According to the World Bank (November 2017), Cambodia's economy maintains a positive outlook. Growth is projected to remain strong, at 6.9% in 2018, furthered by export diversification and healthy inflows of foreign direct investment. In 2017, economic growth was mainly driven by construction activities, garment exports, an expansion of the agriculture sector especially in rice production, and tourist arrivals.**

Aid Investment Plan, Cambodia, 2015-18 (DFAT)

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Agriculture remains the backbone of Cambodia. Rice is by far the most important product, making up 60% of agriculture's contribution to GDP. Many smallholder farmers in Cambodia continue to rely on the cereal as the cornerstone of their crop production. The Cambodian Ministry of Agriculture, Forestry and Fisheries estimates that the total area taken up by rice production ranges between two-thirds and three-quarters of cultivated land. In 2013, the total production area for rice in Cambodia was more than three million hectares. The next most-produced crop was maize, which covered just under 240,000 hectares.

Priorities of the Cambodian Government, such as the goal of one million tonnes of rice exports per year, remain unattained. Despite exporting almost 300,000 tonnes of milled rice in the first six months of 2017, poor infrastructure and high energy costs have left the market price for white rice in Cambodia constantly higher than its competitors (Thailand and Vietnam). With global rice prices falling, and neighbouring countries, such as Thailand and Vietnam, more able to boost domestic production, there is a growing demand among farmers for more profitable alternatives.

Under the Cambodian Government's Rectangular Strategy, diversification into other crops, such as corn, sugarcane, cashew nut, rubber and cassava have expanded. According to the Ministry of Agriculture, Fisheries and Forestry, the land area of non-paddy crops grew from 210,000 hectares in 2008 to 770,000 hectares in 2012. The area being cultivated for rubber nearly doubled between 2008 and 2013, when it reached almost 308,000 hectares. By mid-2017, almost 434,000 hectares were being cultivated for rubber.

Given the many challenges in the sector, agriculture now provides a livelihood for a smaller proportion of the local population than in the past. A June 2017 report from the Ministry of Agriculture, Fisheries and Forestry stated that only about 40% of the population works in farming, down from about 80% in 1993. Young workers are leaving family farms and looking for more lucrative ways to earn a living. Rural households have progressively diversified their livelihoods to non-farm jobs (such as garment, construction and services). By 2015, non-agriculture wage incomes made up more than one-third of rural incomes, compared with less than one-fifth in 2007.

According to the World Bank, about 75% of Cambodia's women are employed in agriculture, and rural women are responsible for 80% of food production. Women household heads are more likely to work in agriculture than male household heads, and women are more likely to be landless or have significantly smaller plots of land. Women comprise 56% of subsistence farmers, and 54% of workers in market-oriented agriculture.

Women's contribution in the agriculture sector is significant, especially as migration steadily increases and more farming responsibilities fall on them. In 2015, the Cambodian Government set out policies embedding gender in the agriculture sector, to improve the livelihoods of women in rural areas, and push more women to engage in the sector.

The Cambodian Government continues to prioritise agriculture as a key sector for development since it first released its Rectangular Strategy. The third version of the strategy aims to push agricultural investment beyond strengthening rural incomes, into improved technology, research and development, crop diversification and promotion of commercial production and agro-industries.

Australia has a long history of bilateral relationship with Cambodia, which started in 1952, and continues to deliver considerable official development assistance through different Australian Government agencies. Based on Australia's Aid Investment Plan 2015–2018, Australia continues its longstanding support for Cambodia's agriculture sector through aid investments that provide access to modern farming techniques, lift productivity and crop quality, promote gender equality and improve the incomes of thousands of farmers.

## Country priorities

Australia supports Cambodia's agricultural development through its program of assistance under ACIAR. Over 2017–2027, ACIAR is committed to broker and invest in research partnerships with a strategic focus on the sustainable intensification and diversification of agriculture, particularly in crop-rice, crop-livestock and inland aquaculture systems. This will also take into consideration climate variability and food safety and standards.

Two cross-cutting themes further refine ACIAR investments in Cambodia:

- » A majority of ACIAR investment in Cambodia will integrate the potential to economically empower women and girls as a component in its research. This is particularly important in the context of increasing labour migration.
- » Research investments will include mitigation and adaptation to climate change.



## 2018–19 research program

ACIAR supports 15 projects in Cambodia, four of which are specific to this country, and the remainder are part of regional projects. The projects address ACIAR's high-level objectives, as outlined in the 10-year Strategy 2018–2027, and engage with six of ACIAR's research programs.

The following sections briefly describe ACIAR-supported projects in Cambodia, for each research program. Each project description is referenced in a list at the end of this section, which provides the ACIAR project code and title.

### Agribusiness

A short research activity will determine the geographical spread, local incidence and severity of a Sri Lankan strain of cassava mosaic disease in Cambodia and Vietnam. The disease threatens the livelihoods of South-East Asian cassava farmers, and results of the project will guide local, national and subregional mitigation strategies.<sup>1</sup>

### Crops

Mechanisation options, such as combine harvesters and seed drills, and postharvest technologies, such as artificial dryers, have the potential to increase intensification, diversification and labour efficiency of the cropping system, and the market value of produce. A project in the Crops Program aims to improve household livelihoods and food security in lowland rice-growing areas of Cambodia and Laos.<sup>2</sup>

A project in north-western Cambodia aims to help farmers adopt innovative crop production methods to sustainably intensify the rainfed lowland rice system, and to develop market links within the value-chain network.<sup>3</sup>

### Fisheries

Fish is an essential component of food security in the Lower Mekong Basin. In Cambodia, about 80% of animal protein consumed originates from freshwater fisheries, and the fisheries sector provides full-time and part-time work for about two million people.

A new project will look at ways to speed up the development of finfish mariculture in Cambodia through south-south research cooperation with Indonesia. Cambodian and Indonesian researchers jointly proposed the use of established research and development capability in Indonesia to train Cambodian researchers in supporting their developing marine finfish aquaculture industry. Cambodian researchers will gain skills in fish nutrition, hatchery production and fish health to a standard that can support marine finfish aquaculture development in their home country. The use of south-south collaboration as a capacity-building approach will be assessed, and a framework proposed for application in future ACIAR projects.<sup>4</sup>

### Forestry

A forestry research project aims to develop appropriate biological controls for gall wasp—an insect pest of eucalypt plantations in the Mekong region—by importing and testing natural enemies of the pest from Australia. The project will focus on plantations in Lao PDR, with some related work in Vietnam, Thailand and Cambodia.<sup>5</sup>

### Global Program

Work continues on collecting detailed institutional, financial, human resource and research output data from agricultural research agencies to be included in the ASTI database, and on supporting stakeholder access to such information, analysis and support for future policy through various online tools and publications. ASTI provides open-access data and analysis on agricultural research systems in developing countries. This project will be implemented by IFPRI and APAARI, in close collaboration with the main national agricultural research institutes of the region.<sup>6</sup>

### Livestock Systems

A project is developing and testing a village-level livestock biosecurity system in Cambodia. It builds on successes of previous projects (AH/2005/086 and AH/2006/159), during which a series of mainly knowledge-based disease prevention and livestock production interventions were developed.<sup>7</sup>

## Social Science

A group of projects is investigating the potential to improved livelihoods through better marketing and uptake of new technologies. The project is looking at establishing fruit and vegetable supply chains for markets, to develop integrated vegetable production and postharvest management packages for adoption by growers and communities in Siem Reap, Kampong Thom, Takeo and Kampot provinces. The focus of this work is on food safety, out-of-season production, supply chains for domestic markets and postharvest handling.<sup>8</sup>

A project is looking at the decision-making process of farmers in Battambang and Pailin provinces associated with the uptake of agricultural technologies and best practices, to:

- » understand why farmers make decisions
- » identify connections between needs and technologies
- » test extension-adoption using partnerships and demonstration sites
- » measure adoption.<sup>9</sup>

A third project is identifying ways to increase the adoption of profitable and sustainable technologies for cassava production, and evaluating opportunities for production and marketing systems to improve smallholder livelihoods in Cambodia and Lao PDR.<sup>10</sup>

## Soil and Land Management

Increasing agricultural productivity and profitability throughout East Asia is an important means of reducing poverty, food insecurity and poor nutrition, particularly among small landholders. Identifying production constraints, and developing knowledge and new practices will enable more sustainable use of resources by farmers in the region.

There is potential to grow dry-season, high-value, non-rice grain and forage in the lowland Mekong region. Research continues to identify constraints, develop technologies, and communicate information to support improved management and use of water, improved crop nutrition and the alleviation of key soil constraints.<sup>11</sup>

A project in Cambodia and Laos aims to identify and promote promising management practices to increase the overall productivity of crop–livestock systems, through improved forage and fodder production, better use of water and nutrients and sustainable soil management.<sup>12</sup>

By improving understanding of practice change, and identifying improved input, soil and water management, a project focused on vegetable production in Cambodia and Laos aims to sustainably improve vegetable yields and household economies.<sup>13</sup>

A project in Cambodia's uplands is focusing on understanding soil types and suitable land use, and determining site-specific soil management. The project will help smallholder farmers choose the best field crops and management for their location, to minimise risk of production losses and soil degradation.<sup>14</sup>

To bring the learnings from various soil and land projects together, and to yield cross-disciplinary lessons, a project will support select cross-project activities, and analyse project outputs to form program-wide research goods for Cambodia.<sup>15</sup>

## 2018–19 project outputs

- » Testing undertaken of improved postharvest systems in rice-based farming systems, notably rice drying practices.
- » Non-rice cropping options during the dry season tested in rice-based systems.
- » New ways developed to speed up the development of finfish mariculture.
- » Out-of-season production opportunities and constraints identified for Cambodian vegetables.
- » A regional research program for improving production and marketing of vegetables started.
- » Partnerships established to begin a project to improve livestock biosecurity in the Mekong region.
- » Findings about uptake of technology and best practice disseminated to farmers, researchers, and agricultural development practitioners in north-western Cambodia and South-East Asia.
- » Constraints to dry season cropping following rice identified and solutions tested.



## Five-year region outcomes

- » 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.
- » Development of a soil information system for upland areas, to help select land-use options.

### Regional Manager, East and South-East Asia

Ms Dulce Carandang Simmanivong

### Research Program Managers

To be appointed, Agribusiness

Dr Eric Huttner, Crops

Dr Ann Fleming, Fisheries

Mr Tony Bartlett, Forestry

Ms Mellissa Wood, Global Program

Dr Werner Stur/Dr Anna Okello, Livestock Systems

Dr Jayne Curnow, Social Science

Dr Robert Edis, Soil and Land Management

Contact details are provided in Appendix 2

## Current and proposed projects

1. **AGB/2016/032**—Developing an emergency response and long-term management strategy for cassava mosaic virus in Cambodia and Vietnam
2. **CSE/2012/077**—Mechanisation and value adding for diversification of lowland cropping systems in Lao PDR and Cambodia
3. **CSE/2015/044**—Sustainable intensification and diversification in the lowland rice system in north-western Cambodia
4. **FIS/2016/130**—Accelerating the development of finfish mariculture in Cambodia through south-south research cooperation with Indonesia
5. **FST/2012/091**—Biological control of galling insect pests of eucalypt plantations in the Mekong region
6. **GP/2016/093**—Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific
7. **AH/2011/014**—Village-based biosecurity for livestock disease risk management
8. **ASEM/2012/081**—Improving market engagement, postharvest management and productivity of the Cambodian and Lao PDR vegetable industries
9. **ASEM/2013/003**—Uptake of agricultural technologies among farmers in Battambang and Pailin provinces, Cambodia
10. **ASEM/2014/053**—Developing cassava production and marketing systems to enhance smallholder livelihoods in Cambodia, Lao PDR and Myanmar
11. **SMCN/2012/071**—Improving water and nutrient management to enable double-cropping in the rice growing lowlands of Lao PDR and Cambodia
12. **SMCN/2012/075**—Management practices for profitable crop-livestock systems for Cambodia and Lao PDR
13. **SMCN/2014/088**—Integrated resource management for vegetable production in Lao PDR and Cambodia
14. **SMCN/2016/237**—Land suitability assessment and site-specific soil management for Cambodian uplands
15. **SLaM/2018/127**—Cross projects and synthesis in Cambodia

# China

**Table 3.8: China, key statistics, 2017**

Country	GDP per capita (US\$)	Population (million)
China	8,826	1,386.40

Source: [data.worldbank.org/indicator](http://data.worldbank.org/indicator).

**Table 3.9: ACIAR funding to China, 2016-17 to 2018-19**

Year	A\$ million
2016-17 (actual)	0.7
2017-18 (estimated actual)	0.7
2018-19 (budget)	0.8



## Country context

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

China Country Brief (DFAT)

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China's economy grew by 6.9% in 2017, according to China's State Statistical Bureau. The medium to high growth rate of GDP meets the expectations of the Chinese Government, and is consistent with the Chinese Government's 13th Five-Year Plan, which states that by 2020, China GDP and per capita personal income of residents of 2010 will be doubled, and it will increase the ratio of the research and development expenditure to 2.5% of GDP.

Agriculture is one of the pillars of China's economy, and food security plays a key role in ensuring national stability in the country. As a result of progress in agricultural modernisation, China's annual grain production has reached more than 600 million metric tonnes. More than 80 million people have moved from rural to urban areas, and gained permanent urban residency, with the level of urbanisation rising by an average of 1.2% per year.

The 19th National Congress of the Communist Party of China was held in Beijing in November 2017, and China's leadership at the central level was determined for the next five years. A two-stage plan to develop China into a modern socialist country was also announced at this event. The first stage of the plan (2020–35) will see China build on the foundation created by its moderately prosperous society to achieve socialist modernisation. The second stage (2035–50) aims to develop China into a modern socialist country that is 'prosperous, strong, democratic, culturally advanced, harmonious and beautiful'.

Important for ACIAR's activities in China, a Rural Vitalisation Strategy was proposed at the Congress, which promotes restructuring of supply in rural areas. The goals of the strategy were set out in the *2018 Central Government no. 1 document*, released in February 2018, against a timeline.

Broadly the goals strive for:

- » the formation of institutional framework and policy systems, further integration of the primary, secondary and tertiary industries in rural areas, and all people in rural areas living above the poverty line, in an improved environment by 2020
- » agricultural modernisation, improved rural living conditions and solid progress toward prosperity for everyone by 2035
- » comprehensive realisation of rural vitalisation by 2050.

Agriculture, rural community and farmer-related issues remain China's top priorities, as identified by China's *No. 1 Central Government document* for the past 15 years. Over the past 30 years, China has lifted more than 700 million people out of poverty, according to *The Right to Development—China's Philosophy, Practice and Contribution*, a white paper issued by China's State Council in December 2016.

China is of strategic importance to Australia, as its largest trading partner, for exports and imports. ACIAR's program in China targets strategic partnerships and aims to improve 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 the Tibet Autonomous Region.

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 aims of the Chinese Government. 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 in the Chinese national agricultural research system, and the strong mutual benefits to Australia, all ACIAR activities in China involve substantial co-investment with Chinese partners.

## Country priorities

Priorities for research collaboration in China were determined through consultation with senior leaders and researchers from the ministries of Science and Technology, and 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 align with the new policies set out in the 13th Five-Year Plan.

The priorities for ACIAR's China program in the medium term are:

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

## 2018-19 research program

ACIAR supports five projects in China, two of which are specific to this country, and three that are part of regional projects. The projects address ACIAR's high-level objectives, as outlined in the 10-year Strategy 2018-2027, and engage with two of ACIAR's research programs.

The following sections briefly describe ACIAR-supported projects in China, for each research program. Each project description is referenced in a list at the end of this section, which provides the ACIAR project code and title.

### Agricultural Development Policy

China and Mongolia's vast inter-connected grasslands support the livelihoods of more than five million low-income pastoral households and provide a variety of ecosystem services—from improving air and water quality to acting as a carbon sink. An interdisciplinary project will investigate whether existing programs, policies and incentives for improving grassland management in China and Mongolia meet environmental and livelihood objectives.<sup>1</sup>

China's experience in agricultural market reform will be studied to formulate a market reform program to increase growth, employment and productivity for Pakistan's agricultural markets, and develop the China-Pakistan Economic Corridor.<sup>2</sup>

As development proceeds, countries will undergo rural transformation. A new project in China, Bangladesh, Indonesia and Pakistan endeavours to understand the nature and drivers of rural transformation to provide better policy advice that will underpin the success of transformation.<sup>3</sup>

### Livestock Systems

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



## Soil and Land Management

A short research activity in 2018–19 will seek to understand the current status of inoculant production, distribution and use in the Greater Mekong subregion. The findings will clarify anecdotal evidence of a decline in the use, efficacy and production standards of inoculants that increase nutrient acquisition, particularly, but not limited to, rhizobia and mycorrhizae inoculants. The project will also identify the potential application of recent advances in inoculant delivery.<sup>5</sup>

## 2018–19 project outputs

- » Recommendations published for efficient and environmentally sustainable grassland management options in Mongolia and China.
- » Report on production potential and nutrition requirements of major dairy breeds in Tibet completed.
- » A greater understanding gained about inoculant use and production, and the potential future application of the technology in the Greater Mekong subregion.

## Five-year region outcomes

- » Establishment of regional agricultural research interventions jointly funded by Australia, China and third-country collaborators.
- » Improved smallholder access to cropping and livestock techniques in Tibet Autonomous Region to alleviate poverty.
- » Establishment of economically efficient and environmentally sustainable grassland management policies and programs.

## Current and proposed projects

1. **ADP/2012/107**—Strengthening incentives for improved grassland management in China and Mongolia
2. **ADP/2014/043**—Policy and institutional reforms to improve horticultural markets in Pakistan
3. **ADP/2017/024**—Facilitating inclusive rural regional transformation: sharing experiences and lessons in Bangladesh, China, Indonesia and Pakistan
4. **LPS/2014/036**—Developing profitable dairy and sheep meat production systems in China
5. **SLaM/2018/123**—Assessment of biofertilisers for enhancing agriculture in Mekong region countries

### Country Manager

Mr Wang Guanglin

### Research Program Managers

Dr Werner Stur/Dr Anna Okello, Livestock Systems

Dr Robert Edis, Soil and Land Management  
For information about Agricultural Development Policy projects, Dr Daniel Walker

Contact details are provided in Appendix 2



# Indonesia

**Table 3.10: Indonesia, key statistics, 2017**

Country	GDP per capita (US\$)	Population (million)
Indonesia	3,847	263.99

Source: data.worldbank.org/indicator.

**Table 3.11: ACIAR funding to Indonesia, 2016-17 to 2018-19**

Year	A\$ million
2016-17 (actual)	6.4
2017-18 (estimated actual)	7.8
2018-19 (budget)	10.1



## Country context

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**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 agriculture 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)

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## Country priorities

With Indonesia's strategic position and significant influence in the global forum, combined with a modest development of its economy, the country remains an important partner for Australia. With a population of more than 260 million, the majority of which depends on the agriculture and maritime sectors, Indonesia offers diverse opportunities for research for development that bring mutual benefits for both countries.

The Indonesian Government has strategically defined nine priority areas for growth and development of its nation. In the agriculture sector, the specific aspects of these priorities include:

- » ensuring food security
- » achieving self-sufficiency in priority commodities
- » developing policy to support export commodities
- » substituting imports
- » facilitating production of bio-energy raw materials
- » improving agricultural product competitiveness
- » facilitating development of infrastructure and agro-industry in villages
- » empowering and facilitating farmer protection by establishing appropriate regulation and providing subsidies
- » improving governance.

In the marine and fisheries sector, high priority has been placed on:

- » improving sustainable management of marine and fisheries resources
- » strengthening the outer most areas of the archipelago with infrastructure development, such as fisheries postharvest processing facilities and seaport capacity development—this opens up trilateral research collaboration opportunities on the border area such as with Timor-Leste.

In the forestry sector, high priority has been placed on:

- » improving livelihoods for communities from forestry products and services
- » changing cultural attitudes to the use of fire, and developing appropriate incentives to support adoption of agricultural and land management systems that do not rely on the use of fire
- » developing appropriate systems for rehabilitating two million hectares of peatland degraded by drainage and fire.

ACIAR programs in Indonesia spread across several provinces, and reach less-developed villages in areas such as Aceh, East and West Nusa Tenggara, South Sumatra and Central Sulawesi.

The recently launched Indobeef projects have identified East and South Kalimantan and Riau provinces as suitable areas for its research on palm-cow and crop-cow integrated systems.

ACIAR continues to explore the opportunity of taking part in the Australia's whole-of-government approach to aid, in particular with DFAT and the Department of Agriculture and Water Resources.

## 2018-19 research program

ACIAR supports 37 projects in Indonesia, 20 of which are specific to this country, and the remainder are part of regional projects. The projects address ACIAR's high-level objectives, as outlined in the 10-year Strategy 2018-2027, and engage with seven of ACIAR's research programs.

The following sections briefly describe ACIAR-supported projects in Indonesia, for each research program. Each project description is referenced to a list at the end of this section, which provides the ACIAR project code and title.

### Agricultural Development Policy

Recent studies conclude that agricultural policies and decentralised administrative systems are contributing to a permanent decline in productivity in Indonesia's upland catchments. A new project is looking at how local and national policies affect land and crop management practices, to provide alternative policy pathways to improve the environmental and long-term performance of agriculture in these catchments.<sup>1</sup>

As development proceeds, countries will undergo rural transformation. Another new project in China, Bangladesh, Indonesia and Pakistan endeavours to understand the nature and drivers of rural transformation to provide better policy advice that will underpin the success of transformation.<sup>2</sup>

### Agribusiness

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
- » increase 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 are priorities for the Indonesian Government. Supporting this objective is ongoing research to identify opportunities to enhance farmer-market linkages for chilli, shallot, mango and citrus production, and develop policy options that will strengthen seed markets.<sup>3</sup>

Market development for coffee and cocoa is being explored with Indonesian and global coffee and cocoa certification companies. The impacts of certification schemes, buyer linkages, geographical indicators and downstream processing on smallholder livelihoods and environmental sustainability are being evaluated.<sup>4</sup>

A project in Indonesia and Vietnam aims to make smallholder cassava production more profitable and sustainable, by linking value-chain actors to increase the adoption of improved technologies.<sup>5</sup>

Indonesia currently supplies only 20% of its domestic milk needs from local sources, with almost all milk produced in Java by smallholder producers who have only three or four dairy cows. A project aims to 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>6</sup>



Five small research activities apply a strategic agribusiness approach to mango research and development in the Asia-Pacific region. In addition to undertaking targeted pilot research and scoping studies, the small research activities will have an important function to create networks, and to engage and collaborate with multiple Australian and key Asia-Pacific research, government and industry partners.

The objectives of the mango agribusiness projects are to:

- » improve communication, collaboration and capacity development (information access)<sup>7</sup>
- » identify market development opportunities and implications in China<sup>8</sup>
- » identify strategic research and development opportunities (particularly for biosecurity) for market entry<sup>9</sup>
- » evaluate opportunities for improving mango quality<sup>10</sup>
- » identify priority opportunities in fruit processing in selected mango markets.<sup>11</sup>

A project in Vietnam, Indonesia and Myanmar is looking at innovative and inclusive financing of agricultural value chains,<sup>12</sup> while another aims to improve smallholder linkages to markets by optimising transport and logistics infrastructure.<sup>13</sup>

### Crops

Rice industries across Asia, including growers in Indonesia, will reap future benefit from research being conducted at IRRI to identify the genetics responsible for low chalk in rice grain. The project aims to validate functional molecular markers that can routinely be used to reduce chalk in rice breeding programs.<sup>14</sup>

### Fisheries

The Fisheries Research Program focuses on developing appropriate fisheries and aquaculture livelihoods, and improving management of marine and freshwater fisheries. These are in line with the Indonesian Government's priorities of combating illegal, unregulated and unreported fishing, by reviewing fishing vessel licences, and setting up new regulations on the capture and export of juveniles in selected species.

Aquaculture is an important industry for coastal and inland communities in Indonesia, and various projects are addressing opportunities in this industry. One project aims to develop commercially relevant production technology for on-growing of legal-sized lobsters, through improved formulated diets and husbandry practices.<sup>15</sup> Another is to identify the constraints and knowledge gaps for seaweed production, to improve the quality of seaweeds produced, and develop innovative products from seaweeds, including soil fertilisers from their processed waste streams.<sup>16</sup> Another project continues to support the sustainable benefits derived from Indonesia's tuna fishery, by estimating the productivity of the tuna fisheries resource.<sup>17</sup>

Indonesian scientists will collaborate on a project to support the development of finfish mariculture in Cambodia through a south-south research collaboration to build Cambodian researcher's aquaculture research skills.<sup>18</sup>

A project in Timor-Leste and the Nusa Tenggara Timur province of Indonesia seeks to optimise the role of fish in addressing nutrition insecurity, by exploring approaches to promote nutrition-sensitive fisheries management policy in each country context. The project will determine the importance of fish within women's and men's livelihoods, focusing on two fishery case studies with high nutritional value—fish-aggregating device fishing and intertidal gleaning. By evaluating the nutritional value of these fisheries to households, coupled with work to identify the factors enabling or limiting the consumption of fish, the project aims to highlight the potential of fish to reduce malnutrition, particularly during early childhood development.

Through a south-south collaboration the lessons learned in Indonesia from their extensive commercial fish-aggregating device industry will be used to guide policy development in Timor-Leste for sustainable inshore fish-aggregating device management that benefits poor households.<sup>19</sup>

A new project is evaluating processes and outcomes in south-south research collaboration focused on finfish mariculture development in Cambodia in cooperation with Indonesia. Cambodian and Indonesian researchers jointly proposed the use of established research and development capability in Indonesia to train Cambodian researchers in support of that country's developing marine finfish aquaculture sector. The project is designed to complement project FIS/2016/130 by evaluating the processes used to deliver south-south training, as well as the broad capacity-development outcomes for individuals and involved institutions.<sup>20</sup>

Another new project aims to extend the capacity of data collection staff in Indonesia to identify fish, in particular for fish 'market condition', to improve fisheries assessments of important food fish groups. This project is an extension of an ACIAR-supported project that led to the development of the pilot website *fishIDER.org*.<sup>21</sup>

## Forestry

ACIAR's forestry projects in Indonesia focus on supporting programs to improve management of peatlands, and enhancing and sustaining values from forest plantations, agroforestry systems and natural forests, including improving smallholder plantation management and investment decisions.

A project in Indonesia and Vietnam will help growers of short rotation eucalypt and acacia plantations to improve productivity and profitability. Acacias have been a plantation species of choice in both countries, but bacterial wilt and root rot diseases threaten productivity. Project work will continue to show the benefits and limitations of eucalypts as replacement for acacias.<sup>22</sup>

Another project in Indonesia and Vietnam also focuses on health of acacia plantations, to reduce the impacts of two very damaging fungal diseases (*Ganoderma* and *Ceratocystis*) that affect acacia plantations throughout South-East Asia.<sup>23</sup>

Two projects focus on developing community-based plantation forestry enterprises to provide social, economic and environmental benefits for the people of Indonesia. Work continues in Gorontalo, Lampung, South Sulawesi, Yogyakarta and Central Java provinces, to increase the capacity of farmer forest groups to make better investment decisions.

The project is analysing the social and economic dimensions of two alternative community-based commercial forestry systems, and how they can be adopted more widely.<sup>24</sup>

Teak is one of the most commercially important timbers in the world, due to its durability and water resistance. Illegally logged timber products, including teak, enters markets by being mixed with legitimate supply chains, with associated document fraud. Building on previous research activity that developed DNA markers for teak timber, and studied teak chains of custody in Indonesia and Myanmar, similar work continues in Laos, Indonesia, Solomon Islands and Papua New Guinea.<sup>25</sup>

Diversification of market-based integrated agroforestry systems is being looked at in Gunungkidul, Sumbawa, Central Lombok and South Central Timor regencies. The project will enhance the production and marketing of timber and non-timber forest products, and foster improved extension and policy approaches. It is also conducting new research in support of Indonesia's Thousand Bamboo Villages initiative on the island of Flores.<sup>26</sup>

A multidisciplinary program of research is underway to underpin Indonesia's commitment to achieve fire-wise villages, and restore large areas of peatland. The project is conducting research to prevent fires in peatlands, and improve peatland restoration practices, while facilitating profitable and sustainable alternative livelihoods. It will also look at ways to improve access to and use of knowledge on fire prevention and peatland management.<sup>27</sup>

## Global Program

Work continues on collecting detailed institutional, financial, human resource and research output data from agricultural research agencies to be included in the ASTI database, and on supporting stakeholder access to such information, analysis and support for future policy through various online tools and publications. ASTI provides open-access data and analysis on agricultural research systems in developing countries. This project will be implemented by IFPRI and APAARI, in close collaboration with the main national agricultural research institutes of the region.<sup>28</sup>

## Horticulture

ACIAR supports the Indonesian horticultural sector to develop environmentally and socially sustainable integrated production systems, and improve the market competitiveness of these industries. In line with the Indonesian Government's emphasis on self-sufficiency in major agricultural commodities, a continuing project is addressing virus diseases of sugarcane, to increase the profitability of smallholder sugarcane farmers, by developing a reliable integrated disease management strategy.<sup>29</sup>

## Livestock Systems

Research into cattle production systems in Indonesia has an emphasis on technology development for on-farm application by smallholder farmers, and on-farm work is being integrated with projects that assess broader characteristics of the beef supply chain.

A current project is investigating the integration of herbaceous tropical legumes into grain cropping systems in East Nusa Tenggara province, by examining the benefits of legume-based cropping systems, both for subsequent crops and associated livestock.<sup>30</sup>

Another project is developing simple, low-cost feed rations for cow-calf and cattle-fattening operations that will markedly increase the profitability of smallholder and small-scale feedlot systems. Supplementary feeds will complement local feed resources, and be based on a small number of low-cost, locally-available ingredients.<sup>31</sup> This project builds on previous research that demonstrated the benefits of using low-quality feeds, such as rice straw, in combination with small amounts of supplements to increase both cattle growth rates in fattening systems and farm income.

Credible, consolidated and easy-to-access knowledge underpins improvement to livestock production systems. A small project continues to update the online tool, SoFT (Selection of Forages for the Tropics), ensuring that researchers and development professionals in developing countries have access to the latest information on forages.<sup>32</sup>

Two projects are part of the IndoBeef Program, which aims to significantly improve both beef supply and the livelihoods of smallholders and other beef value chain participants in Indonesia. Rapid income growth, population growth and urbanisation have increased the demand for beef in Indonesia, but domestic production of beef cattle has not increased sufficiently to match this demand. The CropCow<sup>33</sup> and PalmCow<sup>34</sup> projects are working to increase cattle production in ricebased systems and cattle in oil palm enterprises, respectively.

## Soil and Land Management

An ACIAR-supported project aims to improve allium (shallot and garlic) and chilli/capsicum crop productivity by addressing issues associated with pathogen management and excessive fertiliser and chemical inputs into these systems. This project, which is nearing completion, has:

- » established a benchmark for farmer practices and supply chain processes to identify current inputs and management
- » evaluated crop nutrient input efficiencies and nutrient responses
- » developed diagnostics for shallot pathogens
- » surveyed key production areas for virus incidence
- » investigated propagation techniques to reduce virus spread
- » screened germplasm for virus resistance and productivity.<sup>35</sup>

In line with the Indonesian Government's emphasis on self-sufficiency in major agricultural commodities, the main aim of a project in Aceh is to identify and apply soil management and crop nutrient strategies to increase the productivity and sustainability of dryland cropping systems across four districts.

Yields and profitability of dryland food crop—such as soybean, rice, peanut, maize and vegetables—are limited by poor soil fertility and water availability. The project has been developing and testing integrated soil, water and crop management practices to increase the cost-effective production of crops in rotations, as well as developing strategies for disseminating information on promising technologies.<sup>36</sup>

Connected to the research on improving community fire management and peatland restoration in Indonesia, a small research activity has been developed that will trial eddy covariance flux towers and Chameleon sensors, to evaluate peatland restoration in Indonesia. This will enable Indonesian researchers and authorities to monitor the success of rewetting peatlands.<sup>37</sup>

## 2018-19 project outputs

- » 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.
- » Recommendations to enhance farmer participation in citrus, shallot, chilli and mango value chains developed.
- » Evidence gathered about the effectiveness of certification schemes and geographical indications for coffee and cocoa to provide farm-level environmental and livelihood benefits.
- » Strategies and policies devised to support development of sustainable, profitable and smallholder-inclusive dairy supply chains in North Sumatra and West Java.
- » Production management techniques made available for marine species grown in hatcheries and farms.
- » Data gathered to guide management plans for pelagic fisheries.
- » Nutrition-sensitive fisheries management policy recommendations delivered in Timor-Leste and Nusa Tenggara Timur Province, Indonesia.
- » Farmers and extension officers trained in growing high-quality Acacia trees.
- » New knowledge about costs and benefits of different forest certification schemes published.
- » Workshop on assessing and managing risks of tree diseases conducted.
- » Recommendations on improvements to the current peat fire danger rating systems developed.
- » Research on beef cattle value chains using feed resources from palm plantations in Sumatra and Kalimantan started.
- » Cattle growth response curves to various locally available feed resources determined.

- » A new program of research on community-based beef production systems begun, to significantly improve beef supply and the livelihoods of smallholders and other participants in beef value chains.
- » Profitable dryland agriculture in Aceh demonstrated.
- » Approaches to produce cleaner planting material of shallot and garlic developed.
- » Preliminary assessment completed of the usefulness of flux towers and Chameleon sensors to monitor peatland restoration success.

## Five-year region outcomes

- » Improved evidence of costs and advantages of alternative agricultural, domestic and trade policy options.
- » 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 adoption of improved production and distribution pathways.
- » Reduced poverty, through improved natural resource management.

### Country Manager, Indonesia

Ms Mirah Nuryati

### Research Program Managers

To be appointed, Agribusiness

Dr Eric Huttner, Crops

Dr Ann Fleming, Fisheries

Dr Nora Devoe, Forestry

Ms Mellissa Wood, Global Program

Dr Irene Kernot, Horticulture

Dr Werner Stur/Dr Anna Okello, Livestock Systems

Dr Robert Edis, Soil and Land Management

For information about Agricultural Development Policy projects, Dr Daniel Walker

Contact details are provided in Appendix 2



## Current and proposed projects

1. **ADP/2015/043**—Agricultural policy research to support natural resource management in Indonesia's upland landscapes
2. **ADP/2017/024**—Facilitating inclusive rural regional transformation: sharing experiences and lessons in Bangladesh, China, Indonesia and Pakistan
3. **AGB/2009/060**—Improving market integration for high-value fruit and vegetable production systems in Indonesia
4. **AGB/2010/099**—Evaluating smallholder livelihoods and sustainability in Indonesian coffee and cocoa value chains
5. **AGB/2012/078**—Developing value-chain linkages to enhance the adoption of profitable and sustainable cassava production systems in Vietnam and Indonesia
6. **AGB/2012/099**—Improving milk supply, competitiveness and livelihoods in smallholder dairy chains in Indonesia
7. **AGB/2016/006**—Supporting access to mango research information, communication, collaboration and capacity development
8. **AGB/2016/007**—Challenges and opportunities for meeting requirements of China mango markets
9. **AGB/2016/008**—Opportunities and strategies to improve biosecurity, market access and trade for selected mango markets
10. **AGB/2016/009**—Enhancing mango fruit quality in Asian mango chains
11. **AGB/2016/010**—Priority opportunities in tropical fruit processing in selected mango markets
12. **AGB/2016/163**—Innovative and inclusive agriculture value-chain financing
13. **AGB/2017/036**—Enhancing smallholder linkages to markets by optimising transport and logistics infrastructure
14. **CIM/2016/046**—Breeding for low chalk in rice
15. **FIS/2014/059**—Research for development of lobster grow-out technology in Indonesia
16. **FIS/2015/038**—Improving seaweed production and processing opportunities in Indonesia
17. **FIS/2016/116**—Harvest strategies for Indonesian tropical tuna fisheries to increase sustainable benefits
18. **FIS/2016/130**—Accelerating the development of finfish mariculture in Cambodia through south-south research cooperation with Indonesia
19. **FIS/2017/032**—Improved food security nutrition outcomes from sustainable coastal fisheries development in Timor-Leste and Nusa Tenggara Timur Province, Indonesia
20. **FIS/2018/115**—Evaluating processes and outcomes in south-south research collaboration: finfish mariculture development in Cambodia through cooperation with Indonesia
21. **FIS/2018/116**—Extending capacity of fish identification skills for improved fisheries assessments
22. **FST/2014/064**—Maximising productivity of eucalyptus and acacia plantations for growers in Indonesia and Vietnam
23. **FST/2014/068**—Management strategies for acacia plantation diseases in Indonesia and Vietnam
24. **FST/2015/040**—Enhancing community-based commercial forestry in Indonesia
25. **FST/2016/025**—Developing DNA-based chain of custody systems for legally-sourced teak
26. **FST/2016/141**—Developing and promoting market-based agroforestry options and integrated landscape management for smallholder forestry in Indonesia (Kanoppi 2)
27. **FST/2016/144**—Improving community fire management and peatland restoration in Indonesia
28. **GP/2016/093**—Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific
29. **HORT/2012/083**—Integrated disease management of sugarcane streak mosaic in Indonesia
30. **LPS/2012/064**—Integrating herbaceous forage legumes into crop and livestock systems in East Nusa Tenggara, Indonesia
31. **LPS/2013/021**—Profitable feeding strategies for smallholder cattle in Indonesia
32. **LPS/2016/097**—Update of SoFT (selection of forages for the tropics)
33. **LS/2015/047**—Improving cattle production and smallholder livelihoods in crop-based farming systems in Indonesia
34. **LS/2015/048**—Improving smallholder beef supply and livelihoods through cattle-palm system integration in Indonesia
35. **SMCN/2009/056**—Increasing productivity of allium and solanaceous vegetable crops in Indonesia and subtropical Australia
36. **SMCN/2012/103**—Improving soil and water management and crop productivity of dryland agriculture systems of Aceh and New South Wales
37. **SLaM/2018/122**—Trial of eddy covariance flux towers and Chameleon sensors for evaluating peatland restoration in Indonesia

# Lao People's Democratic Republic

**Table 3.12: Lao PDR, key statistics, 2017**

Country	GDP per capita (US\$)	Population (million)
Lao PDR	2,457	6.86

Source: data.worldbank.org/indicator.

