Australian Government

Australian Centre for International Agricultural Research

ACIAR

ANNUAL OPERATIONAL PLAN 2019–20

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Cover photo: The role of women in sustainable intensification of agricultural systems is being investigated by an ACIAR-supported project in Cooch Behar district, West Bengal, India. The project is part of the Australian Government's Sustainable Development Investment Portfolio (page 123) and led by CIMMYT, in partnership with Uttar Banga Krishi Viswavidyalaya. Credit: ACIAR/Conor Ashleigh (2019)

ACIAR

ANNUAL OPERATIONAL PLAN 2019–20

ACIAR

About ACIAR

Research that works for developing countries and Australia

200 agricultural
research-for-development projects

35 partner countries
throughout the Indo–Pacific

25 significant partnerships
in multilateral programs and co-investment alliances

Responsible minister

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

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.

Governance

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

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.

Contents

Preface

The Australian Centre for International Agricultural Research (ACIAR) is the Australian Government's specialist agricultural research-for-development agency, within the Australian aid program. ACIAR is established by the *Australian Centre for International Agricultural Research Act 1982* and is an agency of the Foreign Affairs and Trade portfolio.

Our mission is to achieve more productive and sustainable agricultural systems, for the benefit of developing countries and Australia, through international agricultural research partnerships. We broker, facilitate, invest in and manage strategic partnerships in agricultural research-for-development in the Indo-Pacific region.

Global aggregate food supply has kept up with population growth over recent decades, however 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 to feed the predicted global population of almost 10 billion people. As productivity growth flattens in the major staple crops, this is a big task. Moreover, need is not evenly distributed: Sub-Saharan Africa and South Asia need to more than double food production 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.

Another layer of complexity in the regions where we work is the 'triple burden' of nutrition facing many low- and middle-income countries, where acute hunger and malnutrition (including micronutrient deficiencies), co-exist with increasing levels of obesity, and associated diseases such as diabetes and heart disease.

Australia's world-leading agricultural innovation system is a strategic national capability that ACIAR is able to mobilise in international research partnerships to address food insecurity. Tackling shared challenges through agricultural research collaboration is a compelling element of Australian soft power in the Indo-Pacific region. Australia is well equipped to play a leading role within our region and globally, disproportionate to the size of our population or our economy.

Our work is organised across nine research areas: agribusiness, crops, livestock, horticulture, fisheries, forestry, social sciences, soil and land management, and water and climate. The ACIAR 10-Year Strategy 2018–2027 sets out how we intend to work with partners across the Indo-Pacific region to build the knowledge base to underpin six high-level development objectives:

- food security and poverty reduction
- natural resources and climate change
- human health and nutrition
- gender equity and women's empowerment
- inclusive value chains
- durable scientific and policy capability.

The ACIAR Gender Equity Policy and Strategy 2017–2022 informs the design and implementation of our research activities with partners, and our own internal organisation. Many ACIAR projects work towards improving women's access to resources and decision-making, as this is a direct route to reducing poverty and boosting food security at family, community and societal levels. There is increasing evidence, in both the public and private sectors, that organisations drawing equally on the talents of women and men at all levels outperform those that do not. Within ACIAR, the proportion of women in senior roles increased from 11% in 2016 to 63% by July 2019.

The knowledge base generated by ACIAR projects and programs empowers smallholder farmers, extension agents, scientists and policymakers to take on the intersecting challenges of growing more food and reducing poverty, using less land, water and energy.

Partnerships with other international research and development agencies are integral to our work. In recognition of the importance of these to our core business, our performance framework to government reports on the establishment and management of these relationships.

To ensure our work and achievements align with the ACIAR 10-Year Strategy 2018–2027, and its strategic objectives, we will continue to develop our Monitoring and Evaluation Strategy during 2019–20. The strategy provides an integrated and portfolio-wide approach to assessing the performance of our programs and understanding how our work is contributing to change in our partner countries. This complements our long-established impact evaluation at the research project level and longitudinal analysis of uptake of research results.

ACIAR is highly regarded nationally and internationally for facilitating research that works for developing countries and Australia. Our monitoring and evaluation program has several complementary components that work together to measure and understand our impact against the performance criteria set out in our Corporate Plan 2019–20. Our performance is measured against the achievements of three areas of investment, which all have the common goal of engaging with partners to progress our objectives.

- Our multilateral and co-investment program fosters research collaborations with development partners.
- Our bilateral program brokers and manages bilateral research partnerships in partner countries.
- Our capacity building program identifies and establishes opportunities for individuals and institutions in partner countries to boost technical, policy and management skills in agricultural research-for-development.

This Annual Operational Plan provides a comprehensive outline of the investment by ACIAR of around 2.5% of the Australian aid budget during 2019–20. 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 approximately 200 individual bilateral projects. The bilateral projects focus on aspects of productivity, resilience, sustainability, opportunity and equity of agriculture, forestry and fisheries systems throughout the Indo–Pacific region, to reduce poverty and improve livelihoods.

I have every confidence that together, our committed and skilled staff and partners will deliver successfully on this plan. Through ACIAR partnerships, we will continue to grow the knowledge base for agricultural research-for-development and, in turn, improve livelihoods of smallholder farmers and fishers in our partner countries. Along the way, we will introduce new technologies, risk management and capabilities to Australian agriculture and agricultural sciences, generating a very high return on public investment.

Andrew Campbell
Chief Executive Officer
ACIAR

Pawpaw trees, Ethiopia. ACIAR project: Trees for food security 2 (FST/2015/039)

1

Overview

Overview

The Australian Centre for International Agricultural Research (ACIAR) works with regional partners to tackle the complex and intersecting challenges of growing more food, improving human nutrition and reducing poverty, while at the same time using less land, water and energy, and adapting to and mitigating climate change.

As an agency of the Australian Government, the purpose of ACIAR is to contribute to reducing poverty and improving the livelihoods of many in the Indo-Pacific region, through more productive and sustainable agriculture emerging from collaborative international research.

Our work aligns closely with Australia's broader development assistance program. We support research collaboration, while emphasising individual and institutional capacity building and private sector-led development to improve livelihoods in agriculture, forestry and fisheries. This work also focuses on economic diplomacy and women's economic empowerment.

Australia's security and economic interests remain inter-linked with the countries of the 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, supports 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 primarily helps smallholder farmers and rural communities in developing countries, but it 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.

While diversity and flexibility are key to our work, it is equally important that all programs, projects and partners are working towards some common objectives and goals. Six high-level strategic objectives guide our partnerships and research programs. These objectives are consistent with the purpose stated in our enabling legislation.

Our objectives reflect the Australian Government's policy imperatives articulated in the:

- Australian Overseas Development Assistance policy framework
- Sustainable Development Goals of the United Nations 2030 Agenda for Sustainable Development
- Paris Agreement under the United Nations Framework Convention on Climate Change.

Results through partnerships

ACIAR is a small agency that achieves outstanding results throughout the Indo-Pacific region. A dedicated team of 81 staff in Australia and overseas works with partners to improve the productivity and sustainability of agricultural systems and the resilience of food systems in partner countries.

Partnerships are at the heart of all we do. We work with public and private research institutions in Australia and partner countries to address complex and intersecting challenges.

ACIAR generates and establishes research partnerships through three pathways:

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

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

Chief among our multilateral collaborations is support of ACIAR to CGIAR (formerly known as the Consultative Group for International Agricultural Research). ACIAR manages Australia's contribution to CGIAR, which in 2019–20 will be just over A$25 million of restricted and unrestricted funding. Australia's expertise in, and commitment to, international agricultural research is reflected in ACIAR staff and Australian research leaders being involved in the highest levels of governance of the CGIAR system.

In line with our 10-Year Strategy 2018–2027, ACIAR develops and fosters 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 complement our well-established traditional bilateral partnerships and our long-term commitment to multilateral international research.

Chapter 2 'Global partnerships' describes our multilateral research collaborations and co-investment partnerships.