**Table 3.13: ACIAR funding to Lao PDR, 2016-17 to 2018-19**

Year	A\$ million
2016-17 (actual)	5.2
2017-18 (estimated actual)	4.7
2018-19 (budget)	4.8



## Country context

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**The economic growth of Lao PDR remained positive in 2017, albeit slower compared with previous years. Growth in the first half of 2017 was 6.8% and was driven mainly by strong electricity exports, upbeat services sector growth, the start of the construction of the cross-border railway, and a surge in cash crop production and exports. GDP growth for Laos is forecasted to moderate, reaching 7% in 2018, which is a slight increase from the 6.8% growth recorded in 2016 and 2017.**

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

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Significant progress is being made to achieve the Lao Government goal of graduating from the list of the Least Developed Countries by 2020. But, while it seems on track to graduate from the list, poverty remains high, inequality is increasing, and its growth model needs to become more inclusive. According to the International Monetary Fund (2017), the Lao Government needs to pay particular attention to integrating the mainly agrarian population into more productive activities. At present, more than two-thirds of the population remain in agriculture, where productivity has consistently been the lowest in the region.

As an ASEAN member, Lao PDR is increasing its integration into the regional and global economy but this itself poses challenges (for example, tariff cuts lead to lower government revenues). Still, Laos can gain comparative advantage from the ASEAN economic integration in several areas, including:

- » agro-processing (from the emerging agricultural surplus, such as in tea and coffee)
- » value-added cultural and eco-tourism opportunities
- » organic agri-horticulture
- » high-value-added secondary wood products, which the Lao Government has already identified.

Agriculture continues to play a major role in the Lao economy. On average, the sector annually contributes at least 25% of the GDP, and absorbs an estimated 75% of the total workforce.

Women farmers are responsible for more than half of all agricultural activities. Laos achieved rice self-sufficiency almost 20 years ago, a major milestone in its history. At present, about 72% of the total cultivated area is devoted to rice. Provinces that have a shortfall in rice are surplus maize producers. The other significant crops include coffee, sugarcane, cassava, sweetpotato and industrial tree crops (such as rubber, eucalyptus and acacia).

Although the share of agriculture in GDP declined has declined in recent years, its share in employment did not. It accounts for more than 60% of the Lao economy's total working hours. The fast-growing mining, electricity and gas sectors account for only 1% of total working hours. Again, this underscores how Laos' impressive economic growth has not been inclusive and broad based.

Unlike Cambodia, Laos is seeing a weaker migration trend. There has not been a large movement of labour out of agriculture and into manufacturing and services. One reason for this is due to a lack of remarkable improvements in agriculture productivity, which would free up workers to move to the cities for work. The low productivity of agriculture means that more workers are needed to stay on the farm. Further, the financial incentives for workers to move out of agriculture and into other sectors, such as manufacturing, is not strong. Low labour productivity and low wages are barriers to people moving off the farm in sufficient numbers.

The Lao Government's Agricultural Development Strategy 2025 and Vision 2030 aim for agriculture to grow by 3.4% by 2020, to contribute 19% to overall GDP. The sectoral priorities include 'ensuring food security, producing comparative and competitive agricultural commodities, developing clean, safe and sustainable agriculture and shifting gradually to the modernisation of a resilient and productive agriculture economy linking with rural development contributing to the national economic basis'.

With this vision, the emphasis will be on:

- » ensuring food security, safety and nutritional security
- » commercialisation of agricultural products with high-value addition
- » the sustainable use and management of natural resources.

Australia's long and unbroken diplomatic relationship with Laos is underpinned by deepening economic ties, community links and development cooperation. Australia's aid to Laos aims to build prosperity and reduce poverty, while helping Laos to take advantage of economic integration with the region.

Under the current Aid Investment Plan (2015–16 to 2019–20), the bilateral aid program focuses on:

- » basic education
- » human resource development
- » a stronger trade regime
- » more competitive private-sector growth.

Australian support, through ACIAR, on agricultural research plays an increasingly important role, as Laos works towards its goals on agricultural development, poverty reduction and inclusive economic growth. Since 1990, ACIAR has supported more than 100 research projects and collaboration in Laos, and invested more than A\$50 million on these research partnerships.

## Country priorities

In 2018–20, the Laos Country Program of ACIAR expects to develop a new set of strategic priorities based on outcomes of dialogue with the Lao Government.

In the meantime, the current strategic priority outcomes guiding ongoing research initiatives are to establish:

- » 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
- » increased fish habitat restoration and protection of fish migration routes

- » cost-effective and sustainable rice-based farming systems, through mechanisation, diversification and intensification in, together with better crop quality, quarantine standards and value-adding for domestic and export markets
- » improved natural resource management that benefits livelihoods and food security, by delivering land-use options to smallholders, with attention to both water and nutrient management within climate change adaptation
- » improved institutional training and communication frameworks that enable smallholders to adopt and adapt new technologies, and increase the capacity development of researchers and educators.

## 2018–19 research program

ACIAR supports 22 projects in Lao PDR, five of which are specific to this country, and the remainder are part of regional projects. The projects address ACIAR's high-level objectives, as outlined in the 10-year Strategy 2018–2027 and engage with seven of ACIAR's research programs.

The following sections briefly describe ACIAR-supported projects in Laos, for each research program. Each project description is referenced to a list at the end of this section, which provides the ACIAR project code and title.

### Agricultural Development Policy

In Laos and Vietnam, an ACIAR-supported project is identifying public policy options to develop forest plantations, by supporting linkages between industry and smallholder producers, and to support the contribution of forest plantations to rural livelihoods, poverty alleviation and environmental sustainability.<sup>1</sup>

### Crops

Building on the success of past ACIAR projects, a small research activity is analysing the rapid adoption of direct seeding of rice in southern Laos to understand the constraints and drivers of adoption, and identify the most effective business models.<sup>2</sup>



Mechanisation options, such as combine harvesters and seed drills, and postharvest technologies, such as artificial dryers, have the potential to increase intensification, diversification and labour efficiency of the cropping system, and the market value of produce. In turn, a project in the Crops Program aims to improve household livelihoods and food security in lowland rice-growing areas of Cambodia and Laos.<sup>3</sup>

### Fisheries

ACIAR supports several projects in the Lower Mekong Basin to restore fisheries productivity in an environment of increasing regulation that manages competing demands over water resourcing for fisheries, agriculture and hydropower.

Rice and fish are two of the most essential components for sustaining life in the Lower Mekong Basin. Fish from the Mekong River, its tributaries and its low-level wetlands is the main source of animal protein for Lao people. Many thousands of low-level irrigation barriers have been installed in the Lower Mekong Basin to enable better regulation of water flow for rice cultivation and flood control. Although these barriers have assisted rice farmers, they have prevented fish migration to and from floodplains, which are vital breeding and nursery habitat for fish. Fish ladders for upstream fish passage are being developed and assessed, based on designs used successfully in the Murray-Darling Basin in Australia. This project has led to significant investment by the World Bank and Asia Development Bank to build permanent fish ladders that have helped fish recolonise wetland habitat.<sup>4</sup>

A related project is focusing on downstream fish migration, by developing regulator designs for fishfriendly downstream passage. These new designs improve fish survival, and allow fish to pass without injury back to the main river systems.<sup>5</sup>

### Forestry

Laos has a target forest coverage of 70% by 2020, to safeguard the country's water resources and enhance rural livelihoods. To this end, the Lao Government encourages the planting of high-value trees such as teak and eucalypts. ACIAR's forestry projects in Laos currently focus on supporting the planted forestry sector.

A forestry research project aims to develop appropriate biological controls for gall wasp—an insect pest of eucalypt plantations in the Mekong region—by importing and testing natural enemies of the pest from Australia. The project will focus on plantations in Lao PDR, with some related work in Vietnam, Thailand and Cambodia.<sup>6</sup>

Teak is one of the most commercially important timbers in the world, due to its durability and water resistance. 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>7</sup> Illegally logged timber products, including teak, enters markets by being mixed with legitimate supply chains, with associated document fraud. Building on previous research activity that developed DNA markers for teak timber and studied teak chains of custody in Indonesia and Myanmar, similar work continues in Laos, Indonesia, Solomon Islands and Papua New Guinea.<sup>8</sup>

Lao wood manufacturing industries are in their infancy and have not adopted new processing technologies widely used in Vietnam and China. Research is underway to develop new processing capability and engineered wood products from small diameter timbers. The timber value chain is being investigated to ensure that wood is supplied efficiently, and to support business cases for investment in new processing facilities.<sup>9</sup> This project will benefit wood manufacturing industries in Laos, by increasing capacity and growing markets for timber from new plantations, and in Australia, by increasing the use of underused plantation resources.

### Global Program

Work continues on collecting detailed institutional, financial, human resource and research output data from agricultural research agencies to be included in the ASTI database, and on supporting stakeholder access to such information, analysis and support for future policy through various online tools and publications. ASTI provides open-access data and analysis on agricultural research systems in developing countries. This project will be implemented by IFPRI and APAARI, in close collaboration with the main national agricultural research institutes of the region.<sup>10</sup>

## Livestock Systems

Diseases of livestock severely reduce village incomes in Laos, and farmers often lack the technical knowledge and skills to manage livestock diseases. Area-level control of rapidly spreading diseases is important, especially given the position of Laos as a major livestock transit route.

Two projects are assessing biosecurity hazards and practices to reduce risk in livestock market chains, to sustainably expand livestock trading in Laos and beyond. One is focusing on improving risk management of trans-boundary livestock diseases, by assessing biosecurity interventions for ruminants, and understanding the influence of animal husbandry measures, and the presence of pigs and poultry in the village.<sup>11</sup>

Another is assisting the development of a biosecure market-driven beef production system in Laos.<sup>12</sup>

The goat population of Laos has more than doubled over the past 10 years, driven largely by high demand for goat meat from Vietnam. A small research activity will deliver models for goat production and marketing systems to capitalise on strong opportunities, and create market linkages for smallholder farmers in areas of Laos and Vietnam with poor access to high-value markets.<sup>13</sup>

Following on from this research, a new project will develop new goat production practices that are sustainable and productive, recognising that expanded goat production using traditional extensive goat raising methods would result in overgrazing of feed resources, negative consequences for the environment and higher incidence of diseases and parasites in livestock.<sup>14</sup>

## Social Sciences

The prevalence of food insecurity in Lao PDR remains largely unchanged, despite strong economic growth and reductions in poverty over the past decade. The drivers of food insecurity in the northern uplands of Laos are being identified, to provide evidence to guide the scaling-up of interventions aimed at improving food security status of vulnerable households.<sup>15</sup>

Two projects are investigating the potential to improve livelihoods through better marketing systems. A research project is looking at establishing fruit and vegetable supply chains for markets, to develop integrated vegetable production and postharvest management packages for adoption by growers and communities. The focus of this work is on food safety, out-of-season production, supply chains for domestic markets and postharvest handling.<sup>16</sup>

Another project is identifying ways to increase the adoption of profitable and sustainable technologies for cassava production, and evaluating opportunities for production and marketing systems to improve smallholder livelihoods in Cambodia and Lao PDR.<sup>17</sup>

Another project will review what influences smallholder farmers' decisions to adopt proven technologies and management systems to improve farm productivity. It will also look at the influence on farming decisions of complex interactions between economics, politics, technology and the biological environment, along with ethnicity, local social traditions, personal motivation and leadership.<sup>18</sup>

## Soil and Land Management

Increasing agricultural productivity and profitability throughout East Asia is an important means of reducing poverty, food insecurity and poor nutrition particularly among small landholders. Identifying production constraints and developing knowledge and new practices will enable more sustainable use of resources by farmers in the region.

There is potential to grow dry-season, high-value, non-rice grain and forage in the lowland Mekong region. Research continues to identify constraints, develop technologies, and communicate information to support improved management and use of water, improved crop nutrition and the alleviation of key soil constraints.<sup>19</sup>

A project in Laos and Cambodia aims to identify and promote promising management practices to increase the overall productivity of crop-livestock systems, through improved forage and fodder production, better use of water and nutrients and sustainable soil management.<sup>20</sup>

Increasing numbers of smallholder farmers in Laos and northern Vietnam are growing maize on sloping land to meet demand for concentrate livestock feeds by Chinese and South-East Asian poultry, pig and cattle industries. A project is helping farmers adopt maize-based farming systems that reduce soil degradation and improve smallholder livelihoods and economic viability.<sup>21</sup>

By improving understanding of practice change, and identifying improved input, soil and water management, a project focused on vegetable production in Laos and Cambodia aims to sustainably improve vegetable yields and household economies.<sup>22</sup>

### 2018-19 project outputs

- » Techniques for direct seeding of rice, and business models for access to machinery identified in 15 villages in southern Laos.
- » New fish-passage technology introduced in the Lower Mekong Basin.
- » New knowledge on three value chains for smallholder plantation timbers published.
- » Extension booklet on growing teak on short rotations produced for farmers.
- » Recommendations reported on alternative plantation policies for Vietnam and Lao PDR.
- » Report delivered on the outcomes and impacts of redistribution of *Leptocybe* parasitoids (gall wasp) in partner countries.
- » Integrated program for ACIAR-supported research on livestock health and production planned and documented.
- » A program to improve farming systems on sloping lands started.
- » Options for improving soil management during vegetable production introduced.
- » Options for cropping during the dry season, in rotation with monsoonal rice, introduced and tested.
- » Capacity and awareness of integrated systems research methods in the national agricultural research system increased.

- » Strategies for improving provincial-level extension started.
- » Capacity to integrate rice, water, forage and socioeconomic research increased.

### Five-year region outcomes

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



## Current and proposed projects

1. **ADP/2014/047**—Improving policies for forest plantations to balance smallholder, industry and environmental needs in Lao PDR and Vietnam
2. **CIM/2018/113**—Understanding direct-seeded rice techniques and business models
3. **CSE/2012/077**—Mechanisation and value adding for diversification of lowland cropping systems in Lao PDR and Cambodia
4. **FIS/2012/100**—Improving the design of irrigation infrastructure to increase fisheries production in floodplain wetlands of the Lower Mekong and Murray-Darling basins
5. **FIS/2014/041**—Quantifying biophysical and community impacts of improved fish passage in Lao PDR and Myanmar
6. **FST/2012/091**—Biological control of galling insect pests of eucalypt plantations in the Mekong region
7. **FST/2012/041**—Teak-based agroforestry systems to enhance and diversify smallholder livelihoods in Luang Prabang province of Lao PDR
8. **FST/2016/025**—Developing DNA-based chain of custody systems for legally-sourced teak
9. **FST/2016/151**—Advancing enhanced wood manufacturing industries in Laos and Australia
10. **GP/2016/093**—Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific
11. **AH/2012/067**—Enhancing transboundary livestock disease risk management in Lao PDR
12. **AH/2012/068**—Development of a market-driven biosecure beef production system in Lao PDR
13. **LPS/2016/027**—Assessing goat production and marketing systems in Lao PDR and market linkages into Vietnam
14. **LS/2017/034**—Smallholder goats systems and marketing in Laos and Vietnam
15. **ASEM/2012/073**—Improving food security in the northern uplands of Lao PDR: identifying drivers and overcoming barriers
16. **ASEM/2012/081**—Improving market engagement, postharvest management and productivity of the Cambodian and Lao PDR vegetable industries
17. **ASEM/2014/053**—Developing cassava production and marketing systems to enhance smallholder livelihoods in Cambodia, Lao PDR and Myanmar
18. **ASEM/2014/052**—Smallholder farmer decision-making and technology adoption in southern Lao PDR: opportunities and constraints
19. **SMCN/2012/071**—Improving water and nutrient management to enable double-cropping in the rice growing lowlands of Lao PDR and Cambodia
20. **SMCN/2012/075**—Management practices for profitable crop-livestock systems for Cambodia and Lao PDR
21. **SMCN/2014/049**—Improving maize-based farming systems on sloping lands in Vietnam and Lao PDR
22. **SMCN/2014/088**—Integrated resource management for vegetable production in Lao PDR and Cambodia

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# Myanmar

**Table 3.14: Myanmar, key statistics, 2017**

Country	GDP per capita (US\$)	Population (million)
Myanmar	1,299	53.37

Source: data.worldbank.org/indicator.

**Table 3.15: ACIAR funding to Myanmar, 2016-17 to 2018-19**

Year	A\$ million
2016-17 (actual)	3.8
2017-18 (estimated actual)	4.2
2018-19 (budget)	4.4



Image: ACIAR/Conor Asheigh

## Country context

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**Myanmar has one of the fastest growing economies in South-East Asia, and it is expected to grow by 6.7% in the current financial year ending March 2018. This is above the 5.9% growth achieved in 2016–17, and well above the projected 5.1% expansion across South-East Asia in 2017 (IMF 2017). Agriculture is critical to the overall economy, accounting for 38% of GDP, and 23% of exports, and employing some 60% of the national workforce (World Bank 2017).**

Aid Investment Plan, Pacific Regional, 2015–2020 (DFAT)

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Myanmar has a total land area of 67.6 million hectares and an abundance of arable land. Much of the land remains untouched by modern cultivation, and cultivated land accounts for only 19% of the total land mass. Myanmar's fertile soils hold significant potential to lift the country's economy from a basic grain producer to a high-value goods exporter. But even though the poverty rate is estimated to have declined from 32.1% in 2004–05, to 25.6% in 2009–10, and 19.4% in 2015, it is still high. A further 14% of the population is classified as near-poor, meaning they live within 20% of the poverty line.

Poverty in Myanmar's rural areas is substantially higher than in urban areas—38.8% of the rural population is estimated to be poor compared with 14.5% of those in its towns and cities. Residents of rural areas who are poor account for 84% of the total impoverished population. Poorer households are exceedingly concentrated in the agriculture sector—either as casual labourers or as smallholder farmers—and tend to be less diversified in their activities than larger farm enterprises. Those who work in the farming industry are likely to not own the land that they cultivate. Poverty is strongly linked to low farming or agricultural labour incomes and a heavy reliance on the main monsoon crop for productivity.

Rural women in Myanmar work in all sectors of agriculture, cultivating crops, rearing animals for food or trade, and working in forestry and fisheries. Women constitute about half of the agricultural population, but less than 20% head agricultural holdings.

The rural context of Myanmar is marked by limited job opportunities and low growth in income generation outside of agricultural production. Migration has become a common coping strategy for family survival, and remittances have become a major off-farm source of income. Of the nearly 1.1 million migrants from Myanmar in Thailand, 45% are women. The largest numbers of migrants were employed in agriculture, construction, the seafood processing industry and households (domestic work).

Although agricultural productivity has grown over the past five years, the potential of agriculture as a driver of rapid poverty reduction has yet to be realised. The agriculture sector has not grown at the same rate as the overall economy—agricultural growth stagnated at below 2% per year since 2011.

In July 2016, four months after taking power, the Myanmar Government released a 12-point economic plan aimed at creating a market-oriented economy. Under the strategy, the government aims to bolster farming production, increase food security, increase exports and boost living standards of the rural population, most of whom rely on farming as their primary source of income. To achieve these targets, the government has set out to reform the laws governing the agriculture sector.

Australia has a longstanding bilateral relationship with Myanmar, which started in 1952. It is working to broaden and deepen bilateral partnership with Myanmar through strengthening government-to-government ties, growing trade and investment, and expanding people-to-people links.

This is underpinned by Australia's development assistance that aims to support Myanmar's reform process, by improving the quality of education, promoting peace and stability, and promoting inclusive economic growth and government management. Australian support on agricultural research and development through ACIAR started in Myanmar in the late 1980s.

## Country priorities

To support the Government of Myanmar's goals on agricultural development, and consistent with Australia's strategic objective on inclusive economic growth, ACIAR and DFAT developed a multidisciplinary program, MyFarm, in consultation with Myanmar counterparts, donors and potential research providers. A long-term country program strategy is expected to be finalised in 2018-19.

At present, research priorities for ACIAR's program in Myanmar focus on:

- » increasing net production of food and cash incomes of rural households in the Central Dry Zone and Ayeyarwaddy Delta, through improvements in, and adoption of, production and postharvest technologies in agriculture, including livestock and fisheries
- » building capacity in agricultural, livestock and fisheries research, development and evaluation, through program activities, and postgraduate and short-term training
- » providing technical assistance and advice on policy strengthening to relevant Myanmar Government departments.

## 2018-19 research program

ACIAR supports 21 projects in Myanmar, 11 of which are specific to this country, and the remainder are part of regional projects. The projects address ACIAR's high-level objectives, as outlined in the 10-year Strategy 2018-2027, and engage with six of ACIAR's research programs.

The following sections briefly describe ACIAR-supported projects in Myanmar, for each research program. Each project description is referenced to a list at the end of this section, which provides the ACIAR project code and title.

### Agribusiness

Improving the agricultural value chain and developing trade models is a means of improving the livelihoods of farmers in Myanmar, across many industries. In Myanmar and Vietnam, a 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>1</sup>

This work builds on the lessons and achievements of vegetable research and market development in the Moc Chau district of Vietnam. Supporting agriculture in Myanmar more broadly, another project is exploring innovative and inclusive agricultural value-chain financing.<sup>2</sup>

A regional project is focusing on building a sustainable beef and cattle industry in Myanmar and neighbouring countries, including developing a beef trade model and information network.<sup>3</sup>

### Crops

The Myanmar national mungbean breeding program is a partner in the International Mungbean Improvement Network, which is led by the World Vegetable Center, and comprises Australia, Bangladesh, Myanmar and India. Mungbean growers in Myanmar will continue to benefit from improved varieties and agronomy practices developed by the network.<sup>4</sup> They will also benefit from potential efficiencies to be gained from another project that is investigating mechanisation of harvesting and improved seed production systems.<sup>6</sup>

Rice industries across Asia, including growers in Myanmar, will reap future benefit from research being conducted at IRRI to identify the genetics responsible for low chalk in rice grain. The project aims to validate functional molecular markers that can routinely be used to reduce chalk in rice breeding programs.<sup>5</sup>

### Fisheries

The work ACIAR has achieved in Lao PDR to improve fish passage through low-level irrigation barriers has attracted interest from many other South-East Asian countries. A project is underway to apply the new technology to barriers in the Ayeyarwady catchment of Myanmar. This project will deliver the first fishway in Myanmar, which will be a demonstration unit before more widespread application.<sup>7</sup>

Despite the importance of fisheries to the Myanmar economy and people's livelihoods, fishery management in Myanmar is relatively weak. As a result, important fish-production areas are at risk, and the people who rely upon them are increasingly vulnerable.



A project is underway to assist Myanmar's Department of Fisheries to identify suitable comanagement approaches and fisheries access arrangements to secure maximum benefits for small-scale fishers. The project will also build the capabilities of government and fisheries organisations to conduct fisheries research and develop policy.<sup>8</sup>

Rice and fish are key elements of people's diet in Myanmar, and are major agricultural production sectors. Rice-fish systems encompass a spectrum of farming and fishing practices—from traditional capture of fish in rice-dominated landscapes through to controlled farming of fish in rice fields.

Recent policy shifts in Myanmar are now encouraging farmers to diversify farming systems in agriculture, livestock and fishery, presenting a window of opportunity for more productive rice-fish systems. A project seeks to characterise rice-fish systems in the Ayeyarwaddy Delta to identify ways to improve rice-fish production and management to optimise income, food and nutritional outcomes for households, with a focus on women. The project will also help policy-makers develop policy for land use, rice production and fisheries.<sup>9</sup>

### Forestry

Teak is one of the most commercially important timbers in the world, due to its durability and water resistance. Illegally logged timber products, including teak, enters markets by being mixed with legitimate supply chains, with associated document fraud. Building on previous research activity that developed DNA markers for teak timber and studied teak chains of custody in Indonesia and Myanmar, similar work continues in Laos, Thailand, Myanmar, Indonesia, Solomon Islands and Papua New Guinea.<sup>10</sup>

### Global Program

Work continues on collecting detailed institutional, financial, human resource and research output data from agricultural research agencies to be included in the ASTI database, and on supporting stakeholder access to such information, analysis and support for future policy through various online tools and publications. ASTI provides open-access data and analysis on agricultural research systems in developing countries. This project will be implemented by IFPRI and APAARI, in close collaboration with the main national agricultural research institutes of the region.<sup>11</sup>

### Livestock Systems

Goats and sheep (small ruminants) are an important income source and asset for rural and periurban smallholders in many parts of the world, including Myanmar. Often cattle are kept for draught power, but small ruminants are the source of income and/or food for households. A new project aims to assist farmers in Myanmar to improve their goat/sheep production, transforming their herd from an opportunistic, low-input/low-output activity to a market-focused, profitable enterprise, through more efficient management of animal production and health.<sup>14</sup>

A small project<sup>12</sup> will instigate preliminary activities—such as ongoing support of forage agronomy field trials and seed production, and socioeconomic research—in preparation for the development and inception of a larger project<sup>15</sup> aiming to improve cattle production in the Dry Zone of Myanmar through improved animal nutrition, health and management. About half of Myanmar's 15 million cattle are located within the Central Dry Zone, and their primary use is to provide draught power, transportation and manure for fertiliser. Myanmar is undergoing significant transformation, and it is expected that mechanisation will quickly reduce the need for draught animals over the next decade. This provides a unique opportunity for smallholder farmers to transition from draught to beef cattle production.

Indigenous poultry is the most dominant livestock species in Myanmar, and is predominately owned by women. Completing activities that began under a previous project, a new small project will continue to identify opportunities for diversifying rural poultry production in Myanmar, by looking at semi-intensive family poultry rearing. The research aims to determine whether the production system can be adopted by a significant proportion of small-scale farmers with limited resources, and includes value chain and economic analysis of the system to identify constraints and opportunities to the production system being a source of family income.<sup>13</sup>

### Social Sciences

A project being conducted in Myanmar, Cambodia and Lao PDR is identifying ways to increase the adoption of profitable and sustainable technologies for cassava production, and evaluating opportunities for production and marketing systems that have the potential to improve smallholder livelihoods.<sup>16</sup>

## Soil and Land Management

Agriculture is one of the dominant economic sectors of Myanmar, generating about 24% of GDP, and employing more than 60% of the country's population. But the agriculture sector is currently characterised by some of the lowest levels of productivity in the Asian region. The only providers of agricultural and veterinary tertiary education in Myanmar are Yezin Agricultural University and the University of Veterinary Science.

A proposed project will address this low productivity by increasing the capacity of both universities to deliver graduates with the research skills and knowledge to identify constraints to agricultural production, and to develop pragmatic solutions.<sup>17</sup>

A short research activity in 2018-19 will seek to understand the current status of inoculant production, distribution and use in the Greater Mekong subregion. The findings will clarify anecdotal evidence of a decline in the use, efficacy and production standards of inoculants that increase nutrient acquisition, particularly, but not limited to, rhizobia and mycorrhizae inoculants. The project will also identify the potential application of recent advances in inoculant delivery.<sup>18</sup>

A project on nutrient use to improve yields, profitability and sustainability in central Myanmar builds on existing work on rice and legumes, and will include maize. The project will increase the productivity and profitability of rice and maize-based production systems, while ensuring environmental preservation through correct use of fertiliser.<sup>19</sup>

Another project aims to develop land evaluation methods and capacity to improve planning of agricultural development for productive and resilient landscapes in Myanmar's Central Dry Zone. In turn, this will contribute to national food security, improve the livelihoods of farmers and provide ecosystem services.<sup>20</sup>

A project aiming to increase the productivity of pulses and oilseed legumes—the most important crops after rice—will further improve the livelihoods of farmers and resilience of the landscape in the Central Dry Zone.<sup>21</sup>

## 2018-19 project outputs

- » 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.
- » Mungbean core collection characterised (ongoing phenotyping, for biotic stress and abiotic stress, using digital data capture, and storing the data in the plant breeding database).
- » Farming practices, value chains and women's participation affecting mungbean harvesting identified.
- » Knowledge increased on management of fisheries resources, and research capacity built in government fisheries agencies, through a series of fisheries mini projects.
- » A regional model created to develop an understanding of the flow of beef products and beef cattle.
- » Effective partnerships established for cattle, sheep and goat research in the Central Dry Zone.
- » Initial training, equipment and laboratories established for land evaluation, including first soil sampling and analysis campaign in the Central Dry Zone.
- » A greater understanding built of inoculant use and production, and the potential future application of the technology in the Greater Mekong subregion.
- » A research program started on nutrient management for cropping systems in central Myanmar, with an Australia-Myanmar university-to-university partnership forged.
- » The use of digital data collection applications explored.

## Five-year region outcomes

- » Development and adoption of well-researched technologies for improved smallholder productivity and diversification contributing to food 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.

## Current and proposed projects

1. **AGB/2014/035**—Improving livelihoods in Myanmar and Vietnam through vegetable value chains
2. **AGB/2016/163**—Innovative and inclusive agriculture value-chain financing
3. **AGB/2016/196**—Sustainable and inclusive development of the cattle and beef industry in South-East Asia and China
4. **CIM/2014/079**—Establishing the international mungbean improvement network
5. **CIM/2016/046**—Breeding for low chalk in rice
6. **CIM/2016/174**—Improved mungbean harvesting and seed production systems for Bangladesh, Myanmar and Pakistan
7. **FIS/2014/041**—Quantifying biophysical and community impacts of improved fish passage in Lao PDR and Myanmar
8. **FIS/2015/046**—Improving fishery management in support of better governance of Myanmar’s inland and delta fisheries
9. **FIS/2016/135**—Development of rice–fish systems in the Ayeyarwaddy Delta, Myanmar
10. **FST/2016/025**—Developing DNA-based chain of custody systems for legally-sourced teak
11. **GP/2016/093**—Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific
12. **LS/2018/100**—Establishing the project: improving cattle health and production in Myanmar
13. **LS/2018/106**—Diversifying rural poultry production in Myanmar: opportunities for small-scale farmers
14. **LS/2014/056**—Improving farmer livelihoods by developing market-oriented small ruminant production systems in Myanmar
15. **LS/2016/132**—Improving cattle production in the Dry Zone of central Myanmar through improved animal nutrition, health and management
16. **ASEM/2014/053**—Developing cassava production and marketing systems to enhance smallholder livelihoods in Cambodia, Lao PDR and Myanmar
17. **SLaM/2017/041**—Mainstreaming research in Myanmar’s agricultural and veterinary universities
18. **SLaM/2018/123**—Assessment of biofertilisers for enhancing agriculture in Mekong region countries
19. **SMCN/2014/044**—Management of nutrients for improved profitability and sustainability of crop production in Central Myanmar
20. **SMCN/2014/075**—Land resource evaluation for productive and resilient landscapes in the Central Dry Zone of Myanmar
21. **SMCN/2011/047**—Increasing productivity of legume-based farming systems in the Central Dry Zone of Myanmar

### Regional Manager, East and South-East Asia

Ms Dulce Carandang Simmanivong

### Research Program Managers

To be appointed, Agribusiness

Dr Eric Huttner, Crops

Dr Ann Fleming, Fisheries

Dr Nora Devoe, Forestry

Ms Mellissa Wood, Global Program

Dr Werner Stur/Dr Anna Okello, Livestock Systems

Dr Robert Edis, Soil and Land Management

Contact details are provided in Appendix 2

# Philippines

**Table 3.16: The Philippines, key statistics, 2017**

Country	GDP per capita (US\$)	Population (million)
The Philippines	2989	104.92

Source: [data.worldbank.org/indicator](http://data.worldbank.org/indicator).

**Table 3.17: ACIAR funding to the Philippines, 2016-17 to 2018-19**

Year	A\$ million
2016-17 (actual)	4.6
2017-18 (estimated actual)	3.7
2018-19 (budget)	4.1





## Country context

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**The Philippines is one of Australia’s longest-standing bilateral relationships. We have shared interests and values, supported by strong people-to-people links. 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, which has been limited to a few sectors of the economy and society. Growth in the Philippines is heavily reliant on remittances from Filipinos working overseas, and is limited to a few sectors of the Philippine economy. Analysis by DFAT has identified that the top constraints to economic growth are poor infrastructure planning processes, bureaucratic capacity and unequal access to education.**

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

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The Philippine Development Plan 2017–2022 outlines the basis for ‘more inclusive growth, high-trust and resilient society, and globally-competitive knowledge economy’. In the medium term, the targets are for the economy to grow by 7%–8% annually, and for poverty to be reduced from 21.6% in 2015 to 14% by 2022.

Central to achieving these targets is harnessing the growth potential of the agriculture sector, which accounts for 10% of the national income, employs about 11 million Filipinos (almost a third of the labour force), is a supplier of raw materials for the manufacturing sector and is a food source for the population. Despite its significant role in economic growth and food security, the sector continues to be held back by poverty and long-standing problems that constrain productivity, and threaten sustainability of production and production systems.

Many farmers and fishers are smallholders with insecure land tenure, and cultivating already marginal lands. Farming and fisher households are also unable to increase their production and take advantage of market opportunities, due to their limited access to production support, extension and financing, including technology and innovation.

In addition, the country’s high rate of population growth (2% per year) adds pressure on the sector to meet the increasing demand for food and raw materials. There is now little new land in the Philippines suitable for expanding production. This is on top of already competing use of the same natural resources (land and water) for other development needs.

Climate change and disasters further increase the vulnerability of farmers and fishers to production and economic shocks, which could drive them further into poverty.

In 2006–2015, poverty incidence was highest in households headed by farmers and fishers, and those who were engaged in the sector. Agriculture-based families consistently posted the highest poverty incidence among nine basic sectors. To address these constraints, the Philippine Government aims to expand the economic opportunities of the agriculture sector, by helping farmers and fishers to have more and easier access to economic opportunities, participate in the market and take part in economic growth.

Public investments and interventions will be directed to:

- » implementing strategies to increase agri-based enterprise and promote high-value commodities
- » expanding agri-based enterprises through new and innovative production and marketing schemes
- » supporting farmers’ and fishers’ access to value chains, extension and financing services.

Cross-cutting strategies to reduce the sector’s vulnerability to disaster and climate change, and to promote the sustainable use and management of natural resources will also be prioritised. Further, the Philippines now puts greater importance on the role of technology, innovation and capacity building in increasing sustainable production and productivity across value chains.

The National Harmonized Research and Development Agenda for Agriculture, Aquatic and Natural Resource, 2017-2022 articulates these national priorities, and outlines public investment in research and development in livestock, fisheries, aquaculture, marine resources, forestry, natural resources, environment, climate change mitigation and adaptation, technology transfer, socioeconomics and policy research and capacity building.

The Australian Government's aid program is working with the Philippine Government to promote prosperity, reduce poverty, increase stability and help respond to the Philippines' priorities in agricultural research and development. ACIAR's work aligns with the aid program's focus on providing targeted advice and technical assistance in the agriculture, fisheries and water and building capacities of the Philippine Government and its stakeholders on research for development.

ACIAR's support to the Philippines focuses on research to increase the productivity, marketability and international competitiveness of agricultural products, as well as to reduce the adverse effects of climate change on the poor residents of rural areas.

The need to develop more effective extension processes and greater responsiveness to market opportunities underpins these two priorities. The emphasis on higher-value products and market competitiveness aims to improve food security, by supporting research that can provide smallholder farmers and traders with higher incomes, enabling them to buy staple foods and to access other basic services and economic opportunities.



Image: ACIAR/Conor Ashleigh

## Country priorities

ACIAR's agricultural research focuses on building the knowledge base to increase productivity, and competitiveness of higher-value agricultural and fisheries products, with equal emphasis on reducing the adverse effects of climate change on poor residents of rural areas.

Towards this end, the Philippines program's key research priorities are to:

- » increase the market competitiveness of high-value fruit and vegetable products
- » develop competitive and sustainable fisheries and aquaculture production
- » improve returns from low-input livestock production systems
- » manage land and water resources more effectively
- » mitigate the adverse impacts of climate change on poor residents of rural areas
- » foster technology adoption by poor indigenous households in the southern Philippines.

The ACIAR Philippines program supports research for development to improve the market competitiveness of products from aquaculture, horticulture and livestock enterprises. The emphasis on higher-value products and competitiveness aims to improve food security, by providing smallholder farmers and traders with diverse and significant opportunities to improve their livelihoods.

Underpinning these priorities is a commitment to:

- » promote effective transfer of technology and knowledge
- » ensure the sustainable management and use of the natural resource base
- » advocate gender equity principles across the research program, operations and activities.

The Philippines program shall continue to have greater focus in the southern Philippines (Mindanao and Visayas) where low productivity, natural resource degradation, high poverty incidence, and vulnerability to climate variability and disasters represent more serious constraints to agricultural development than in other regions. It will also continue to build on the strong relationship and network of Australian and Filipino partners working in the southern Philippines, including through broader support.

## 2018–19 research program

ACIAR supports 20 projects in the Philippines, 12 of which are specific to this country, and the remainder are part of regional projects. The projects address ACIAR's high-level objectives, as outlined in the 10-year Strategy 2018–2027, and engage with eight of ACIAR's research programs.

The following sections briefly describe ACIAR-supported projects in the Philippines, for each research program. Each project description is referenced to a list at the end of this section, which provides the ACIAR project code and title.

### Agribusiness

Projects in the ACIAR Agribusiness program strive to build capacity of individuals and communities, to enhance livelihoods and income in the Philippines. Poverty levels in the southern Philippines average 35%–45%, and are highest among smallholder farmers and fishers.

Fruit and vegetable production is an important economic activity in this region, but is limited by small farm size, poor adoption of technology, low productivity and product quality, and high postharvest losses. Improving the performance of smallholder value chains for fruit and vegetables and building community capacity is the focus of a continuing project in this region, to improve smallholders' income, livelihoods and community wellbeing.<sup>1,7</sup>

Five small research activities apply a strategic agribusiness approach to mango research and development in the Asia-Pacific region. In addition to undertaking targeted pilot research and scoping studies, the small research activities will have an important function to create networks, and to engage and collaborate with multiple Australian and key Asia-Pacific research, government and industry partners.