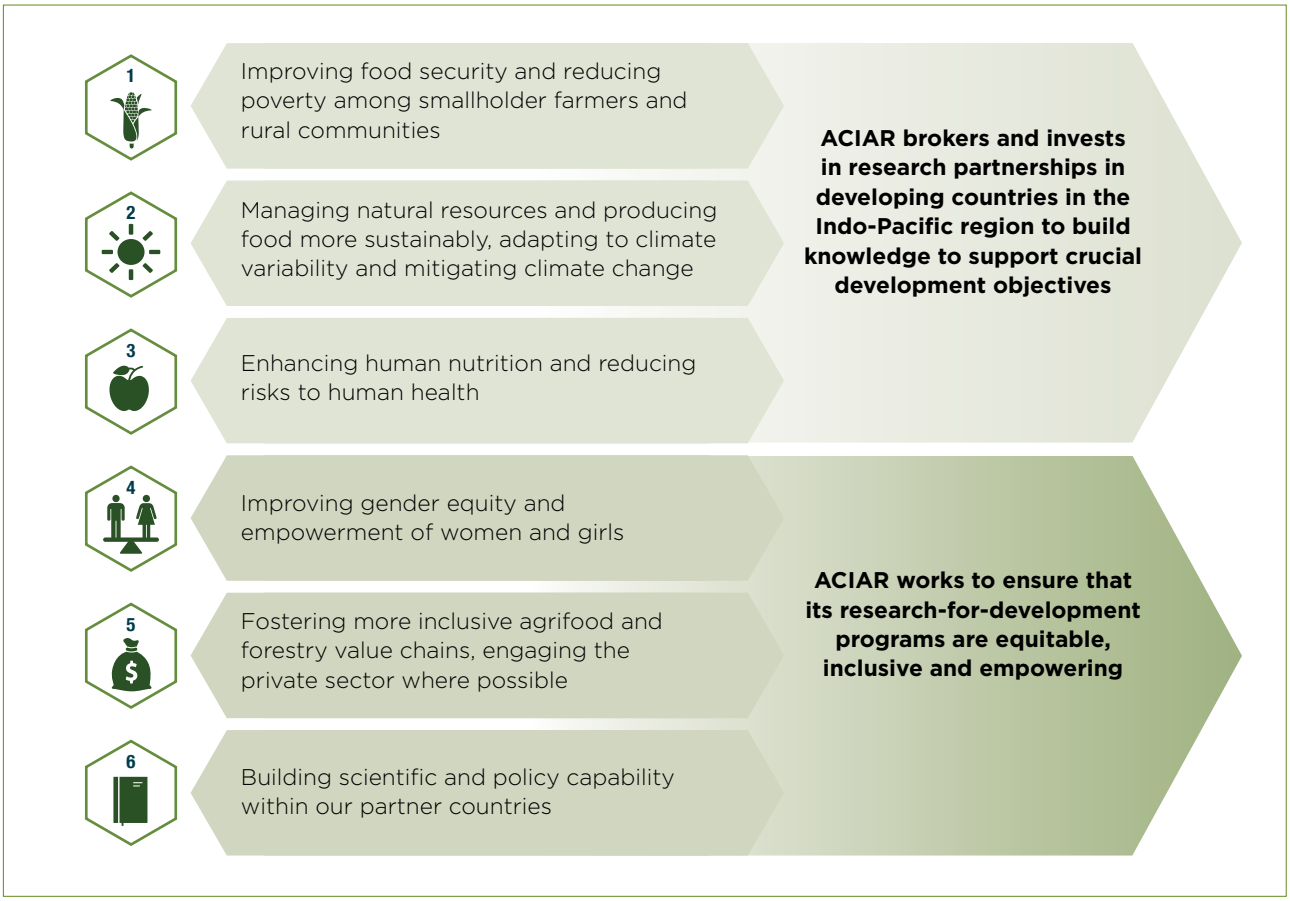


Figure 1.1: **Strategic objectives**

There are approximately 200 projects active during 2019–20 that are established as bilateral country partnerships. These partnerships have the fundamental aim of lifting the productivity, profitability and sustainability of agriculture, forestry and fisheries sectors in developing countries, in a changing climate. Australia has outstanding capabilities in these fields.

Projects and partnerships will operate in 35 countries in the Indo-Pacific region, as well as in Australia. ACIAR works with partner countries to identify research priorities, and then to broker research partnerships and commission research projects. Generally, ACIAR commissions an Australian scientific organisation (for example, universities, Commonwealth Scientific and Industrial Research Organisation (CSIRO), state government agencies or private firms) to undertake a research project, which is consistent with jointly agreed priorities, and informed by regular consultations between ACIAR and partner countries.

Chapter 5 'ACIAR in the Indo-Pacific' presents our regional and country priorities, and describes the research projects underway in each of our partner countries.

High return on investment

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 adoption of research results.

The findings of the independent evaluations are consistent with studies by the United States Agency for International Development 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.

Figure 1.2: **Research structure**

In-country consultation

Our work aligns closely with the Australian Government development assistance program. We support research collaboration, while emphasising human capacity building and private sector-led development in agriculture, forestry and fisheries. The aid investment plans of Australian overseas missions also inform our bilateral and regional research partnerships.

To ensure that our core business as an agricultural research-for-development agency is as effective as possible, ACIAR has 10 country offices throughout the Indo-Pacific region. The country offices guide the development and regular adjustment of the strategic directions of our research investments with country partners. They also provide immediate oversight and liaison for in-country project operations.

The strength of our partnership model will be maintained through regular strategy discussions with country partners, consultation with Australian, regional and international research agencies, and continued support to the strategic capabilities of our network of country offices. To ensure alignment with, and relevance to, Australia's broader aid initiatives, ACIAR will maintain active communication with the Australian Government Department of Foreign Affairs and Trade (DFAT), and Heads of Mission, Ambassadors and High Commissioners in partner countries.

To strengthen and maintain our partnerships with countries and organisations in our region, we continue to invest in our long-term 'compacts' with Cambodia, Myanmar, Pakistan, Papua New Guinea and Vietnam, and implement a regional strategy for eastern and southern Africa.

Chapter 3 'Country partnerships' outlines the location and roles of our country office network, and introduces our country managers.

Research planning and evaluation

Our operations are—to a large extent, but certainly not exclusively—planned and managed on a regional basis. The focus of the research program in each country and region is determined through various processes, consultations and forums. As a result of this process, ACIAR-supported research addresses the specific challenges and opportunities arising in the local environment, as well as building on established relationships.

ACIAR builds its research portfolio on nine program areas that encompass:

- key agriculture sectors—crops, fisheries, forestry, horticulture and livestock
- science and research fields supporting the sectors—agribusiness, social sciences, soil and land management, and water and climate.

The program areas encompass key cross-cutting issues, such as climate change, economics and policy, gender, integrated farming systems, and the link between livestock and human health risks.

Review, evaluation and monitoring are important to ensure we are on track, are achieving objectives and are allocating valuable resources of time, talent and money to achieve the best result. With more than A$100 million budgeted for investment in research-for-development programs in the Indo-Pacific region during 2019–20, 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.

During 2019–20, we will continue to build on our strong project-level impact evaluation process with the design and implementation of a more sophisticated portfolio-level monitoring and evaluation system. This will enable us to better analyse and report against our six high-level objectives, and better measure 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 strategies.

Chapter 4 'Programs' outlines our research areas and priorities. It also introduces our portfolio planning, monitoring and evaluation process.

Building capability

While science and innovation are critical to advancing agriculture and livelihoods in the Indo-Pacific region, the development of individual and institutional science and policy capability in our partner countries is equally important.

One of our strategic objectives is to develop durable scientific and policy capability. The ACIAR Capacity Building Program identifies and establishes opportunities for individuals and institutions in partner countries to boost technical, policy and management skills in agricultural research-for-development. Building capacity in partner countries is a key priority for ACIAR to extend and maximise the adoption of new knowledge and technologies.

During 2019–20, the program continues its focus on leadership and career development, while maintaining an ongoing commitment to support postgraduate study. A new element of the program will be introduced, with the launch of a new leadership program for women in agricultural research and the roll-out of an executive leadership program.

Chapter 6 'Building capability' outlines the work of the Capacity Building Program for the coming year.

Increasing influence and impact

The Outreach Program communicates the work of ACIAR to various audiences both in Australia and overseas. The program has the broad objectives to increase the influence and impact of ACIAR research, as well as build our reputation as a trusted and valued research broker in the Indo-Pacific region.

A series of comprehensive plans, programs and projects will be developed and/or implemented during 2019–20 to achieve our objectives. Through its Outreach Program, ACIAR will continue its efforts to increase understanding within Australia of the impact of Australian aid investment, through ACIAR, and ensure that more audiences in Australia and in our partner countries can access, understand and use our research findings.

Chapter 7 'Increasing influence and impact' outlines the work of the Outreach Program for the coming year.

Executive management

ACIAR is established by the *Australian Centre for International Agricultural Research Act 1982* (the ACIAR Act), as amended. It is a non-corporate Commonwealth entity under *the Public Governance, Performance and Accountability Act 2013* and a statutory agency under the *Public Service Act 1999*. ACIAR is part of the Australian Government Foreign Affairs and Trade portfolio.

ACIAR has an executive management governance structure headed by the Chief Executive Officer (CEO), who reports to the Minister for Foreign Affairs. The CEO manages the administrative and financial affairs of ACIAR and its staff, subject to, and in accordance with, any directions given by the Minister.

An executive team supports and advises the CEO on strategic priorities and corporate and operational policies.

ACIAR executive management

Chief Executive Officer
Professor Andrew Campbell FTSE FAICD

The Chief Executive Officer is directly responsible to the Minister for managing the affairs of ACIAR, in a way that provides proper use of the Commonwealth resources for which the CEO is responsible. As agency head, the CEO is also responsible for managing the agency with direct accountability to the Australian Government.