The objectives of the mango agribusiness projects are to:

- » improve communication, collaboration and capacity development (information access)<sup>2</sup>
- » identify market development opportunities and implications in China<sup>3</sup>
- » identify strategic research and development opportunities (particularly for biosecurity) for market entry<sup>4</sup>

- » evaluate opportunities for improving mango quality<sup>5</sup>
- » identify priority opportunities in fruit processing in selected mango markets.<sup>6</sup>

### Crops

Rice industries across Asia, including growers in the Philippines, will reap future benefit from research being conducted at IRRI to identify the genetics responsible for low chalk in rice grain. The project aims to validate functional molecular markers that can routinely be used to reduce chalk in rice breeding programs.<sup>8</sup>

### Fisheries

ACIAR's fisheries program works with Philippine research agencies, both national and regional, to develop and refine technologies for aquaculture that benefit smallholders. Currently, this work is focused on giant grouper hatchery production, developing technologies for the control of sex change, hormonal manipulation of reproduction and genetic management.<sup>9</sup>

Another project aims to scale up community-based sea cucumber ranching activities in Vietnam and the Philippines to expand opportunities for coastal communities.<sup>11</sup>

An innovative conservation project underway in the Northern Luzon region of the Philippines aims to restore coral reefs damaged from past dynamite fishing practices. The project is testing mass larval reseedling methods, where mature larvae are delivered onto reefs, and held there until settlement occurs. The project is also evaluating the socioeconomic benefits of reef restoration to coastal communities, both through improved fish abundance and tourism. This work has potential application to the Great Barrier Reef and other climate-affected coral reefs globally.<sup>10</sup>

### Global Program

Work continues on collecting detailed institutional, financial, human resource and research output data from agricultural research agencies to be included in the ASTI database, and on supporting stakeholder access to such information, analysis and support for future policy through various online tools and publications. ASTI provides open-access data and analysis on agricultural research systems in developing countries. This project will be implemented by IFPRI and APAARI, in close collaboration with the main national agricultural research institutes of the region.<sup>12</sup>

### Horticulture

*Fusarium* wilt (also known as Panama disease) has devastated commercial banana production in many Asian countries. It now threatens the crop in the southern Philippines, where banana exports provide a major contribution to employment and the economy. A novel approach, developed in a series of ACIAR-funded projects, centres on the use of groundcover plants that encourage biological suppression of this soil-borne disease. Combined with appropriate containment measures, this approach is showing considerable potential to sustain profitable banana production.<sup>13</sup>

Few people in the southern Philippines eat vegetables, resulting in public health issues. Low consumption is partly due to the high prices and poor availability of fresh produce. Although prices for fresh fruit and vegetables are relatively high in the Philippines, returns to growers are extremely low, with many farmers earning less than a dollar a day, well below the poverty line.

Postharvest losses are a major problem for producers and the value chain in the Philippines, and reduce farmers' incomes, as well as the amounts of fruit and vegetables purchased and consumed. Up to 40% of harvested vegetables are wasted before they reach the consumer. A project aims to determine where and why post-harvest losses occur, and develop strategies to reduce losses and improve product quality. Improved postharvest management of fruit and vegetables could both increase farmers' incomes and improve public health.<sup>14</sup>



## Impact Evaluation

An established focus for ACIAR is to understand the impact of research on smallholders and communities in partner countries and Australia. The Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development has been a long-term partner with ACIAR in research for development. The council also has a keen interest in measuring the impact of research projects.

The specific objectives of this small research activity are for ACIAR and the council to jointly review, identify and adapt mixed method approaches for impact assessment, to:

- » ensure any economic, social, environmental and capacity-building impacts are captured
- » apply the mixed method approaches to the impact assessment of the ACIAR Landcare projects in Philippines
- » develop capacity among key research partners in the Philippines to conduct impact assessments incorporating mixed method approaches.<sup>15</sup>

## Livestock 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 variety 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 previously closed markets, such as Singapore. A project on pig respiratory diseases builds 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. The project is developing disease surveillance systems to improve returns and the competitiveness of pig-production systems.<sup>16</sup>

## Social Sciences

Current research is building on previous ACIAR investment in Mindanao, which highlighted how certain types of community-based extension methods can rapidly improve agricultural livelihoods. This project is comprehensively testing and evaluating these improved extension methods in conflict-vulnerable areas in the southern and western Philippines.<sup>17</sup>

Agriculture in the Philippines is especially susceptible to the adverse effects of climate change through increasing weather variability, higher incidence of climate-related disasters and longer-term changes. Smallholder farmers and fishers need access to evidence-based options for managing the effects of climate change. As part of a whole-of-government approach, ACIAR is researching the circumstances under which climate information is useful for decision-making on smallholder farms, and the ability of local government units to mitigate risks for smallholder farmers.<sup>18</sup>

Improving livelihoods of poor residents of rural area remains a critical issue for the Philippines, especially in the country's rural uplands. It is estimated that more than 24 million people rely on subsistence agriculture, most of whom are below the poverty line. In addition, deforestation and land degradation in the uplands are major national environmental and social issues. Research is underway into forest landscape restoration to improve food security and livelihoods.<sup>19</sup>

## Soil and Land Management

Vegetable consumption in the Philippines is low due to high prices resulting from constraints to production and supply. Vegetable yields are low in the southern Philippines, because of poor soil fertility. A project will:

- » identify constraints to vegetable production in the southern Philippines
- » compare the productivity and soil fertility of different vegetable production systems (organic, conventional and protected systems) to identify crop species and cultivar nutrient demands
- » train extension and research staff to manage soil and nutrients.<sup>20</sup>

## 2018-19 project outputs

- » Best-bet guidelines for production and postharvest handling of mango developed and trialled with farmer groups.
- » Molecular markers for low-chalk rice lines identified.
- » At least five new communities engaged in sea-ranching of sea cucumbers based on previous collaborative research.
- » Techniques made available for mass coral spawning and settlement onto degraded coral reefs.
- » Information provided for breeding giant grouper for mariculture purposes in the Philippines and Vietnam.
- » 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 increase smallholder net income, and improve livelihoods and community wellbeing for selected fruits and vegetables in the southern Philippines.
- » Diagnostic systems improved for respiratory diseases of pigs in two selected regions of the Philippines.
- » Pilot testing completed, and the Livelihood and Improvement through Facilitated Extension model used by a local government unit and non-government organisations.
- » Nutrient management recommendations supported by evidence developed for vegetable production in the southern Philippines.



## Five-year region outcomes

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

## Current and proposed projects

1. **AGB/2012/109**—Developing vegetable and fruit value chains and integrating them with community development in the southern Philippines
2. **AGB/2016/006**—Supporting access to mango research information, communication, collaboration and capacity development
3. **AGB/2016/007**—Challenges and opportunities for meeting requirements of China mango markets
4. **AGB/2016/008**—Opportunities and strategies to improve biosecurity, market access and trade for selected mango markets
5. **AGB/2016/009**—Enhancing mango fruit quality in Asian mango chains
6. **AGB/2016/010**—Priority opportunities in tropical fruit processing in selected mango markets
7. **AGB/2017/039**—Developing vegetable and fruit value chains and integrating them with community development in the southern Philippines
8. **CIM/2016/046**—Breeding for low chalk in rice
9. **FIS/2012/101**—Developing technologies for giant grouper (*Epinephelus lanceolatus*) aquaculture in Vietnam, the Philippines and Australia
10. **FIS/2014/063**—Restoring damaged coral reefs using mass coral larval reseedling
11. **FIS/2016/122**—Increasing technical skills supporting community-based sea cucumber production in Vietnam and the Philippines
12. **GP/2016/093**—Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific
13. **HORT/2012/097**—Integrated management of *Fusarium* wilt of bananas in the Philippines and Australia
14. **HORT/2012/098**—Improved postharvest management of fruit and vegetables in the southern Philippines and Australia
15. **IAP/2017/010**—Development of mixed-method approaches to impact assessments of Philippines research projects
16. **AH/2012/066**—Improving the production and competitiveness of Australian and Philippines pig production through better health and disease control
17. **ASEM/2012/063**—Improving the methods and impacts of agricultural extension in western Mindanao, Philippines
18. **ASEM/2014/051**—Action-ready climate knowledge to improve disaster risk management for smallholder farmers in the Philippines
19. **ASEM/2016/103**—Enhancing livelihoods through forest and landscape restoration
20. **SMCN/2012/029**—Soil and nutrient management strategies for sustainable vegetable production in southern Philippines

### Country Manager

Ms Gay (Mai) Maureen Alagcan

### Research Program Managers

To be appointed, Agribusiness

Dr Eric Huttner, Crops

Dr Ann Fleming, Fisheries

Ms Mellissa Wood, Global Program

Dr Irene Kernot, Horticulture

Dr Andrew Alford, Impact Assessment

Dr Werner Stur/Dr Anna Okello, Livestock Systems

Dr Jayne Curnow, Social Sciences

Dr Robert Edis, Soil and Land Management

Contact details are provided in Appendix 2

# Thailand

**Table 3.18: Thailand, key statistics, 2017**

Country	GDP per capita (US\$)	Population (million)
Thailand	6,594	69.04

Source: [data.worldbank.org/indicator](http://data.worldbank.org/indicator).

**Table 3.19: ACIAR funding to Thailand, 2016-17 to 2018-19**

Year	A\$ million
2016-17 (actual)	0.17
2017-18 (estimated actual)	0.00
2018-19 (budget)	0.02





## Country context

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**In 2017, Thailand laid out its long-term economic goals in its 20-Year National Strategy (2017–2036) for attaining developed country status and transitioning to a digital economy. Over the course of 2017, the Thai economy grew at its fastest pace in more than four years. Gross domestic product rose 3.7% as farm incomes recover from the 2016 drought, merchandise and tourism exports rise, and the continued fiscal stimulus. However, despite the good performance last year, expectations are modest in terms of economic growth (only 3.8%) in 2018. In November 2003, Thailand moved from being an aid recipient to an aid donor. A number of regional Australian aid programs in human trafficking, labour rights, health, disaster management and economic integration continue to include Thailand. Australia also provides limited support to Thailand as part of efforts to strengthen the capacity of regional organisations such as ASEAN and APEC.**

Thailand country brief (DFAT)

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The agriculture sector still remains a crucial component of the Thai economy. Thailand continues to capitalise on its long-standing farming traditions and favourable climate as it retains its enviable position as a key exporter of products around the world—including widely consumed agricultural commodities, such as rice, sugar and rubber. Agriculture, particularly rice, is still the dominant economic activity in rural Thailand.

Despite the economic success, the benefits of growth are not shared with all citizens. Poverty in Thailand mainly affects those living in rural areas. About 7.1 million people live in poverty in Thailand, 80% of whom live in rural areas. Poverty and inequality create a challenge for a country with an uncertain GDP.

The Royal Thai Government introduced a 20-year strategic plan to end poverty, and help attain developed country status. It includes reforms to stabilise the economy and provide equal economic opportunities, environmental stability, and effective government bureaucracies. The Thai Prime Minister also recently announced a shift to organic and higher-value production that would propel Thailand to be a world food ‘superpower’ within two decades.

The Thai Government is set to introduce a package of reforms that would help transform the sector’s cultivation, processing and marketing techniques through new innovations, strengthening both agriculture and manufacturing, and promoting food security and innovation. The reforms will include greater focus on agricultural cooperatives and support for growers to raise product quality.

Australia and Thailand have longstanding and deep connections, and this was evident with the commemoration of the 65th anniversary of the establishment of diplomatic relations. Australia and Thailand cooperate in many areas of mutual interest, including trade and investment, law enforcement, counter-terrorism, education, security, migration and tourism.

Since moving from aid recipient to aid donor, Thailand has maintained a strong technical cooperation program that includes development projects, volunteer and expert programs, fellowships, and scholarship and training courses.

ACIAR’s current program reflects this redefined development role of Thailand. It focuses on specific issues that Thailand has technical expertise to share with its neighbouring countries—implementing Mekong regional biosecurity systems and managing Mekong fisheries, partnering regionally with Laos, Cambodia and Vietnam.

## Country priorities

Australian support to regional economic growth is in part delivered through ACIAR's strategic research interventions. In 2018-19, ACIAR's research efforts will retain an emphasis on:

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

## 2018-19 research program

ACIAR supports four projects in Thailand, all of which are part of regional projects. The projects address ACIAR's high-level objectives, as outlined in the 10-year Strategy 2018-2027, and engage with two of ACIAR's research programs.

The following sections briefly describe ACIAR-supported projects in Thailand, for each research program. Each project description is referenced to a list at the end of this section, which provides the ACIAR project code and title.

### Crops

Rice industries across Asia, including growers in Thailand, will reap future benefit from research being conducted at IRRI to identify the genetics responsible for low chalk in rice grain. The project aims to validate functional molecular markers that can routinely be used to reduce chalk in rice breeding programs.<sup>1</sup>

### Forestry

A forestry research project aims to develop appropriate biological controls for gall wasp, an insect pest of eucalypt plantations in the Mekong region, by importing and testing natural enemies of the pest from Australia. The project will focus on forests in Lao PDR, with some related work in Vietnam, Thailand and Cambodia.<sup>2</sup>

Teak is one of the most commercially important timbers in the world, due to its durability and water resistance. Illegally logged timber products, including teak, enters markets by being mixed with legitimate supply chains, with associated document fraud. Building on previous research activity that developed DNA markers for teak timber and studied teak chains of custody in Indonesia and Myanmar, similar work continues in Laos, Thailand, Myanmar, Indonesia, Solomon Islands and Papua New Guinea.<sup>3</sup>

### Global Program

Work continues on collecting detailed institutional, financial, human resource and research output data from agricultural research agencies to be included in the ASTI database, and on supporting stakeholder access to such information, analysis and support for future policy through various online tools and publications. ASTI provides open-access data and analysis on agricultural research systems in developing countries. This project will be implemented by IFPRI and APAARI, in close collaboration with the main national agricultural research institutes of the region.<sup>4</sup>

## 2018-19 project outputs

- » Capacity developed for trade and market access, by establishing remote microscopy equipment for routine use in national plant biosecurity centres in Cambodia, Lao PDR and Thailand.

## Five-year region outcomes

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

## Current and proposed projects

1. **CIM/2016/046**—Breeding for low chalk in rice
2. **FST/2012/091**—Biological control of galling insect pests of eucalypt plantations in the Mekong region
3. **FST/2016/025**—Developing DNA-based chain of custody systems for legally-sourced teak
4. **GP/2016/093**—Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific

### Regional Manager, East and South-East Asia

Ms Dulce Carandang Simmanivong

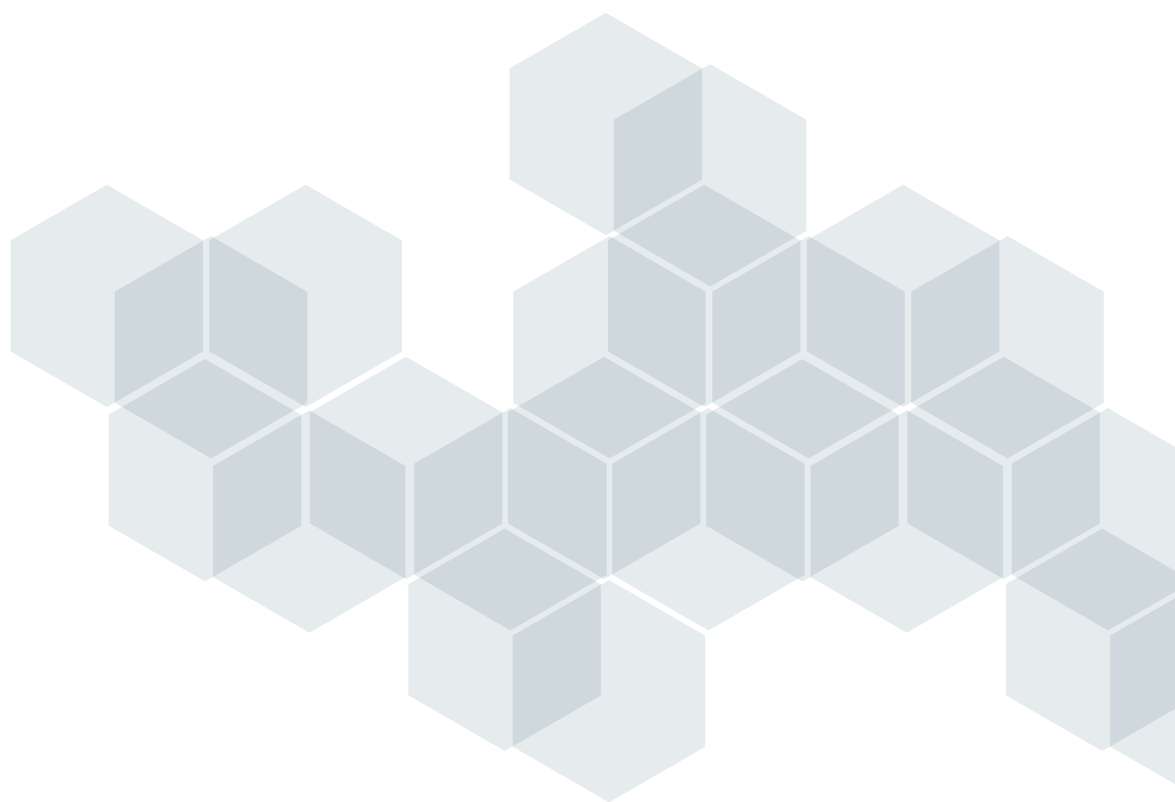
### Research Program Manager

Dr Eric Huttner, Crops

Dr Nora Devoe, Forestry

Ms Mellissa Woods, Global Program

Contact details are provided in Appendix 2



# Timor-Leste

**Table 3.20: Timor-Leste, key statistics, 2017**

Country	GDP per capita (US\$)	Population (million)
Timor-Leste	2,279	1.30

Source: data.worldbank.org/indicator.

**Table 3.21: ACIAR funding to Timor-Leste, 2016-17 to 2018-19**

Year	A\$ million
2016-17 (actual)	1.5
2017-18 (estimated actual)	1.2
2018-19 (budget)	2.4





## Country context

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**Timor-Leste is at an important moment in its history. It has achieved significant economic development, social progress and stability gains since independence, but still faces major challenges to achieve the ambitious goals set out in its Strategic Development Plan 2011–2030. These include reaching upper-middle-income status, eradicating extreme poverty and establishing a diversified non-oil economy by 2030. About 80% of households rely on agriculture activity as the major source of income and for their direct food needs, with an annual ‘hungry season’ from November to March. Timor-Leste has embarked on a program of economic diversification to reduce reliance on the oil and gas sector. This includes promoting private sector-led growth, in particular in agriculture and tourism. Despite significant gains, poverty levels remain high—particularly in rural areas where most people live. Stunting rates are among the highest in the world.**

Timor-Leste Aid Program Performance Report 2016–17 (DFAT)

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## Country priorities

Descriptions of the challenges facing the agriculture sector of Timor-Leste inevitably stray towards emphasising the seemingly insurmountable challenges facing the country. This is not surprising, given that about 80% of the population is engaged in low input–output subsistence farming.

Most rural households suffer medium to very high vulnerability as a consequence of the multiple causes of poverty. Many are on the edge of the cash economy, and face major and multiple challenges to achieving productive, profitable and resilient agriculture-based livelihoods, including very poor infrastructure, very low access to information, inputs and markets, and high vulnerability to climate variability and degraded natural resources.

Young people are moving from rural areas to the towns and the capital, Dili, where more than 30% of the population now lives. This is creating new problems in rural areas, including an ageing population, and lack of incentives to increase agricultural production.

An ongoing challenge for the food crops sector in Timor-Leste is the ability to sustainably increase production of the main staples as well as diversifying into higher nutrition crops, especially legumes. Livestock production is widespread, with more than 90% of households managing multiple types of animals. Traditional management systems and poor market access mean that farmers tend to maximise the numbers of unproductive animals. While these challenges are very substantial, there are many opportunities to improve rural livelihoods through research addressing productivity, sustainability and marketing of agricultural and livestock products.

An earlier ACIAR program (Seeds of Life) demonstrated this through research that identified new high-yielding varieties of staple food crops. By 2016, about 65,000 farming households had adopted these varieties. The new crop varieties showed substantially higher yields over local varieties in all 13 of the nation’s districts. Yields on farmer fields rose by 50% for maize, 54% for peanut, 40% for cassava, 24% for rice and an impressive 130% for sweetpotato.

Farmers are also rapidly adopting improved mungbeans and climbing beans released in 2016. These results show what can be achieved through long-term research partnerships with Timor-Leste.

ACIAR is maintaining a program of research collaboration with Timor-Leste. It is characterised by programs with a long-term view and a strong focus on capacity and partnership development. In 2019, ACIAR will develop a plan for research collaboration with Timor-Leste through to 2029.



## 2018–19 research program

ACIAR supports six projects in Timor-Leste, five of which are specific to this country. The projects address ACIAR's high-level objectives, as outlined in the 10-year Strategy 2018–2027, and engage with four of ACIAR's research programs.

The following sections briefly describe ACIAR-supported projects in Timor-Leste, for each research program. Each project description is referenced to a list at the end of this section, which provides the ACIAR project code and title.

### Crops and Soil and Land Management

A project, managed under two ACIAR research programs (Crops and Soil and Land Management) is helping farmers in Timor-Leste change from subsistence to income-generating farming. Research will focus on cropping intensification to produce legumes and grain for an emerging stock and food processing industry, and non-timber, native tree products (fodder tree legumes and sandalwood) to diversify farm income, and act as a buffer to climate variability.

The project will improve agricultural productivity and profitability in pilot communities, by addressing technical and social impediments to annual crop intensification and establishment of fodder tree legumes and sandalwood. This will provide a sustainable income source, while sustainable land management will halt or reverse land degradation. These approaches will contribute to environmental sustainability and increase rural incomes. The research will be undertaken in two agro-ecological zones, covering a quarter of the country's population.<sup>1</sup>

### Fisheries

A new project seeks to optimise the role of fish in addressing nutrition insecurity in Timor-Leste and the Nusa Tenggara Timur province of Indonesia, by looking at ways to promote nutrition-sensitive fisheries management policy in each country context. The project will determine the importance of fish in women's and men's livelihoods, focusing on two fishery case studies with high nutritional value—fish-aggregating device fishing and intertidal gleaning.

By evaluating the nutritional value of these fisheries to households, and working to identify the factors enabling or limiting the consumption of fish, the project aims to highlight the potential of fish to reduce malnutrition, particularly during early childhood. Through a south-south collaboration the lessons learned in Indonesia from its extensive commercial fish-aggregating device industry will be used to guide policy development in Timor-Leste for sustainable inshore management that benefits poor households.<sup>2</sup>

### Global Program

Work continues on collecting detailed institutional, financial, human resource and research output data from agricultural research agencies to be included in the ASTI database, and on supporting stakeholder access to such information, analysis and support for future policy through various online tools and publications. ASTI provides open-access data and analysis on agricultural research systems in developing countries. This project will be implemented by IFPRI and APAARI, in close collaboration with the main national agricultural research institutes of the region.<sup>3</sup>

### Livestock Systems

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

The vast majority of cattle producers in Timor-Leste use extensive grazing systems to grow cattle as a way to retain and accumulate capital. But strong and increasing demand for beef from urban areas is providing opportunities for farmers to sell fat cattle to these markets. A project supports this transition, 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>4</sup>

Another project is focusing on pig health and husbandry, particularly the management of classical swine fever, which is endemic in Timor-Leste and most of Indonesia. This project aims to improve the livelihoods of households in villages in Timor-Leste through improved smallholder pig husbandry and production.<sup>5</sup>

A small research activity is working to identify husbandry practices that can be practically applied by smallholder pig farmers to improve pig production. A detailed understanding of current husbandry practices and possible feeds will be gained through literature reviews, a survey, interviews, focus group discussions and field trips. Possible modifications to current husbandry practices were identified, and preliminary trials of these practices have been undertaken with smallholder farmers in Bobanaro and Baucau. Close involvement in these trials will provide farmers and other participants with practical hands-on training in pig husbandry. The results will inform pig programs over the next four to five years by ACIAR and the Farming for Prosperity Program in Timor-Leste.<sup>6</sup>

## 2018–19 project outputs

- » Small-scale irrigation for cropping in the dry season tried and evaluated.
- » Effect of biochar on yield of diverse crops evaluated.
- » Current land-use practices and potential to intensify cropping assessed in two livelihood zones.
- » Nutrition-sensitive fisheries management policy recommendations delivered.
- » Initial research sites assessed and selected for suitability for forage tree legume and sandalwood agroforestry.
- » Partnerships established to start a project to improve smallholder pig-production systems in Timor-Leste.
- » Effective beef systems development groups established that drive beef cattle production and marketing in their districts.
- » National and regional understanding of management options for major pig diseases increased.

## Five-year region outcomes

- » Establishment of community-based land-use planning to sustainably intensify agricultural production.
- » Increased national and regional understanding of management options for major livestock diseases.
- » Increased value of agricultural production.

## Current and proposed projects

1. **CIM/2014/082**—Agricultural innovations for communities for intensified and sustainable farming systems in Timor-Leste (AI-Com)
2. **FIS/2017/032**—Improved food security nutrition outcomes from sustainable coastal fisheries development in Timor-Leste and Nusa Tenggara Timur Province, Indonesia
3. **GP/2016/093**—Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific
4. **LPS/2014/038**—Smallholder cattle enterprise development in Timor-Leste
5. **LS/2012/065**—Investigating and improving pig health and husbandry in Timor-Leste
6. **LS/2017/102**—Identifying husbandry options for smallholder pig farmers in Timor-Leste

### Country Manager

For country enquiries, contact Dr Peter Horne

### Research Program Managers

Dr Eric Huttner, Crops

Dr Ann Fleming, Fisheries

Ms Mellissa Wood, Global Program

Dr Werner Stur/Dr Anna Okello, Livestock Systems

Dr Robert Edis, Soil and Land Management

Contact details are provided in Appendix 2

# Vietnam

**Table 3.22: Vietnam, key statistics, 2017**

Country	GDP per capita (US\$)	Population (million)
Vietnam	2,343	95.54

Source: [data.worldbank.org/indicator](http://data.worldbank.org/indicator).

**Table 3.23: ACIAR funding to Vietnam, 2016-17 to 2018-19**

Year	A\$ million
2016-17 (actual)	4.9
2017-18 (estimated actual)	5.1
2018-19 (budget)	5.6





## Country context

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**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 uncompetitively wedged 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. Ethnic minorities still have not benefitted equally from economic growth—although they comprise just 15% of the population, they account for around half of those living in poverty.**

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

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Vietnam ended 2017 with a growth rate of 6.8%, the highest since 2011. Agriculture remains the third largest contributor to the economy, and accounts for 15.3% of the current GDP, despite the negative impacts from multiple severe floods and storms across the country during the year. Export value of agricultural, especially horticultural, products has increased, due to better quality management and market development.

There have been positive changes in the sector, especially for the two national targeted programs aimed at sustaining agricultural production and increasing the prosperity of farmers in rural areas—agricultural restructuring and new rural development programs.

Food safety is an important concern in Vietnam, and efforts are being made to ensure safe production, partly because of the more stringent quality demands for exported products. Organic farming is increasingly practised throughout the country.

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

The companies are considered a catalyst for high-tech/internet-of-things applications, which trigger agriculture development for Vietnam.

ACIAR continues to be part of the Australian Government’s commitment to development in Vietnam, which underlines equal partnerships in economic growth, security and innovations.

ACIAR’s Vietnam program is well aligned with Vietnam’s agricultural priorities under the Science and Technological Co-operation Treaty 2014, focusing on agriculture, aquaculture, food security, environment and natural resource management.

It also supports the DFAT Aid Investment Plan 2015-16 to 2019-20 in Vietnam, which aims to:

- » enable and engage the private sector for development
- » assist the development and employment of a highly skilled workforce
- » promote women’s economic empowerment, including ethnic minorities.

ACIAR works closely with the Department of Agriculture and Water Resources, and has actively been participating in the Vietnam–Australia Agricultural Forum.

## Country priorities

ACIAR and Vietnam recently signed a strategy for research collaboration for 2017–2027. The strategy is founded on a mutual recognition that the relationship between ACIAR and Vietnam has grown from donor–recipient to partnership, to co-investment, and, possibly, through this period, to trilateral collaboration.

The strategy expresses the desire of both parties to join with the private sector, wherever possible, to catalyse opportunities for poor residents of rural and urban areas through inclusive agribusiness systems. It also highlights a strong focus on transformational opportunities for women in research, agribusiness systems and on farms.

The strategy's 10-year goals include to:

- » establish and sustain long-term international partnerships in research and technology development
- » improve capacity of Vietnam researchers, research managers and development partners to support sustainable and equitable growth through agricultural research
- » improve the skills, livelihoods and incomes of smallholder farmers, including ethnic minorities in mountainous areas of Tay Nguyen and Tay Bac, supported by knowledge networks that allow profitable engagement in domestic and international markets
- » improve human health and nutrition through research on integrated farming systems, nutrition-sensitive agriculture and one health
- » improve quality and safety of meat, fish, vegetables and fruit for domestic consumption
- » develop deeper knowledge of markets that help prevent and reduce economic shocks for participants in the agricultural supply chains
- » reduce inputs of chemicals and fertiliser for a cleaner environment, safer produce, improved soil health, and more profitable sustainable production systems
- » improve resource use efficiency, producing more food with fewer resources
- » implement practices and inform policy-makers to manage climate change impacts in agriculture.

The strategy focuses on the six research themes/sectors of:

- » 1. food safety
- » 2. climate change
- » 3. soil fertility and efficiency of crop-livestock systems
- » 4. market knowledge, access to markets, and skills for better policy analyses
- » 5. use of value from forests
- » 6. aquaculture.

The research themes are focused on Mekong Delta, Central Highlands and North West. While Mekong Delta and Central Highlands have capacity for exporting agricultural products, they face climate change challenges, and share challenges for development—including sloping land conservation, generating better livelihoods for ethnic minorities and economically empowering women. Marine aquaculture research will occur along the coastal line, while forestry research on the plantation and value-added processing might occur across the country. More details on these research themes are available at <[vietnam.embassy.gov.au/hnoi/ACIAR\\_Strategy.html](http://vietnam.embassy.gov.au/hnoi/ACIAR_Strategy.html)>

## 2018–19 research program

ACIAR supports 38 projects in Vietnam, 13 of which are specific to this country, and the remainder are part of regional projects. The projects address ACIAR's high-level objectives, as outlined in the 10-year Strategy 2018–2027, and engage with eight of ACIAR's research programs.

The following sections briefly describe ACIAR-supported projects in Vietnam, for each research program. Each project description is referenced to a list at the end of this section, which provides the ACIAR project code and title.

### Agricultural Development Policy

In Vietnam and Laos, a project is identifying public policy options to develop forest plantations—by supporting linkages between industry and smallholder producers—and to support the contribution of forest plantations to rural livelihoods, poverty alleviation and environmental sustainability.<sup>1</sup>

Another project is developing capacity in policy analysis and engaging with key stakeholders and policy-makers to improve food safety in Vietnam's local and international markets. Foodborne illness is a major public health issue across the East Asian region, and particularly in Vietnam, and food safety risks are likely to increase with rapid intensification of animal food production systems and urbanisation.<sup>2</sup>

A new short research activity aims to facilitate more robust business activity in the agriculture sector in Vietnam, and increase investment in agriculture by the private sector over the longer term, by proposing changes to existing government policies and/or proposing new policies. This project complements an existing review by the Ministry of Planning and Investment of agricultural policies.<sup>3</sup>

### Agribusiness

Several projects in Vietnam aim to increase the productivity, profitability and sustainability of agricultural production, through market research, market development and value-chain analysis. These projects aim to ensure all farmers have equitable access to opportunities in Vietnam to engage with a growing global economy.

Focusing on women and ethnic minorities in north-western Vietnam, opportunities for smallholder vegetable farmers are being identified through comprehensive market analysis, testing of valuechain and postharvest interventions, and determining best management practices.<sup>4</sup>

A similar approach is being taken by a project in southern Vietnam to improve net income and livelihoods of smallholder mango growers, by identifying opportunities in the fresh and processed mango value chain. The project also aims to overcome selected barriers to competitiveness and emphasise understanding of the roles and opportunities for women in the industry.<sup>5</sup>

A project in Vietnam and Indonesia aims to make smallholder cassava production more profitable and sustainable, by linking value-chain actors to increase the adoption of improved technologies.<sup>6</sup>

Building on earlier research and market development in the Moc Chau district of Vietnam, a project focuses on upscaling off-season vegetable production systems in Vietnam and Myanmar, for the supply of safe produce into urban, wholesale and retail markets.<sup>7</sup>

Five small research activities apply a strategic agribusiness approach to mango research and development in the Asia-Pacific region. In addition to undertaking targeted pilot research and scoping studies, the small research activities will have an important function to create networks, and to engage and collaborate with multiple Australian and key Asia-Pacific research, government and industry partners.

The objectives of the mango agribusiness projects are to:

- » improve communication, collaboration and capacity development (information access)<sup>8</sup>
- » identify market development opportunities and implications in China<sup>9</sup>
- » identify strategic research and development opportunities (particularly for biosecurity) for market entry<sup>10</sup>
- » evaluate opportunities for improving mango quality<sup>11</sup>
- » identify priority opportunities in fruit processing in selected mango markets.<sup>12</sup>

The rapid expansion of growing area for cassava has been closely followed by the emergence of certain pests and diseases, as a result of unchecked transfer of planting materials. A small research project will develop an emergency response and long-term management strategy for cassava mosaic virus in Cambodia and Vietnam.<sup>13</sup>

Another set of projects will address various aspects of understanding and improving market opportunities in Vietnam, and neighbouring countries for some projects. These projects will:

- » examine innovative and inclusive financing of agricultural value chains in Vietnam, Indonesia and Myanmar<sup>14</sup>
- » develop a beef trade model and information network in Vietnam and neighbouring countries<sup>15</sup>
- » integrate gender and social inclusion into agricultural value-chain research in Vietnam<sup>16</sup>
- » increase smallholder linkages to markets, by optimising transport and logistics infrastructure.<sup>17</sup>

### Crops

Rice industries across Asia, including growers in Vietnam, will reap future benefit from research being conducted at IRRI to identify the genetics responsible for low chalk in rice grain. The project aims to validate functional molecular markers that can routinely be used to reduce chalk in rice breeding programs.<sup>18</sup>

## Fisheries

ACIAR's aquaculture program in Vietnam has been tailored to complement the Vietnamese Government's significant investment in research infrastructure and staff development for aquaculture. The program focuses on capacity building in key skill areas (genetics and husbandry), as well as the timely transfer and adaptation of suitable aquaculture technologies. Project outputs will benefit industries throughout the Indo-Pacific region, including Australia.

Before 2007, oyster farming in Vietnam was not established. Now, Vietnam produces more than 15,000 tonnes of oysters annually, and oyster farming has spread across 28 provinces. Demand for oysters in the domestic market has increased rapidly, and has a great potential for export.

The rapid development of oyster farming has been driven by the contribution from ACIAR's fisheries research program. Community involvement is growing, and the processing and marketing sectors are expanding.

Currently, an estimated 70% of oysters in Vietnam are raised by smallholder farmers in coastal areas, especially in Hai Phong and Quang Ninh. Several large commercial companies have also seized the opportunity in this sector, and there are private farms specialising in commercial seed production.

Oyster farming has created about 3,000 jobs, including those working in the processing and marketing sectors. A follow-on project aims to increase hatchery-based bivalve production in Vietnam and New South Wales, Australia, to expand opportunities for coastal communities to rear bivalve molluscs.<sup>19</sup> With similar aims to the oyster project, another project is working to scale up community-based sea cucumber culture in Vietnam and the Philippines.<sup>21</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>20</sup>

Production of cultured half-pearls (mabé) provides significant opportunities for coastal communities to generate an income. Oysters used for mabé production are found in Vietnam, but they are not used for mabé or handicraft production, despite a considerable tourist market.





Using expertise developed in Tonga, this project will assess the feasibility of establishing community-based mabé culture in the Nha Trang area of Vietnam in partnership with the Ministry of Fisheries, Research Institute for Aquaculture.<sup>22</sup>

### Forestry

Vietnam has about two million hectares of Australian eucalyptus and acacia plantations that supply major processing industries and export markets, generating substantial income for smallholder plantation owners and the people engaged in forest industries. ACIAR's forestry program adds value to these industries through several research and development projects.

One project aims to develop appropriate biological controls for gall wasp, an insect pest of eucalypt plantations in the Mekong region, by importing and testing natural enemies of the pest from Australia. The project will focus on forests in Lao PDR, with some related work in Vietnam, Thailand and Cambodia.<sup>23</sup>

A project in Vietnam and Indonesia will help growers of short rotation eucalypt and acacia plantations to improve productivity and profitability. Acacias have been a plantation species of choice in both countries, but bacterial wilt and root rot diseases threaten productivity. Project work will continue to show the benefits and limitations of eucalypts as replacement for acacias.<sup>24</sup>

Another project in Vietnam and Indonesia also focuses on health of acacia plantations, to reduce the impacts of two very damaging fungal diseases (*Ganoderma* and *Ceratocystis*) that affect acacia plantations throughout South-East Asia.<sup>25</sup>

Research will continue on the development and adoption of locally-appropriate market-based agroforestry systems and rehabilitation of degraded forests in north-western Vietnam. The project works closely with the Department of Agricultural and Rural Development offices in Son La, Yen Bai and Dien Bien provinces to implement 'exemplar landscapes' to support adoption of the new systems, and improve livelihood options for the H'mong and Thai ethnic minorities living in these provinces.<sup>26</sup>

### Global Program

Work continues on collecting detailed institutional, financial, human resource and research output data from agricultural research agencies to be included in the ASTI database, and on supporting stakeholder access to such information, analysis and support for future policy through various online tools and publications. ASTI provides open-access data and analysis on agricultural research systems in developing countries. This project will be implemented by IFPRI and APAARI, in close collaboration with the main national agricultural research institutes of the region.<sup>27</sup>

### Livestock Systems

Market demand for beef is increasing rapidly in Vietnam, but cannot be met by current levels of domestic production. A project is investigating and implementing whole-farm solutions for smallholder cattle producers in the highlands of north-west Vietnam to shift from extensive to more intensive production systems, so that they can meet market specifications, increase market linkages and improve profitability of smallholder farmers.<sup>28</sup>

Similarly, demand for goat meat in Vietnam is high, and the goat population of Vietnam has trebled over the past 10 years. A small research activity will deliver models for goat production and marketing systems to capitalise on strong opportunities, and create market linkages for smallholder farmers in areas of Lao PDR to high-value markets in Vietnam.<sup>29</sup> Following on from this research, a new project will develop new goat production practices that are sustainable and productive, recognising that expanded goat production using traditional extensive goat raising methods would result in overgrazing of feed resources, negative consequences for the environment and higher incidence of diseases and parasites in livestock.<sup>32</sup>

Asia is a major global producer of pork, with South-East Asia and southern China currently providing the majority of regional production. Several projects look to improve smallholder pig enterprises through better product quality and production systems.

Food safety is a significant and growing concern in Vietnam, and presents a barrier to smallholder farmers wishing to sell product in high-value domestic and export markets. Through market-based approaches the Safe Pork project aims to reduce the burden of foodborne disease across various markets in Vietnam.<sup>31</sup>

Credible, consolidated and easy-to-access knowledge underpins improvements to livestock production. A small project continues to update the on-line tool, SoFT (Selection of Forages for the Tropics), ensuring that researchers and development professionals in developing countries have access to the latest information on forages.<sup>30</sup>

### Soil and Land Management

The ACIAR Soil and Land Management Research Program addresses various issues in Vietnam, with the common aim of sustainable resource management to improve livelihoods and productivity.

A short research activity in 2018-19 will seek to understand the current status of inoculant production, distribution and use in the Greater Mekong subregion. The findings will clarify anecdotal evidence of a decline in the use, efficacy and production standards of inoculants that increase nutrient acquisition, particularly, but not limited to, rhizobia and mycorrhizae inoculants. The project will also identify the potential application of recent advances in inoculant delivery.<sup>33</sup>

The productivity and sustainability rice-shrimp farming systems in the Mekong Delta of Vietnam is threatened by increasing salinity caused by changing environmental conditions and riverine and tidal flow regulation. Shrimp production is also reduced through recurrent disease outbreaks exacerbated by stocking of poor-quality post-larvae. A project is testing a re-designed rice-shrimp farming system and new varieties of salt-resistant rice. Farm management and institutional arrangements are also being assessed to determine their influence on the productivity of new rice-shrimp farming systems.<sup>34</sup>

Improving the productivity and sustainable management of low-fertility sands through improved water and nutrient-use efficiency, and reduced exploitation and contamination, are common priorities for south-central coastal Vietnam and Western Australia. A project is looking to improve planning, regulation and use of groundwater, by developing a groundwater model and technologies to increase productivity.<sup>35</sup>

Increasing numbers of smallholder farmers in Laos and northern Vietnam are growing maize on sloping land to meet demand for concentrate livestock feeds by Chinese and South-East Asian poultry, pig and cattle industries. A project is helping farmers adopt maize-based farming systems that reduce soil degradation, while improving smallholder livelihoods and economic viability.<sup>36</sup>

### Water and Climate

A new project is assessing ways to reduce agricultural emissions in the Asia-Pacific, and offset methods appropriate to developing countries (using Fiji and Vietnam as pilot examples). The project leverages the success of Australian emissions accounting, carbon farming offset methods and emission-reduction research in the agricultural and land sectors. It will develop a governance checklist enabling user countries to identify, adopt and manage locally appropriate emission-reduction options. It will also provide a detailed analysis of potential cobenefits to food security and existing capacity gaps to using carbon farming methods or emission-reduction options in Fiji and Vietnam, in delivering to their commitments under the Paris Agreement (COP21).<sup>37</sup>

### 2018-19 project outputs

- » Preliminary recommendations provided for improved market linkages, productivity, food safety, group governance and household livelihoods in smallholder vegetable and temperate fruit systems.
- » Knowledge of existing agricultural development policies for food security in Vietnam increased.
- » One integrated agriculture and forestry systems land-use plan prepared by a multisector planning forum in North-West Vietnam.
- » Research partnerships initiated to improve smallholder incomes in the north-western highlands region, through identifying improved market information, market access and value-chain competitiveness for high-value fruits and vegetables.
- » Opportunities and constraints for smallholder production and marketing of cassava in different agro-economic settings assessed.

- » Hatchery production and farming techniques for edible oysters made available, and large-scale industry development supported.
- » Culture methods for mabé production made available, and the feasibility of community-based handicraft production assessed.
- » Pond-based sea cucumber production methods developed, and market analysis help farmers maximise income.
- » Hatchery guidelines for giant grouper made available, and research capacity of fisheries organisations strengthened.
- » A regional model created to develop an understanding of the flow of beef products and beef cattle.
- » Potential incentive-based approaches to reduce risks associated with pig diseases and porkborne illnesses in pork value chains documented.
- » Competitiveness of smallholder pig producers in north-western Vietnam assessed.
- » A greater understanding of inoculant use and production gained, with potential future application of the technology in the Greater Mekong subregion.
- » A program to improve agricultural productivity and sustainability on sloping lands in the northwestern highlands started.
- » The use of digital data collection applications explored.

### Five-year region outcomes

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

#### Country Manager, Vietnam

Ms Nguyen Thi Thanh An

#### Research Program Managers

To be appointed, Agribusiness

Dr Eric Huttner, Crops

Dr Ann Fleming, Fisheries

Dr Nora Devoe, Forestry

Ms Mellissa Wood, Global Program

Dr Werner Stur/Dr Anna Okello, Livestock Systems

Dr Robert Edis, Soil and Land Management

Dr Robyn Johnston, Water and Climate

For information about Agricultural Development Policy projects, contact Dr Daniel Walker

Contact details are provided in Appendix 2

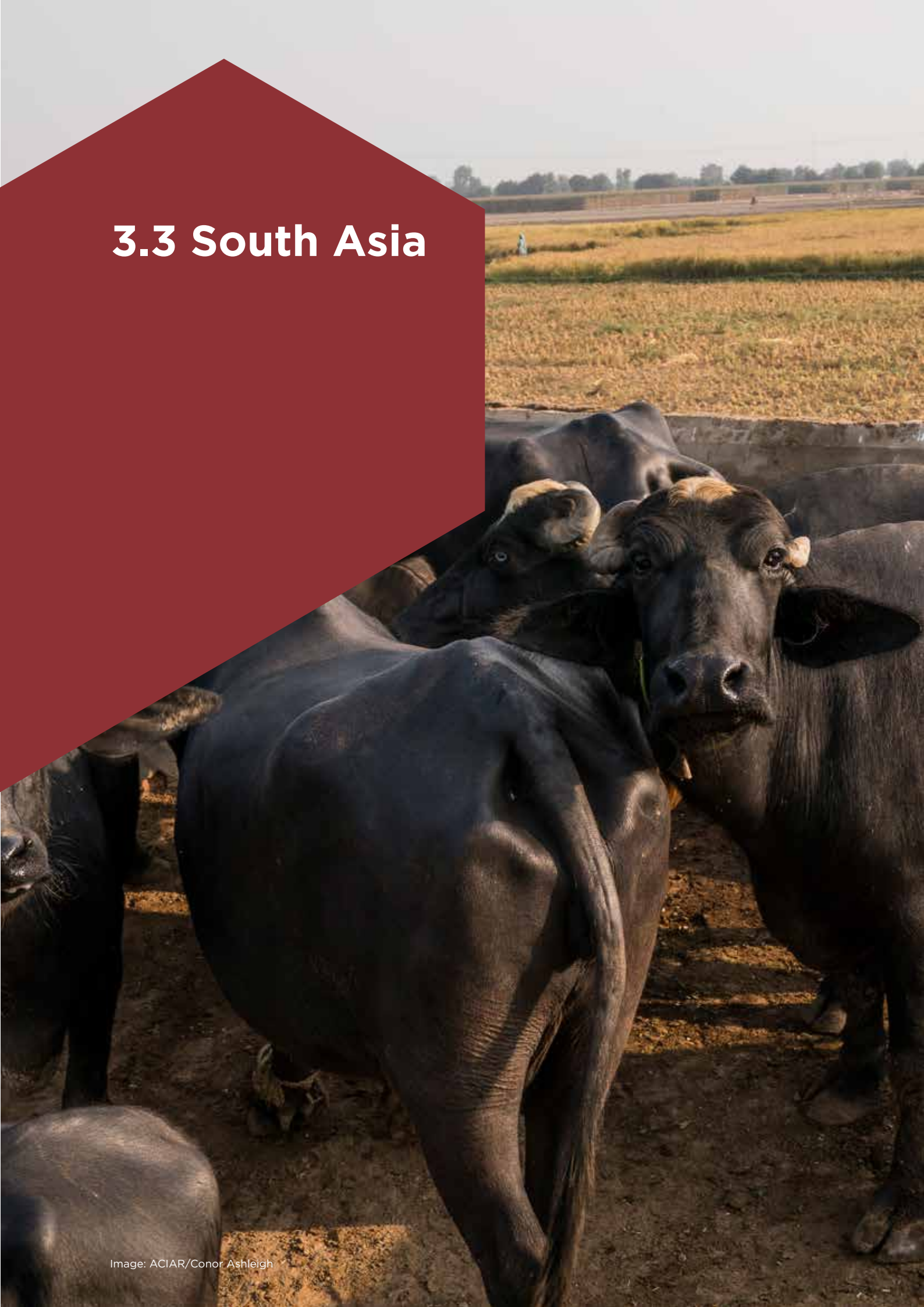


## Current and proposed projects

1. **ADP/2014/047**—Improving policies for forest plantations to balance smallholder, industry and environmental needs in Lao PDR and Vietnam
2. **ADP/2016/140**—Policy analysis of food safety and trade in Vietnam
3. **ADP/2018/120**—Evaluating and improving policies for attracting investment in the agricultural sector in Vietnam
4. **AGB/2012/059**—Towards more profitable and sustainable vegetable production systems in north-western Vietnam
5. **AGB/2012/061**—Improving smallholder farmer incomes through strategic market development in mango supply chains in southern Vietnam
6. **AGB/2012/078**—Developing value-chain linkages to enhance the adoption of profitable and sustainable cassava production systems in Vietnam and Indonesia
7. **AGB/2014/035**—Improving livelihoods in Myanmar and Vietnam through vegetable value chains
8. **AGB/2016/006**—Supporting access to mango research information, communication, collaboration and capacity development
9. **AGB/2016/007**—Challenges and opportunities for meeting requirements of China mango markets
10. **AGB/2016/008**—Opportunities and strategies to improve biosecurity, market access and trade for selected mango markets
11. **AGB/2016/009**—Enhancing mango fruit quality in Asian mango chains
12. **AGB/2016/010**—Priority opportunities in tropical fruit processing in selected mango markets
13. **AGB/2016/032**—Developing an emergency response and long-term management strategy for cassava mosaic virus in Cambodia and Vietnam
14. **AGB/2016/163**—Innovative and inclusive agriculture value-chain financing
15. **AGB/2016/196**—Sustainable and inclusive development of the cattle and beef industry in South-East Asia and China
16. **AGB/2017/008**—Integrating gender and social inclusion into agricultural value chain research in Vietnam
17. **AGB/2017/036**—Enhancing smallholder linkages to markets by optimising transport and logistics infrastructure
18. **CIM/2016/046**—Breeding for low chalk in rice
19. **FIS/2010/100**—Enhancing bivalve production in northern Vietnam and Australia
20. **FIS/2012/101**—Developing technologies for giant grouper (*Epinephelus lanceolatus*) aquaculture in Vietnam, the Philippines and Australia
21. **FIS/2016/122**—Increasing technical skills supporting community-based sea cucumber production in Vietnam and the Philippines
22. **FIS/2016/126**—Half-pearl industry development in Tonga and Vietnam
23. **FST/2012/091**—Biological control of galling insect pests of eucalypt plantations in the Mekong region
24. **FST/2014/064**—Maximising productivity of eucalyptus and acacia plantations for growers in Indonesia and Vietnam
25. **FST/2014/068**—Management strategies for acacia plantation diseases in Indonesia and Vietnam
26. **FST/2016/152**—Developing and promoting market-based agroforestry and forest rehabilitation options for north-western Vietnam
27. **GP/2016/093**—Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific
28. **LPS/2015/037**—Intensification of beef cattle production in upland cropping systems in north-western Vietnam
29. **LPS/2016/027**—Assessing goat production and marketing systems in Lao PDR and market linkages into Vietnam
30. **LPS/2016/097**—Update of SoFT (selection of forages for the tropics)
31. **LS/2016/143**—Safe pork: market-based approaches to improving the safety of pork in Vietnam
32. **LS/2017/034**—Smallholder goats systems and marketing in Lao PDR and Vietnam
33. **SLaM/2018/123**—Assessment of biofertilisers for enhancing agriculture in Mekong region countries
34. **SMCN/2010/083**—Improving the sustainability of rice–shrimp farming systems in the Mekong Delta, Vietnam
35. **SMCN/2012/069**—Integrated water, soil and nutrient management for sustainable farming systems in south-central coastal Vietnam and Australia
36. **SMCN/2014/049**—Improving maize-based farming systems on sloping lands in Vietnam and Lao PDR
37. **LWR/2017/029**—Emission-reduction options for nationally determined contributions (NDCs) in the Asia-Pacific region, Fiji and Vietnam



## 3.3 South Asia





## Regional program summary

The South Asia research program for ACIAR involves a set of Indian Ocean Rim countries—Afghanistan, Bangladesh, India, Nepal, Pakistan and Sri Lanka— that are strategically important for Australia, which is also part of the Indian Ocean Rim.

Through various associations and forums, there is potential for Indian Ocean Rim countries to collectively address and work on issues, such as maritime safety and security, trade and investment, fisheries management, disaster relief management, academic, scientific and research exchanges, and tourism and cultural exchanges.

South and West Asia have the highest concentration of poor people in the world, with more than 500 million people 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 highest regional Global Hunger Index and a very low Human Development Index. Half of the total population of 1.5 billion depends on agriculture for its livelihood.

Countries in South and West Asia have a low level of integration within the region, despite common historical, geographical, cultural and socioeconomic characteristics. This restricts 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 is the key institution facilitating economic and political cooperation, but it has had limited success in the region.

By contrast, subregional cooperation, such as the Bangladesh, Bhutan, India, Nepal Initiative, has gained some momentum in the infrastructure and energy sector. India and ASEAN have completed five years of strategic partnership, and there is a renewed interest in collaboration in various sectors, including agriculture.

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 and South Asia Regional Trade Facilitation Program. Gender equality will be a focus in all the investments under the regional program.

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

There are significant opportunities to improve the productivity and diversification of agricultural crops, especially beyond cereals, and to improve the sustainability of farming systems through technical, institutional, value-chain and policy research and development.

Climate change makes smallholders vulnerable to risks that will significantly reduce their incomes. Countries in South Asia and Australia share similar challenges to growth of agricultural productivity, including drought and water management, and constraints to production of food grain and livestock.

Australian agricultural and resource management expertise is highly regarded in the region, and there would be significant benefits from long-term research-for-development partnerships to deliver technologies for the farmers of South Asia and Australia. In this connection, ACIAR has a long and strong history of research and development in improving crop productivity, water use efficiency and policy reforms.

ACIAR's regional strategy in South Asia focuses on communities, production systems and resource management in the three main ecosystems of the region—highlands, plains and coastal areas, which are common to Pakistan, India, Bangladesh and Nepal.

Research in these areas looks to identify appropriate reform policy, increase adoption of technology, improve productivity and livelihoods in marginalised communities and improve productivity of crop, livestock and forestry systems.

## ACIAR-supported projects in the South Asia region

The list starting on page 120 contains all current and proposed ACIAR-supported projects in South Asia during 2018–19. Some of these operate at one or more sites in a single country, but many have sites at several countries in the region. In some instances, projects in this region are part of a large research program, conducted across more than one of the four regions in which ACIAR operates.

ACIAR assigns an identification code to each project, which appears at the start of each project listed, and indicates the research program under which the project is managed. This code is also used to identify projects in other reports and publications.

In the subsequent country sections of this chapter, each project underway in that country is described briefly, and expected activities, outputs and outcomes of the ACIAR research program in that country are presented.



Image: ACIAR/Conor Ashleigh

# Current and proposed regional projects in the South Asia region

## Agricultural Development Policy

**ADP/2014/043**—Policy and institutional reforms to improve horticultural markets in Pakistan [Pakistan, China]

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

**ADP/2016/028**—Creating wealth for women in Pakistan

**ADP/2017/004**—Developing modern value chains to increase pulses supply in Pakistan

**ADP/2017/024**—Facilitating inclusive rural regional transformation: sharing experiences and lessons in Bangladesh, China, Indonesia and Pakistan

## Agribusiness

**AGB/2016/006**—Supporting access to mango research information, communication, collaboration and capacity development [Indonesia, Pakistan, Philippines, Vietnam]

**AGB/2016/007**—Challenges and opportunities for meeting requirements of China mango markets [Indonesia, Pakistan, Philippines, Vietnam]

**AGB/2016/008**—Opportunities and strategies to improve biosecurity, market access and trade for selected mango markets [Indonesia, Pakistan, Philippines, Vietnam]

**AGB/2016/009**—Enhancing mango fruit quality in Asian mango chains [Indonesia, Pakistan, Philippines, Vietnam]

**AGB/2016/010**—Priority opportunities in tropical fruit processing in selected mango markets [Indonesia, Pakistan, Philippines, Vietnam]

## Crops

**CIM/2011/026** (multilateral, CIMMYT)—Sustainable wheat and maize production in Afghanistan

**CIM/2014/076**—Incorporating salt-tolerant wheat and pulses into smallholder farming systems in southern Bangladesh

**CIM/2014/079**—Establishing the international mungbean improvement network [Bangladesh, India, Myanmar]

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

**CIM/2015/041**—Increasing productivity and profitability of pulse production in cereal-based cropping systems in Pakistan

**CIM/2016/039**—Insect tolerant chickpea for Bangladesh

**CIM/2016/046**—Breeding for low chalk in rice [Bangladesh, India, Indonesia, Myanmar, Philippines, Thailand, Vietnam]

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

**CIM/2016/219**—Identification of sources of resistance to wheat blast and their deployment in wheat varieties adapted to Bangladesh

**CSE/2011/077**—Sustainable and resilient farming system intensification in the Eastern Gangetic Plains (SRFSI) [Bangladesh, India, Nepal]

**CSE/2012/108**—Understanding farm-household management decision-making for increased productivity in the Eastern Gangetic Plains [Bangladesh, India, Nepal]

**CSE/2017/101**—Value-chain and policy interventions to accelerate adoption of Happy Seeder zero tillage in rice-wheat farming systems across the Gangetic Plains [Bangladesh, India]

## Fisheries

**FIS/2017/002**—Assessing production of giant freshwater prawns in reservoirs in Sri Lanka

**FIS/2018/157**—Improved productivity and efficiency of the culture-based fishery for giant freshwater prawn in Sri Lankan reservoirs

## Forestry

**FST/2017/037**—Enhancing livelihoods from improved forest management in Nepal

## Horticulture

**HORT/2016/012**—Strengthening vegetable value chains in Pakistan for greater community livelihood benefits

## Livestock Systems

**AH/2012/021** (multilateral, ICARDA)—Forage options for smallholder livestock in water-scarce environments of Afghanistan

**LPS/2016/011**—Improving smallholder dairy and beef profitability by enhancing farm production and value-chain management in Pakistan

**LPS/2016/022**—Potential of new Australian old man saltbush varieties to fill ruminant feed gaps in arid and saline areas of Pakistan

**LPS/2016/096**—Smallholder goat value chains in Pakistan: challenges and research opportunities

**LS/2018/105**—Enhancing small-ruminant production to benefit farming families in Sindh and Punjab, Pakistan

## Water and Climate

**LWR/2008/047** (multilateral, ICARDA/ICRISAT)—Integrated catchment management and capacity building for improving livelihoods in Afghanistan

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

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

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

**LWR/2014/074**—Developing approaches to enhance farmer water management skills in Balochistan, Punjab and Sindh, Pakistan

**LWR/2017/027**—Improving salinity and agricultural water management in the Indus Basin of Pakistan

**LWR/2015/036**—Improving groundwater management to enhance agriculture and farming livelihoods in Pakistan

**LWR/2016/136**—Nutrient management for diversified cropping in Bangladesh (NUMAN)

**LWR/2018/104**—Institutions to support intensification, integrated decision-making and inclusiveness in agriculture in the Eastern Gangetic Plains [Bangladesh, India, Nepal]

**LWR/2018/111**—Pilot project on commercialisation of smallholders' conservation agriculture-based planters in Bangladesh



# Afghanistan

**Table 3.24: Afghanistan, key statistics, 2017**

Country	GDP per capita (US\$)	Population (million)
Afghanistan	586	35.53

Source: [data.worldbank.org/indicator](http://data.worldbank.org/indicator).

**Table 3.25: ACIAR funding to Afghanistan, 2016-17 to 2018-19**

Year	A\$ million
2016-17 (actual)	3.1
2017-18 (estimated budget)	0.5
2018-19 (budget)	0.1





## Country context

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**Around 76% 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% (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)

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Afghanistan ranked 169 out of 188 countries on the Human Development Index 2016. In its contribution to improving this situation, Australian aid targets three priorities in Afghanistan— agriculture, building resilience and infrastructure.

These priorities aim to strengthen rural populations' access to economic opportunities, and to protect their livelihoods against economic shocks. Gender-based violence in Afghanistan is widespread, and the maternal mortality rate is among the highest in the world. The Australian Government is committed to international efforts to stabilise Afghanistan's economy and to ensure security in the country.

But the operating environment in Afghanistan is complex, and the security situation is often challenging for the implementation of agricultural research-for-development programs. Consequently, the ACIAR country program in Afghanistan ended in September 2018.

The final ACIAR-supported program in Afghanistan has been fully funded by DFAT, and comprised three projects implemented by the ICARDA and CIMMYT. Strong efforts were made to collaborate and coordinate with other implementing partners, including government, non-government organisations, grower and industry groups and donor organisations.

Running this program, as with previous projects, continues to be extremely challenging and expensive, and access by international scientists is limited due to poor security and political uncertainty. Capacity building of Afghan personnel is a cornerstone of the program, and the projects are exploring options for transition in which there is greater ownership by the Afghanistan Government.

ACIAR's collaboration with Afghanistan began in 2002 on wheat and maize varietal improvement. While wheat dominates crop production, maize is also important in irrigated areas. In the current program, particular attention has been paid to improving rust resistance in wheat, and promoting improved crop management. ACIAR's work in Afghanistan includes a project on improved forages for livestock, and another focusing on integrated catchment management and capacity building.

## 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 and other senior staff, and through discussions with leading agricultural research and development institutions and government bodies.

A desktop study in 2011 by ACIAR and AusAID (now absorbed into DFAT) of agricultural research and development priorities of Afghanistan recognised the key role of agricultural development in reducing 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 to improve water management. Crop and livestock intensification is of critical importance to the Afghanistan Government, and is supported by Australia.

## 2018-19 research program

The remaining project for the ACIAR country program in Afghanistan will conclude its investigation of community interventions that work to diversify cropping systems, increase water use efficiency and build the long-term sustainability of agricultural systems.

Intervention has been by way of improved catchment management, improved forages for dryland livestock and better varieties and agronomic practices for growing wheat and maize.

## 2018-19 project outputs

- » Capacity of national scientists in community-based watershed development built.
- » Community-based watershed sites developed, and capacity for this work embedded with the Government of Afghanistan.
- » Improved crop and forage varieties demonstrated.
- » Line sowing and minimum-tillage wheat crop establishment demonstrated at three hubs.

## Current projects

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

### Regional Manager, South Asia

Dr Pratibha Singh

### Research Program Managers

Dr Eric Huttner, Crops

Dr Werner Stur, Livestock Systems

Dr Robyn Johnston, Water and Climate

Contact details are provided in Appendix 2





# Bangladesh

**Table 3.26: Bangladesh, key statistics, 2017**

Country	GDP per capita (US\$)	Population (million)
Bangladesh	1,517	164.67

Source: data.worldbank.org/indicator.

**Table 3.27: ACIAR funding to Bangladesh, 2016-17 to 2018-19**

Year	A\$ million
2016-17 (actual)	2.1
2017-18 (estimated actual)	2.6
2018-19 (budget)	3.8





## Country context

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

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

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Bangladesh is modernising quickly, supported by solid annual economic growth over the past 10 years. During this period, poverty levels have halved, and real per capita GDP has almost quadrupled. The country ranked 136 on the Human Development Index 2017.

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

One of Bangladesh's key development challenges is to improve farm incomes within the context of climate change. Low-lying areas and rainfed cropping systems are negatively affected by seasonal climate variability, reduced freshwater river flows and seawater intrusion.

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

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

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

Bangladesh has been an ACIAR partner country since the mid-1990s. ACIAR has consulted with key stakeholders to develop a medium-term strategy. ACIAR-supported programs in Bangladesh are focused in the northern and southern regions of the country.

## Country priorities

Priorities for collaboration are developed through consultations between ACIAR senior staff and leaders of agricultural research and development institutions and government bodies in Bangladesh. Concerns about Bangladesh's ability to maintain food security are ongoing in light of the country's 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 its poorest and most vulnerable, so this region is a priority for the Government of Bangladesh.

As a result of consultations, research priorities for ACIAR in Bangladesh are:

- » farming systems research on agronomy, conservation agriculture, improving water use efficiency and mechanisation for smallholder farmers
- » plant breeding, using molecular techniques to develop crop varieties in wheat, maize and pulses that fit into a profitable farming system and help diversify the system
- » management of dry-season irrigation, and sustainable surface water and groundwater use, including precision agriculture for improved irrigation
- » soil salinity and fertility management
- » research on commodities to diversify the farming system into higher-value crops, such as pulses and animal/livestock production
- » integrated social, agricultural and policy research.

The Krishi Gobeshona Foundation is a Bangladeshi agricultural research funding organisation that has made major investments in funding research and capacity building in ACIAR-supported projects. The foundation is a strategic partner for ACIAR.

## 2018–19 research program

ACIAR supports 16 projects in Bangladesh, four of which are specific to this country, and the remainder are part of regional projects. The projects address ACIAR's high-level objectives, as outlined in the 10-year Strategy 2018–2027, and engage with two of ACIAR's research programs.

The following sections briefly describe ACIAR-supported projects in Bangladesh, for each research program. Each project description is referenced to a list at the end of this section, which provides the ACIAR project code and title.

## Agricultural Development Policy

As development proceeds countries will undergo rural transformation. A new project in several countries throughout the Indo-Pacific region, including Bangladesh, endeavours to understand the nature and drivers of rural transformation to provide better policy advice that will underpin the success of transformation.<sup>1</sup>

## Crops

The potential to intensify and diversify cropping in Bangladesh is addressed through several projects looking at dry-season cropping as well as new crops.

Dry-season crops in the southern region of the country are being investigated, with an emphasis on salinity management and trialling salt-tolerant wheat lines, recently developed in Australia. Pulse crops are also being tested in the same environment.<sup>2</sup>

The Bangladesh national mungbean breeding program is a partner in the International Mungbean Improvement Network led by the World Vegetable Center, comprising partners from Australia, Bangladesh, Myanmar and India. Mungbean growers in Bangladesh will continue to benefit from improved varieties and agronomy practices developed by the network<sup>3</sup>, as well as potential efficiencies to be gained from another project that is investigating mechanisation of harvesting and improved seed production systems.<sup>6</sup>

Two projects are looking at crop genetics to improve crop options and suitability in Bangladesh and across Asia. A small project will strive to identify genes that could protect chickpea against key insect pests in Bangladesh, pod borer and bruchids.<sup>4</sup> While rice industries across Asia, including growers in Bangladesh, will reap future benefit from research being conducted at IRRI to identify the genetics responsible for low chalk in rice grain.<sup>5</sup>

A major challenge to cropping in Bangladesh and other wheat-growing countries is crop disease. A project that began in 2017 continues work to identify sources of resistance to wheat blast, which devastated crops in southern and south-western Bangladesh in 2016.<sup>7</sup>

The Sustainable and Resilient Farming Systems Intensification in the Eastern Gangetic Plains (SRFSI) project is a large collaborative venture between ACIAR and CIMMYT, and more than 20 partners from the research, development and educational sectors. The project aims to reduce poverty in the Eastern Gangetic Plains, by making smallholder agriculture more productive, profitable and sustainable, while safeguarding the environment and involving women.

In the final stages of the project, which concludes June 2019, new partners will be engaged to increase awareness and stakeholder engagement to speed up scale out of successful conservation agriculture and sustainable intensification methods identified by the project.<sup>8</sup>

Several projects seek to identify mechanisms and behaviours to speed up adoption of new technology in the Eastern Gangetic Plains. One project will research the effectiveness of modern information technologies to support the practice-change decisions of smallholder women and men, with regard to intensifying farming systems in a changing climate.<sup>9</sup>

Through value-chain and policy intervention, another project looks to speed up the adoption of the Happy Seeder, which enables seed to be drilled into stubble of the previous crop, eliminating the need for stubble burning and its polluting effects.<sup>10</sup>

### Water and Climate

A set of projects in the Water and Climate Research Program aims to improve livelihoods in Bangladesh and neighbouring countries, through the sustainable use and management of natural resources.

By understanding how marginal and tenant farmers in the Eastern Gangetic Plains have used pond and groundwater resources to promote dry-season production, one project aims to identify innovative measures to increase the efficiency and sustainability of water use.<sup>11</sup>

Marginal landholders, those without land, tribal people and those who rely on ecosystem services (such as fishing communities) in the coastal zones of Bangladesh and West Bengal, India, are often disadvantaged by low levels of agricultural development. Another project aims to discover research and development approaches that can provide more equitable and less-risky development pathways for these marginalised communities.<sup>12</sup>

In the same region, a project will aim to sustainably increase cropping intensity and productivity, particularly in the dry season, through integrated soil, water and crop management.<sup>13</sup> Another project complementing this project by identifying institutions to support intensification, integrated decision-making and inclusiveness in agriculture in the Eastern Gangetic Plains.<sup>15</sup>

Specifically focused on Bangladesh, a project is looking at nutrient management for diversified and intensified cropping, to make fertiliser use more effective and profitable, and consider the long-term effects on soils of the very high cropping intensity. This project will also conduct research in the coastal zone, where there has been little research on crop fertiliser management.<sup>14</sup>

A new project in 2018–19 will identify gaps in policy, capacity and roadblocks for the adoption of conservation agriculture-based farm mechanisation on small farms. It will build on previous project outputs, especially the development of the versatile multi-crop planter, and evaluate commercialisation models for two-wheel tractors for conservation agriculture. Research into the scope for conservation agriculture (strip) planters for four-wheel tractors on small farms in Bangladesh will also be initiated.<sup>16</sup>

### 2018–19 project outputs

- » Ongoing results from dry-season trials of pulses, wheat or forages in the southern region collected and analysed.
- » Mungbean core collection characterised (genotyping and first year of phenotyping).
- » Breeding management system implemented by the Bangladesh mungbean breeding team to manage workflow and data.
- » Factors affecting mungbean harvesting identified, including farming practices, value chains and women's participation.
- » Precision phenotyping platform established for wheat blast in Bangladesh.
- » Knowledge increased 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 decisionmaking.

- » Supply chain developed, including the private sector, for the minimum-tillage versatile multicrop planter for use with two-wheel tractors.
- » Policy options developed for scaling out conservation agriculture in Bangladesh.
- » Initial testing and assessment of sustainable and resilient farming systems intensification in north-western Bangladesh completed.
- » A project looking at soil and fertiliser management across Bangladesh initiated, providing valuable information to other ACIAR projects.

## Five-year region 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.

### Regional Manager, South Asia

Dr Pratibha Singh

### Research Program Managers

Dr Eric Huttner, Crops

Dr Robyn Johnson, Water and Climate

For information about Agricultural Development Policy projects, contact Dr Daniel Walker

Contact details are provided in Appendix 2

## Current and proposed projects

1. **ADP/2017/024**—Facilitating inclusive rural regional transformation: sharing experiences and lessons in Bangladesh, China, Indonesia and Pakistan
2. **CIM/2014/076**—Incorporating salt-tolerant wheat and pulses into smallholder farming systems in southern Bangladesh
3. **CIM/2014/079**—Establishing the international mungbean improvement network
4. **CIM/2016/039**—Insect tolerant chickpea for Bangladesh
5. **CIM/2016/046**—Breeding for low chalk in rice
6. **CIM/2016/174**—Improved mungbean harvesting and seed production systems for Bangladesh, Myanmar and Pakistan
7. **CIM/2016/219**—Identification of sources of resistance to wheat blast and their deployment in wheat varieties adapted to Bangladesh
8. **CSE/2011/077**—Sustainable and resilient farming systems intensification in the Eastern Gangetic Plains (SRFSI)
9. **CSE/2012/108**—Understanding farm-household management decision-making for increased productivity in the Eastern Gangetic Plains
10. **CSE/2017/101**—Value-chain and policy interventions to accelerate adoption of Happy Seeder zero tillage in rice-wheat farming systems across the Gangetic Plains
11. **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
12. **LWR/2014/072**—Promoting socially inclusive and sustainable agricultural intensification in West Bengal and Bangladesh
13. **LWR/2014/073**—Cropping system intensification in the salt-affected coastal zones of Bangladesh and West Bengal, India
14. **LWR/2016/136**—Nutrient management for diversified cropping in Bangladesh (NUMAN)
15. **LWR/2018/104**—Institutions to support intensification, integrated decision-making and inclusiveness in agriculture in the Eastern Gangetic Plains
16. **LWR/2018/111**—Pilot Project on commercialisation of smallholders' conservation-agriculture planters in Bangladesh





# India

**Table 3.28: India, key statistics, 2017**

Country	GDP per capita (US\$)	Population (million)
India	1,940	1,339.18

Source: [data.worldbank.org/indicator](http://data.worldbank.org/indicator).

**Table 3.29: ACIAR funding to India, 2016-17 to 2018-19**

Year	A\$ million
2016-17 (actual)	3.3
2017-18 (estimated actual)	3.2
2018-19 (budget)	3.1



## Country context

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**South Asia has the highest concentration of poor people in the world with more than 500 million people still living in extreme poverty. Many more people, particularly women and those working in the informal sector, live just above the poverty line and are extremely vulnerable to economic and environmental shocks and disasters. In the past two decades, over 50% 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, 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 Aid Investment Plan targets these three inter-related sectors where Australia is uniquely placed to contribute expertise and technologies.**

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

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India is a major regional power but its Human Development Index ranking was 131 out of 188 countries in 2016. The greatest concentration of extremely poor people is in the eastern part of India—around a third of the world's total.

India is active within regional groupings such as the South Asian Association for Regional Cooperation, the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation, and the Brazil, Russia, India, China and South Africa group. A new regional subgrouping of Bangladesh, Bhutan, India and Nepal is active in cooperation, and working on power trade, inter-grid connectivity, transit facilities and multimodal transport in the region.

The Indian Government is now shifting its focus from increasing productivity to improving the incomes of farmers—with a target of doubling farmers' incomes by 2022. The Indian Government has increased funding of institutional credit for the agriculture sector. There are funds allocated to boost the diversification from cereal crops to high-value commodities like fruits, vegetables, dairy and fisheries. There is also a new guideline to subsidise machinery that enables management of crop residue to prevent burning.

Limited resources or knowledge is available to implement gender-inclusive agricultural development strategies. Non-government organisations and international collaborations have piloted innovative approaches towards gender inclusion, which have been adopted by the government as the National Rural Livelihoods Mission.

Australia has placed India at the forefront of its bilateral partnerships. Both governments recognise the significant potential for further cooperation across various areas, including water management expertise, science and technology, and agriculture. ACIAR has supported collaborative agricultural research between Australia, India and other South Asian countries since 1983.

The national agricultural research system is led by the Indian Council of Agricultural Research, and has substantial resources and influence within the ACIAR program in India. It has great potential to support cooperative activities in the region and in South-East Asia and Africa.

ACIAR's research activities in India are part of the regional South Asia program as bilateral programs between Australia and India come to an end. Consultation on country priorities in February 2017 confirmed that ACIAR will continue to work with India through 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 will become a prerequisite to maintain an ongoing program of collaboration in future.

## Country priorities

Following the stakeholder consultations in February 2017, ACIAR re-confirmed the priorities of its program in India, as developed by Indian Council of Agricultural Research and ACIAR. There was informal agreement (yet to be formalised) that ACIAR continue its efforts towards designing a regional program involving India, Bangladesh and Nepal.

The geographical focus will remain the eastern area. A regional approach potentially offers transformative advantages through knowledge sharing.

The medium- to long-term strategy of ACIAR's work in India is focused around creating regional collaborations that target:

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





## 2018–19 research program

ACIAR supports 11 projects in India, all of which are part of regional projects. The projects address ACIAR's high-level objectives, as outlined in the 10-year Strategy 2018–2027, and engage with two of ACIAR's research programs.

The following sections briefly describe ACIAR-supported projects in India, for each research program. Each project description is referenced to a list at the end of this section, which provides the ACIAR project code and title.

### Agricultural Development Policy

Creating the appropriate policy environment in the irrigation management sector has the potential to overcome institutional weaknesses and deliver major benefits. A project in eastern India and Pakistan aims to improve the analytical skills and understanding of policy-makers and irrigation officials, and to devolve decision-making to farmers.<sup>1</sup>

### Crops

Research is currently being conducted on improved sustainable management of cropping systems to increase cereal rotation and yields of other high-value crops, and make the use of water, energy, nutrients and other inputs more efficient. The research also increases the resilience of cropping systems to climate change and other risks through conservation agriculture, which will stabilise farmers' incomes.