Professor Andrew Campbell commenced the role of CEO on 1 August 2016. Previously, Andrew was the inaugural Director of the Research Institute for the Environment and Livelihoods at Charles Darwin University, in the Northern Territory. Andrew has played influential roles in sustainable agriculture and natural resource management in Australia for over 30 years. He has a Diploma of Forestry from Creswick, a Bachelor of Forest Science (Honours) from the University of Melbourne and a Master of Science (Management of Agricultural Knowledge Systems) from Wageningen University in The Netherlands. Andrew is an elected Fellow of the Academy of Technology and Engineering, Fellow of the Australian Institute of Company Directors and an honorary Professorial Fellow at the Australian National University and Charles Darwin University.

Chief Finance Officer
Ms Audrey Gormley

The Chief Finance Officer is responsible for providing strategic financial advice to the organisation, in addition to managing human resources, business services (IT), procurement, legal, property and other corporate activity.

Ms Audrey Gormley joined ACIAR in July 2017 and has over 30 years' experience in all facets of finance and accounting both at strategic and operational levels, working in investment banking and insurance sectors before joining the Australian Government. Prior to joining ACIAR, Audrey was Chief Finance Officer at Food Standards Australia New Zealand for over 10 years. She holds a Bachelor of Commerce from University College Dublin and is a Fellow of the Association of Chartered Certified Accountants.

Chief Scientist
Dr Daniel Walker

The Chief Scientist oversees the strategic science focus of the ACIAR research portfolio and its impact assessment, monitoring and evaluation work. The Chief Scientist also provides leadership for Research Program Managers across nine research areas, and oversight of our relationship with the Australian innovation system.

Dr Daniel Walker joined ACIAR in November 2017 to take up the newly-created role of Chief Scientist. Prior to ACIAR, Daniel spent 23 years at CSIRO, where he was Research Director for Agriculture and Global Change with CSIRO Agriculture and Food and previously, Chief of CSIRO Ecosystem Sciences. Daniel has a Bachelor of Science (Honours) in agriculture, forestry and rural economy from the University of Edinburgh and a PhD from the University of Wales.

General Manager, Country Programs
Dr Peter Horne

The General Manager, Country Programs is responsible for leading and setting the research strategy for ACIAR country (bilateral) programs, managing the ACIAR country office network, and leading the engagement with key research partners and stakeholders, in Australia and overseas.

Previously, Dr Peter Horne was Research Program Manager for Livestock Production Systems for ACIAR. Peter has spent most of his career based in Asia involved in agricultural research-for-development, with a particular focus on forages and livestock systems. Peter has a Bachelor of Science (Honours) in environmental sciences from Griffith University and a PhD in tropical forage agronomy from University of New England, Australia.

General Manager, Global Program
Ms Mellissa Wood

The General Manager, Global Program leads the formulation and implementation of Australia's international stakeholder engagement strategies with CGIAR and other international agricultural research centres, and is responsible for ACIAR engagement with global and multilateral fora, such as the G20 and the United Nations Food and Agriculture Organization. The General Manager, Global Program also oversees ACIAR co-investment alliances, notably with DFAT and the Canadian International Development Research Centre (IDRC).

Ms Mellissa Wood joined ACIAR in 2012 as Director of the new Australian International Food Security Centre. She was appointed General Manager, Global Program in 2015. Prior to ACIAR, Mellissa held a number of positions developing expertise in improving the adoption of research outputs for food and nutrition security, through partnering with policymakers and the private sector, including several years with the Crop Trust in Rome. She holds a Bachelor of Science in resource and environmental management and Master of Public Policy in development.

General Manager, Outreach and Capacity Building
Ms Eleanor Dean

The General Manager, Outreach and Capacity Building leads the development and implementation of the ACIAR outreach strategy and leads and directs a team responsible for ACIAR communications, stakeholder engagement, capacity building and outreach activities.

Ms Eleanor Dean has worked in public affairs and communication for the Australian Government for more than 25 years, on a diverse range of issues including natural resource management, biodiversity, education and training. Prior to joining ACIAR in 2017, Eleanor led the safety promotion and communication branch at the Civil Aviation Safety Authority. She has a Bachelor of Communication (Honours) from the University of Canberra.

Funding and expenditure

Table 1.1: **Overview of planned funding and expenditure, 2019–20**

	2019–20 (budget estimate)
Funding	**A$ million**
Administered	
Administered appropriation	92.15
Special accounts	19.25
Total administered funding	*111.40*
Departmental	
Departmental appropriation	9.31
s74 retained revenue receipts[a]	1.95
Expenses not requiring appropriation[b]	0.54
Total departmental funding	*11.81*
Total funding	**123.21**
Expenditure	
Administered	
Bilateral partnerships[c]	64.92
Co-investment alliances and partnerships	15.73
Multilateral partnerships[d]	19.89
Capacity Building Program[e]	8.76
Outreach Program	2.00
Total administered costs	*111.40*
Departmental	
Total departmental costs[f]	*11.81*
Total expenditure	**123.21**

(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, 2019–20**

Region and country	Target appropriation budget allocations	ACIAR base appropriation	DFAT and other external funding	2019–20 total allocation
	(%)		A$ million	
Pacific	**28**	**17.99**	**4.63**	**22.62**
Fiji	—	3.87	0.78	4.65
Kiribati	—	0.41	0.46	0.87
Samoa	—	0.83	—	0.83
Solomon Islands	—	0.87	0.46	1.33
Tonga	—	1.11	—	1.11
Tuvalu	—	0.11	—	0.11
Vanuatu	—	1.85	0.45	2.30
Pacific region—other	—	0.27	—	0.27
Papua New Guinea	—	6.33	2.48	8.81
Timor-Leste	—	2.34	—	2.34
East and South-East Asia	**49**	**32.24**	**5.17**	**37.41**
Cambodia	—	2.58	0.35	2.93
China	—	0.41	—	0.41
Indonesia	—	11.52	4.30	15.82
Laos	—	3.98	0.52	4.50
Mongolia	—	0.13	—	0.13
Myanmar	—	4.92	—	4.92
The Philippines	—	3.52	—	3.52
Vietnam	—	5.18	—	5.18
South Asia	**12**	**7.89**	**3.87**	**11.76**
Bangladesh	—	2.90	0.59	3.49
India	—	1.04	1.35	2.39
Nepal	—	0.76	0.58	1.34
Pakistan	—	3.11	1.35	4.46
Sri Lanka	—	0.08	—	0.08
Eastern and Southern Africa	**12**	**7.65**		**7.65**
Burundi	—	0.05	—	0.05
Ethiopia	—	1.51	—	1.51
Kenya	—	1.09	—	1.09
Malawi	—	0.62	—	0.62
Mozambique	—	0.81	—	0.81
Rwanda	—	0.51	—	0.51
South Africa	—	0.74	—	0.74
Tanzania	—	0.52	—	0.52
Uganda	—	1.16	—	1.16
Zambia	—	0.10	—	0.10
Zimbabwe	—	0.54	—	0.54
Total project expenditure	**100**	**65.77**	**13.67**	**79.44**

Note: Due to rounding, not all subtotals add up to the total.

Table 1.3: **Planned expenditure of DFAT funding, by country, 2019–20**

Country/program	2019–20 (budget estimate)
	A$ million
Pacific	
Papua New Guinea	2.48
Pacific island countries	2.15
East and South-East Asia	
Cambodia	0.35
Indonesia	4.30
Laos	0.52
South Asia	
Bangladesh	0.59
India	1.35
Nepal	0.58
Pakistan	1.35
Other	
Postgraduate scholarships	4.18
Food Futures	0.50
Funding under negotiation	0.90
Total	**19.25**