India's national mungbean breeding program is a key partner in the International Mungbean Improvement Network, led by the World Vegetable Center, and comprising Australia, Bangladesh, Myanmar and India. Mungbean growers in India will continue to benefit from improved varieties and agronomy practices developed by the network.<sup>2</sup>

A regional project on stripe (yellow) rust in wheat is supporting research teams of India, Pakistan, Nepal and Ethiopia to better characterise disease variability, and to identify new sources of resistance, to address this growing threat in South Asia.<sup>3</sup> Rice industries across Asia, including growers in India, will reap future benefit from research being conducted at IRRI to identify the genetics responsible for low chalk in rice grain.<sup>4</sup>

The Sustainable and Resilient Farming Systems Intensification in the Eastern Gangetic Plains (SRFSI) project is a large collaborative venture between ACIAR and CIMMYT, and more than 20 partners from the research, development and educational sectors. The project aims to reduce poverty in the Eastern Gangetic Plains, by making smallholder agriculture more productive, profitable and sustainable, while safeguarding the environment and involving women. In the final stages of the project, which concludes June 2019, new partners will be engaged to increase awareness and stakeholder engagement to speed up scale out of successful conservation agriculture and sustainable intensification methods identified by the project.<sup>5</sup>

Several projects seek to identify mechanisms and behaviours to speed up adoption of new technology in the Eastern Gangetic Plains. One project will research the effectiveness of modern information technologies to support the practice-change decisions of smallholder women and men, in intensifying farming systems in a changing climate.<sup>6</sup> Through value-chain and policy intervention, another project looks to speed up adoption of the Happy Seeder, which enables seed to be drilled into stubble of the previous crop, eliminating the need for stubble burning and polluting effects.<sup>7</sup>

### Water and Climate

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. By understanding how marginal and tenant farmers in the Eastern Gangetic Plains have used pond and groundwater resources to promote dryseason production, one project aims to identify innovative measures to increase the efficiency and sustainability of water use.<sup>8</sup> This project is also investigating institutional constraints around water and land that hinder development. The project aims to improve smallholder livelihoods in the Indian states of Bihar and West Bengal. Another project will identify institutions to support intensification, integrated decision-making and inclusiveness in agriculture in the Eastern Gangetic Plains.<sup>12</sup>



Marginal landholders, the landless, tribal people and those who rely on ecosystem services (such as fishing communities) in the coastal zones of Bangladesh and West Bengal are often disadvantaged by low levels of agricultural development. Another project aims to discover research and development approaches that can provide more equitable and less-risky development pathways and more socially inclusive policy options for these marginalised communities.<sup>10</sup> In the same region, a project will aim to sustainably increase cropping intensity and productivity in the, particularly in the dry season, through integrated soil, water and crop management.<sup>11</sup> This project will be working in the embankments of the West Bengal Sunderbans region.

## 2018-19 project outputs

- » Assistance provided with water policy research into improving water management institutions in India and Pakistan.
- » Mungbean core collection characterised (genotyping and first year of phenotyping).
- » Core set of 250 wheat lines selected, multiplied and dispatched for multi-location wheat yellow rust resistance screening.
- » Field sites that consider social inclusivity and sustainability in water, land and salinity management in India and Bangladesh established.
- » Initial testing and assessment carried out of sustainable and resilient farming systems intensification in eastern India.
- » Knowledge increased of the impacts of cross-border informal trade in agricultural outputs in eastern South Asia (India, Nepal and Bangladesh).

- » Priority research and scaling-out challenges assessed for intensification and diversification of sustainable and resilient farming systems in eastern India, Bangladesh and Nepal.
- » Final workshop of the Indo-Australian program on marker-assisted wheat breeding (IAP-MAWB) held.
- » Trials of women's groups communally renting and managing land established in the Eastern Gangetic Plains.
- » Knowledge increased 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 decisionmaking.
- » Key institutional constraints to the use of groundwater for irrigation and aquaculture identified, and approaches to overcome these trialled in the Eastern Gangetic Plains.

## Five-year country outcomes

- » Wider regional research collaboration between Australian, Indian and other countries' agencies focused on regional priorities that cover 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.



## Current and proposed projects

1. **ADP/2014/045**—Efficient participatory irrigation institutions to support productive and sustainable agriculture in South Asia
2. **CIM/2014/079**—Establishing the international mungbean improvement network
3. **CIM/2014/081**—Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa
4. **CIM/2016/046**—Breeding for low chalk in rice
5. **CSE/2011/077**—Sustainable and resilient farming systems intensification in the Eastern Gangetic Plains (SRFSI)
6. **CSE/2012/108**—Understanding farm-household management decision-making for increased productivity in the Eastern Gangetic Plains
7. **CSE/2017/101**—Value-chain and policy interventions to accelerate adoption of Happy Seeder zero tillage in rice-wheat farming systems across the Gangetic Plains
8. **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
9. **LWR/2014/072**—Promoting socially inclusive and sustainable agricultural intensification in West Bengal and Bangladesh
10. **LWR/2014/073**—Cropping system intensification in the salt-affected coastal zones of Bangladesh and West Bengal, India
11. **LWR/2018/104**—Institutions to support intensification, integrated decision-making and inclusiveness in agriculture in the Eastern Gangetic Plains

### Regional Manager, South Asia

Dr Pratibha Singh

### Research Program Managers

Dr Eric Huttner, Crops

Dr Robyn Johnson, Water and Climate

For information about Agricultural Development Policy projects, contact Dr Daniel Walker

Contact details are provided in Appendix 2



# Nepal

**Table 3.30: Nepal, key statistics, 2017**

Country	GDP per capita (US\$)	Population (million)
Nepal	835	29.0

Source: data.worldbank.org/indicator.

**Table 3.31: ACIAR funding to Nepal, 2016-17 to 2018-19**

Year	A\$ million
2016-17 (actual)	1.5
2017-18 (estimated actual)	1.3
2018-19 (budget)	1.7



Image: ACIAR/Conor Asheigh

## Country context

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**Australia's aid program in Nepal is in a period of transition from a phase of post-disaster reconstruction to one of longer-term programmed aid. Australia's objectives will be to: promote enterprise and job-creation; support the government to improve governance and policy implementation; and support basic education and enterprise development. A new program will focus on promoting an enabling environment for strong, effective, and inclusive sub-national governance. Gender equality and social inclusion will be a key feature of all major investments, as encompassed by the overarching gender strategy.**

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

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Nepal emerged from civil conflict in 2006, and historic elections completed Nepal's transition to a federal democratic republic in 2008. Elections held in December 2017 were meant to mark the final phase in the country's long political transition but no government was formed until February 2018 due to political reasons.

Nepal's overall development has been slow, and its development indicators are among the lowest in South Asia. It ranks 149 out of 189 countries on the Human Development Index 2017. Reconstruction following the earthquakes of 2015 continues to have a negative impact on Nepal's growth prospects in the short to medium term.

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

The strategy will also guide policies that include women, and states that all agricultural programs will be designed to benefit women. It promotes women's organisations and agro-enterprises led by women through specific programs, and recommends equal wages for women labourers, which:

- » recognises women as independent farmers
- » ensures women's access to means of production
- » increases female leadership
- » improves women's position in different structures of the government, non-government and private sectors.

The strategy also promotes action to raise awareness of women's rights to land, and builds the capacity of women to manage irrigation, water resources and finances.

Agriculture is the largest sector of Nepal's economy, and faces a set of numerous interdependent challenges associated with:

- » degrading resources
- » underdeveloped agricultural institutions and policies
- » declining availability of labour
- » 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 (part of the Eastern Gangetic Plains) to those in 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 education, health, hydro-electricity, community forestry management, and livestock and grain management. The Sustainable Development Investment portfolio, a regional program conducted by ACIAR has a significant component in Nepal addressing water and energy integration.

ACIAR has supported collaborative research in Nepal since the early 1990s, including projects on small ruminants, wheat and legumes. Engaging Nepal in a regional program on improved integration of soil, water, crop, livestock and tree components of the farming systems is a logical and welcomed approach.

## 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 affected by the recent earthquakes were reassessed in 2017, with a request from the Nepalese Government to focus primarily on research to support increased timber production from community forests.

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, to address key issues such as declining soil health, burning of rice stubble, falling groundwater levels and inequities in access to water.

## 2018–19 research program

ACIAR supports six projects in Nepal, five of which are part of regional projects. The projects address ACIAR's high-level objectives, as outlined in the 10-year Strategy 2018–2027, and engage with three of ACIAR's research programs.

The following sections briefly describe ACIAR-supported projects in Nepal, for each research program. Each project description is referenced to a list at the end of this section, which provides the ACIAR project code and title.

### Crops

Developing sustainable agricultural systems is key to Nepal's economic development and poverty reduction. Agriculture faces numerous interdependent challenges associated with degrading resources, underdeveloped agricultural institutions and policies, and lack of productive technologies, all of which limit the improvement of farm household livelihoods.

A regional project on yellow rust in wheat is supporting research teams of India, Pakistan, Nepal and Ethiopia to better characterise disease variability and to identify new sources of resistance, to address this growing threat in South Asia.<sup>1</sup>

The Sustainable and Resilient Farming Systems Intensification in the Eastern Gangetic Plains (SRFSI) project is a large collaborative venture between ACIAR and CIMMYT, and more than 20 partners from the research, development and educational sectors. The project aims to reduce poverty in the Eastern Gangetic Plains, by making smallholder agriculture more productive, profitable and sustainable, while safeguarding the environment and involving women. In the final stages of the project, which concludes June 2019, new partners will be engaged to increase awareness and stakeholder engagement to speed up scale out of successful conservation agriculture and sustainable intensification methods identified by the project.<sup>2</sup>

Several projects seek to identify mechanisms and behaviours to speed up adoption of new technology in the Eastern Gangetic Plains. One project will research the effectiveness of modern information technologies to support the practice-change decisions of smallholder women and men, in intensifying farming systems in a changing climate.<sup>3</sup>

### Forestry

In the Middle Hills of Nepal, forests and agriculture are closely linked systems, and most households derive their livelihood from a combination of agriculture and forest products. While most forest lands have been handed over to community forest user groups, the management of most community forests is sub-optimal, with only very limited timber being harvested. A new project has started to build on the achievements and lessons of a previous ACIAR forestry project, which demonstrated the effectiveness of a silvicultural management package called Active and Equitable Forest Management.<sup>4</sup>

The project aims to improve forest management practices in community forests and on private farm land in Kahbre Palanchok and Sindhu Palchok districts to improve livelihoods, social equity and environmental impact. In each district the project will work with 15 community forest user groups in three newly established local governments—Bhumlu, Bethanchowk and Banepa in Kavre, and Sunkoshi, Chautaura and Lisankhupakha in Sindhu. Project activities will focus on adoption of improved forestry practices, development of community forestry planning, governance and gender equity frameworks and establishment of pro-poor small-scale forest enterprises.

### Water and Climate

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 Nepal. By understanding how marginal and tenant farmers in the Eastern Gangetic Plains have used pond and groundwater resources to promote dry-season production, one project aims to identify innovative measures to increase the efficiency and sustainability of water use.<sup>5</sup> This project is also investigating institutional constraints around water and land that hinder development. Another project will identify institutions to support intensification, integrated decision-making and inclusiveness in agriculture in the Eastern Gangetic Plains.<sup>6</sup>

### 2018–19 project outputs

- » Core set of 250 wheat lines selected, multiplied and dispatched for multi-location wheat yellow rust resistance screening.
- » Key institutional constraints to use of groundwater for irrigation and aquaculture identified, and approaches to overcome these trialled.
- » Six highly visible community forests demonstrating active and equitable forest management established.
- » Irrigation to improve agricultural productivity, increase incomes and provide food security to marginal communities demonstrated by collective farming groups.

### Five-year program outcomes

- » Provision to Nepalese agencies of research and technical information and capacities to enable improved cropping and regional linkages for ongoing research and development.
- » Definition and communication of improved systems for water, forestry and farmland use.
- » Improved livelihood of marginal farming communities through scaling of agricultural systems, based on improved irrigation and agricultural practices and strengthened collectives.

### Current and proposed projects

1. **CIM/2014/081**—Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa
2. **CSE/2011/077**—Sustainable and resilient farming systems intensification in the Eastern Gangetic Plains (SRFSI)
3. **CSE/2012/108**—Understanding farm-household management decision-making for increased productivity in the Eastern Gangetic Plains
4. **FST/2017/037**—Enhancing livelihoods from improved forest management in Nepal
5. **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
6. **LWR/2018/104**—Institutions to support intensification, integrated decision-making and inclusiveness in agriculture in the Eastern Gangetic Plains

#### Regional Manager, South Asia

Dr Pratibha Singh

#### Research Program Managers

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Dr Nora Devoe, Forestry

Dr Robyn Johnson, Water and Climate

Contact details are provided in Appendix 2



# Pakistan

**Table 3.32: Pakistan, key statistics, 2017**

Country	GDP per capita (US\$)	Population (million)
Pakistan	1,548	197.02

Source: data.worldbank.org/indicator.

**Table 3.33: ACIAR funding to Pakistan, 2016-17 to 2018-19**

Year	A\$ million
2016-17 (actual)	3.4
2017-18 (estimated actual)	4.2
2018-19 (budget)	4.7



Image: ACIAR/Conor Ashleigh

## Country context

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**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)

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While Pakistan ranked 150 out of 189 countries in the Human Development Index 2017, its economic performance continues to grow, and inflation stays well below target.

Growth is expected to continue to increase and reach 5.8% in 2018-19. 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 in 2018 was about 31%, well behind the average across South Asia of about 50%.

The Government of Pakistan has been working to an Agriculture and Food Security Policy that recognises the importance of reactivation of agriculture sector. The policy provides guidelines to overcome the stagnant growth and inequity that typifies much of Pakistan's agriculture sector. The policy revolves around three pillars:

- » build an innovation-based sustainable agriculture sector
- » use public investment to improve the profitability of agriculture
- » ensure food security and freedom from hunger.

ACIAR has aligned its new investments in Pakistan with the country's Agriculture and Food Security Policy through ongoing discussions at the national and subnational levels.

### Agricultural issues

Agriculture remains central in Pakistan's economy. It accounts for nearly 21% of total GDP, generating employment for 44% of the total labour force, and providing 78% of the country's exports (textile, food and leather). But it is constrained, and would benefit from improved cereal-legume productivity, crop diversification and management practices.

Natural resource management requires research, such as surface and groundwater availability and the effective management of these resources at farm and national scales. There is increasing pressure on the availability of surface and groundwater water resources for irrigation, due to increasing agricultural intensification and competing demand by urban and industrial users. 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 communities. Limited water availability combined with low agricultural productivity results in crop yields per hectare and per cubic meter of water that are far lower than international benchmarks. Waterlogging and salinity in Sindh province and parts of Punjab province is increasing, due to poor irrigation management practices, combined with poor drainage and soil management.

Climate change is another emerging threat to agriculture in Pakistan. While higher concentrations of carbon dioxide might benefit crops, rising temperatures and reduced precipitation upset the biological complex. The number of heatwave days per year has increased nearly fivefold in the past 30 years in Pakistan. Historically, annual precipitation has been highly variable, but it has increased slightly in the past 50 years.

ACIAR's research collaboration with Pakistan dates back to 1984, and has encompassed various sectors, including key fruit crops (mangoes and citrus), livestock (smallholder dairy), agricultural policy and agricultural water management. ACIAR works closely with the Government of Pakistan, DFAT, other donor partners, non-government organisations and the Pakistani private sector to provide research and development and technical capacity building. Technical support and carefully targeted research and development 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 co-investment between ACIAR, and DFAT, the Aik Saath (Agriculture Value Chain Collaborative Research Program) in Pakistan, has been structured around the success of two previous phases of the Australia–Pakistan Agriculture Sector Linkages Program. The program 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. The program will continue to involve private-sector engagement in new and innovative partnerships, which will make a real difference to livelihoods, by reducing poverty, and will help to achieve the outcomes related to agriculture outlined in Pakistan Vision 2025.

### Focus on gender

Women constitute about half of the country's population, and 22.7% of the labour force. The Government of Pakistan, through its Vision 2025 and 11th Five-Year Plan, aims to increase women's participation in decision-making, by increasing development, adoption and growth of best-practice technologies, and by supporting trials of small and medium enterprise development and village community centres to mobilise and innovate rural communities.

These will provide an enabling environment and equal opportunities for women to develop their full potential. Pakistan is also committed to achieving the United Nations Agenda 2030 Sustainable Development Goals, of which Goal 5—*Gender equality: ending all forms of discrimination against women and girls*—aims to empower women, which is fully aligned with Pillar I of Pakistan Vision 2025.

### Country priorities

ACIAR's priorities for Pakistan are based on formal and informal consultations with government agencies and other stakeholders in Pakistan, as well as the Australian Inclusive Economic Growth Investment Strategy.

The last detailed consultations were held in 2015, at the end of Australia–Pakistan Agriculture Sector Linkages Program, and resulted in high-priority agriculture value chains being identified as valuable and feasible targets for further consideration for the Aik Saath 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 pillars of its future development in Pakistan Vision 2025. Through its aid program, Australia is committed to helping Pakistan meet these challenges, and has developed a complementary portfolio of projects.

Rural transformation is pivotal to achieving food security, improving farmers' income, reducing rural poverty and attaining sustainability. Transformation can only be achieved through institutional transformation, innovative policies in agriculture market reforms, technology and inputs, and investment in agriculture, all of which require policy research.

Policy research has also been focusing on issues such as weak and fragmented markets, market efficiency and inefficient allocation and use of irrigation water. The analysis of water institutions is required to identify and support technical and social research, and to establish what will help ensure that water and related resources are appropriately managed.

Irrigation water supply management is mainly at a provincial level in Pakistan, and is done by Provincial Irrigation and Drainage Authorities. As in many other parts of the world, these authorities follow a relatively simple policy agenda that centres on improving water management by devolving decisions to farmers. Often known as participatory irrigation management, this approach has yielded mixed results, with productivity gains attributable to participatory irrigation management, and irrigation management transfer often failing to materialise.

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. In 2017, the ACIAR Country Office and ICARDA held stakeholder consultations to gauge the depth of this issue. The findings have been circulated among relevant stakeholders by ICARDA Pakistan. A scoping study has been completed, and a new project on 'Living with Salinity' is being designed.

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

- » improving horticultural crop management and value-chain practices, particularly in high-value crops, such as vegetables, mango, citrus, and pulses
- » improving value chains of dairy, beef and small ruminants—with particular focus on smallholder farmers and women—and developing effective extension support and building the capacity of researchers
- » assessing productivity issues and disease risk in wheat, and helping smallholder diversify into other crops, such as legumes (chickpea, lentil and peanuts)
- » improving management of land and water resources, including options for salinity-related work to sustain productive enterprises, input into policy development for agriculture markets and investigation of social policy, capacity constraints and issues in water management.

## 2018–19 research program

ACIAR supports 21 projects in Pakistan, 10 of which are part of regional projects. The projects address ACIAR's high-level objectives, as outlined in the 10-year Strategy 2018–2027, and engage with five of ACIAR's research programs.

The following sections briefly describe ACIAR-supported projects in Pakistan, for each research program. Each project description is referenced to a list at the end of this section, which provides the ACIAR project code and title.

### Agricultural Development Policy

Pakistan is home to one of the largest horticulture industries of the world, with great potential domestically and globally. The China–Pakistan Economic Corridor will provide Pakistan with preferential access to the world's fastest growing horticulture market. A project will investigate marketing arrangements, assess market potential, identify problems, and, drawing on Pakistani and international reform, formulate a market reform program to increase growth, employment and productivity.<sup>1</sup>

Reform in the irrigation sector will help ensure that water and related resources are appropriately managed. Creating the appropriate policy environment in the irrigation management sector has the potential to overcome institutional weaknesses, and to deliver major benefits. A project in eastern India and Pakistan aims to improve the analytical skills and understanding of policy-makers and irrigation officials, and devolve decision-making to farmers.<sup>2</sup>

To promote entrepreneurial opportunities for smallholders in Pakistan's horticultural sector, especially women, a project investigating credit markets and financing schemes is being extended, to continue to identify the most suitable options for the sector.<sup>3</sup>

Another project aims to develop the potential of the pulse industry through value-chain research. As well as improving productivity and market options for chickpea, lentil and mungbean, the project will also focus on improved social inclusion of the industry.<sup>4</sup>

As development proceeds, countries will undergo rural transformation. A new project in several countries including Pakistan endeavours to understand the nature and drivers of rural transformation to provide better policy advice that will underpin the success of transformation.<sup>5</sup>

### Agribusiness

Mangoes provide a powerful vehicle for increasing the incomes of smallholder farmers across many parts of the Asia-Pacific region. Mangoes are also one of the most economically significant tropical fruit crops in Australia. With more strategic planning, and a stronger focus on communication and collaboration between ACIAR projects and stakeholder communities in partner countries and Australia, mango producers across the region can benefit.

Five small research activities apply a strategic agribusiness approach to mango research and development in the Asia-Pacific region. In addition to undertaking targeted pilot research and scoping studies, the small research activities will have an important function to create networks, and to engage and collaborate with multiple Australian and key Asia-Pacific research, government and industry partners.

The objectives of the mango agribusiness program are to:

- » improve communication, collaboration and capacity development (information access)<sup>6</sup>
- » identify market development opportunities and implications in China<sup>7</sup>
- » identify strategic research and development opportunities (particularly for biosecurity) for market entry<sup>8</sup>
- » evaluate opportunities for improving mango quality<sup>9</sup>
- » identify priority opportunities in fruit processing in selected mango markets.<sup>10</sup>

Micro, small and medium scale enterprises dominate mango supply chains throughout the Asia-Pacific region. So opportunities for mango growers and supply chain businesses to access highvalue domestic and export markets, and improve quality, productivity, competitiveness and value addition can significantly benefit millions men and women throughout the region. Within Indonesia alone, more than two million people are receiving income from mango production and supply.

### Crops

Cereal productivity in Pakistan is lower than in equivalent environments elsewhere in South Asia, and there is unrealised potential for smallholder diversification.

A regional project on stripe (yellow) rust in wheat is supporting research teams in India, Pakistan, Nepal and Ethiopia to better characterise disease variability and identify new sources of resistance, to address this growing threat in South Asia.<sup>11</sup>

Another project aims to expand the production of legumes (chickpea, lentil and peanut), through understanding the barriers to improving the productivity and profitability of their cultivation, and onfarm testing of agronomic innovations and improved varieties. This will help provide smallholders more options for diversification.<sup>12</sup> Mungbean growers in Pakistan will continue to benefit from potential efficiencies to be gained from a project that is investigating mechanisation of harvesting and improved seed production systems.<sup>13</sup>



## Horticulture

The horticulture sector in Pakistan is significant, both domestically and for export production. Highvalue horticultural crops, such as citrus, mangoes and vegetables, are an important source of farm income. But crop management practices are often suboptimal, and losses along the value chain are high.

Under the Australia–Pakistan Agriculture Sector Linkages Program, 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 underway in Punjab and Sindh Provinces under the Agriculture Value Chain Collaborative Research Program, focusing on potatoes, chillies, tomatoes and onions. The choice of localities and crops to be included in this project is based on the potential of these horticulture value chains to deliver broadbased livelihood benefits.<sup>14</sup>

## Livestock

Dairy is the largest livestock sector in Pakistan, with demand for milk and dairy products growing at about 8% per year. In Pakistan, milk and dairy products are sourced mostly from small farms with fewer than 10 animals. Production is very low, despite quite good genetic potential of livestock, due to poor nutrition, management, and marketing. Additionally, research efforts and extension support services are fragmented. At the same time demand and prices for beef are rising strongly, opening opportunities for smallholder farmers. Traditionally, beef is a by-product of the dairy sector, using male animals and old cows for meat. So there are trade-offs between increasing milk production and growing cattle and buffaloes for meat on farms. A project is underway that takes a whole-family approach to improving farm profitability and marketing. It will also engage with partners to build capacity for more efficient and effective livestock extension.<sup>15</sup>

An investigation into the possibility of introducing germplasm of improved old man saltbush concluded in 2018. By identifying appropriate germplasm and organisations to assess introductions and support adoption, the project will help reclaim productivity on salinity-affected soil, and provide nutrition for ruminants.<sup>16</sup>

A small research activity that describes goat (and sheep) production systems, and identifies constraints and opportunities throughout the goat value chain in the Pakistani provinces of Punjab and Sindh concluded in 2018. The research, found that poor supply (quantity, quality and consistency) of animals from farms is the major restriction in many value chains. Further, extension and other services for small ruminant farmers are very limited.<sup>17</sup>

Following on from this research, another project focused on including women, by developing strategies for higher and more sustainable production and value chain engagement, to improve the livelihoods and wellbeing of small ruminant farming families.<sup>18</sup>

## Water and Climate

Irrigation is critical to Pakistan's food security, reducing poverty and developing its economy, but the country's irrigation is among the least profitable in the world. Australia is well placed to help Pakistan improve its irrigation, drainage and salinity management in major cropping systems, and this is an important focus of three projects in the ACIAR research program.

One project is working with farmers to test various simple irrigation management tools to measure soil moisture and soil nutrients, and is developing appropriate training methods that focus on a colearning approach. The aim is to encourage farmers to learn from each other, either as a commercial service or supported by an extension service and non-government organisations.<sup>19</sup>

Groundwater use is extensive in Pakistan, with some areas being completely reliant on groundwater (Balochistan), and others (Punjab) using groundwater in conjunction with surface water to increase cropping intensity. In Sindh, large areas are affected by waterlogging, which could be reduced by greater use of groundwater.

A project is identifying approaches for farmers/communities and managers/policy-makers to manage both groundwater quantity and quality, while increasing agricultural productivity. This project is building the capacity of researchers, farmers, farming communities and relevant government and non-government agencies to improve groundwater management, and, in turn, farming family livelihoods in Pakistan.<sup>20</sup>

A new project will start in 2019 to build the adaptive capacity of farming and coastal communities in salinity-affected areas of the Indus Basin to maintain and improve their livelihoods. The project will work with a broad network of local partners to develop adaptation options for 'living with salinity, given the growing extent of the problem and the lack of success of remediation programs'.<sup>21</sup>

## 2018-19 project outputs

- » Wheat stripe (yellow) rust resistance collaboration established.
- » Participatory analysis of the pulses situation in six districts completed and applied to design on farm trials.
- » Opportunities to improve livelihoods of smallholders and communities, by strengthening selected horticulture market chains, identified.
- » Smallholder performance increased, through collaborative supply-chain interventions for innovation practice change.
- » Potential of new Australian old man saltbush varieties to fill ruminant feed gaps in arid and saline areas of Pakistan investigated.
- » Constraints and opportunities identified along the smallholder goat value chains.
- » Increased knowledge and assessment of policies affecting Pakistani agriculture developed and documented for policy decision-makers.
- » A portfolio of projects established to research groundwater and surface water management, on-farm irrigation productivity and socioeconomic outcomes for men, women and youth.
- » Water policy research undertaken to improve water management institutions in India and Pakistan.

## Five-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.
- » Development of 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.
- » Development of options and adaptive capacity for communities in salinity-affected areas to maintain and improve their livelihoods.

### Country Manager, Pakistan

Dr Munawar Raza Kazmi

### Research Program Managers

To be appointed, Agribusiness

Dr Eric Huttner, Crops

Dr Irene Kernot, Horticulture

Dr Werner Stur/Dr Anna Okello, Livestock Systems

Dr Robyn Johnston, Water and Climate

For information about Agricultural Development Policy projects, contact Dr Daniel Walker

Contact details are provided in Appendix 2





## Current and proposed projects

1. **ADP/2014/043**—Policy and institutional reforms to improve horticultural markets in Pakistan
2. **ADP/2014/045**—Efficient participatory irrigation institutions to support productive and sustainable agriculture in South Asia
3. **ADP/2016/028**—Creating wealth for women in Pakistan
4. **ADP/2017/004**—Developing modern value chains to increase pulses supply in Pakistan
5. **ADP/2017/024**—Facilitating inclusive rural regional transformation: sharing experiences and lessons in Bangladesh, China, Indonesia and Pakistan
6. **AGB/2016/006**—Supporting access to mango research information, communication, collaboration and capacity development
7. **AGB/2016/007**—Challenges and opportunities for meeting requirements of China mango markets
8. **AGB/2016/008**—Opportunities and strategies to improve biosecurity, market access and trade for selected mango markets
9. **AGB/2016/009**—Enhancing mango fruit quality in Asian mango chains
10. **AGB/2016/010**—Priority opportunities in tropical fruit processing in selected mango markets
11. **CIM/2014/081**—Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa
12. **CIM/2015/041**—Increasing productivity and profitability of pulse production in cereal-based cropping systems in Pakistan
13. **CIM/2016/174**—Improved mungbean harvesting and seed production systems for Bangladesh, Myanmar and Pakistan
14. **HORT/2016/012**—Strengthening vegetable value chains in Pakistan for greater community livelihood benefits
15. **LPS/2016/011**—Improving smallholder dairy and beef profitability by enhancing farm production and value-chain management in Pakistan
16. **LPS/2016/022**—Potential of new Australian old man saltbush varieties to fill ruminant feed gaps in arid and saline areas of Pakistan
17. **LPS/2016/096**—Smallholder goat value chains in Pakistan: challenges and research opportunities
18. **LS/2018/105**—Enhancing small-ruminant production to benefit farming families in Sindh and Punjab, Pakistan
19. **LWR/2014/074**—Developing approaches to enhance farmer water management skills in Balochistan, Punjab and Sindh, Pakistan
20. **LWR/2015/036**—Improving groundwater management to enhance agriculture and farming livelihoods in Pakistan
21. **LWR/2017/027**—Improving salinity and agricultural water management in the Indus Basin of Pakistan

# Sri Lanka

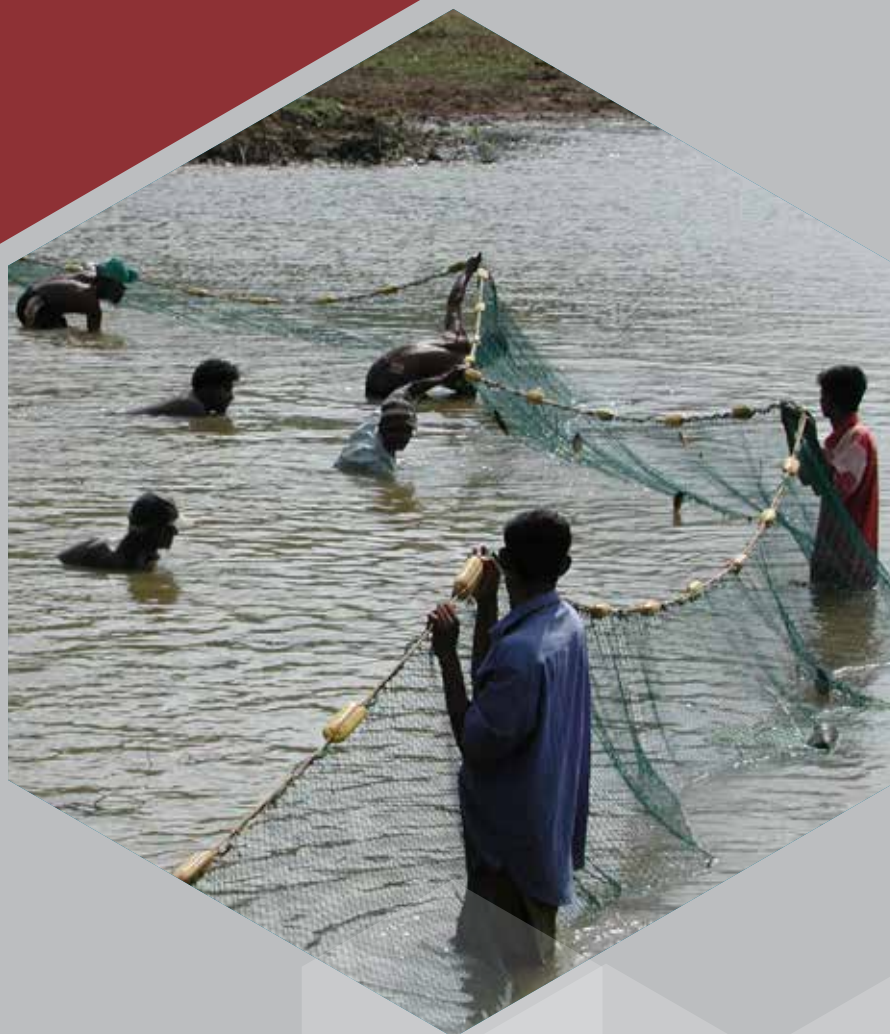
**Table 3.34: Sri Lanka, key statistics, 2017**

Country	GDP per capita (US\$)	Population (million)
Sri Lanka	4,065	21.44

Source: data.worldbank.org/indicator.

**Table 3.35: ACIAR funding to Sri Lanka, 2016-17 to 2018-19**

Year	A\$ million
2016-17 (actual)	—
2017-18 (estimated actual)	—
2018-19 (budget)	0.13





## Country context

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**Sri Lanka has experienced strong economic growth for a decade and has significantly reduced its rates of extreme poverty, to some extent overcoming economic impacts of prolonged civil conflict that ended in 2009. Sri Lanka is now approaching upper-middle-income status and while its overall economic prospects are positive, much of the growth is concentrated in the Western Province and significant inequality and marginalisation exists, especially in rural and plantation areas and districts directly affected by the civil conflict. Australia's aid program is guided by objectives of: expanding economic opportunities for the poor; supporting government to be more responsive to the needs of citizens and the private sector; and increasing gender equality.**

Aid Investment Plan, Sri Lanka, 2015–2019 (DFAT)

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Sri Lanka has faced many recent challenges. A 26-year civil war scarred the nation, and a tsunami in 2004 left tens of thousands of people dead, injured or homeless. Despite these catastrophes, growth over the past decade has been strong, resulting in significant poverty reduction across the country.

Today, Sri Lanka has achieved most of the Millennium Development Goals, and has achieved middleincome country status. But growth has not been uniform, and significant pockets of poverty exist in the former conflict districts of Mullaitivu, Manar and Kilinochchi in the Northern Province, as well as Batticaloa in the Eastern Province and Moneragala in the Uva Province.

From 1980 until 1992, ACIAR had a broad collaborative research program with Sri Lanka that covered fisheries, agriculture policy, forestry, animal health and crops. This collaborative program was gradually reduced, until the last fisheries project ended in 2005.

Australia has a strong interest in ensuring Sri Lanka continues its development as a secure, stable and prosperous partner of Australia in the Indian Ocean region, underpinned by an effective postconflict reconciliation process (Aid Investment Plan, Sri Lanka Program, 2015–2019).

Given this, early in 2016, Australia's Commission for International Agricultural Research requested an assessment to consider re-establishing a collaborative research program with Sri Lanka, subject to funding availability. In response, ACIAR undertook a scoping study to assess the potential of such a partnership that aligned with Sri Lankan Government and Australian Government priorities (ACIAR Scoping study: re-engagement in agricultural research for development partnerships in Sri Lanka). The study concluded there is a conducive environment to re-establish a collaborative research program with Sri Lanka, and that this should start with a multidisciplinary project in aquaculture for freshwater shrimp, focused on communities in the Northern Province. Given Sri Lanka's middleincome status, this re-engagement with Sri Lanka is based on significant co-investment from the Sri Lankan research agencies.

## Country priorities

Improved income and employment opportunities for many Sri Lankans are currently constrained by gender, geography, ethnicity, caste, lack of productive assets and a weak private sector. The main development priority for Sri Lanka is supporting inclusive growth and human development.

ACIAR's re-engagement with Sri Lanka supports Objective 1 of the Australian Government's development cooperation program with Sri Lanka: to expand economic opportunities for the poor. This objective specifically notes:

The growth and competitiveness of the Sri Lanka economy, particularly small and medium sized enterprises, is constrained by issues such as lack of access to finance, markets, market linkages and technology, skills gaps in the workforce, and lack of effectively coordinated and inclusive policy reform. Australia will identify a number of target sectors and value chains that offer the highest potential to benefit the poor, and women in particular.



We will work closely with the private sector and government to enhance the business-enabling environment by improving the relevance, quality and effectiveness of skills, technology, regulations and policies. The objective is for more poor Sri Lankans to receive higher wages, more stable income and rising wealth as a result of equitable engagement with the private sector.

## 2018–19 research program

Sri Lanka has a well-developed and sustainable inland reservoir fishery that contributes about 12%–15% to total fish production, and significantly benefits rural communities in the former conflict-affected Northern Province. Management practices and stocking strategies for sustainable culture-based fisheries, based on a co-management strategy, have been established in two previous ACIAR projects, and have increased the productivity of the reservoir fishery.

The Government of Sri Lanka has long recognised the potential for the extensive culture of the indigenous giant fresh water prawn in inland reservoirs, but development has been ad hoc, with productivity and returns relatively low.

ACIAR-supported projects underway in Sri Lanka are using a science-based stocking strategy to help improve the yields of giant fresh water prawn.<sup>1</sup> This is being complemented with improvements in the design and use of harvest equipment specific for the prawn, preventing damage to the animals. Another aspect of the projects is to better understand of the market chains, to enable further improvements in the value of the fishery to benefit both men and women fishers and traders.<sup>2</sup>

## 2018–19 project outputs

- » Guidelines on improved stock, monitoring and harvesting practices for giant freshwater prawn in reservoirs developed.
- » Advice provided on reservoir fisheries management, to increase the economic value for local communities.
- » Analysis completed of most effective and efficient market-chain modes to maximise benefit to male and female actors along the supply chain.

## Five-year region outcomes

- » Development of strategies to increase reservoir communities' knowledge, attitudes, assets, skills, equity and adoption of best practices for culture-based prawn fisheries.
- » Better product quality and value along the supply chain from improved stocking and fishery management practices leading to more efficient and greater production, and improved harvesting and postharvest methods.

## Current and proposed projects

1. **FIS/2017/002**—Assessing production of giant freshwater prawns in reservoirs in Sri Lanka
2. **FIS/2018/157**—Improved productivity and efficiency of the culture-based fishery for giant freshwater prawn in Sri Lankan reservoirs

### Regional Manager, South Asia

Dr Pratibha Singh

### Research Program Manager

Dr Ann Fleming, Fisheries

Contact details are provided in Appendix 2

## 3.4 Eastern and Southern Africa





## Regional program summary

On opposite sides of the Indian Ocean, the agricultural environments of Africa and Australia have much in common—the wet tropics of Rwanda and northern Queensland, the semi-arid tropics of eastern Africa and central Queensland, the irrigated schemes of southern Africa and the Murray-Darling Basin, and the arid rangelands of Ethiopia and the Northern Territory.

Africa and Australia share similar environmental constraints, including poor soils and climatic variability. 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.