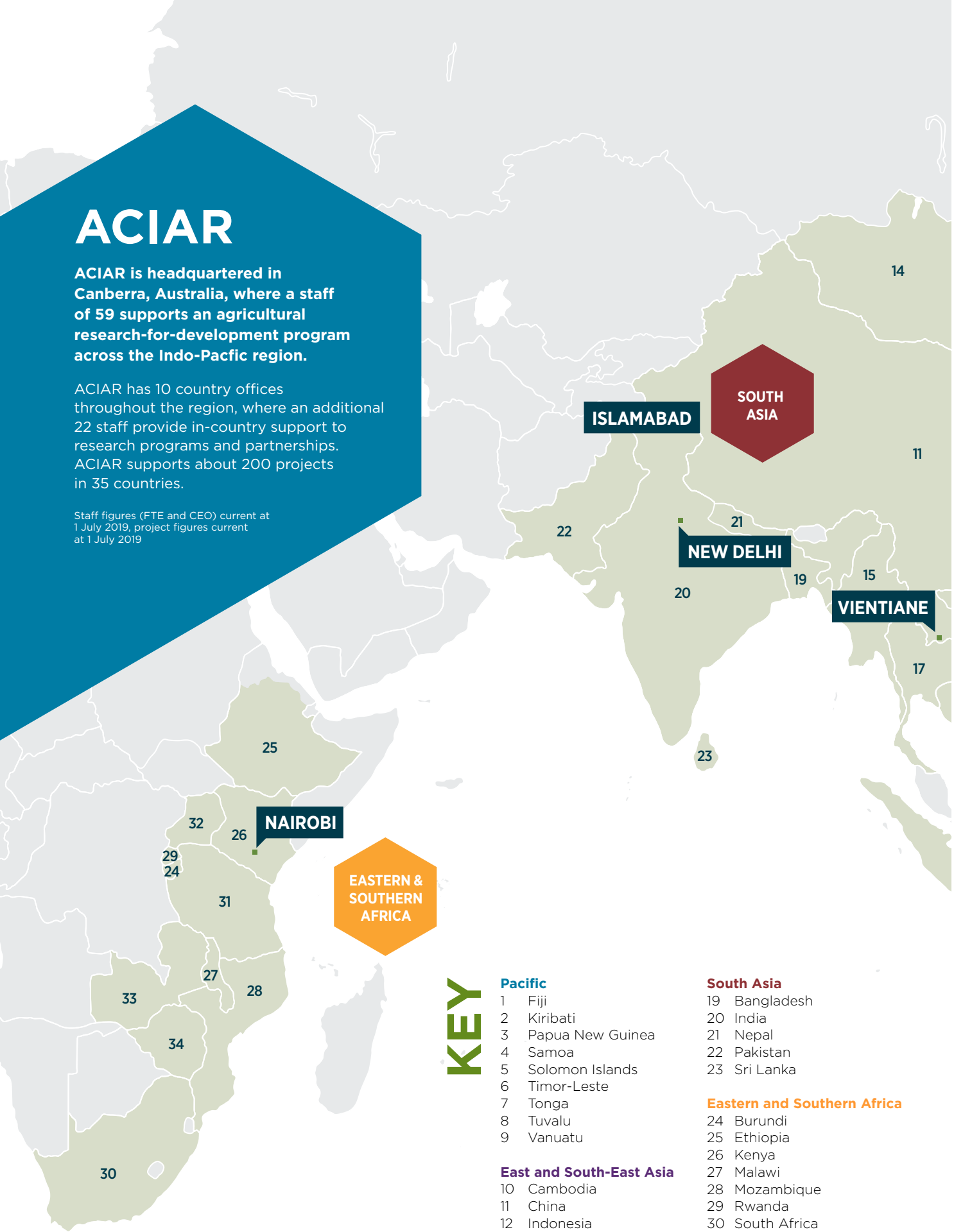
Note: There is no external funding expenditure on projects and programs in Africa by DFAT.

ACIAR

ACIAR is headquartered in Canberra, Australia, where a staff of 59 supports an agricultural research-for-development program across the Indo-Pacfic region.

ACIAR has 10 country offices throughout the region, where an additional 22 staff provide in-country support to research programs and partnerships. ACIAR supports about 200 projects in 35 countries.

Staff figures (FTE and CEO) current at 1 July 2019, project figures current at 1 July 2019



KEY

Pacific
1 Fiji
2 Kiribati
3 Papua New Guinea
4 Samoa
5 Solomon Islands
6 Timor-Leste
7 Tonga
8 Tuvalu
9 Vanuatu

East and South-East Asia
10 Cambodia
11 China
12 Indonesia
13 Laos
14 Mongolia
15 Myanmar
16 Philippines
17 Thailand
18 Vietnam

South Asia
19 Bangladesh
20 India
21 Nepal
22 Pakistan
23 Sri Lanka

Eastern and Southern Africa
24 Burundi
25 Ethiopia
26 Kenya
27 Malawi
28 Mozambique
29 Rwanda
30 South Africa
31 Tanzania
32 Uganda
33 Zambia
34 Zimbabwe

Ghana (not shown)

ACIAR country office

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 2019

Farmers assembling beehive in an agroforestry plantation, Uganda.
ACIAR project: Trees for food security 2 (FST/2015/039)

2

Global partnerships

Global partnerships

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

The ACIAR Global Program builds and manages multilateral partnerships with international organisations, institutes and associations engaged in agricultural research and the delivery of global public goods. The program implements one of our mandated roles of funding and supporting the international agricultural research centres. The program also manages co-funded programs across many countries in the Indo-Pacific region.

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. The CGIAR is explained in detail on page 17.

Multilateral partnerships also encompass support of and/or engagement with other organisations relevant to our mission. During 2019–20, relationships will continue with:

- African Union
- Asia–Pacific Association of Agricultural Research Institutions (APAARI), where ACIAR Chairs the Executive Committee for 2019–21
- Association of Southeast Asian Nations (ASEAN)
- Australia Africa Universities Network (AAUN)
- Centre for Agricultural Biosciences International (CABI)
- Food and Agriculture Organization of the United Nations
- Global Forum on Agricultural Research
- The Group of 20—Meeting of the Agricultural Chief Scientists
- The Pacific Community (SPC)
- Global Research Alliance on Agricultural Greenhouse Gases
- The World Bank
- World Vegetable Center (WorldVeg).

Also significant for ACIAR global partnerships are developing and managing co-investment alliances and partnerships with like-minded donors such as DFAT, the Australian Government Department of Agriculture, Canada's International Development Research Centre, the Syngenta Foundation for Sustainable Agriculture, and organisations in the private sector. Co-investment partnerships signify strong trust, and enable each partner to leverage complementary research strengths, build a critical mass of resources, and invest in more ambitious research than either could achieve alone.

The Global Program also establishes research activities at a regional level, where coordination of approaches is the best way to address an agricultural challenge, such as managing biosecurity risk and trade harmonisation. Research initiated by the Global Program also aims to be innovative and future-focused, especially when co-investing with a like-minded partner.

The ACIAR strategy under the Global Program is to be a valued, engaged donor, and a strong, innovative partner in international agricultural research. Partnerships built through our multilateral engagement contribute to Australia's global citizenship goals. Our deep engagement in global forums helps ensure that Australia is influential and held in high esteem by the international agricultural research sector, national governments and donor communities.

During 2019–20, ACIAR will provide effective funding support on behalf of Australia to about 25 partnerships through multilateral, co-investment and regional relationships managed by the Global Program.

Table 2.1: ACIAR funding to the Global Program, 2019–20

Year	International agricultural research centres	Other research organisations and programs[a]	Total
	A$ million		
2019–20 (budget)	17.3	4.9	**22.2**

(a) Includes regional research funding and funding contributions to other multilateral (non-CGIAR) partners, such as SPC, AAUN, APAARI, CABI and WorldVeg and regional and co-investment research.

Multilateral partnerships

CGIAR

CGIAR[1] is the world's largest global agricultural innovation network, comprising 15 international agricultural research centres and about 9,000 scientists who work mostly in developing countries. The centres work towards a world free of poverty, hunger, malnutrition and environmental degradation. With a presence in more than 70 countries, and a deep knowledge of local customs, values and market operations, the CGIAR research centres work closely with more than 3,000 partner organisations. These include national and regional research institutes, civil society organisations, academia and the private sector.

CGIAR is more connected with the international development agenda and associated partners at global, national, subnational and local levels than any other agrifood research entity. CGIAR research centres are responsible for hands-on research programs and operations guided by policies and research directions set by the System Management Board. The centres conduct world-class, interdisciplinary research that combines biophysical and social sciences to deliver development impact at scale. CGIAR operates on an annual budget of about US$900 million.

Our key multilateral partnership is with the CGIAR, which receives the largest proportion of the Global Program budget. As part of its mandated role, ACIAR has been a regular and significant funder and research partner to CGIAR since 1982. Accordingly, Australia has high-level representation on the CGIAR governance bodies, which in 2019–20 includes the System Council and its Strategic Impact Assessment Monitoring and Evaluation Committee, the System Reference Group and the System Management Board.

Through ACIAR, Australia works in the governance of CGIAR alongside the US, World Bank, United Kingdom, Europe Commission, Bill and Melinda Gates Foundation, Germany, Japan and China, among others. Australia is also well represented at the highest levels of leadership within the CGIAR as board chairs and board members, directors general and Research Program leaders.

CGIAR donors work together to deliver greatest impact. One current example is The Crops to End Hunger Initiative, which aims to improve and modernise CGIAR crop breeding programs, so that CGIAR can respond optimally to the food security and related human welfare and climatic challenges articulated by the Sustainable Development Goals.

Significant Australian leadership has been provided—including the University of Queensland developing the tool to assess modern breeding program performance—and 2019–20 will see the initiative being implemented after two years of planning.