Australia has also met challenges to food security, including poor livestock nutrition, weak adoption of new technologies and low levels of farmer participation in the agricultural value chain.

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.

African society has a greater proportion of poor people than any other global region, and features high levels of food insecurity and very low Human Development Index rankings. Average gross national income per capita in the countries where ACIAR projects are concentrated is about US\$250-US\$900 per year.

Current ACIAR projects are strongly aligned with the priorities of:

- » the Comprehensive Africa Agriculture Development Programme
- » the Forum for Agricultural Research in Africa
- » the 2014 Malabo Declaration
- » subregional organisations, including:
  - the Association for Strengthening Agricultural Research in Eastern and Central Africa
  - the Centre for Coordination of Agricultural Research and Development for Southern Africa
  - the Common Market for Eastern and Southern Africa.



ACIAR has regular informal consultations with DFAT and the CSIRO on current and prospective African projects and programs to ensure the best possible synergies.

ACIAR will also consult and consider regional agricultural research nodes—such as Association for Strengthening Agricultural Research in Eastern and Central Africa and the Centre for Coordination of Agricultural Research and Development for Southern Africa—in eastern and southern Africa, where there are areas of comparative advantage and mutual objectives on which to partner.

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.

A higher proportion of ACIAR projects in eastern and southern Africa are regional (that is, they operate in more than one country). ACIAR is also investigating opportunities for 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 have potential combined benefits in Africa.

## Regional context and priorities

Reducing poverty in Africa is one of the world's largest development challenges, and the World Bank considers growing the agriculture sector as key to achieving a transformational impact.

Africa's economy is inherently dependent on agriculture, with:

- » more than 60% of its 1.2 billion people living in rural areas
- » farming being the primary source of food and income, providing up to 60% of all jobs on the continent
- » more than 32% of the continent's GDP coming from the sector.

A vibrant, sustainable and resilient agriculture sector is critical for sub-Saharan Africa's economic transformation. There is considerable potential for agricultural growth, given the resources base that has not been intensively farmed and the low yields that Africa continues to achieve, combined with the growing demand for food driven by population growth, rising incomes and increased urbanisation.

According to the 2017 Africa Agriculture Status Report (AGRA report), the agricultural transformation needed for Africa is different from that in Asia at the time of the green revolution, and should be focused on entire food systems. With a favourable global food balance, African countries can feed themselves through a mix of own production and international trade, meaning they can focus on producing what matches available resources (including non-farming activities) and export opportunities.

African food systems have also been evolving rapidly as a result of urbanisation, rising incomes and changing diets. In addition, rural demographics continue to change—growing rural populations, many farms getting too small to support a family, rural youths looking for more lucrative livelihoods in urban areas than in traditional farming—necessitating the need to create more productive and interesting jobs in agriculture for young workers.

In response to these changes, in eastern and southern Africa, for example, smallholder farmers are transforming to be business actors at the core of a multi-layered food system, producing food for their family, as well as for sale to other rural and urban families as the market continues to expand.

The AGRA report suggested segmenting smallholders into those who:

- » can move into commercial farming and need business assistance
- » need other types of support to move out of farming.

The role of trees in farming systems is an important theme being addressed in eastern and southern Africa, particularly for developing locally appropriate agroforestry systems that can help farmers improve food security and livelihoods, diversify their farming systems, increase climate resilience and support improved land management practices across farming landscapes. This theme also includes work on improving market access for agroforestry products, and strengthening community-private sector partnerships through innovation platforms. Ethiopia, Rwanda, Uganda, Burundi and Zambia are benefiting from this research.

As a relatively small donor in the region, it is important that Australia's aid contribution to SubSaharan Africa is carefully targeted for greatest impact. Australian aid has the capacity to make a difference and be recognised if we:

- » target sectors where Australian experience and knowledge demonstrably add value
- » concentrate efforts in fewer countries, where we can deepen our engagement
- » continue to be a flexible and responsive donor in our chosen areas of expertise.

DFAT's Aid Investment Plan for the region includes a commitment to increase agriculture's contribution to sustainable and inclusive economic growth and food security.

## ACIAR-supported projects in the Eastern and Southern Africa region

The list on page 157 contains all current and proposed ACIAR-supported projects in Eastern and Southern Africa during 2018-19. Some of these operate at one or more sites in a single country, but many have sites at several countries in the region. In some instances, projects in this region are part of a large research program, conducted across more than one of the four regions in which ACIAR operates.

ACIAR assigns an identification code to each project, which appears at the start of each project listed, and indicates the research program under which the project is managed. This code is also used to identify projects in other reports and publications.

In the subsequent country sections of this chapter, each project underway in that country is described briefly, and expected activities, outputs and outcomes of the ACIAR research program in that country are presented.





## Current and proposed regional projects in the Eastern and Southern Africa region

### Crops

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

**CIM/2017/030**—Faba bean in Ethiopia: mitigating disease constraints to improve productivity and sustainability

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

**FSC/2012/047**—Farm mechanisation and conservation agriculture for sustainable intensification

### Forestry

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

**FST/2015/039**—Developing integrated options and accelerating scaling-up of agroforestry for improved food security and resilient livelihoods in eastern Africa (Trees for Food Security, phase 2)

### Global Program

**C2016/367**—Cultivate Africa's Future (CultiAF), phase 2—scaling up results from CultiAF, phase 1

**GP/2018/101**—Schools as a platform to improve nutrition, livelihoods and environmental sustainability

**FSC/2013/019**—Demand-led plant breeding and accelerating new variety adoption in Sub-Saharan Africa, phase 2

### Livestock Systems

**LS/2016/276**—High-quality markets and value chains for small-scale and emerging beef cattle farmers in South Africa (Stage 2)

**FSC/2012/023**—Strengthening food and nutrition security through family poultry and crop integration in Tanzania and Zambia

### Water and Climate

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

**LWR/2016/137**—Transforming smallholder irrigation into profitable and self-sustaining systems in southern Africa

**LWR/2018/119**—Digital Earth Africa, phase 1: scoping

# Eastern and Southern Africa

**Table 3.36: Eastern and southern African countries, key statistics, 2017**

Country	GDP per capita US\$	Population (million)
Burundi	320	10.86
Ethiopia	768	104.96
Kenya	1,508	49.70
Malawi	339	18.62
Mozambique	416	29.67
Republic of South Africa	6,161	56.72
Rwanda	748	12.21
Tanzania	936	57.31
Uganda	604	42.86
Zambia	1,510	17.09
Zimbabwe	1,080	16.53

Source: [data.worldbank.org/indicator](http://data.worldbank.org/indicator).

**Table 3.37: ACIAR funding to eastern and southern African countries, 2016-17 to 2018-19**

Year	A\$ million
2016-17 (actual)	12.0
2017-18 (estimated actual)	11.8
2018-19 (budget)	8.9



## 2018–19 research program

ACIAR supports 14 projects in eastern and southern Africa. The projects address ACIAR's high-level objectives, as outlined in the 10-year Strategy 2018–2027, and engage with five of ACIAR's research programs.

The following sections briefly describe ACIAR-supported projects in Africa, for each research program. Each project description is referenced to a list at the end of this section, which provides the ACIAR project code and title.

### Crops

Consistent with ACIAR objectives, projects in the Crop Research Program focus on improving productivity, nutrition, sustainability and gender equity, in specific countries and across the region.

A project on stripe (yellow) rust in wheat supporting research teams in India, Pakistan, Nepal and Ethiopia to better characterise disease variability, and to identify new sources of resistance, to address this growing threat in Africa and South Asia.<sup>1</sup>

A new project in Ethiopia will define the conditions and practices driving the spread and impact of faba bean gall and initiate a search for sources of genetic resistance. The results of the project will help design and evaluate integrated pest-management packages, and develop resistant varieties. The project will also establish the presence and relevance of other diseases in faba beans.<sup>2</sup>

A large project, in its second phase, is working in five countries of eastern and southern Africa, to sustainably increase the productivity of selected maize-based farming systems by 30% by 2023 (based on the average in 2009). At the same time, the project is working to reduce seasonal downside production risks by 30%. 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 countries that depend on maize as their staple food.<sup>3</sup>

Farm power and conservation agriculture are important elements of sustainable intensification of agriculture in Sub-Saharan Africa. Access to farm power is declining, due to the collapse of most tractor hire schemes, and diminishing numbers of draught animals and human labourers. To improve access to mechanisation, a project is speeding up the delivery of two-wheel tractor-based machinery to smallholder farmers in five African countries, and helping them adopt the technologies.<sup>4</sup>

### Forestry

Locally-appropriate agroforestry systems have potential to lift crop yields, and to diversify and provide additional income sources for smallholder farmers from agroforestry products. Now in its second phase, the Trees for Food Security project builds on previous research to integrate tree management with value-chain development, better water management and new livestock management approaches. The project is also developing sound scientific information about tree–crop interactions across different climates and soil types, and in different farming systems to guide policies and extension programs in Ethiopia, Rwanda and Uganda, to enable farmers to choose the best agroforestry system for their circumstances. To increase adoption of these agroforestry systems, cross-sector communities of practice are being established, along with capacity development, in a network of tertiary educational institutions.<sup>5</sup>

Many of the products of agroforestry systems can be used directly by farmers to substantially improve livelihoods. But farmers need access to markets, and communities need the ability to work with the private sector to supply the quantity and quality of products to meet market demand. A project in Uganda and Zambia is looking at establishing effective innovation platforms to support greater collective action to increase farmer access to markets, so that farmers earn more for their produce, while managing natural resources sustainably.<sup>6</sup>



## Global Program

The Global Program supports several regional research programs in eastern and southern Africa. The work conducted by these programs is varied, as is the nature of the outcomes and benefits of the work. These programs are described in the Global Program chapter and include the following projects:

- » Cultivate Africa's Future (CultiAF), phase 2—scaling up results from CultiAF, phase 1<sup>12</sup>
- » *Schools as platforms to increase dietary diversity, improve nutrition and enhance livelihoods and environmental sustainability in Kenya, Ethiopia, Tanzania and Uganda*<sup>13</sup>
- » *Demand-led plant breeding and accelerating new variety adoption in Sub-Sahara Africa*<sup>14</sup>.

## Livestock

Livestock management is an important source of farm-level diversification for smallholder farmers in eastern and southern Africa. Projects in the Livestock Research Program provide opportunities for smallholder farmers to meet market requirements and raise awareness of the importance of production system sustainability, product quality and human nutrition.

An important research theme is improved linkages between farmers and the private agribusiness sector. A project is building on previous research that developed opportunities for small-scale farmers to supply pasture-fed beef for sale at selected supermarket outlets. The project is establishing commercially viable value chains and improving the competitiveness of small-scale beef cattle farmers in South Africa.<sup>7</sup>

A project in Tanzania and Zambia is exploring how to strengthen food and nutrition security, by improving the quantity, quality, accessibility and consumption of nutrient-rich food of animal and plant origin (for example, eggs and traditional vegetables). In these countries, stunting occurs in more than 40% of children aged under five years. The project aims to reduce childhood undernutrition. Women are largely responsible for household nutrition, so the project is testing

interventions (for example, controlling Newcastle disease in family poultry) that will increase the role women play in integrating poultry and crop production, as well as improving household nutrition.<sup>8</sup>

## Water and Climate

While irrigation has significant potential to contribute to food security in Sub-Saharan African countries, investment in irrigation infrastructure and distribution faces major impediments to generating adequate returns. Markets are poorly integrated, water governance is weak and there is significant degradation and abandonment of irrigated land. Despite this, irrigation expansion is taking place, through both government and individual smallholder farmer schemes. The Water and Climate Research Program supports research to increase water-use productivity and prevent/reverse environmental degradation in established and new irrigated lands.

While there is ample knowledge about the design and construction of irrigation infrastructure, irrigation management skills are needed to capitalise on this infrastructure. To address this need, a project in Malawi, South Africa and Tanzania is developing a system of continual social and institutional learning to improve the profitability and sustainability of irrigated farming. Described as a Virtual Irrigation Academy, the project combines new irrigation monitoring tools with an online communication and learning system.<sup>9</sup>

Another regional project aims to improve farmer livelihoods, equity and community management in smallholder irrigation schemes in southern Africa, by determining the best method to disseminate technologies identified by previous projects (particularly FSC/2013/006) that have substantially increased farmers' productivity and incomes and made irrigation schemes more self-sustaining.<sup>10</sup>

ACIAR is working with Geoscience Australia to scope out the potential to apply Australian technology and expertise in earth observations and 'big data' to track changes across Africa, to provide insights into flooding, droughts, agricultural change and other environmental and food security issues and challenges.<sup>11</sup>



## 2018-19 project outputs

- » Testing of integrated forage–legume–maize systems in two countries in the region documented.
- » Dry environments characterised, and crop production modelled by the Ethiopian sorghum breeding program.
- » Knowledge of practices of farming systems intensification increased, through joint research with national research and development agencies.
- » Survey for faba bean gall disease occurrence in Ethiopia completed, and data analysed and reported.
- » Core set of 250 wheat lines selected, multiplied and dispatched for multi-location wheat yellow rust resistance screening.
- » Small-scale farmers started supplying beef cattle to two abattoirs that process pasture-fed beef for sale at selected supermarkets in South Africa.
- » Suitability maps for agroforestry species and management options across different sites and farmer circumstances produced for Ethiopia, Uganda and Rwanda.
- » Outcomes of improved poultry and vegetable production on childhood undernutrition evaluated.
- » About 20,000 households practising agroforestry systems in participating regions of Ethiopia, Uganda and Rwanda.
- » About 200 participants of Innovation Platforms trained and mentored through action learning in Uganda and Zambia.
- » A hub established in South Africa, which provides simple tools and training for the virtual irrigation academy.
- » A new project established to scale out simple tools and best practices for transforming smallholder irrigation schemes.
- » Innovative education module developed for teaching the best-practice plant variety design, to form part of the syllabus for postgraduate degrees in plant breeding in the region.
- » African regional plant biosecurity Network Coordinator actively working in Common Market for Eastern and Southern Africa, and being supported by an Australian mentor.
- » Phase 2 of CultiAF developed.
- » Pilot scaling of maize and legume intensification documented.





## Five-year region outcomes

- » Improved smallholder access to traditional and modern market chains with higher food safety and quality standards.
- » Increased and sped up 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 support uptake of technical research results through effective synergies between science and policy.
- » Documented economic and social benefits to farmers from adoption of agroforestry systems.
- » Improved nutritional quality and diversity of diets.
- » Strengthened regional plant biosecurity capacity.
- » Improved plant breeding network across Africa.
- » New partnerships with like-minded organisations funding agricultural research.
- » Demonstrated and available approaches and tools for transforming smallholder irrigation systems.

### Regional Manager, Africa

Dr Leah Ndung-u

### Research Program Managers

Dr Eric Huttner, Crops

Dr Nora Devoe, Forestry

Ms Mellissa Wood, Global Program

Dr Werner Stur/Dr Anna Okello, Livestock Systems

Dr Robyn Johnston, Water and Climate

Contact details are provided in Appendix 2

## Current and proposed projects

1. **CIM/2014/081**—Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa
2. **CIM/2017/030**—Faba bean in Ethiopia: mitigating disease constraints to improve productivity and sustainability
3. **CSE/2013/008**—Sustainable intensification of maize-legume cropping systems for food security in eastern and southern Africa II (SIMLESA II)
4. **FSC/2012/047**—Farm mechanisation and conservation agriculture for sustainable intensification
5. **FST/2014/093**—Developing value-chain innovation platforms to improve food security in eastern and southern Africa
6. **FST/2015/039**—Developing integrated options and accelerating scaling-up of agroforestry for improved food security and resilient livelihoods in eastern Africa (Trees for Food Security, phase 2)
7. **LS/2016/276**—High-quality markets and value chains for small-scale and emerging beef cattle farmers in South Africa (Stage 2)
8. **FSC/2012/023**—Strengthening food and nutrition security through family poultry and crop integration in Tanzania and Zambia
9. **LWR/2014/085**—A virtual irrigation academy to improve water productivity in Malawi, Tanzania and South Africa
10. **LWR/2016/137**—Transforming smallholder irrigation into profitable and self-sustaining systems in southern Africa
11. **LWR/2018/119**—Digital Earth Africa, phase 1: scoping
12. **C2016/367**—Cultivate Africa's Future (CultiAF), phase 2—scaling up results from CultiAF, phase 1
13. **GP/2018/101**—Schools as a platform to improve nutrition, livelihoods and environmental sustainability
14. **FSC/2013/019**—Demand-led plant breeding and accelerating new variety adoption in Sub-Saharan Africa, phase 2



4

# Impact Evaluation Program





# Impact Evaluation Program

**Table 4.1: ACIAR funding for impact evaluation, 2016-17 to 2018-19**

Year	A\$ million
2016-17 (actual)	0.5
2017-18 (estimated actual)	0.8
2018-19 (budget)	1.3

The impact of ACIAR's research is periodically assessed to demonstrate to stakeholders the difference made by investments in research for development at scientific, institutional and community levels in our partner countries and in Australia.

Importantly, impact assessments inform future project selection, design and delivery, and help determine the appropriate pathways to impacts.

The three types of assessment of finished projects that the Impact Evaluation Program commissions are:

- » economic evaluations
- » impact pathway analysis
- » adoption studies.

Economic evaluations are undertaken by independent economists with special expertise in measuring the impact of agricultural research. These involve in-depth analysis of the adoption and impact of project outputs in the partner countries and Australia. These assessments provide estimates of the returns to investment in the research area of interest, typically looking at several projects focused on a particular geography or technical area. Qualitative assessments of social and environmental impacts are also sought in these analyses. Reports on economic evaluations are published as the ACIAR Impact Assessment Series.

Impact pathway analysis articulates the path from a body of research to impact, providing an in-depth analysis of the contextual environment, key stakeholders, pathway linkages, any changes that have occurred, and actions that could be undertaken in the project or program to increase the likelihood of the ultimate goals of the research being reached. These analyses are also published in the Impact Assessment Series.

Adoption studies primarily provide ACIAR and our project partners with a greater understanding of the pathways to change. The studies are undertaken by the Australian project leader three to four years after completion of the project. The study provides ACIAR with information on the difference that the project has made at scientific and community levels in the partner countries and Australia. If uptake of project outputs has not occurred, reasons are sought. Increased understanding of the contextual environment in which we operate increases the likelihood that future research will have a positive impact. These reports are published as the ACIAR Adoption Studies Series.

## Development of future evaluation

ACIAR recognises that many of the social, environmental and capacity-building impacts of research for development are not adequately characterised and quantified by economic assessment alone. During 2018-19, the Impact Evaluation Program will continue to develop and expand the suite of methods used for evaluation of outputs, to better describe and assess social, environmental and capacity-building impacts resulting from our research; and to complement the rigorous economic impact assessments that are central to the Impact Evaluation Program.



The program will explore mixed-methods approaches to ex-post impact assessment. These mixed-methods approaches will help undertake portfolio-level evaluations against ACIAR's strategic objectives articulated in the ACIAR 10-year Strategy 2018–2027.

For example, the objective of 'Improving gender equity and empowerment of women and girls' requires specific tools and methods to provide a richer assessment of gender-related impacts, in addition to the current impact assessment methods. The Impact Evaluation Program will review various evaluation approaches that can be adapted to support ex-post assessment of the impacts on women and girls from ACIAR research-for-development investments, and then apply some of these approaches to evaluate the social impacts using several projects as case studies.

It is anticipated that these complementary methods and tools will also inform current and future ACIAR research project teams in designing project measurement, evaluation and learning activities, for gender-sensitive reporting and women and girls' empowerment outcomes and impacts in communities.

The experience gained by ACIAR through its long history of impact assessment activities has been used to provide training courses for research groups, so that consideration of impact and adoption is an integral part of research project design and management. Consequently, emphasis is also placed on developing collaborative networks with Australian and partner-country practitioners responsible for impact evaluations, and on building capabilities to undertake robust analyses.

These activities help improve the accuracy of the information used in ex-post assessment of the impacts of research, and the effectiveness of the methods used to quantify and qualify the returns on an investment. An extension of this is the Impact Evaluation Program's new collaboration with Philippines partner, the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development, to develop relevant mixed-methods approaches to evaluate complex agricultural research-for-development investments (ACIAR project IAP/2017/010 described in Chapter 3.2).

The resulting framework and tools will be applied to the Landcare investments in the Philippines, with its complex economic, social and environmental impacts.

## 2018–19 priorities

- » Evaluate accountability and lessons learned.
- » Assess the impacts of ACIAR's research, with an emphasis on measuring the impact of agricultural research on productivity and farm household incomes, capacity-building and social and environmental impacts.
- » Develop methods and processes to improve the monitoring and assessment of capacity-building outcomes arising from ACIAR-funded projects.
- » Complete the 2018 project leader Adoption Studies report for the set of large projects concluded in 2013–14.

## 2018–19 key performance indicators

- » At least four reports completed in the Impact Assessment Series.
- » Annual project leader Adoption Studies report completed.
- » Methods to evaluate the impacts of research project outcomes on women and girls developed and applied, complementing ACIAR's rigorous impact assessment method.
- » Partner country and project teams to evaluate agricultural research initiatives strengthened, including impact assessment and monitoring and evaluation.

### Research Program Manager, Impact Evaluation

Dr Andrew Alford

Contact details are provided in Appendix 2



Image: ACIAR/Conor Ashleigh





5

# Capacity Building Program

# Capacity Building Program

**Table 5.1: ACIAR funding for formal training, 2016-17 to 2018-19**

Year	A\$ million
2016-17 (actual)	7.8
2017-18 (estimated actual)	8.3
2018-19 (budget)	9.0

Building capacity in partner countries is a key priority for ACIAR. Following the 2016-17 review of the Capacity Building Program, ACIAR is renewing its activities to have a greater focus on leadership and career development in our partner countries. Our focus on postgraduate training continues, while initiatives are developed and implemented.

During 2018-19, ACIAR will launch an executive leadership program for John Allwright Fellows. For the first time, the fellows will complete courses in leadership, communication, financial and project management, and gender awareness and inclusion.

ACIAR will also introduce a second round of the John Dillion Fellowship, targeting researchers in the Pacific region. The fellowship has been refined to deliver a more seamless program, and includes a program leader and pre- and post-fellowship engagement.

During the year, development of a new women's leadership program for agricultural researchers will continue for launch in 2020. ACIAR will also pilot an expanded internship program and farmers volunteering program.

## Postgraduate training

ACIAR will continue to provide John Allwright Fellowships during 2018-19. Fellowships are awarded to partner-country scientists involved in ACIAR-supported collaborative research projects to undertake postgraduate training, 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.

In the first semester of 2019, the first cohort of John Allwright fellows will start the John Allwright Fellowships executive leadership program on a part-time basis over 18 months. The program includes:

- » a 10-day camp with workshops and field trips
- » a series of online short course modules
- » a four-day reflective workshop at the end.

The fellows will be awarded a certificate of completion that counts for half of a Graduate Certificate in Professional Practice or Applied Leadership.

ACIAR also provides scholarships to citizens of seven South Pacific countries (Fiji, Kiribati, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu) to complete a postgraduate diploma or Master of Science degree at the University of the South Pacific. The students undertake research in close collaboration with an ACIAR-funded project in the region, on a topic of high priority to one of ACIAR's Pacific partner countries. During 2018-19, the scholarship program will continue to be supported, with an Australian university to strengthen and support the scholarship program.



## Agribusiness Intern Scholarships

During 2018, ACIAR will offer a further seven three-month agribusiness internship scholarships, as part of a pilot to identify and attract talented graduates from Australian university business schools and Master of Business Administration (MBA) programs.

Interns get to develop and apply their experience, skills and knowledge to agribusiness problems, by undertaking a small business project with private sector partners linked to ACIAR projects. For example, a University of Queensland MBA graduate worked with Yoma Bank in Myanmar, investigating value-chain financing opportunities in the sugar sector. A Melbourne Business School MBA graduate investigated the potential for a customised mobile app to improve information flow between cassava starch processors, traders and farmers in Vietnam.

## Research leadership and management and career development

In addition to the new John Allwright Fellowships executive leadership program, for the first time in 2018-19, ACIAR will conduct two rounds of the John Dillon Fellowship program for outstanding midcareer agricultural scientists from ACIAR partner countries.

The program started in 2002 with cohorts of 10 individuals. In 2017-18, an Australian researcher also participated in the program, and this practice will continue. ACIAR will now also deliver a second round, targeting groups from the one organisation to build institutional capacity.

The John Dillon Fellowship program now runs over six weeks in Australia, and includes modules focusing on leadership, communication, project management and policy development. The fellows engage in networking events and field trips, including an individual placement at an institution of their choice.

ACIAR is developing a new women's leadership program for agriculture for development researchers in the Indo-Pacific. During 2018-19, ACIAR will develop the curriculum and operating model for the program. It is anticipated that applications for the first cohort will open in the second half of 2019, with the program launching early in 2020.

### ACIAR alumni

During 2018-19, ACIAR is allocating funding for a program of alumni events in our partner countries. These events are designed to maintain and strengthen relationships, and continue to build capacity. A stronger alumni identity will also be launched, along with social media forums to enable greater engagement.

An awards and recognition program for senior research scientists working overseas in agriculture for development will also be established. Through the program, individuals who have made a significant contribution to agricultural research in the Indo-Pacific region will be publicly acknowledged.

### Internships and volunteers

In 2018-19, ACIAR is developing a volunteering program that will provide opportunities for Australian farmers to work with farmers in the Indo-Pacific region on ACIAR projects.

The Crawford Fund, with support from ACIAR, is establishing a strategy and modus operandi to grow mentoring activities, and to increase the number of mentors.

**Table 5.2: Five-year history of participants in John Allwright and John Dillon fellowships**

	2014-15 (actual)	2015-16 (actual)	2016-17 (actual)	2017-18 (estimated)	2018-19 (estimated)
John Allwright Fellows: total active in year	138	130	140	97	90
John Allwright Fellowships awarded in year	27	24	22	7	12
John Dillon Fellows: total active and awarded in year	10	10	10	10	20

## Cross-programs training

ACIAR supports training activities delivered by the Crawford Fund. This includes the Master Class and Training Program, which is a key capacity-building program for international agricultural research for development in the region. Participants include mid-career international scientists and young scholars.

ACIAR's events program has been renamed the Launch Fund. The fund provides financial assistance to organisations or individuals wishing to conduct or attend events that directly benefit international agricultural research. Activities supported by the fund will develop skills and knowledge, and/or develop and maintain research partnerships to improve international agricultural research.

## 2018–19 key performance indicators

- » At least 10 students successfully complete postgraduate awards.
- » At least 20 students enrol in the first cohort of the John Allwright Fellowship executive leadership program.
- » Size and management of the John Allwright Fellowship program is within budget allocation.
- » Two rounds of the John Dillon Fellowship program are delivered within budget and with high overall satisfaction results from participants.
- » New capacity-building programs, including for women's leadership, farmer volunteers, and reward and recognition of agricultural science researchers, will be designed.
- » At least 10 alumni events, reaching a minimum of 80 ACIAR alumni, are held in partner countries.
- » The performance of capacity-building service providers meets contractual obligations and ACIAR expectations.

## General Manager, Outreach and Capacity Building

Ms Eleanor Dean

A committee of senior staff provides guidance on training priorities and the selection of fellowship and funding recipients.

The contact person for ACIAR fellowships is Mr Geoffrey O'Keefe, Manager, Capacity Building Program.

Contact details are provided in Appendix 2



6

# Outreach Program





# Outreach Program

**Table 6.1: ACIAR funding for communicating research results, 2016-17 to 2018-19**

Year	A\$ million
2016-17 (actual)	0.6
2017-18 (budget allocation)	1.3
2018-19 (budget)	2.5

The Outreach Program will continue to focus on increasing understanding in Australia of the impact of Australia's aid investment through ACIAR, and on ensuring that more audiences can access, understand and use research findings, both in Australia and in partner countries.

Several significant projects started in 2017-18 and will progress further in 2018-19 to raise the profile of the organisation.

The first phase of the redeveloped website was launched in 2017-18, which saw ACIAR move from a text-heavy site to a much more engaging site with captivating imagery and highlights. During 2018-19, the next phase of website development will see the interactive map integrate more closely with projects in each country, and the search function developed to include targeted search terms.

A digital manager has been engaged to oversee the next phases of the website, as well as work with the Outreach Program and Business Systems Unit to drive the digital asset and customer relationship management systems projects. A digital asset management system will be established to house ACIAR's collection of stunning images and videos from projects all around the world, providing ease of access for use across promotional tools and other needs. The customer relationship management system will allow ACIAR to understand what stakeholders want to be informed about, and how they would like to receive it.

Social media continues to be a key promotional tool for ACIAR. The channels are used to promote the work ACIAR does, both domestically and internationally, featuring a variety of images, videos and blog stories about projects all around the world. In 2018-19, the ACIAR Exposure blog will continue to be one of the key tools for disseminating information—with an interesting narrative and high-quality images—and encouraging the public to subscribe to our other channels. These social media tools also enable ACIAR to show support of, and cross-promote, partnering and collaborating organisations.

Several long-term media partnerships were created in 2017-18 to communicate to Australian audiences about the value of international agricultural research, both domestically and internationally. During 2018-19, the outcomes from these partnerships will start to roll out through mainstream media. Six episodes of *The Good Cooks*—a television cooking program that profiles ACIAR projects in six different countries—will be aired on the SBS Food channel.

Several ABC journalists will visit ACIAR projects in the Indo-Pacific region to capture different stories and angles that will interest the general public in Australia, helping ACIAR increase awareness about the work it does. ACIAR will continue to work closely with the Crawford Fund to generate positive media coverage, especially in the regional media in Australia.



Work will continue on developing a stakeholder management strategy that will target key agriculture peak bodies and associations to communicate the benefits of ACIAR's work to Australia, and specific agriculture industries. The implementation of the campaign will roll out through 2018-19.

ACIAR will progressively roll out its network of communication officers based in the country offices. These officers will develop communication products and activities to meet the information needs of in-country stakeholders.

ACIAR will continue to produce its flagship publication, *Partners in research for development*, with an ongoing push to move towards electronic subscription, where suitable.

During 2018-19, ACIAR will publish scientific information in various formats. An overarching scientific publishing strategy will be developed and implemented to heighten the profile and credibility of ACIAR's scientific publishing series. This will include a renewed focus on 'how to' style documents, as well as project outcomes. More ACIAR publications will be translated into the languages used in our partner countries, and engagement with online academic forums for Australians and international audiences will be increased.

Corporate publications will be published as per statutory and legislative requirements, and these will be available both online and in limited hard copy.

## 2018-19 key performance indicators

- » Next phase of the ACIAR website released.
- » Social media following increases by 3,000 people per month across the platforms.
- » Four blogs published per month.
- » *The Good Cooks* television program is launched publicly.
- » At least six media stories mentioning ACIAR are published/broadcast.
- » Three issues of *Partners in research for development* are published.
- » Research publications are produced in a timely manner, with accompanying distribution strategies.
- » All statutory and legislative reporting and information requests are met in an efficient and timely manner.

### General Manager, Outreach and Capacity Building

Ms Eleanor Dean

Contact details are provided in Appendix 2











7

# Corporate Programs

# Corporate programs

**Table 7.1: ACIAR funding for corporate programs, 2016-17 to 2018-19**

Year	A\$ million
2016-17 (actual)	11.1
2017-18 (estimated actual)	10.4
2018-19 (budget)	12.0

Corporate programs underpin the effective and efficient project development and management of ACIAR and are integral to managing a diverse portfolio of operations across partner countries. ACIAR has 10 overseas offices, mostly located at Australian diplomatic posts, where country office staff play a key role in managing stakeholder relations and ensuring that partner-country priorities are reflected in ACIAR's work. The corporate area also supports officers at these posts.

The three key components of corporate management in ACIAR are:

- » Finance, Procurement and Legal
- » Human Resources
- » Business Systems.

The Finance, Procurement and Legal team is responsible for delivery of key finance, procurement and legal functions, that are compliant with government requirements and enable ACIAR to effectively conduct its business.

The Human Resources team influences the culture and wellbeing of the agency, by developing policy, and implementing practical solutions to human resource matters, including recruitment, induction, learning and development, performance management, work health and safety and workplace diversity. The Human Resources area also manages workplace relations and implements the ACIAR Enterprise Agreement.

The Business Systems team works with people, processes and technology to provide staff and external stakeholders with access to ACIAR's information and knowledge, and provides information technology (IT) services, including design and delivery of information and communication technology management and systems. The unit also manages compliance in the areas of records and information management, web accessibility, freedom of information, privacy and the Information Publication Scheme.

## 2017-18 priorities

### Finance, Procurement and Legal

- » Provide high-quality financial management for ACIAR, and report in an accurate, legally compliant and timely manner, both internally and externally.
- » Contribute to ACIAR's business and strategic planning initiatives, 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 helping to negotiate international and domestic agreements.
- » Manage and provide advice on ACIAR's tendering and procurement functions (including travel), and ensuring adherence to government procurement rules and requirements.
- » Support the Audit Committee in both its operational and strategic agendas.
- » Contribute to the management, maintenance and development needs of ACIAR's business systems, and work to integrate key agency financial information systems to better meet business and user needs.
- » Manage ACIAR's property arrangements, in Australia and overseas.





## Human Resources

- » Manage workplace relations and implementation of ACIAR's Enterprise Agreement and other agreements for staff engaged overseas, in accordance with current Australian Government policy.
- » Ensure that work health and safety legislation is appropriately incorporated into the ACIAR policies and procurement framework, including training in, and awareness of, individual responsibilities under the legislation.
- » Ensure that staff understand ACIAR's values and encourage senior management to be champions and role models for appropriate behaviours.
- » Ensure the integration and development of both locally-engaged staff, and those who work remotely.
- » Maintain ACIAR's workforce planning framework, ensuring that strategies are in place for the right people to be in the right job at the right time.

## Business Systems

- » Maintain the current business systems to deliver on-core business requirements.
- » Contribute to the development and implementation of new business systems, to ensure that infrastructure, information and records management, and technology issues are taken into account with new system implementation.
- » Manage records and information management practices consistent with Australian Government standards, and support a compliant information environment.
- » Manage the maintenance and development, and provide helpdesk services, for ACIAR's business systems environment, including project management requirements, records management, and internal and external communication requirements, and work to meet business and user needs.
- » Further improve the whole-of-agency's remote access capabilities, and use of web conferencing and other communication applications within the constraints allowed by a secure environment and overseas telecommunications facilities.

## Chief Finance Officer

Ms Audrey Gormley

Contact details are provided in Appendix 2

## 2017-18 key performance indicators

- » Departmental and administered costs are maintained within agreed budget parameters.
- » All legislative, reporting and information requirements and requests are met in an efficient and timely manner.
- » Business systems meet the needs of ACIAR and the Australian Government in a secure, efficient and effective manner.
- » A safe and productive workforce is supported with appropriate policies and procedures.