CGIAR delivers significant economic and social returns on investment. Over its lifetime, the return on investment for every US$1 provided to CGIAR is evaluated at US$17. 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.

Australian agricultural industries have benefited from CGIAR research, with research outputs helping to keep Australian farmers competitive in world markets, by increasing yields and/or reducing costs. For example, CGIAR germplasm has been incorporated into, and greatly improved, the Australian sorghum breeding system. Similarly, chickpea improvements in Australia have been heavily dependent on germplasm from the CGIAR in India and Syria, while research collaboration with the CGIAR, through exchange of livestock germplasm, has led improvements in the productivity of Australia's livestock sector. 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.

As CGIAR moves towards celebrating its 50th anniversary in 2021, it is assessing its narrative and forward vision against 21st century and future challenges, to develop an ambitious CGIAR System 2030 Business Plan. This will include exploring a revised compelling and aligned mission and research portfolio, new ways of organising the transformative research programs, institutions and governance to ensure CGIAR's long-term relevance is based on its unique comparative advantage. ACIAR is actively contributing to these deliberations to ensure CGIAR is well placed to deliver against both the Sustainable Development Goals and Paris Agreement, as well as to attract new funder contributions.

ACIAR provides both unrestricted (core) and restricted project funds to the CGIAR Fund. More than half of our funding is unrestricted and is reviewed annually. The remainder (restricted) is delivered through specific research projects between ACIAR programs and individual centres in the CGIAR network. Through ACIAR, Australia's annual contribution to the CGIAR system is shown in Table 2.2.

Table 2.2: Australia's funding, through ACIAR, to the CGIAR system, 2019–20

Year	Unrestricted	Project specific (restricted)	Total
		A$ million	
2019–20 (budget)	17.3	8.4	**25.7**

Intensification of agricultural systems is the focus of an ACIAR-supported project in West Bengal, India. The project is part of the Australian Government's Sustainable Development Investment Portfolio (page 123) and led by CIMMYT, in partnership with Uttar Banga Krishi Viswavidyalaya. Credit: ACIAR/Conor Ashleigh (2019)

Centres of the CGIAR system

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

To ensure the quality and value for money of Australia's ongoing contributions to CGIAR, during 2019–20, 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
- lead Theme 1 'Research Objectives and Focus' of the System Reference Group to deliver options on defining a transformative and compelling portfolio coverage to the System Council
- participate as an active observer on the CGIAR System Management Board, with a focus on implementation of the 2019–2021 Business Plan
- collaborate with key donors through participation in multi-funder activities, where they align with the ACIAR strategy and Australian interests
- 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 and networks

ACIAR also has multilateral partnerships with five international agricultural research centres and networks outside 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)
- The Pacific Community (SPC)
- World Vegetable Centre (WorldVeg).

The ACIAR contribution to these organisations has grown over the past 10 years, and A$1.59 million is budgeted for support in 2019–20.

Asia–Pacific Association of Agricultural Research Institutions

The Asia–Pacific Association of Agricultural Research Institutions[2] (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 agrifood research and innovation systems in Asia and the Pacific*—identifies strategic priorities, which are used to inform our 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 2019–21, ACIAR will chair the APAARI Executive Council and the Asia–Pacific Consortium on Agricultural Biotechnology and Bioresources, and support APAARI to become the long-term coordinating agency for the Agricultural Science and Technology Indicators (ASTI) program for the South-East Asia and Pacific region.

Australia Africa Universities Network

Launched in 2012, the Australia Africa Universities Network[3] (AAUN) is a group of 22 leading universities—10 in Australia and 12 in Africa—that connects researchers and academics through institutional partnerships, forming sustainable teams to address major challenges facing both continents.

With a small secretariat led by the University of Sydney and the University of Pretoria, the network fosters a growing relationship between Australia and Africa, by building on educational and research links. The vision is to build equal partnerships between leading research universities, develop active teams and communities of scholars who are ready and able to address mutual challenges, and engage allied research and education networks and institutions in the program.

AAUN has established 50 intercontinental, multidisciplinary research programs that address mutual challenges in the areas of agriculture and environment, food and nutrition security, public health, and related higher education and economic development.

Australian universities in the network are:

- Curtin University
- Murdoch University
- The University of Melbourne
- The University of Newcastle
- The University of Queensland
- University of New South Wales
- University of Western Australia
- University of Technology Sydney
- University of Wollongong
- Western Sydney University.

The African universities in the network are:

- Makerere University (Uganda)
- Tshwane University of Technology (South Africa)
- University of Botswana (Botswana)
- 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).

Food production plot, Rwanda

The four-year (2018–21) partnership arrangement between ACIAR and AAUN supports an annual competitive call for multi-institutional research proposals in the selected research areas. African and Australian senior and emerging research leaders engage in the research programs, keynote forums, workshops and conferences. AAUN fosters mobility of researchers and students, and links with alumni and diaspora communities.

This work will continue in 2019–20, building the quality, feasibility, impact and sustainability of programs. Many programs are directly relevant to global and national policy initiatives, including the United Nations Sustainable Development Goals, the African Union Africa 2063 Agenda, and the Australian International Policy.

Centre for Agricultural Biosciences International

The Centre for Agricultural Biosciences International[4] (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 US, Africa, South America and Asia.

CABI addresses issues of global concern through science, information and communication, with a focus on 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 the Australia Africa Plant Biosecurity Partnership and the Common Market for eastern and southern Africa, to support the sustainability of the African Plant Biosecurity Network.

The four-year (2019–23) partnership arrangement between ACIAR and CABI supports Plantwise, an Organisation for Economic Co-operation and Development (OECD) Development Assistance Committee award-winning global program led by CABI, which helps farmers lose less of what they grow to pests and diseases.

The Pacific Community

The Pacific Community[5] or SPC, which was previously known as the Secretariat of the Pacific Community, is the principal scientific and technical organisation working to support development in the Pacific region, and has been doing so 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 delivering Australia's wider strategies to support strong benefits from the region's fisheries, agriculture, forestry and biosecurity sectors. The four-year (2018–21) strategic partnership arrangement between ACIAR and SPC supports core scientific, technical and management capacities, and activities in agriculture and fisheries that add value to the development activities of Pacific Island countries and territories in these areas. ACIAR works directly with the two divisions of SPC—Land Resources Division and Fisheries, Aquaculture and Marine Ecosystems.

ACIAR is committed to supporting SPC to maintain the institutional capacity to sustain the capabilities of these divisions. During 2019–20, ACIAR and SPC will collaborate to progress strategic regional initiatives, including the Pacific Plant Biosecurity Program and the Coconut Genetic Resources Network. ACIAR will also engage with SPC on supporting the 2019 Pacific Week of Agriculture in Samoa.

World Vegetable Centre

The World Vegetable Center[6], 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. Through its extensive networks and research partnerships WorldVeg disseminates improved varieties of vegetable crops, and promotes improved production methods to farmers in developing and developed countries. This results in higher vegetable harvests, higher incomes, more jobs and 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 mung bean 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.

During 2019–20, work will continue against the four-year (2019–22) strategic partnership between ACIAR and WorldVeg, which supports breeding activities and capacity-building in developing countries in Asia and sub-Saharan Africa. This includes:

- developing improved lines of vegetables with higher yields, tolerance/resistance against pest and diseases and/or higher nutrient content
- introducing improved agricultural practices, before and after harvest, for safe, sustainable and competitive value chains
- collaborating with, and building capacity of, partners from the public and private seed sectors.

Co-investment programs

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. These relationships take the two main forms 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 manages the project, such as projects managed by ACIAR under the DFAT–ACIAR Record of Understanding.

Cultivate Africa's Future, Phase 2

During 2019–20, ACIAR will continue the successful Cultivate Africa's Future (CultiAF) partnership with the Canadian International Development Research Centre (IDRC). The first phase of CultiAF began in 2013, and supported eight projects across five countries in eastern and southern Africa, addressing post-harvest management, food processing, nutrition, business opportunities and value chains.

Phase 2 of CultiAF[7] was launched in May 2019, and during 2019–20, five projects selected for Phase 2 will begin. These are:

- Improving agricultural productivity and resilience with satellite and cell phone imagery to scale climate smart crop insurance
- User-driven approaches to make government and farmer-led smallholder irrigation schemes in Mozambique more productive, self-sustaining and equitable
- Alien invasive fruit flies in southern Africa—implementation of a sustainable integrated pest management program to combat these menaces
- Harnessing dietary nutrients of under-utilised fish and fish processing by-products to reduce micronutrient deficiencies among vulnerable groups in Uganda
- Climate smart interventions for smallholder farmers in Ethiopia.

A further four projects from CultiAF Phase 1 will be rolled over to Phase 2. These are:

- Insect feed for poultry, fish and pig production in Kenya and Uganda
- Business opportunities for youth in the fish and poultry sectors in Kenya
- Improved fish processing technologies in Malawi
- Supply and utilisation of pre-cooked beans for improved food and nutrition security in Kenya and Uganda.

Through CultiAF2, ACIAR and IDRC, will invest more than A$20 million (over five years) in high-quality applied research that addresses food and nutrition insecurity in Africa. The ACIAR–IDRC partnership will jointly invest more than A$37 million for the two phases.

Food Futures Research Program

The Food Futures Research Program[8] is an innovative partnership between ACIAR and the IDRC. The program seeks to canvass and support strategic agricultural research that will have a potential breakthrough and/or transformative impact on global food security into the foreseeable future. ACIAR and IDRC have jointly committed A$5 million to the program, which ACIAR is managing on behalf of the partnership.

During 2019–20, the program will finalise its foresight and impact analysis work to understand prevailing macro and sector trends in food security, and identify the major future obstacles and key gaps in the research. The USA's Foundation for Food and Agricultural Research is co-investing in this foresight work being undertaken by XPRIZE. The program will design and commission innovative agricultural research to address these obstacles and help deliver a sustainable and food and nutrition secure future.

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 Syngenta Foundation for Sustainable Agriculture and the Crawford Fund. Alliance partners co-fund innovative approaches to research-for-development activities and delivery, using the unique and diverse strengths and expertise of the parties, to better promote and achieve food security.

The first of these co-investments is a highly successful project—Demand-led plant variety design for emerging markets in Sub-Saharan Africa[9]. Phase 1 of the project increased the availability of high-performing plant varieties that meet market demands. An external review of Phase 1 noted that the project has engaged extensively with the plant-breeding and university sectors in many countries, towards having a truly comprehensive and transformative effect on plant breeding, small-scale agriculture and food security in Africa.

Phase 2 of the project will build on research outcomes from Phase 1 during 2019–20. The new phase will provide wider access to plant breeders, and focus on implementation of best practice in demand-led plant breeding programs, using beans (*Phaseolus* sp.) and tomatoes 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, based on private sector best practice.

Pacific Plant Biosecurity Partnership

The Pacific Plant Biosecurity Partnership[10] aims to strengthen biosecurity capacity in Pacific island countries, Papua New Guinea and Timor-Leste. Led by ACIAR, the partnership is implemented by Kalang Consultancy Pty Ltd, and is supported by the Australian Government Department of Agriculture and the Crawford Fund.

The partnership is based on the format and approach used between 2014 and 2017 in the successful delivery of the ACIAR plant biosecurity capacity-building program in eastern and southern Africa.

Biosecurity is a highly important area of work for Australia and the Pacific region, as plant pests and diseases negatively affect food production and biodiversity, and can limit trade and market access opportunities for plant products, including safe food access and importation.

By targeting regional, national/institutional and individual needs, and placing people in Australian biosecurity agencies, providing mentoring and training, and developing a long-term regional network, the program aims to build greater capacity and empower Pacific National Plant Protection Officers and their institutions.

The program goals are to improve:

- the 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, to meet 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.

A total of 19 fellows from the Pacific completed the first phase of the program during 2018–19, sharing expertise, research and national plant biosecurity challenges through a market access simulation workshop, communications masterclass and placements with Australian biosecurity institutions.

During 2019–20, the program will continue to strengthen biosecurity capacity, through continued training in the region. This will include additional fellows from the region's biosecurity agencies and private sector, and establishing a home for the biosecurity network to support ongoing liaison between Pacific island and Australian biosecurity officials and experts. This is critical to advance plant biosecurity programs across the region and in the international market access arena.

Coconut Genetic Resources Network

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 is threatened by senile plantings, which face further declines from pests and diseases, climate change and poor conservation and management of genetic resources. Access to coconut genetic diversity is vital to sustaining the livelihoods of millions of smallholders and their communities around the world, and particularly in the Asia–Pacific region.

In 2019–20, ACIAR, DFAT and the International Coconut Community will collaborate on a new program to reinvigorate and sustain the Coconut Genetic Resources Network[11] (COGENT). Under the leadership of Mr Uron Salum, the program will focus on better coconut science, through a global coconut strategy to address these major challenges.

This program will collaborate with other organisations to ensure a viable COGENT Secretariat, to safeguard coconut genetic resources and to better address disease threats, through new leadership by the International Coconut Committee. ACIAR and DFAT will jointly invest $500,000 to support this important initiative.

Participant of the Pacific Plant Biosecurity Program communications masterclass. Credit: Patrick Duthie

Co-investments with other government agencies

Our largest and most important partnership with a government agency is with portfolio partner, DFAT. The existing partnership agreement between ACIAR and DFAT was 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.

During 2019–20, ACIAR and DFAT will update the partnership agreement, under which ACIAR will manage 14 activities, and, through well-managed DFAT–ACIAR co-investment agreements, ensure the timely delivery of revenue and expenditure and risk mitigation for these activities.

Table 2.3. ACIAR and partner investment in co-investment programs (funds are for the life of the project)

Project	Project partner/s	ACIAR	Partner	Total	Leverage of ACIAR investment
			(A$ million)		%
Demand-led plant variety design (FSC/2013/019)	Syngenta Foundation	1.085	1.085	2.170	100
CultiAF2 (C2016-367)	Canadian International Development Research Centre	10.000	10.000	20.000	100
Food Futures Research Program (GP/2018/218)	Canadian International Development Research Centre	2,500	3.237	5.737	129
Pacific Plant Biosecurity Program (GP/2018/109)	Australian Department of Agriculture Crawford Fund	0.650	0.154	0.804	24
COGENT (GP/2018/193)	Australian Department of Foreign Affairs and Trade	0.250	0.250	0.500	100
TOTAL		**13.400**	**13.641**	**27.041**	**102**

Regional research programs

The Global Program supports regional research programs that vary both in nature and in the regions that benefit from the work. During 2019–20, there is one such program.

Agricultural Science and Technology Indicators

The ASTI program[13], active in South-East Asia and the Pacific (Papua New Guinea and Fiji), is led by the International Food Policy Research Institute, and hosted and coordinated by APAARI. The program works with national and regional partners to survey and analyse data on the funding, human resource capacity and outputs of agricultural research in the Indo-Pacific region. Data collection is ongoing, and, in 2019–20, ACIAR will support national and regional analysis of the data to inform future agricultural research policy and decision-making in the region.

The program also provides a basis to guide research investment decisions and build a foundation for the long-term monitoring of agricultural research investment and capacity. ACIAR, through the Global Program, is investing more than A$1 million in this program over 2017–20.

Current and proposed partnerships and projects 2019–20

Multilateral partnerships with international organisations and networks

1. CGIAR
2. Asia–Pacific Association of Agricultural Research Institutions (C000341)
3. AAUN Partnership Arrangement (C000425)
4. CABI Partnership Arrangement (C001048)
5. Strategic Partnership Arrangement with the Pacific Community (C000386)
6. World Vegetable Center Partnership Arrangement (C001047)

Co-investment alliances and partnerships

7. Cultivate Africa's Future, Phase 2 (CultiAF2) [Ethiopia, Kenya, Uganda, Malawi, Mozambique, Zambia, and Zimbabwe] (C2016/367)
8. Food Futures Research Program (GP/2018/218)
9. Demand-led plant variety design for emerging markets in Sub-Saharan Africa [Ghana, Kenya, South Africa, Tanzania] (FSC/2013/019)
10. Improving plant biosecurity in the Pacific islands [Fiji, Kiribati, Papua New Guinea, Samoa, Solomon Islands, Timor-Leste, Tonga, Tuvalu, Vanuatu] (GP/2018/109)
11. Reinvigorating the Coconut Genetic Resources Network (COGENT) [Fiji, Indonesia, Papua New Guinea, Samoa] (GP/2018/193)

Regional research programs

12. Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific—Agricultural Science and Technology Indicators (ASTI) program [Cambodia, Indonesia, Malaysia, Myanmar, Papua New Guinea, the Philippines, Thailand, Vietnam, Laos, Timor-Leste] (GP/2016/093)

General Manager, Global Program
Ms Mellissa Wood

See page 200 for contact details

Demonstration of new rice-sowing technology, Myanmar. ACIAR project: Diversification and intensification of rice-based systems in lower Myanmar (SMCN/2011/046). Credit: ACIAR/Conor Ashleigh (2018)

3

Country partnerships

Country partnerships

ACIAR Country Programs guide the development and regular adjustment of the strategic directions of our research investments with our bilateral country partners. Generally, these activities are implemented through our regional and country offices in 10 countries across four regions.

Location of ACIAR country offices

- Pacific
  - Fiji (regional office)
  - Papua New Guinea
- East and South-East Asia
  - Laos (regional office)
  - China
  - Indonesia
  - the Philippines
  - Vietnam
- South Asia
  - India (regional office)
  - Pakistan
- Eastern and Southern Africa
  - Kenya (regional office)

ACIAR country offices are located in the site of the Australian High Commission or Embassy, and staff work in close collaboration with DFAT.