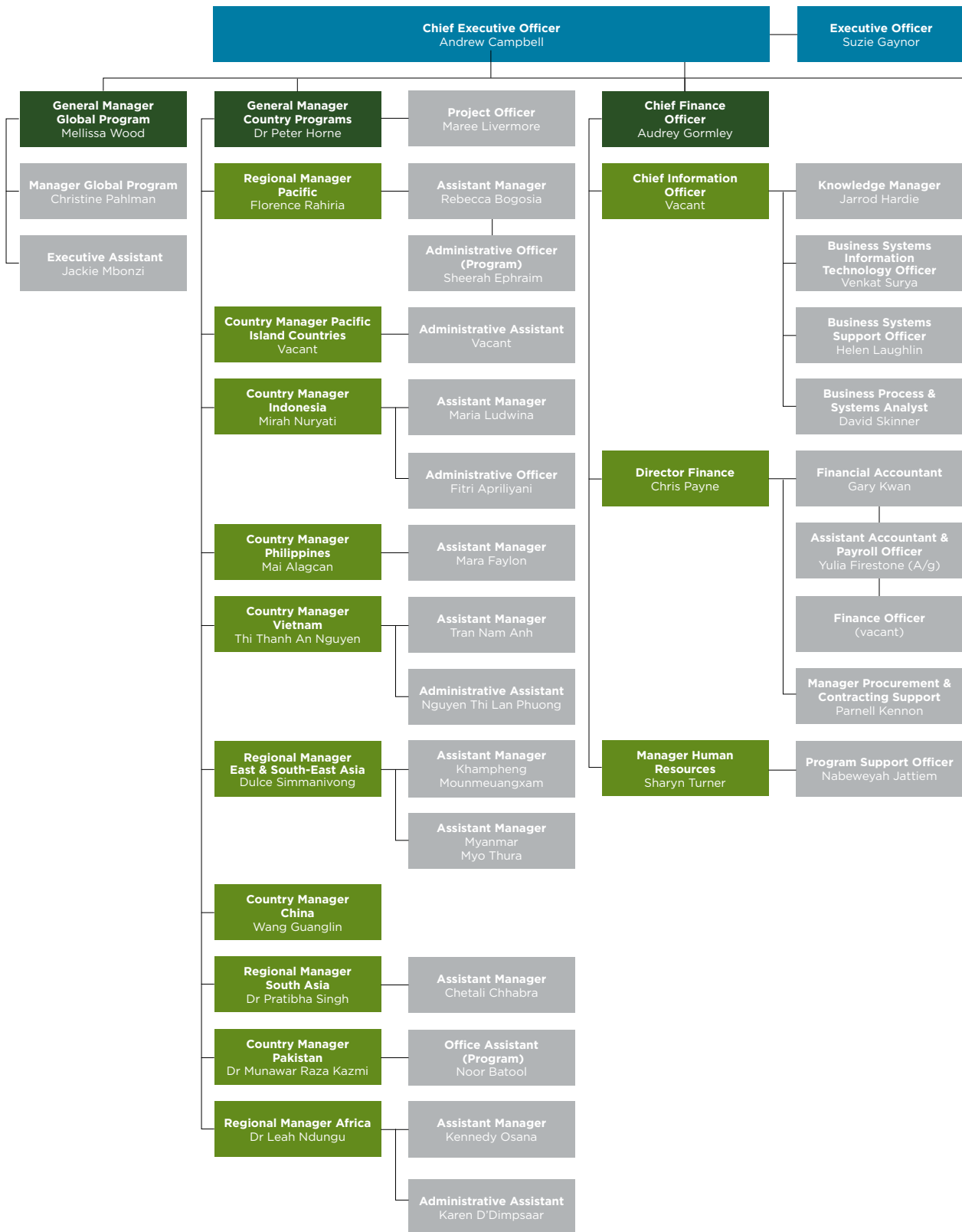




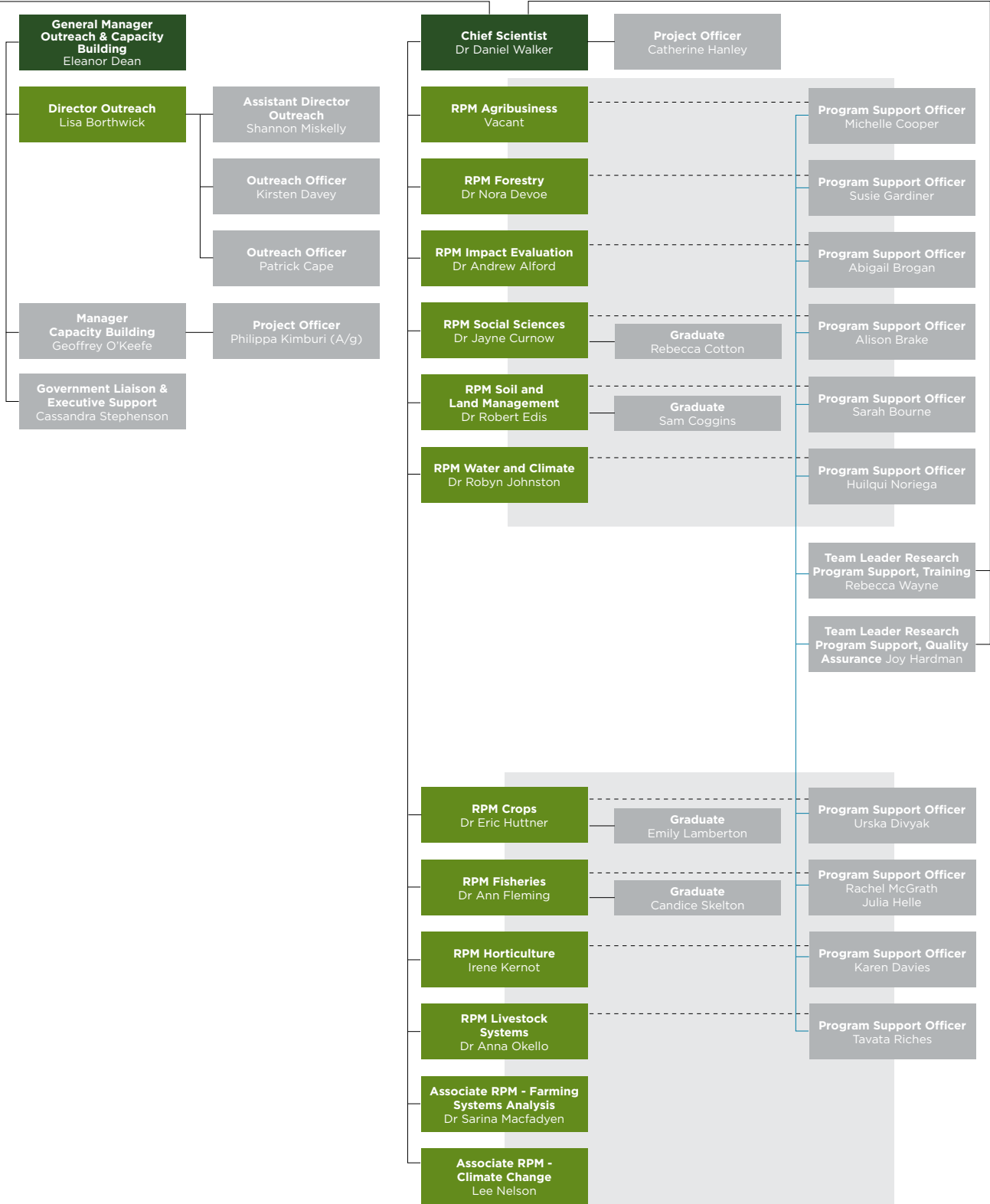
# Appendices



# Appendix 1 Organisational structure



Positions and staff current for six months up until December 2018  
RPM - Research Program Manager





## Appendix 2 ACIAR directory

### ACIAR

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#### General Manager, Outreach and Capacity Building

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### Research Program Managers

#### Agribusiness

Position vacant at time of publication

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## Appendix 3 Commissioned organisation and project leader for current and proposed projects

Project title	Project code	Commissioned organisation	Project leader
<b>Agricultural Development Policy Research Program</b>			
Policy and institutional reforms to improve horticultural markets in Pakistan	ADP/2014/043	Monash University	Dr Thilak Mallawaarachchi
Improved seaweed culture and postharvest waste utilisation in South-East Asia	SMAR/2008/025	Southern Cross University	Assoc Prof Symon Dworjany
Agricultural policy research to support natural resource management in Indonesia's upland landscapes	ADP/2015/043	The University of Adelaide	Prof Randy Stringer
Understanding the drivers of successful and inclusive rural regional transformation: sharing experiences and policy advice in Bangladesh, China, Indonesia and Pakistan	ADP/2017/024	The University of Adelaide	Prof Christopher Findlay
Improving policies for forest plantations to balance smallholder, industry and environmental needs in Lao PDR and Vietnam	ADP/2014/047	The University of Melbourne	Prof Rod Keenan
Strengthening incentives for improved grassland management in China and Mongolia	ADP/2012/107	The University of Queensland	Dr Colin Brown
Creating wealth in smallholders farms through efficient credit systems in Pakistan	ADP/2016/028	The University of Queensland	Assoc Prof John Steen
Evaluating and improving policies for attracting investment in the agricultural sector in Vietnam	ADP/2018/120	The University of Sydney	Dr Tiho Ancev
Policy analysis of food safety and trade in Vietnam	ADP/2016/140	The University of Western Australia	Dr Elizabeth Petersen
Efficient participatory irrigation institutions to support productive and sustainable agriculture in south Asia	ADP/2014/045	University of South Australia	Prof Lin Crase
Developing competitive and inclusive value chains of pulses in Pakistan	ADP/2017/004	University of Tasmania	Dr Rajendra Adhikari
Policy drivers for public-private partnerships in pacific organics: improving extension policy through an evidence-based approach	ADP/2018/131	University of the Sunshine Coast	Assoc Prof Christine Jacobson
<b>Agribusiness Research Program</b>			
Improving livelihoods in Myanmar and Vietnam through vegetable value chains	AGB/2014/035	Applied Horticultural Research	Dr Gordon Rogers
Analysis of the private sector landscape in Myanmar: opportunities for inclusive agribusiness	AGB/2018/125	Business for Millenium Development	Mr Mark Ingram
Increasing the sustainability, productivity and economic value of coffee farming systems and value chains in the Central Highlands region of Vietnam	AGB/2018/208	CIRAD	Mr Philippe Vaast
Enhancing smallholder linkages to markets by optimising transport and logistics infrastructure	AGB/2017/036	CSIRO Land and Water	Dr Chris Chilcott
Improving smallholder farmer incomes through strategic market development in mango supply chains in southern Vietnam	AGB/2012/061	Griffith University	Dr Robin Roberts
Supporting access to mango research information, communication, collaboration and capacity development	AGB/2016/006	Griffith University	Dr Robin Roberts
Challenges and opportunities for meeting requirements of China mango markets	AGB/2016/007	Griffith University	Dr Robin Roberts

Project title	Project code	Commissioned organisation	Project leader
Opportunities and strategies to improve biosecurity, market access and trade for selected mango markets	AGB/2016/008	Griffith University	Dr Robin Roberts
Enhancing mango fruit quality in Asian mango chains	AGB/2016/009	Griffith University	Dr Robin Roberts
Priority opportunities in tropical fruit processing in selected mango markets	AGB/2016/010	Griffith University	Prof Chengrong Chen
Developing an emergency response and long-term management strategy for cassava mosaic virus in Cambodia and Vietnam	AGB/2016/032	International Center for Tropical Agriculture	Dr Nami Minato
Inclusive agriculture value chain financing	AGB/2016/163	International Food Policy Research Institute	Dr Alan de Brauw
Integrating gender and social inclusion into agricultural value chain research in Vietnam	AGB/2017/008	International Potato Center	Ms Nozomi Kawarazuka
Pacific Agribusiness Research in Development Initiative Phase 2 (PARDI 2)	AGB/2014/057	Pacific Australia Reforestation Company	Dr Lex Thomson
Improving market integration for high value fruit and vegetable production systems in Indonesia	AGB/2009/060	The University of Adelaide	Prof Randy Stringer
Towards more profitable and sustainable vegetable production systems in north-western Vietnam	AGB/2012/059	The University of Adelaide	Dr Wendy Umberger
Improving milk supply, competitiveness and livelihoods in smallholder dairy chains in Indonesia	AGB/2012/099	The University of Adelaide	Dr Wendy Umberger
Impact assessment of cocoa interventions in Vanuatu	AGB/2016/053	The University of Adelaide	Dr Alexandra Peralta
Revision and update of Markets for the Poor (M4P) and Agribusiness Master Class (AMC)	AGB/2018/121	The University of Adelaide	Dr Wendy Umberger
Improving smallholder incomes in the north-western highlands of Vietnam by increasing access and competitiveness in regional temperate and subtropical fruit markets	AGB/2012/060	The University of Queensland	Mr Oleg Nicetic
Developing value-chain linkages to enhance the adoption of profitable and sustainable cassava production systems in Vietnam and Indonesia	AGB/2012/078	The University of Queensland	Dr Dominic Smith
Developing vegetable and fruit value chains and integrating them with community development in the southern Philippines	AGB/2012/109	The University of Queensland	Dr Phillip Currey
Sustainable and inclusive development of the cattle and beef industry in Vietnam and trade relationships with other countries in the region	AGB/2016/196	The University of Queensland	Dr Dominic Smith
Developing vegetable and fruit value chains and integrating them with community development in the southern Philippines	AGB/2017/039	The University of Queensland	Dr Gomathy Palaniappan
Strengthening leadership, coordination and economic development of the temperate fruit industry in northern Vietnam	AGB/2018/171	The University of Queensland	Mr Oleg Nicetic
Inclusive agribusiness-led development for high-value fruit and vegetable in the southern Philippines	AGB/2018/196	The University of Queensland	Dr Neal Menzies
Evaluating smallholder livelihoods and sustainability in Indonesian coffee and cocoa value chains	AGB/2010/099	The University of Sydney	Dr Jeff Neilson
Increasing the sustainability, productivity and economic value of coffee and black pepper farming systems and value chains in the Central Highlands region of Vietnam.	AGB/2018/175	World Agroforestry Centre	Dr La Nguyen
<b>Crops Research Program</b>			
Increasing productivity and profitability of pulse production in cereal based cropping systems in Pakistan	CIM/2015/041	Charles Sturt University	Dr Ata Rehman

Project title	Project code	Commissioned organisation	Project leader
Insect tolerant chickpea for Bangladesh	CIM/2016/039	CSIRO Agriculture and Food	Dr TJ Higgins
Understanding drill-seeding of rice techniques and business models	CIM/2018/113	Deakin University	Dr John Hornbuckle
Improving post-rainy sorghum varieties to meet the growing grain and fodder demand in India	CIM/2007/120	International Crops Research Institute for the Semi-Arid Tropics	Dr Vincent Vadez
Identification of sources of resistance to wheat blast and their deployment in wheat varieties adapted to Bangladesh	CIM/2016/219	International Maize and Wheat Improvement Center	Dr Pawan Kumar Kumar
Sustainable and resilient farming systems intensification in the Eastern Gangetic Plains (SRFSI)	CSE/2011/077	International Maize and Wheat Improvement Center	Dr Thakur Tiwari
Sustainable intensification of maize-legume cropping systems for food security in eastern and southern Africa II (SIMLESA II)	CSE/2013/008	International Maize and Wheat Improvement Center	Dr Mulugetta Mekuria
Farm mechanisation and conservation agriculture for sustainable intensification	FSC/2012/047	International Maize and Wheat Improvement Center	Dr Bruno Gerard
Breeding for low chalk in rice	CIM/2016/046	International Rice Research Institute	Dr Nese Sreenivasulu
Protection of stored grains against insect pests	CIM/2017/031	Plant Biosecurity Cooperative Research Centre	Dr David Eagling
Value chain and policy interventions to accelerate adoption of Happy Seeder zero tillage in rice-wheat farming systems across the Gangetic Plains	CSE/2017/101	The University of Adelaide	Dr Adam Loch
Developing a foundation for the long-term management of basal stem rot of oil palm in Papua New Guinea and Solomon Islands	CIM/2012/086	The University of Queensland	Assoc Prof Ian Godwin
Identifying Eastern Gangetic Plains Soil Constraints	CROP/2018/210	The University of Queensland	Dr Neal Menzies
Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa	CIM/2014/081	The University of Sydney	Prof Robert Park
Sustainable intensification and diversification in the lowland rice system in Northwest Cambodia	CSE/2015/044	The University of Sydney	Assoc Prof Daniel Tan
Incorporating salt-tolerant wheat and pulses into smallholder farming systems in southern Bangladesh	CIM/2014/076	The University of Western Australia	Prof William Erskine
Agricultural innovations for communities for intensified and sustainable farming systems in Timor-Leste (AI-Com)	CIM/2014/082	The University of Western Australia	Prof William Erskine
Faba Bean in Ethiopia - Mitigating disease constraints to improve productivity and sustainability	CIM/2017/030	The University of Western Australia	Prof Martin Barbetti
Enhancing farm-household management decision-making for increased productivity in the Eastern Gangetic Plains	CSE/2012/108	The University of Western Australia	Dr Fay Rola-Rubzen
Establishing the international mungbean improvement network	CIM/2014/079	The World Vegetable Center	Dr Ramakrishnan Nair
Improved mungbean harvesting and seed production systems for Bangladesh, Myanmar and Pakistan	CIM/2016/174	The World Vegetable Center	Dr Ramakrishnan Nair
<b>Fisheries Research Program</b>			
Building research and project management skills in fisheries staff in Papua New Guinea	FIS/2010/055	University of Tasmania	Prof Janelle Allison
Enhancing bivalve production in northern Vietnam and Australia	FIS/2010/100	Department of Primary Industries (NSW)	Dr Wayne O'Connor

Project title	Project code	Commissioned organisation	Project leader
Improving the design of irrigation infrastructure to increase fisheries production in floodplain wetlands of the Lower Mekong and Murray-Darling Basins	FIS/2012/100	Department of Primary Industries (NSW)	Dr Craig Boys
Developing technologies for giant grouper ( <i>Epinephelus lanceolatus</i> ) aquaculture in Vietnam, the Philippines and Australia	FIS/2012/101	University of the Sunshine Coast	Prof Abigail Elizur
Sustainable management of sport fisheries for communities in Papua New Guinea	FIS/2013/015	James Cook University	Assoc Prof Marcus Sheaves
Quantifying biophysical and community impacts of improved fish passage in Lao PDR and Myanmar	FIS/2014/041	Charles Sturt University	Dr Lee Baumgartner
Research for development of lobster growout technology in Indonesia	FIS/2014/059	James Cook University	Dr Clive Jones
Developing pearl industry-based livelihoods in the western Pacific	FIS/2014/060	James Cook University	Prof Paul Southgate
Improving technical and institutional capacity to support development of mariculture-based livelihoods and industry in New Ireland, Papua New Guinea	FIS/2014/061	James Cook University	Prof Paul Southgate
Improving technologies for inland aquaculture in Papua New Guinea	FIS/2014/062	University of New South Wales	Dr Jesmond Sammut
Restoring damaged coral reefs using mass coral larval reseeding	FIS/2014/063	Southern Cross University	Dr Peter Harrison
Improving seaweed production and processing opportunities in Indonesia.	FIS/2015/038	James Cook University	Dr Aji Nugroho
Improving fishery management in support of better governance of Myanmar's inland and delta fisheries	FIS/2015/046	WorldFish Center	Mr Micheael Akester
Description and risk assessment of the bycatch communities in the Gulf of Papua prawn fishery	FIS/2016/049	CSIRO Oceans and Atmosphere	Mr Gary Fry
Harvest strategies for Indonesian tropical tuna fisheries to increase sustainable benefits	FIS/2016/116	CSIRO National Collections and Marine Infrastructure	Dr Campbell Davies
Increasing technical skills supporting community-based sea cucumber production in Vietnam and the Philippines	FIS/2016/122	University of the Sunshine Coast	Prof Paul Southgate
Half-pearl industry development in Tonga and Vietnam	FIS/2016/126	University of the Sunshine Coast	Prof Paul Southgate
Reef colonisation and socioeconomic impacts from trochus translocations to Samoa	FIS/2016/128	Southern Cross University	Mr Steve Purcell
Accelerating the development of finfish mariculture in Cambodia through south-south research cooperation with Indonesia	FIS/2016/130	University of the Sunshine Coast	Assoc Prof Nicholas Paul
Development of rice fish systems in the Ayeyarwaddy Delta, Myanmar	FIS/2016/135	WorldFish Center	Dr Michael Phillips
Strengthening and scaling community-based approaches to Pacific coastal fisheries management in support of the New Song	FIS/2016/300	University of Wollongong	Dr Neil Andrew
Assessing production of giant freshwater prawns in reservoirs in Sri Lanka	FIS/2017/002	James Cook University	Dr Clive Jones
Assessing fisheries mitigation measures at Xayaburi Dam in Lao PDR	FIS/2017/016	Charles Sturt University	Dr Lee Baumgartner
A nutrition-sensitive approach to coastal fisheries management and development in Timor-Leste and Nusa Tenggara Timur Province, Indonesia	FIS/2017/032	WorldFish Center	Dr David Mills
Evaluating processes and outcomes in south-south research collaboration - finfish mariculture development in Cambodia through cooperation with Indonesia	FIS/2018/115	University of Tasmania	Prof Janelle Allison



Project title	Project code	Commissioned organisation	Project leader
Extending capacity of fish identification skills for improved fisheries assessments	FIS/2018/116	CSIRO National Collections and Marine Infrastructure	Dr William White
Baseline monitoring and evaluation of long-term impacts on fish stocks from coral restoration	FIS/2018/128	Southern Cross University	Dr Peter Harrison
Monitoring and evaluation of socio-economic impacts of pearl-based livelihood development	FIS/2018/129	Sustineo	Assoc Prof Katja Mikhailovich
Extension activities for PNG's shark fishery	FIS/2018/150	CSIRO National Collections and Marine Infrastructure	Dr William White
Forestry Research Program			
Domestication and breeding of sandalwood in Fiji and Tonga	FST/2016/158	CSIRO - Australian Tree Seed Centre	Mr David Bush
Developing integrated options and accelerating scaling up of agroforestry for improved food security and resilient livelihoods in Eastern Africa - Trees for Food Security - 2	FST/2015/039	CSIRO Ecosystem Sciences	Dr Philip Smethurst
Maximising productivity of Eucalyptus and Acacia plantations for growers in Indonesia and Vietnam	FST/2014/064	CSIRO Forestry and Forest Products	Dr Daniel Mendham
Improving community fire management and peatland restoration in Indonesia	FST/2016/144	CSIRO Forestry and Forest Products	Dr Daniel Mendham
Development of durable engineered wood products in Papua New Guinea and Australia	FST/2014/065	Department of Agriculture and Fisheries (Qld)	Dr Henri Bailleres
Improving returns from community teak plantings in Solomon Islands	FST/2014/066	Griffith University	Dr Tim Blumfield
Developing DNA-based chain of custody systems for legally-sourced teak	FST/2016/025	The University of Adelaide	Prof Andrew Lowe
Enhancing livelihoods through improved forest management in Nepal	FST/2017/037	The University of Adelaide	Dr Ian Nuberg
Enhancing value added wood processing in Papua New Guinea	FST/2012/092	The University of Melbourne	Assoc Prof Barbara Ozarska
Teak-based agroforestry systems to enhance and diversify smallholder livelihoods in Luang Prabang province of Lao PDR	FST/2012/041	The University of Queensland	Dr Mark Dieters
Improving agroforestry policy for sloping land in Fiji	FST/2016/147	The University of Queensland	Dr Tyron Venn
Enhance the formation of heartwood in sandalwood in Vanuatu	FST/2016/054	The University of Western Australia	Dr Liz Barbour
Advancing enhanced wood manufacturing industries in Laos and Australia	FST/2016/151	The University of Melbourne	Assoc Prof Barbara Ozarska
Management strategies for Acacia plantation diseases in Indonesia and Vietnam;	FST/2014/068	University of Tasmania	Dr Caroline Mohammed
Biological control of galling insect pests of eucalypt plantations in the Mekong region	FST/2012/091	University of the Sunshine Coast	Dr Simon Lawson
Enhancing value added products and environmental benefits from agroforestry systems in Papua New Guinea and the Pacific	FST/2014/067	University of the Sunshine Coast	Prof Helen Wallace
Improvement and management of teak and sandalwood in Papua New Guinea and Australia	FST/2014/069	University of the Sunshine Coast	Dr Tony Page
Enhancing private sector-led development of the canarium nut industry in Papua New Guinea	FST/2014/099	University of the Sunshine Coast	Prof Helen Wallace
Enhancing community-based commercial forestry in Indonesia	FST/2015/040	University of the Sunshine Coast	Dr Digby Race
Developing sandalwood community and smallholder plantation sector in Yogyakarta	FST/2016/024	University of the Sunshine Coast	Dr Tony Page

Project title	Project code	Commissioned organisation	Project leader
Enabling community forestry in Papua New Guinea	FST/2016/153	University of the Sunshine Coast	Mr Grahame Applegate
Enhancing returns from high-value agroforestry species in Vanuatu	FST/2016/154	University of the Sunshine Coast	Dr Tony Page
Enhancing private sector-led development of the canarium industry in PNG - phase 2	FST/2017/038	University of the Sunshine Coast	Prof Helen Wallace
Developing value chain innovation platforms to improve food security in east and southern Africa	FST/2014/093	World Agroforestry Centre	Dr Clement Okla
Developing and promoting market-based agroforestry options and integrated landscape management for smallholder forestry in Indonesia (Kanoppi2)	FST/2016/141	World Agroforestry Centre	Mr Aulia Perdana
Developing and promoting market-based agroforestry and forest rehabilitation options for northwest Vietnam	FST/2016/152	World Agroforestry Centre	Dr La Nguyen
<b>Global Program</b>			
Demand-led plant breeding and accelerating new variety adoption in sub-Saharan Africa	FSC/2013/019	The University of Queensland	Prof Gabrielle Persley
Monitoring Agricultural Research Investments, capacity and impact in South-East Asia and the Pacific	GP/2016/093	International Food Policy Research Institute	Mr Gert-Jan Stads
Schools as platforms to increase dietary diversity, improve nutrition and enhance livelihoods and environmental sustainability in Kenya, Ethiopia, Tanzania and Uganda	GP/2018/101	Bioversity International	Dr Danny Hunter
Pacific Plant Biosecurity Capacity Building Program	GP/2018/103	Kalang Consultancy Services	Mr Rob Duthie
Demand-led plant breeding and accelerating new variety adoption in Sub-Sahara Africa	GP/2018/108	The University of Queensland	Prof Gabrielle Persley
Improving plant biosecurity in the Pacific Islands	GP/2018/109	Kalang Consultancy Services	Mr Bill Magee
<b>Horticulture Research Program</b>			
Improved postharvest management of fruit and vegetables in the southern Philippines and Australia	HORT/2012/098	Applied Horticultural Research	Dr Jenny Ekman
Developing vegetable value chains to meet evolving market expectations in the Philippines	HORT/2016/188	Applied Horticultural Research	Dr Gordon Rogers
Research into scaling up use of african leafy vegetables for nutrition in Kenya	HORT/2017/012	Bioversity International	Dr Danny Hunter
Integrating protected cropping systems into high value vegetable value chains in the Pacific and Australia	HORT/2014/080	Central Queensland University	Prof Phil Brown
Supporting commercial sweetpotato production and marketing in the Papua New Guinea highlands	HORT/2014/097	Central Queensland University	Prof Phil Brown
Strengthening vegetable value chains in Pakistan for greater community livelihood benefits	HORT/2016/012	Centre for Agriculture and Bioscience International	Dr Babar Bajwa
Bogia coconut syndrome in Papua New Guinea: developing biological knowledge and a risk management strategy	HORT/2012/087	Charles Sturt University	Dr Geoff Gurr
Developing improved crop protection options in support of intensification of sweetpotato production in Papua New Guinea	HORT/2014/083	Charles Sturt University	Dr Geoff Gurr
Integrated management of Fusarium wilt of bananas in the Philippines and Australia	HORT/2012/097	Department of Agriculture and Fisheries (Qld)	Mr Anthony Pattison
Integrated disease management strategies for the productive, profitable and sustainable production of high-quality papaya fruit in the southern Philippines and Australia	HORT/2012/113	Department of Agriculture and Fisheries (Qld)	Dr Nandita Pathania

Project title	Project code	Commissioned organisation	Project leader
Aligning genetic resources, production and post-harvest systems to market opportunities for Pacific island and Australian cocoa	HORT/2014/078	Department of Agriculture and Fisheries (Qld)	Mr Yan Diczbalis
Development of area-wide management approaches for fruit flies in mango for Indonesia, Philippines, Australia and the Asia-Pacific region	HORT/2015/042	Department of Agriculture and Fisheries (Qld)	Mr Stefano De Faveri
Basic research on the cocoa pod borer in Papua New Guinea to permit effective pest management	HORT/2018/114	Department of Primary Industries (NSW)	Dr Olivia Reynolds
Enterprise-driven transformation of family cocoa production in East Sepik, Madang, New Ireland and Chimbu Provinces of Papua New Guinea	HORT/2014/096	La Trobe University	Dr Phil Keane
Defining the biotic constraints to fresh taro from Samoa gaining market access to Australia	HORT/2017/014	Plant & Food Research	Dr Robert Fullerton
Coconuts for Pacific Livelihoods	HORT/2017/025	Secretariat of the Pacific Community	Mrs Logotonu Waqainabete
Exploring coffee genetic resources for the Pacific Islands	HORT/2016/057	Southern Cross University	Dr Wayne Hancock
Integrated disease management of sugarcane streak mosaic in Indonesia	HORT/2012/083	Sugar Research Australia	Dr Robert Magarey
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/2010/065	The University of Queensland	Dr Michael Furlong
Optimising tissue culture of coconut in support of saving the Pacific regional genebank	HORT/2016/056	The University of Queensland	Assoc Prof Steve Adkins
Responding to emerging pest and disease threats to horticulture in the Pacific Islands	HORT/2016/185	The University of Queensland	Dr Michael Furlong
Improved management strategies for cocoa in Papua New Guinea	HORT/2012/026	The University of Sydney	Prof David Guest
Developing the cocoa value chain in Bougainville	HORT/2014/094	The University of Sydney	Prof David Guest
Enhanced fruit production and postharvest handling systems for Fiji, Samoa, and Tonga	HORT/2014/077	University of the Sunshine Coast	Prof Steven Underhill
<b>Impact Evaluation Research Program</b>			
Development of mixed-method approaches to impact assessments of Philippines research projects	IAP/2017/010	CSIRO Agriculture and Food	Ms Alison Laing
<b>Livestock Systems Research Program</b>			
Establishing the linkages between foodborne bacterial enteropathies and malnutrition in Timor-Leste	LS/2018/184	Australian National University	Dr Ben Polkinghorne
Point of Care diagnostics	LS/2018/203	CSIRO - Australian Animal Health Laboratory	Dr John Allen
Integrating herbaceous forage legumes into crop and livestock systems in East Nusa Tenggara, Indonesia	LPS/2012/064	CSIRO Agriculture and Food	Dr Lindsay Bell
Developing profitable dairy and sheep meat production systems in central Tibet - China	LPS/2014/036	CSIRO Agriculture and Food	Dr Dianne Mayberry
Potential of new Australian old man saltbush varieties to fill ruminant feed gaps in arid and saline areas of Pakistan	LPS/2016/022	CSIRO Agriculture and Food	Dr Hayley Norman
Improving cattle production in the Myanmar Central Dry Zone through improved animal nutrition, health and management	LS/2016/132	CSIRO Agriculture and Food	Dr Dianne Mayberry
Establishing the project: Improving cattle health and production in Myanmar	LS/2018/100	CSIRO Agriculture and Food	Dr Dianne Mayberry
Smallholder Livestock Futures in South-East Asia	LS/2018/107	CSIRO Agriculture and Food	Dr Mario Herrero

Project title	Project code	Commissioned organisation	Project leader
Update of SoFT (Selection of Forages for the Tropics)	LPS/2016/097	International Center for Tropical Agriculture	Dr Michael Peters
Safe Pork: Market based approaches to improving the safety of pork in Vietnam	LS/2016/143	International Livestock Research Institute	Dr Fred Unger
Impact assessment of Taenia solium control in Phongsali province, Lao PDR and development of future opportunities for the control of zoonotic parasitic infections	LS/2018/201	Murdoch University	Dr Amanda Ash
Improving the bee industry in Fiji, Papua New Guinea and Solomon Islands	LS/2014/042	Southern Cross University	Dr David Lloyd
Novel approaches for increasing participation in the honeybee industries of the Pacific	LS/2017/100	Southern Cross University	Dr David Lloyd
SLEEK and livestock GHG, Kenya	LS/2018/202	The Mullion Group	Dr Robert Waterworth
Improving smallholder dairy and beef profitability by enhancing farm production and value chain management in Pakistan	LPS/2016/011	The University of Melbourne	Dr David McGill
Smallholder goat value chains in Pakistan; challenges and research opportunities	LPS/2016/096	The University of Melbourne	Dr Angus Campbell
Improving farmer livelihoods by developing market-oriented small ruminant production systems in Myanmar	LS/2014/056	The University of Melbourne	Dr Angus Campbell
Enhancing small ruminant production to benefit farming families in Sindh and Punjab, Pakistan	LS/2018/105	The University of Melbourne	Dr Rebecca Doyle
Improving the production and competitiveness of Australian and Philippines pig production through better health and disease control	AH/2012/066	The University of Queensland	Dr Pat Blackall
Profitable feeding strategies for smallholder cattle in Indonesia	LPS/2013/021	The University of Queensland	Prof Dennis Poppi
Increasing the productivity and market options of smallholder beef cattle farmers in Vanuatu	LPS/2014/037	The University of Queensland	Dr Simon Quigley
Smallholder cattle enterprise development in Timor-Leste	LPS/2014/038	The University of Queensland	Dr Geoffry Fordyce
Identifying husbandry options for smallholder pig farmers in Timor-Leste	LS/2017/102	The University of Queensland	Dr Tamsin Barnes
Research opportunities for smallholder beef cattle systems in Pacific Island countries	LS/2018/102	The University of Queensland	Dr Scott Waldron
Diversifying rural poultry production in Myanmar - opportunities for small-scale farmers	LS/2018/106	The University of Queensland	Dr Joerg Henning
Village-based biosecurity for livestock disease risk management in Cambodia	AH/2011/014	The University of Sydney	Dr Russell Bush
Enhancing transboundary livestock disease risk management in Lao PDR	AH/2012/067	The University of Sydney	Dr Russell Bush
Development of a market-driven biosecure beef production system in Lao PDR	AH/2012/068	The University of Sydney	Dr Russell Bush
Strengthening food and nutrition security through family poultry and crop integration in Tanzania and Zambia	FSC/2012/023	The University of Sydney	Assoc Prof Robyn Alders
Investigating and improving pig husbandry and health in Timor-Leste	LS/2012/065	The University of Sydney	Dr Jenny-Ann Toribio
Trilateral support to smallholder cattle systems research in Timor-Leste	LS/2017/035	University of Mataram	Dr Dahlanuddin Dahlanuddin
CropCow initial training and project development activities	GMCP/2018/130	University of New England	Dr Heather Burrow
Assessment of markets and production constraints to small ruminant farming in the Pacific island countries	LPS/2016/021	University of New England	Dr Frances Cowley



Project title	Project code	Commissioned organisation	Project leader
Assessing goat production and marketing systems in Lao PDR and market linkages into Vietnam	LPS/2016/027	University of New England	Dr Stephen Walkden-Brown
Improving smallholder beef value chains in rain-fed cropping systems in Indonesia	LS/2015/047	University of New England	Dr Heather Burrow
Improving smallholder beef supply and livelihoods through cattle-palm system integration in Indonesia	LS/2015/048	University of New England	Dr John Ackerman
High quality markets and value chains for small-scale and emerging beef cattle farmers in South Africa (Stage 2)	LS/2016/276	University of New England	Dr Heather Burrow
Improving small ruminant production and marketing in Fiji and Samoa	LS/2017/033	University of New England	Dr Frances Cowley
Goat production systems and marketing in Laos and Vietnam	LS/2017/034	University of New England	Dr Stephen Walkden-Brown
Intensification of beef cattle production in upland cropping systems in Northwest Vietnam	LPS/2015/037	University of Tasmania	Dr Stephen Ives
<b>Social Sciences Research Program</b>			
Climate smart agriculture opportunities for enhanced food production in PNG	ASEM/2017/026	Australian National University	Mr Steven Crimp
Promoting traditional vegetable production and consumption for improved livelihoods in Papua New Guinea and northern Australia	ASEM/2012/084	Charles Darwin University	Ms Tania Paul
Strengthening livelihoods for food security amongst cocoa and oil palm farming communities in Papua New Guinea	ASEM/2012/072	Curtin University	Dr Gina Koczberski
Identifying opportunities and constraints for rural women's engagement in small-scale agricultural enterprises in Papua New Guinea	ASEM/2014/054	Curtin University	Dr Gina Koczberski
Improving livelihoods of smallholder coffee communities in Papua New Guinea	ASEM/2016/100	Curtin University	Prof George Curry
Smallholder farmer decision-making and technology adoption in southern Lao PDR: opportunities and constraints	ASEM/2014/052	James Cook University	Dr Kim Alexander
Improving food security in the northern uplands of Lao PDR: identifying drivers and overcoming barriers	ASEM/2012/073	Monash University	Dr Paulo Santos
Analysing gender transformative approaches to agricultural development with ethnic minority communities in Vietnam	SSS/2018/139	Murdoch University	Dr Rochelle Spencer
Improving the methods and impacts of agricultural extension in Western Mindanao, Philippines	ASEM/2012/063	RMIT University	Mr Noel Vock
The potential of International Landcare	ASEM/2018/117	RMIT University	Dr Mary Johnson
Action ready climate knowledge to improve disaster risk management for small holder farmers in the Philippines	ASEM/2014/051	South Australian Research and Development Institute	Mr Peter Hayman
Improving market engagement, postharvest management and productivity of the Cambodian and Lao PDR vegetable industries	ASEM/2012/081	The University of Adelaide	Mr Jeremy Badgery-Parker
Uptake of agricultural technologies amongst farmers in Battambang and Pailin provinces, Cambodia	ASEM/2013/003	The University of Melbourne	Dr Brian Cook
Developing cassava production and marketing systems to enhance smallholder livelihoods in Cambodia, Lao PDR and Myanmar	ASEM/2014/053	The University of Queensland	Dr Dominic Smith
Climate-smart landscapes for promoting sustainability of Pacific Island agricultural systems	ASEM/2016/101	The University of Western Australia	Dr Eloise Biggs

Project title	Project code	Commissioned organisation	Project leader
Improving opportunities for economic development for women smallholders in rural Papua New Guinea	ASEM/2014/095	University of Canberra	Prof Barbara Pamphilon
Enhancing livelihoods through Forest and Landscape Restoration	ASEM/2016/103	University of the Sunshine Coast	Dr John Herbohn
<b>Soil and Land Management Research Program</b>			
Improving water and nutrient management to enable double cropping in the rice growing lowlands of Lao PDR and Cambodia	SMCN/2012/071	Charles Sturt University	Dr Philip Eberbach
Land resource evaluation for productive and resilient landscapes in the Central Dry Zone of Myanmar	SMCN/2014/075	CSIRO Agriculture and Food	Dr Anthony Ringrose-Voase
Soil management in Pacific Islands: investigating nutrient cycling and development of the soils portal	SMCN/2016/111	CSIRO Agriculture and Food	Dr Ben Macdonald
Inoculants for plant nutrition use in Greater Mekong Region	SLAM/2018/123	Deakin University	Dr Didier Lesueur
Sustainable productivity improvements in allium and solanaceous vegetable crops in Indonesia and sub-tropical Australia	SMCN/2009/056	Department of Agriculture and Fisheries (Qld)	Dr Stephen Harper
Soil and nutrient management strategies for sustainable vegetable production in southern Philippines	SMCN/2012/029	Department of Agriculture and Fisheries (Qld)	Dr Stephen Harper
Improving soil and water management and crop productivity of dryland agriculture systems of Aceh and NSW	SMCN/2012/103	Department of Primary Industries (NSW)	Dr Malem McLeod
Land management of diverse rubber-based systems in southern Philippines	SLAM/2017/040	Griffith University	Prof Chengrong Chen
Trial of eddy covariance flux towers and Chameleon sensors for evaluating peatland restoration in Indonesia	SLAM/2018/122	La Trobe University	Dr Samantha Grover
X-projects and synthesis, Cambodia	SLAM/2018/127	Murdoch University	Dr Davina Boyd
Integrated water, soil and nutrient management for sustainable farming systems in south central coastal Vietnam and Australia	SMCN/2012/069	Murdoch University	Prof Richard Bell
Land suitability assessment and site-specific soil management for Cambodian uplands	SMCN/2016/237	Murdoch University	Dr Wendy Vance
Improving soil health, agricultural productivity and food security on atolls	SMCN/2014/089	Secretariat of the Pacific Community	Dr Siosua Halavatau
Management practices for profitable crop livestock systems for Cambodia and Lao PDR	SMCN/2012/075	The University of Adelaide	Dr Matthew Denton
Management of nutrients for improved profitability and sustainability of crop production in Central Myanmar	SMCN/2014/044	The University of Melbourne	Prof Deli Chen
Mainstreaming research in Myanmar's Agricultural and Veterinary Universities	SLAM/2017/041	The University of Queensland	Prof Kaye Basford
Sustaining soil fertility in support of intensification of sweetpotato cropping systems	SMCN/2012/105	The University of Queensland	Prof Neal Menzies
Improving maize-based farming systems on sloping lands in Vietnam and Lao PDR	SMCN/2014/049	The University of Queensland	Prof Michael Bell
Optimising soil management and health in Papua New Guinea integrated cocoa farming systems	SMCN/2014/048	The University of Sydney	Assoc Prof Damien Field
Farmer participatory crop benchmarking in the Central Dry Zone of Myanmar	SLAM/2018/206	University of New England	Prof David Herridge
Increasing productivity of legume-based farming systems in the central dry zone of Myanmar	SMCN/2011/047	University of New England	Prof David Herridge