The managers of ACIAR country offices are responsible for managing our relationships with partner countries and stakeholders, communication, coordination and administration of activities related to our collaborative research program in their respective countries/regions. The managers are supported by a small team in each office.

The teams in these 10 offices provide guidance for local research institutions in developing, establishing and administration of collaborative projects, assist visiting Australian project staff and provide general in-country support. They are an important link between scientists in Australia and the relevant in-country research organisations. They also play an important role in negotiating the collaborative/partnership framework for ACIAR research in their respective areas between ACIAR Canberra and in-country ministries.

Many country relationships are undergoing rapid change, as local research capacity grows, creating an opportunity for the country office network to renegotiate relationships. Last year ACIAR negotiated a new partnership with the Philippines, which wanted to become a substantial co-investor with ACIAR in research collaboration.

In 2019–20, a key focus of ACIAR Country Programs will be on partnerships undergoing change, with new long-term strategies being developed with the Pacific, Papua New Guinea and Indonesia. The country office network will also focus on adding to their stakeholder relationship management skills, by expanding capabilities in knowledge and information brokering.

ACIAR regional and country managers

Pacific

Ms Florence Rahiria
Regional Manager, Pacific and Papua New Guinea

Florence is based in Suva but also performed the role from the ACIAR office in Papua New Guinea for two years. Before joining ACIAR, Florence worked in several roles managing development programs for DFAT at the Australian High Commission in Papua New Guinea, in the areas of economics and public sector governance, democratic governance and post-conflict and fragility. She also worked in the public sector and banking industry in Papua New Guinea. Florence holds a Bachelor of Economics from the University of Papua New Guinea and a Master of Public Administration in International Development from the York University in the United Kingdom.

Ms Doreen Iga
Country Manager, Papua New Guinea

Doreen is based in Port Moresby. She has 20 years of experience with environmental non-government organisations, AusAID programs, international non-government organisations in Papua New Guinea and DFAT. Before joining ACIAR in July 2019, Doreen worked with DFAT from 2013, to manage a portfolio of programs in the governance, civil society and education sectors. She has a Bachelor of Arts in Physical Geography and Environmental Science from the University of Papua New Guinea and a master's degree in Development Studies from the University of Auckland.

East and South-East Asia

Ms Dulce Carandang Simmanivong
Regional Manager, East and South-East Asia

Dulce is based in Vientiane, and is responsible for strategic oversight of the Cambodia, Laos and Myanmar country programs. Before joining ACIAR in 2015, Dulce managed the rural development portfolio of AusAID/DFAT for six years, working across sectors, including financial inclusion, social protection, non-government organisation cooperation, mine action and rural livelihoods. Before then, she worked in program management positions with the United Nations and civil society organisations, including a farmers' alliance. Dulce's past work took her across North and South-East Asia. She earned both her degrees—a Bachelor of Arts (Communications) and a Master of Industrial/Organisational Psychology—at Ateneo de Manila University.

Mr Wang Guanglin
Country Manager, China

Guanglin joined ACIAR in 1998, and became ACIAR Country Manager for China in 2011. He is based in Beijing. Before joining ACIAR, Guanglin worked for two years at the Defence Section of the Australian Embassy in Beijing. Guanglin has a background in business administration and more than 20 years' experience working on agriculture development in China. In his current role as Country Manager, he is exploring opportunities for ACIAR and China to work with other countries on common opportunities and challenges in agriculture.

Ms Mirah Nuryati
Country Manager, Indonesia

Mirah is based in Jakarta, and has worked with ACIAR for 28 years. In this time, she has worked in the Indonesia office as administrative officer, Stakeholder Relationship and Manager and Assistant Country Manager. Before ACIAR, Mirah spent 12 months with Australian International Development Assistance Bureau/ AusAID, within DFAT. Mirah is a graduate of the Tarakanita Communication and Secretary Academy in Jakarta. In 2007, Mirah was awarded an Australian Public Service Medal for her contribution to strengthening ACIAR collaboration with relevant Indonesian ministries.

Ms Mai (Gay Maureen) Alagcan
Country Manager, the Philippines

Mai is based in Manila. Before joining ACIAR, Mai worked as a Senior Program Officer on the Climate Change, Disaster Risk Reduction and Humanitarian Program for DFAT at the Australian Embassy in Manila. Mai also has worked in the Philippine public sector, with extensive professional and management experience on program development, policy analysis and monitoring and evaluation in the agriculture and fisheries sector. Mai has a Bachelor of Science in Agricultural Economics from the University of the Philippines and postgraduate certificate in Regional Development Planning from the School of Urban and Regional Planning, University of the Philippines and Technical University of Dortmund in Germany.

Ms Nguyen Thi Thanh An
Country Manager, Vietnam

An is based in Hanoi. She joined ACIAR in December 2007 as an Assistant Country Manager, and became Country Manager in 2014. An has extensive experience as a professional communicator, working in both private and public sectors. She completed her master's degree at University of Queensland in 2013, with a major in Communications for Development. An contributed to the development of the recent ACIAR Vietnam strategy and the Australia in Vietnam Agriculture Strategy, which won the Gold Standard Award for Country or Trade Promotion at the Public Affairs Asia Gold Standard Awards 2018.

South Asia

Dr Pratibha Singh
Regional Manager, South Asia

Pratibha is based in New Delhi, India. Before joining ACIAR in 2018, Pratibha was head of the Technology Advancement Unit of the Indo–Swiss Collaboration in Biotechnology for eight years. She has 20 years' experience in crop research and technology management, including more than 10 years of research experience in molecular plant pathology on crops, including wheat, rice, corn and potato. Pratibha worked at: the Indian Agricultural Research Institute, New Delhi; USDA–Dale Bumpers National Rice Research Center; Cornell University; and Agriculture and Agri-Food Canada, Fredericton. She also worked as a scientist and Coordinator of Research Management System in a corporate biotech industry (E.I. DuPont India). Pratibha is qualified in agriculture and animal husbandry, and holds a Master of Agriculture Biotechnology from G.B. Pant University of Agriculture and Technology, India, and a PhD in Agriculture, with a major in plant pathology as a Monbusho Scholar from Tottori University, Japan.

Dr Kazmi Munawar
Country Manager, Pakistan

Kazmi is based in Islamabad, and has been in the position for 10 years. Before joining ACIAR, he was a researcher at Pakistan's Agricultural Research Council. He completed his master's degree at the University of Agriculture, Faisalabad, and his PhD in plant pathology from Quaid-e-Azam University, Islamabad. Kazmi's studies specialised in mango disease and farmer training. During more than 15 years as a research scientist, he published over 40 peer-reviewed science articles. He is a trained facilitator, and has worked extensively on the Farmer Field School approach, collaborating with national organisations and international agencies in Vietnam, Bangladesh, China, Thailand and Kyrgyzstan.

Eastern and Southern Africa

Dr Leah Ndungu
Regional Manager, Eastern and Southern Africa

Leah is based in Nairobi, where she provides strategic oversight for the ACIAR program in the region. Leah has more than 20 years' experience managing research programs. Before joining ACIAR in 2017, Leah worked at the Biosciences Eastern and Central Africa–International Livestock Research Institute Hub as a Partnership Coordinator, in a DFAT-funded research-for-development program focusing on food security. Previously, she was a Research Manager at the International Livestock Research Institute. Leah has also worked in the public sector as a research scientist in Kenya's national agricultural research system. She holds a Bachelor of Veterinary Medicine from the University of Nairobi, a master's degree in Veterinary Science from Washington State University, US, and a PhD in Veterinary Science with a specialisation in agricultural economics from the University of Pretoria, South Africa.

Cabbage seedling destined for a market garden, Papua New Guinea. TADEP (page 62) and ACIAR project: Improving opportunities for economic development for women in rural Papua New Guinea (ASEM/2014/095). Credit: ACIAR/Conor Ashleigh (2014)

4

Programs

Programs

ACIAR works with scientists in Australia and partner countries to use science and technology to solve local problems and improve the livelihoods of smallholder farmers.

Our core business is to identify research priorities collaboratively with partner countries, and broker research partnerships and projects to tackle those priorities. Once projects are established, ACIAR manages and monitors these investments throughout the research process to maximise impact and return on investment.

Since its inception in 1982, ACIAR has developed three research partnership models:

- multilateral research collaborations
- co-investment alliances and partnerships
- bilateral country partnerships.

Multilateral research collaborations and co-investment alliances and partnerships are described in detail in Chapter 2 ‘Global partnerships’.

Research projects developed as bilateral country partnerships are led by a commissioned organisation (such as an Australian university, CSIRO, state government agency or private firm) and/or an international agricultural research centre. The projects are a collaboration between project leaders and in-country organisations. ACIAR works closely with collaborators to determine and monitor the achievement of project milestones.