Project title	Project code	Commissioned organisation	Project leader
Improving the sustainability of rice-shrimp farming systems in the Mekong Delta, Vietnam	SMCN/2010/083	University of New South Wales	Assoc Prof Jesmond Sammut
Integrated resource management for vegetable production in Lao PDR and Cambodia	SMCN/2014/088	University of Southern Queensland	Dr Alice Melland
<b>Water and Climate Research Program</b>			
Transforming smallholder irrigation into profitable and self-sustaining systems in southern Africa	LWR/2016/137	Australian National University	Prof Jamie Pittock
Improving groundwater management to enhance agriculture and farming livelihoods in Pakistan	LWR/2015/036	Charles Sturt University	Dr Jehangir Punthakey
Salinity Pakistan	LWR/2017/027	Charles Sturt University	Dr Michael Mitchell
Water management for small-holder farmers – out-scaling ACIAR research in Andhra Pradesh Drought Mitigation Program	WAC/2018/164	CSIRO Agriculture and Food	Dr Uday Nidumolu
Cropping system intensification in the salt-affected coastal zones of Bangladesh and West Bengal, India	LWR/2014/073	CSIRO Land and Water	Dr Mohammed Mainuddin
A virtual irrigation academy to improve water productivity in Malawi, Tanzania and South Africa	LWR/2014/085	CSIRO Land and Water	Dr Richard Stirzaker
Promoting socially inclusive and sustainable agricultural intensification in West Bengal and Bangladesh	LWR/2014/072	CSIRO Sustainable Agriculture Flagship	Dr Christian Roth
Digital Earth Africa Business Case	LWR/2018/119	Geoscience Australia	Dr Stuart Minchin
Integrated catchment management and capacity building for improving livelihoods in Afghanistan	LWR/2008/047	International Center for Agricultural Research in the Dry Areas	Dr Yashpal Singh Saharawat
Foresight for sustainable food systems in the Eastern Gangetic Plains	WAC/2018/168	International Food Policy Research Institute	Dr Avinash Kishore
Nutrient management for diversified cropping in Bangladesh (NUMAN)	LWR/2016/136	Murdoch University	Prof Richard Bell
Pilot project on commercialisation of smallholders' conservation agriculture based planters in Bangladesh	LWR/2018/111	Murdoch University	Prof Richard Bell
Aquifer characterisation, artificial recharge and reuse of suddenly available water in South Bihar	WAC/2018/211	Nalanda University	Dr Avinash Kishore
Agriculture based emission-reduction options to supports NDCs in Vietnam and Fiji	LWR/2017/029	Queensland University of Technology	Prof Peter Grace
Support for NDC reporting for Fiji using FLINT (Full Lands Integration Tool)	LWR/2018/118	The Mullion Group	Dr Robert Waterworth
Developing approaches to enhance farmer water management skills in Balochistan, Punjab and Sindh in Pakistan.	LWR/2014/074	University of Canberra	Dr Sandra Heaney-Mustafa
Institutions to support intensification, integrated decision making and inclusiveness in agriculture in the East Gangetic Plain	LWR/2018/104	University of South Australia	Prof Lin Crase
Improving dry season agriculture for marginal and tenant farmers in the Eastern Gangetic Plains through conjunctive use of pond and groundwater resources	LWR/2012/079	University of Southern Queensland	Mr Erik Schmidt

Project list current at 1 November 2018

## Appendix 4 Location of commissioned organisation for current and proposed projects

Project title	Project code	Commissioned organisation
<b>Australian Capital Territory</b>		
Improving opportunities for economic development for women smallholders in rural Papua New Guinea	ASEM/2014/095	University of Canberra
Climate Smart Agriculture opportunities for enhanced food production in PNG	ASEM/2017/026	Australian National University
Insect tolerant chickpea for Bangladesh	CIM/2016/039	CSIRO Agriculture and Food
Protection of stored grains against insect pests	CIM/2017/031	Plant Biosecurity Cooperative Research Centre
Monitoring and evaluation of socio-economic impacts of pearl-based livelihood development	FIS/2018/129	Sustineo
Domestication and breeding of sandalwood in Fiji and Tonga	FST/2016/158	CSIRO - Australian Tree Seed Centre
Development of mixed-method approaches to impact assessments of Philippines research projects	IAP/2017/010	CSIRO Agriculture and Food
Establishing the linkages between foodborne bacterial enteropathies and malnutrition in Timor Leste	LS/2018/184	Australian National University
SLEEK and livestock GHG, Kenya	LS/2018/202	The Mullion Group
Cropping system intensification in the salt-affected coastal zones of Bangladesh and West Bengal, India	LWR/2014/073	CSIRO Land and Water
Developing approaches to enhance farmer water management skills in Balochistan, Punjab and Sindh in Pakistan	LWR/2014/074	University of Canberra
A virtual irrigation academy to improve water productivity in Malawi, Tanzania and South Africa	LWR/2014/085	CSIRO Land and Water
Transforming smallholder irrigation into profitable and self-sustaining systems in southern Africa	LWR/2016/137	Australian National University
Support for NDC reporting for Fiji using FLINT (Full Lands Integration Tool)	LWR/2018/118	The Mullion Group
Digital Earth Africa Business Case	LWR/2018/119	Geoscience Australia
Land resource evaluation for productive and resilient landscapes in the Central Dry Zone of Myanmar	SMCN/2014/075	CSIRO Agriculture and Food
Soil management in Pacific Islands: investigating nutrient cycling and development of the soils portal	SMCN/2016/111	CSIRO Agriculture and Food
<b>New South Wales</b>		
Evaluating and improving policies for attracting investment in the agricultural sector in Vietnam	ADP/2018/120	The University of Sydney
Evaluating smallholder livelihoods and sustainability in Indonesian coffee and cocoa value chains	AGB/2010/099	The University of Sydney
Improving livelihoods in Myanmar and Vietnam through vegetable value chains	AGB/2014/035	Applied Horticultural Research
Pacific Agribusiness Research in Development Initiative, phase 2 (PARDI 2)	AGB/2014/057	Pacific Australia Reforestation Company
Village-based biosecurity for livestock disease risk management in Cambodia	AH/2011/014	The University of Sydney
Enhancing transboundary livestock disease risk management in Lao PDR	AH/2012/067	The University of Sydney
Development of a market-driven biosecure beef production system in Lao PDR	AH/2012/068	The University of Sydney
Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa	CIM/2014/081	The University of Sydney



Project title	Project code	Commissioned organisation
Increasing productivity and profitability of pulse production in cereal based cropping systems in Pakistan	CIM/2015/041	Charles Sturt University
Understanding drill-seeding of rice techniques and business models	CIM/2018/113	Deakin University
Sustainable intensification and diversification in the lowland rice system in Northwest Cambodia	CSE/2015/044	The University of Sydney
Enhancing bivalve production in northern Vietnam and Australia	FIS/2010/100	Department of Primary Industries
Improving the design of irrigation infrastructure to increase fisheries production in floodplain wetlands of the Lower Mekong and Murray-Darling Basins	FIS/2012/100	Department of Primary Industries
Quantifying biophysical and community impacts of improved fish passage in Lao PDR and Myanmar	FIS/2014/041	Charles Sturt University
Improving technologies for inland aquaculture in Papua New Guinea	FIS/2014/062	University of New South Wales
Restoring damaged coral reefs using mass coral larval reseeding	FIS/2014/063	Southern Cross University
Reef colonisation and socioeconomic impacts from trochus translocations to Samoa	FIS/2016/128	Southern Cross University
Strengthening and scaling community-based approaches to Pacific coastal fisheries management in support of the New Song	FIS/2016/300	University of Wollongong
Assessing fisheries mitigation measures at Xayaburi Dam in Lao PDR	FIS/2017/016	Charles Sturt University
Baseline monitoring and evaluation of long-term impacts on fish stocks from coral restoration	FIS/2018/128	Southern Cross University
Strengthening food and nutrition security through family poultry and crop integration in Tanzania and Zambia	FSC/2012/023	The University of Sydney
CropCow initial training and project development activities	GMCP/2018/130	University of New England
Pacific Plant Biosecurity Capacity Building Program	GP/2018/103	Kalang Consultancy Services
Improving plant biosecurity in the Pacific Islands	GP/2018/109	Kalang Consultancy Services
Improved management strategies for cocoa in Papua New Guinea	HORT/2012/026	The University of Sydney
Bogia coconut syndrome in Papua New Guinea: developing biological knowledge and a risk management strategy	HORT/2012/087	Charles Sturt University
Improved postharvest management of fruit and vegetables in the southern Philippines and Australia	HORT/2012/098	Applied Horticultural Research
Developing improved crop protection options in support of intensification of sweetpotato production in Papua New Guinea	HORT/2014/083	Charles Sturt University
Developing the cocoa value chain in Bougainville	HORT/2014/094	The University of Sydney
Exploring coffee genetic resources for the Pacific Islands	HORT/2016/057	Southern Cross University
Developing vegetable value chains to meet evolving market expectations in the Philippines	HORT/2016/188	Applied Horticultural Research
Basic research on the cocoa pod borer in Papua New Guinea to permit effective pest management	HORT/2018/114	Department of Primary Industries
Assessment of markets and production constraints to small ruminant farming in the Pacific Island Countries	LPS/2016/021	University of New England
Assessing goat production and marketing systems in Lao PDR and market linkages into Vietnam	LPS/2016/027	University of New England
Investigating and improving pig husbandry and health in Timor-Leste	LS/2012/065	The University of Sydney
Improving the bee industry in Fiji, Papua New Guinea and Solomon Islands	LS/2014/042	Southern Cross University
Improving smallholder beef value chains in rain-fed cropping systems in Indonesia	LS/2015/047	University of New England
Improving smallholder beef supply and livelihoods through cattle-palm system integration in Indonesia	LS/2015/048	University of New England
High quality markets and value chains for small-scale and emerging beef cattle farmers in South Africa (Stage 2)	LS/2016/276	University of New England

Project title	Project code	Commissioned organisation
Improving small ruminant production and marketing in Fiji and Samoa	LS/2017/033	University of New England
Goat production systems and marketing in Laos and Vietnam	LS/2017/034	University of New England
Novel approaches for increasing participation in the honeybee industries of the Pacific	LS/2017/100	Southern Cross University
Improving groundwater management to enhance agriculture and farming livelihoods in Pakistan	LWR/2015/036	Charles Sturt University
Salinity Pakistan	LWR/2017/027	Charles Sturt University
Farmer participatory crop benchmarking in the Central Dry Zone of Myanmar	SLAM/2018/206	University of New England
Improved seaweed culture and postharvest waste utilisation in South-East Asia	SMAR/2008/025	Southern Cross University
Improving the sustainability of rice-shrimp farming systems in the Mekong Delta, Vietnam	SMCN/2010/083	University of New South Wales
Increasing productivity of legume-based farming systems in the central dry zone of Myanmar	SMCN/2011/047	University of New England
Improving water and nutrient management to enable double cropping in the rice growing lowlands of Lao PDR and Cambodia	SMCN/2012/071	Charles Sturt University
Improving soil and water management and crop productivity of dryland agriculture systems of Aceh and NSW	SMCN/2012/103	Department of Primary Industries
Optimising soil management and health in Papua New Guinea integrated cocoa farming systems	SMCN/2014/048	The University of Sydney
<b>Northern Territory</b>		
Enhancing smallholder linkages to markets by optimising transport and logistics infrastructure	AGB/2017/036	CSIRO Land and Water
Promoting traditional vegetable production and consumption for improved livelihoods in Papua New Guinea and northern Australia	ASEM/2012/084	Charles Darwin University
<b>Queensland</b>		
Strengthening incentives for improved grassland management in China and Mongolia	ADP/2012/107	The University of Queensland
Creating wealth in smallholders farms through efficient credit systems in Pakistan	ADP/2016/028	The University of Queensland
Policy drivers for public-private partnerships in Pacific organics: improving extension policy through an evidence-based approach	ADP/2018/131	University of the Sunshine Coast
Improving smallholder incomes in the north-western highlands of Vietnam by increasing access and competitiveness in regional temperate and subtropical fruit markets	AGB/2012/060	The University of Queensland
Improving smallholder farmer incomes through strategic market development in mango supply chains in southern Vietnam	AGB/2012/061	Griffith University
Developing value-chain linkages to enhance the adoption of profitable and sustainable cassava production systems in Vietnam and Indonesia	AGB/2012/078	The University of Queensland
Developing vegetable and fruit value chains and integrating them with community development in the southern Philippines	AGB/2012/109	The University of Queensland
Supporting access to mango research information, communication, collaboration and capacity development	AGB/2016/006	Griffith University
Challenges and opportunities for meeting requirements of China mango markets	AGB/2016/007	Griffith University
Opportunities and strategies to improve biosecurity, market access and trade for selected mango markets	AGB/2016/008	Griffith University
Enhancing mango fruit quality in Asian mango chains	AGB/2016/009	Griffith University
Priority opportunities in tropical fruit processing in selected mango markets	AGB/2016/010	Griffith University
Sustainable and inclusive development of the cattle and beef industry in Vietnam and trade relationships with other countries in the region	AGB/2016/196	The University of Queensland

Project title	Project code	Commissioned organisation
Developing vegetable and fruit value chains and integrating them with community development in the southern Philippines	AGB/2017/039	The University of Queensland
Strengthening leadership, coordination and economic development of the temperate fruit industry in northern Vietnam	AGB/2018/171	The University of Queensland
Inclusive agribusiness-led development for high-value fruit and vegetable in the southern Philippines	AGB/2018/196	The University of Queensland
Improving the production and competitiveness of Australian and Philippines pig production through better health and disease control	AH/2012/066	The University of Queensland
Smallholder farmer decision-making and technology adoption in southern Lao PDR: opportunities and constraints	ASEM/2014/052	James Cook University
Developing cassava production and marketing systems to enhance smallholder livelihoods in Cambodia, Lao PDR and Myanmar	ASEM/2014/053	The University of Queensland
Enhancing livelihoods through forest and landscape restoration	ASEM/2016/103	University of the Sunshine Coast
Developing a foundation for the long-term management of basal stem rot of oil palm in Papua New Guinea and Solomon Islands	CIM/2012/086	The University of Queensland
Identifying Eastern Gangetic Plains Soil Constraints	CROP/2018/210	The University of Queensland
Developing technologies for giant grouper ( <i>Epinephelus lanceolatus</i> ) aquaculture in Vietnam, the Philippines and Australia	FIS/2012/101	University of the Sunshine Coast
Sustainable management of sport fisheries for communities in Papua New Guinea	FIS/2013/015	James Cook University
Research for development of lobster growout technology in Indonesia	FIS/2014/059	James Cook University
Developing pearl industry-based livelihoods in the western Pacific	FIS/2014/060	James Cook University
Improving technical and institutional capacity to support development of mariculture-based livelihoods and industry in New Ireland, Papua New Guinea	FIS/2014/061	James Cook University
Improving seaweed production and processing opportunities in Indonesia.	FIS/2015/038	James Cook University
Description and risk assessment of the bycatch communities in the Gulf of Papua prawn fishery	FIS/2016/049	CSIRO Oceans and Atmosphere
Increasing technical skills supporting community-based sea cucumber production in Vietnam and the Philippines	FIS/2016/122	University of the Sunshine Coast
Half-pearl industry development in Tonga and Vietnam	FIS/2016/126	University of the Sunshine Coast
Accelerating the development of finfish mariculture in Cambodia through south-south research cooperation with Indonesia	FIS/2016/130	University of the Sunshine Coast
Assessing production of giant freshwater prawns in reservoirs in Sri Lanka	FIS/2017/002	James Cook University
Demand led plant variety design for emerging markets in Africa	FSC/2013/019	The University of Queensland
Teak-based agroforestry systems to enhance and diversify smallholder livelihoods in Luang Prabang province of Lao PDR	FST/2012/041	The University of Queensland
Biological control of galling insect pests of eucalypt plantations in the Mekong region	FST/2012/091	University of the Sunshine Coast
Development of durable engineered wood products in Papua New Guinea and Australia	FST/2014/065	Department of Agriculture and Fisheries
Improving returns from community teak plantings in Solomon Islands	FST/2014/066	Griffith University
Enhancing value added products and environmental benefits from agroforestry systems in Papua New Guinea and the Pacific	FST/2014/067	University of the Sunshine Coast
Improvement and management of teak and sandalwood in Papua New Guinea and Australia	FST/2014/069	University of the Sunshine Coast
Enhancing private sector-led development of the canarium nut industry in Papua New Guinea	FST/2014/099	University of the Sunshine Coast

Project title	Project code	Commissioned organisation
Enhancing community-based commercial forestry in Indonesia	FST/2015/040	University of the Sunshine Coast
Developing sandalwood community and smallholder plantation sector in Yogyakarta	FST/2016/024	University of the Sunshine Coast
Improving agroforestry policy for sloping land in Fiji	FST/2016/147	The University of Queensland
Enabling community forestry in Papua New Guinea	FST/2016/153	University of the Sunshine Coast
Enhancing returns from high-value agroforestry species in Vanuatu	FST/2016/154	University of the Sunshine Coast
Enhancing private sector-led development of the canarium industry in PNG - phase 2	FST/2017/038	University of the Sunshine Coast
Demand-led plant breeding and accelerating new variety adoption in Sub-Sahara Africa	GP/2018/108	The University of Queensland
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/2010/065	The University of Queensland
Integrated disease management of sugarcane streak mosaic in Indonesia	HORT/2012/083	Sugar Research Australia
Integrated management of Fusarium wilt of bananas in the Philippines and Australia	HORT/2012/097	Department of Agriculture and Fisheries
Integrated disease management strategies for the productive, profitable and sustainable production of high-quality papaya fruit in the southern Philippines and Australia	HORT/2012/113	Department of Agriculture and Fisheries
Enhanced fruit production and postharvest handling systems for Fiji, Samoa, and Tonga	HORT/2014/077	University of the Sunshine Coast
Aligning genetic resources, production and post-harvest systems to market opportunities for Pacific island and Australian cocoa	HORT/2014/078	Department of Agriculture and Fisheries
Integrating protected cropping systems into high value vegetable value chains in the Pacific and Australia	HORT/2014/080	Central Queensland University
Supporting commercial sweetpotato production and marketing in the Papua New Guinea highlands	HORT/2014/097	Central Queensland University
Development of area-wide management approaches for fruit flies in mango for Indonesia, Philippines, Australia and the Asia-Pacific region	HORT/2015/042	Department of Agriculture and Fisheries
Optimising tissue culture of coconut in support of saving the Pacific regional genebank	HORT/2016/056	The University of Queensland
Responding to emerging pest and disease threats to horticulture in the Pacific Islands	HORT/2016/185	The University of Queensland
Integrating herbaceous forage legumes into crop and livestock systems in East Nusa Tenggara, Indonesia	LPS/2012/064	CSIRO Agriculture and Food
Profitable feeding strategies for smallholder cattle in Indonesia	LPS/2013/021	The University of Queensland
Developing profitable dairy and sheep meat production systems in central Tibet - China	LPS/2014/036	CSIRO Agriculture and Food
Increasing the productivity and market options of smallholder beef cattle farmers in Vanuatu	LPS/2014/037	The University of Queensland
Smallholder cattle enterprise development in Timor-Leste	LPS/2014/038	The University of Queensland
Improving cattle production in the Myanmar Central Dry Zone through improved animal nutrition, health and management	LS/2016/132	CSIRO Agriculture and Food
Identifying husbandry options for smallholder pig farmers in Timor-Leste	LS/2017/102	The University of Queensland
Establishing the project: Improving cattle health and production in Myanmar	LS/2018/100	CSIRO Agriculture and Food
Research opportunities for smallholder beef cattle systems in Pacific Island countries	LS/2018/102	The University of Queensland
Diversifying rural poultry production in Myanmar – opportunities for small-scale farmers	LS/2018/106	The University of Queensland



Project title	Project code	Commissioned organisation
Smallholder livestock futures in South-East Asia	LS/2018/107	CSIRO Agriculture and Food
Improving dry season agriculture for marginal and tenant farmers in the Eastern Gangetic Plains through conjunctive use of pond and groundwater resources	LWR/2012/079	University of Southern Queensland
Promoting socially inclusive and sustainable agricultural intensification in West Bengal and Bangladesh	LWR/2014/072	CSIRO Sustainable Agriculture Flagship
Agriculture based emission-reduction options to supports NDCs in Vietnam and Fiji	LWR/2017/029	Queensland University of Technology
Land management of diverse rubber-based systems in southern Philippines	SLAM/2017/040	Griffith University
Mainstreaming research in Myanmar's agricultural and veterinary universities	SLAM/2017/041	The University of Queensland
Sustainable productivity improvements in allium and solanaceous vegetable crops in Indonesia and sub-tropical Australia	SMCN/2009/056	Department of Agriculture and Fisheries
Soil and nutrient management strategies for sustainable vegetable production in southern Philippines	SMCN/2012/029	Department of Agriculture and Fisheries
Sustaining soil fertility in support of intensification of sweetpotato cropping systems	SMCN/2012/105	The University of Queensland
Improving maize-based farming systems on sloping lands in Vietnam and Lao PDR	SMCN/2014/049	The University of Queensland
Integrated resource management for vegetable production in Lao PDR and Cambodia	SMCN/2014/088	University of Southern Queensland
<b>South Australia</b>		
Efficient participatory irrigation institutions to support productive and sustainable agriculture in south Asia	ADP/2014/045	University of South Australia
Agricultural policy research to support natural resource management in Indonesia's upland landscapes	ADP/2015/043	The University of Adelaide
Understanding the drivers of successful and inclusive rural regional transformation: sharing experiences and policy advice in Bangladesh, China, Indonesia and Pakistan	ADP/2017/024	The University of Adelaide
Improving market integration for high value fruit and vegetable production systems in Indonesia	AGB/2009/060	The University of Adelaide
Towards more profitable and sustainable vegetable production systems in north-western Vietnam	AGB/2012/059	The University of Adelaide
Improving milk supply, competitiveness and livelihoods in smallholder dairy chains in Indonesia	AGB/2012/099	The University of Adelaide
Impact assessment of cocoa interventions in Vanuatu	AGB/2016/053	The University of Adelaide
Revision and update of Markets for the Poor (M4P) and Agribusiness Master Class (AMC)	AGB/2018/121	The University of Adelaide
Improving market engagement, postharvest management and productivity of the Cambodian and Lao PDR vegetable industries	ASEM/2012/081	The University of Adelaide
Action ready climate knowledge to improve disaster risk management for small holder farmers in the Philippines	ASEM/2014/051	South Australian Research and Development Institute
Value chain and policy interventions to accelerate adoption of Happy Seeder zero tillage in rice-wheat farming systems across the Gangetic Plains	CSE/2017/101	The University of Adelaide
Developing DNA-based chain of custody systems for legally-sourced teak	FST/2016/025	The University of Adelaide
Enhancing livelihoods through improved forest management in Nepal	FST/2017/037	The University of Adelaide
Institutions to support intensification, integrated decision making and inclusiveness in agriculture in the East Gangetic Plain	LWR/2018/104	University of South Australia
Management practices for profitable crop livestock systems for Cambodia and Lao PDR	SMCN/2012/075	The University of Adelaide
Water management for small-holder farmers - out-scaling ACIAR research in Andhra Pradesh Drought Mitigation Program	WAC/2018/164	CSIRO Agriculture and Food

Project title	Project code	Commissioned organisation
<b>Tasmania</b>		
Developing competitive and inclusive value chains of pulses in Pakistan	ADP/2017/004	University of Tasmania
Building research and project management skills in fisheries staff in Papua New Guinea	FIS/2010/055	University of Tasmania
Harvest strategies for Indonesian tropical tuna fisheries to increase sustainable benefits	FIS/2016/116	CSIRO National Collections and Marine Infrastructure
Evaluating processes and outcomes in south-south research collaboration - finfish mariculture development in Cambodia through cooperation with Indonesia	FIS/2018/115	University of Tasmania
Extending capacity of fish identification skills for improved fisheries assessments	FIS/2018/116	CSIRO National Collections and Marine Infrastructure
Extension activities for PNG's shark fishery	FIS/2018/150	CSIRO National Collections and Marine Infrastructure
Maximising productivity of Eucalyptus and Acacia plantations for growers in Indonesia and Vietnam	FST/2014/064	CSIRO Forestry and Forest Products
Management strategies for Acacia plantation diseases in Indonesia and Vietnam	FST/2014/068	University of Tasmania
Developing integrated options and accelerating scaling up of agroforestry for improved food security and resilient livelihoods in Eastern Africa - Trees for Food Security - 2	FST/2015/039	CSIRO Ecosystem Sciences
Improving community fire management and peatland restoration in Indonesia	FST/2016/144	CSIRO Forestry and Forest Products
Intensification of beef cattle production in upland cropping systems in Northwest Vietnam	LPS/2015/037	University of Tasmania
<b>Victoria</b>		
Policy and institutional reforms to improve horticultural markets in Pakistan	ADP/2014/043	Monash University
Improving policies for forest plantations to balance smallholder, industry and environmental needs in Lao PDR and Vietnam	ADP/2014/047	The University of Melbourne
Analysis of the private sector landscape in Myanmar: opportunities for inclusive agribusiness	AGB/2018/125	Business for Millenium Development
Improving the methods and impacts of agricultural extension in Western Mindanao, Philippines	ASEM/2012/063	RMIT University
Improving food security in the northern uplands of Lao PDR: identifying drivers and overcoming barriers	ASEM/2012/073	Monash University
Uptake of agricultural technologies amongst farmers in Battambang and Pailin provinces, Cambodia	ASEM/2013/003	The University of Melbourne
The potential of International Landcare	ASEM/2018/117	RMIT University
Enhancing value added wood processing in Papua New Guinea	FST/2012/092	The University of Melbourne
Advancing enhanced wood manufacturing industries in Laos and Australia	FST/2016/151	The University of Melbourne
Enterprise-driven transformation of family cocoa production in East Sepik, Madang, New Ireland and Chimbu Provinces of Papua New Guinea	HORT/2014/096	La Trobe University
Improving smallholder dairy and beef profitability by enhancing farm production and value chain management in Pakistan	LPS/2016/011	The University of Melbourne
Smallholder goat value chains in Pakistan; challenges and research opportunities	LPS/2016/096	The University of Melbourne
Improving farmer livelihoods by developing market-oriented small ruminant production systems in Myanmar	LS/2014/056	The University of Melbourne
Enhancing small ruminant production to benefit farming families in Sindh and Punjab, Pakistan	LS/2018/105	The University of Melbourne
Point of Care diagnostics	LS/2018/203	CSIRO - Australian Animal Health Laboratory
Trial of eddy covariance flux towers and Chameleon sensors for evaluating peatland restoration in Indonesia	SLAM/2018/122	La Trobe University

<b>Project title</b>	<b>Project code</b>	<b>Commissioned organisation</b>
Inoculants for plant nutrition use in Greater Mekong Region	SLAM/2018/123	Deakin University
Management of nutrients for improved profitability and sustainability of crop production in Central Myanmar	SMCN/2014/044	The University of Melbourne
<b>Western Australia</b>		
Policy analysis of food safety and trade in Vietnam	ADP/2016/140	The University of Western Australia
Strengthening livelihoods for food security amongst cocoa and oil palm farming communities in Papua New Guinea	ASEM/2012/072	Curtin University
Identifying opportunities and constraints for rural women's engagement in small-scale agricultural enterprises in Papua New Guinea	ASEM/2014/054	Curtin University
Improving livelihoods of smallholder coffee communities in Papua New Guinea	ASEM/2016/100	Curtin University
Climate-smart landscapes for promoting sustainability of Pacific Island agricultural systems	ASEM/2016/101	The University of Western Australia
Incorporating salt-tolerant wheat and pulses into smallholder farming systems in southern Bangladesh	CIM/2014/076	The University of Western Australia
Agricultural innovations for communities for intensified and sustainable farming systems in Timor-Leste (AI-Com)	CIM/2014/082	The University of Western Australia
Faba bean in Ethiopia - mitigating disease constraints to improve productivity and sustainability	CIM/2017/030	The University of Western Australia
Enhancing farm-household management decision-making for increased productivity in the Eastern Gangetic Plains	CSE/2012/108	The University of Western Australia
Enhance the formation of heartwood in sandalwood in Vanuatu	FST/2016/054	The University of Western Australia
Potential of new Australian old man saltbush varieties to fill ruminant feed gaps in arid and saline areas of Pakistan	LPS/2016/022	CSIRO Agriculture and Food
Impact assessment of Taenia solium control in Phongsali province, Lao PDR and development of future opportunities for the control of zoonotic parasitic infections	LS/2018/201	Murdoch University
Nutrient management for diversified cropping in Bangladesh (NUMAN)	LWR/2016/136	Murdoch University
Pilot project on commercialisation of smallholders' conservation agriculture based planters in Bangladesh	LWR/2018/111	Murdoch University
X-projects and synthesis, Cambodia	SLAM/2018/127	Murdoch University
Integrated water, soil and nutrient management for sustainable farming systems in south central coastal Vietnam and Australia	SMCN/2012/069	Murdoch University
Land suitability assessment and site-specific soil management for Cambodian uplands	SMCN/2016/237	Murdoch University
Analysing gender transformative approaches to agricultural development with ethnic minority communities in Vietnam	SSS/2018/139	Murdoch University
<b>International</b>		
Developing an emergency response and long-term management strategy for cassava mosaic virus in Cambodia and Vietnam	AGB/2016/032	International Center for Tropical Agriculture
Inclusive agriculture value chain financing	AGB/2016/163	International Food Policy Research Institute
Integrating gender and social inclusion into agricultural value chain research in Vietnam	AGB/2017/008	International Potato Center
Increasing the sustainability, productivity and economic value of coffee and black pepper farming systems and value chains in the Central Highlands region of Vietnam.	AGB/2018/175	World Agroforestry Centre
Increasing the sustainability, productivity and economic value of coffee farming systems and value chains in the Central Highlands region of Vietnam	AGB/2018/208	CIRAD
Improving post-rainy sorghum varieties to meet the growing grain and fodder demand in India	CIM/2007/120	International Crops Research Institute for the Semi Arid Tropics

Project title	Project code	Commissioned organisation
Establishing the international mungbean improvement network	CIM/2014/079	The World Vegetable Center
Breeding for low chalk in rice	CIM/2016/046	International Rice Research Institute
Improved mungbean harvesting and seed production systems for Bangladesh, Myanmar and Pakistan	CIM/2016/174	The World Vegetable Center
Identification of sources of resistance to wheat blast and their deployment in wheat varieties adapted to Bangladesh	CIM/2016/219	International Maize and Wheat Improvement Center
Sustainable and resilient farming systems intensification in the Eastern Gangetic Plains (SRFSI)	CSE/2011/077	International Maize and Wheat Improvement Center
Sustainable intensification of maize-legume cropping systems for food security in eastern and southern Africa II (SIMLESA II)	CSE/2013/008	International Maize and Wheat Improvement Center
Improving fishery management in support of better governance of Myanmar's inland and delta fisheries	FIS/2015/046	WorldFish Center
Development of rice fish systems in the Ayeyarwaddy Delta, Myanmar	FIS/2016/135	WorldFish Center
A nutrition-sensitive approach to coastal fisheries management and development in Timor-Leste and Nusa Tenggara Timur Province, Indonesia	FIS/2017/032	WorldFish Center
Farm mechanisation and conservation agriculture for sustainable intensification	FSC/2012/047	International Maize and Wheat Improvement Center
Developing value chain innovation platforms to improve food security in east and southern Africa	FST/2014/093	World Agroforestry Centre
Developing and promoting market-based agroforestry options and integrated landscape management for smallholder forestry in Indonesia (Kanoppi2)	FST/2016/141	World Agroforestry Centre
Developing and promoting market-based agroforestry and forest rehabilitation options for northwest Vietnam	FST/2016/152	World Agroforestry Centre
Monitoring Agricultural Research Investments, capacity and impact in South-East Asia and the Pacific	GP/2016/093	International Food Policy Research Institute
Schools as platforms to increase dietary diversity, improve nutrition and enhance livelihoods and environmental sustainability in Kenya, Ethiopia, Tanzania and Uganda	GP/2018/101	Bioversity International
Strengthening vegetable value chains in Pakistan for greater community livelihood benefits	HORT/2016/012	Centre for Agriculture and Bioscience International
Research into scaling up use of African Leafy Vegetables for nutrition in Kenya	HORT/2017/012	Bioversity International
Defining the biotic constraints to fresh taro from Samoa gaining market access to Australia	HORT/2017/014	Plant & Food Research
Coconuts for Pacific Livelihoods	HORT/2017/025	Secretariat of the Pacific Community
Update of SoFT (Selection of Forages for the Tropics)	LPS/2016/097	International Center for Tropical Agriculture
Safe Pork: Market based approaches to improving the safety of pork in Vietnam	LS/2016/143	International Livestock Research Institute
Trilateral support to smallholder cattle systems research in Timor-Leste	LS/2017/035	University of Mataram
Integrated catchment management and capacity building for improving livelihoods in Afghanistan	LWR/2008/047	International Center for Agricultural Research in the Dry Areas
Improving soil health, agricultural productivity and food security on atolls	SMCN/2014/089	Secretariat of the Pacific Community
Foresight for sustainable food systems in the Eastern Gangetic Plains	WAC/2018/168	International Food Policy Research Institute
Aquifer characterisation, artificial recharge and reuse of suddenly available water in South Bihar	WAC/2018/211	Nalanda University

Project list current at 1 November 2018



## Appendix 5 Information sources

### **GDP per capita (US\$)**

<https://data.worldbank.org/indicator/NY.GDP.PCAP.CD>

Accessed 31 October 2018

### **Population (million)**

<https://data.worldbank.org/indicator/SP.POP.TOTL?locations=ES>

Accessed 31 October 2018

### **Human Development Index ranking**

<http://hdr.undp.org/en/countries>

Accessed 31 October 2018

## Abbreviations and acronyms

<b>AAUN</b>	Australia Africa Universities Network
<b>ACIAR</b>	Australian Centre for International Agricultural Research
<b>ADP</b>	Agricultural development policy (former ACIAR research program)
<b>AfricaRice</b>	Africa Rice Center
<b>AGB</b>	Agribusiness (ACIAR research program)
<b>AH</b>	Animal Health (former ACIAR research program)
<b>APAARI</b>	Asia-Pacific Association of Agricultural Research Institutions
<b>ASEAN</b>	Association of Southeast Asian Nations
<b>ASEM</b>	Agricultural Systems and Management (former ACIAR research program)
<b>ASTI</b>	Agricultural Science and Technology Indicators
<b>CABI</b>	Centre for Agriculture and Biosciences International
<b>CGIAR</b>	formerly the Consultative Group on International Agricultural Research
<b>CIAT</b>	International Centre for Tropical Agriculture
<b>CIFOR</b>	Center for International Forestry Research
<b>CIM</b>	Crop Improvement and Management (former ACIAR research program)
<b>CIMMYT</b>	International Maize and Wheat Improvement Center
<b>CIP</b>	International Potato Center
<b>COGENT</b>	Global Coconut Genetic Resources Network
<b>CSE</b>	Cropping Systems and Economics (former ACIAR research program)
<b>CSIRO</b>	Commonwealth Scientific and Industrial Research Organisation (Australia)
<b>CultiAF</b>	Cultivate Africa's Future
<b>DFAT</b>	Department of Foreign Affairs and Trade (Australia)
<b>FIS</b>	Fisheries (ACIAR research program)
<b>FST</b>	Forestry (ACIAR research program)
<b>GDP</b>	gross domestic product
<b>GFAR</b>	Global Forum on Agricultural Research
<b>GP</b>	Global Program (ACIAR program)
<b>HORT</b>	Horticulture (ACIAR research program)
<b>IAP</b>	Impact Assessment (ACIAR research program)
<b>ICARDA</b>	International Center for Agricultural Research in the Dry Areas
<b>ICRAF</b>	World Agroforestry Centre
<b>ICRISAT</b>	International Crops Research Institute for the Semi-Arid Tropics
<b>IDRC</b>	Canada's International Development Research Centre
<b>IFPRI</b>	International Food Policy Research Institute (USA)
<b>IITA</b>	International Institute of Tropical Agriculture
<b>ILRI</b>	International Livestock Research Institute
<b>IRRI</b>	International Rice Research Institute

<b>IWMI</b>	International Water Management Institute
<b>LPS</b>	Livestock Production Systems (former ACIAR research program)
<b>LS</b>	Livestock Systems (ACIAR research program)
<b>LWR</b>	Land and Water Resources (former ACIAR research program)
<b>MBA</b>	Masters of Business Administration
<b>MoU</b>	Memorandum of Understanding
<b>PARDI</b>	Pacific Agribusiness Research for Development Initiative II
<b>PNG</b>	Papua New Guinea
<b>ROU</b>	Record of Understanding
<b>SDG</b>	Sustainable Development Goal
<b>SLaM</b>	Soil and Land Management (ACIAR research program)
<b>SMCN</b>	Soil Management and Crop Nutrition
<b>SoFT</b>	SoFT (Selection of Forages for the Tropics)
<b>SPC</b>	The Pacific Community (formerly the South Pacific Commission)
<b>SSS</b>	Social Sciences (ACIAR research program)
<b>US</b>	United States of America
<b>WAC</b>	Water and Climate (ACIAR research program)
<b>WorldFish</b>	CGIAR Research Program Fish
<b>WorldVeg</b>	World Vegetable Center

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[www.aciar.gov.au/publication/AOP-2018-19](http://www.aciar.gov.au/publication/AOP-2018-19)

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