Relationships with our collaborators and in-country partners change as partner countries develop more capability in research and focus in research priorities. So our approach to research prioritisation and partnership brokering adapts, to deliver research projects consistent with jointly agreed priorities, needs and capabilities.

Our research portfolio continues to evolve in response to new research opportunities enabled by new knowledge and technologies, and in response to new research and development imperatives. For example, during 2019–20, we are developing new areas of activity addressing:

- application of digital technologies to smallholder production systems
- contribution of agriculture to greenhouse gas emissions
- adaptation of agriculture to climate change
- links between human, livestock and ecosystem health.

Program areas

The ACIAR research portfolio covers:

- agribusiness
- crops
- fisheries
- forestry
- horticulture
- livestock
- social sciences
- soil and land management
- water and climate.

While each program focuses on priorities within its field, the development of projects across programs is also guided by the objectives of the ACIAR 10-Year Strategy 2018–2027.

Agribusiness

The Agribusiness Program focuses on research and adoption of initiatives and innovations to improve business outcomes for smallholder farmers, their communities and their industries. It includes research at all points along the agricultural, forestry and fisheries value chain. This includes input supply, production and harvest at the farm level, as well as and post-harvest activities of shipping, processing, packaging and marketing of farm products.

The program seeks to understand and identify skills and opportunities for smallholders, communities and industries to manage many complex and interrelated factors, issues and tasks in the production chain, as well as understanding and linking to markets, and adopting new enabling technologies. The program also addresses biosecurity, quality control and quality management of farm production, and compliance with market and government regulations. Finance for smallholders to participate in value chains is also another area of focus.

Communication and information transfer up and down the value chain is a crucial component of successful enterprise. Projects brokered by the Agribusiness Program strive to build and improve communication and management skills of agribusiness chain participants. Projects supported by ACIAR also address factors that influence market development and opportunities, as well as regulations, policies and institutions that influence production, investment and infrastructure for agriculture. Projects include understanding and building capacity to adapt to structural and agricultural transformation.

Mr Howard Hall is the Research Program Manager for Agribusiness. Before joining ACIAR, Howard founded and operated a specialist agribusiness consultancy for almost 30 years, working across tropical and temperate horticulture, intensive and extensive meat and seafood industries, grains, pulses and field crops, and food packing and processing. He has also worked as a senior manager in corporate agribusiness in the agricultural inputs sector, and in both food manufacturing and food and grocery distribution. Howard has worked across North and South-East Asia, Papua New Guinea and the Pacific. He has a Bachelor of Applied Science (Rural Technology) from the University of Queensland and a Graduate Diploma of Business Studies from the University of New England.

Crops

The Crops Program aims to increase the productivity, sustainability and use of major crops, by applying genetic and agronomic innovations to cropping systems of mutual importance to Australia and partner countries. The program is built on two complementary and integrated themes of genetics and sustainable intensification and diversification.

Projects within the genetics theme address specific agronomy issues, such as incorporating tolerance or resistance to pests and diseases, or building skills and technological capacity of plant breeding programs (modernisation). ACIAR-supported projects enable the development of partnerships to enable the release of improved germplasm, rather than directly disseminating new varieties. Current projects supported by the Crops Program identify genes for important traits, and support their introduction into breeding lines. But variety release may also be a direct outcome of the gene discovery work.

Projects supported under the sustainable intensification and diversification theme consider the productivity, profitability and resilience from the whole cropping system. These projects design, test and disseminate cropping system innovations, using farming systems research methods, to increase productivity, returns and the sustainability of targeted systems. Concentration of poverty in rural areas, migration out of farming, the increasing gap between urban and rural incomes, and lower growth for agriculture compared with the overall economy all challenge family farming as a viable, profitable and satisfying pursuit. The Crops Program explores sustainable intensification as one response to these issues.

Dr Eric Huttner is the Research Program Manager for Crops. He started his career in plant molecular genetics, working in the public research institute, Institut National de la Recherche Agronomique, in France, and has worked for more than 20 years in various private companies, including founding a start-up plant genetic analysis service company. Eric has also managed public–private research initiatives in both Australia and France. Eric was a founding partner and director of Australia's Cooperative Research Centre for Plant Science, and a member of the Australian Biotechnology Advisory Council. He is a graduate of France's leading agricultural science school, Institut National Agronomique (AgroParisTech), and was a postdoctoral fellow at the Chinese Academy of Science in 1987.

Fisheries

The Fisheries Program brokers research partnerships that improve fishers' livelihoods from productive aquatic farming systems and sustainable wild-catch fisheries. The program's focus is on small-scale artisanal fisheries and low-technology aquaculture methods, suitable for both men and women, and includes research on post-harvest processing and trade along the supply chain.

The Fisheries Program also invests in a small number of 'big challenge' and emerging-needs research initiatives that address important priorities for our partner countries. It aims to improve food security and human health, by making food systems and policies more nutrition-sensitive, through research on sustainable food systems and fish's contributions to human nutrition, health and wellbeing.

Another key goal of the program is improved sustainability of fish resources, providing economic and social benefits through research on viable fisheries-management policies, both for artisanal fishery communities and for national or export fisheries sectors.

The program also focuses on people within fisheries industries and communities. It has an objective to improve gender equality, empowerment and household income for women through research on small businesses and collective enterprises to meet market demand. The program also strives to strengthen the capacity of fisheries researchers (both Australian and partners) and fisheries managers, through better knowledge of practice-based education and training.

Dr Ann Fleming is the Research Program Manager for Fisheries. Ann came to ACIAR from Monash University, where she was a research development specialist for two years. Before that, Ann was Manager of Aquaculture in Northern Territory Fisheries for five years, and for the 10 years prior she was Assistant Leader and then Leader of the Abalone Aquaculture Program for the Fisheries Research and Development Corporation. Ann has a PhD in Aquaculture from the University of Melbourne, a Bachelor of Science (Honours) from Monash University and a Graduate Certificate in Public Sector Management from Flinders University. She is currently undertaking a Master of International Development at RMIT.

Forestry

The Forestry Program contributes to economic development and natural resource conservation and rehabilitation, through scientific support for the establishment, management and sustainable use of forests, providing optimum social, economic and environmental benefits to partner countries and Australia.

Understanding the role of forestry in helping developing countries achieve their Millennium Development Goals, and its potential to improve livelihoods for smallholder farmers and their communities, the program focuses on aspects of forestry value chains that have good economic potential, and where the benefits will have early benefits for communities and smallholder livelihoods. The program aims to:

- enhance the role of tree growing and forest management in improving subsistence lifestyles, smallholder and community livelihoods and sustainable land management
- enhance the contribution of legal, sustainable and value-adding forest industries to economic development in partner countries
- contribute to the Australian Government's development assistance and international forest policy priorities, combating illegal logging and reducing deforestation.

Areas of focus for projects developed and supported by the program include developing silvicultural systems and improved germplasm, harvesting and processing approaches, and managing threats.

Dr Nora Devoe is the Research Program Manager for Forestry. Before joining ACIAR, Nora worked in commercial hardwood production in Victoria and Western Australia, New Zealand and several tropical countries. She has also been employed in public policy, academia and forestry for rural development. Nora has a long-standing interest in the social dimensions of forestry, with prior research in community forestry and sustainability, including social, economic and ecological aspects. Nora holds a PhD in silviculture and a Master of Forest Science in forest ecology from Yale University, as well as a Bachelor of Science in environmental science from Antioch University, USA.

Horticulture

The Horticulture Program aims to improve the productivity, profitability and sustainability of fruit, vegetable, ornamental and beverage crop production in low- and middle-income countries and Australia. Its emphasis is on improving production practice to increase yield, and on minimising pre-harvest and post-harvest loss, working along the supply chain and across a large variety of commodities, including banana, mango, pineapple, citrus, sweetpotato, coconut, cocoa, coffee and various indigenous and traditional vegetables.

Research supported by the program focuses on increasing on-farm productivity, through integrated crop management, disease and pest control, and improved post-harvest storage and management. Beyond the farm, the focus is on biosecurity, export development and market development of new products.

The Horticulture Program takes a complete supply-chain approach to crop production, which considers consumer needs for safe, high-quality food, and works with the whole chain to deliver sustainable competitive advantages to the smallholders that comprise most farmers in the countries in which ACIAR works.

The challenges for horticulture research are to improve livelihoods in rural areas, and to deliver the safe nutritious food necessary for health in both rural and urban regions. Higher systems—such as protected cropping and production systems that are resilient to climate effects, and can withstand pest and disease pressure—are complemented by projects that effectively reduce loss along the chain.

Ms Irene Kernot is the Research Program Manager for Horticulture. Irene started her career in 1978 as an agronomist with the Northern Territory Department of Primary Industries. Moving to north Queensland in 1990, Irene worked in education as a horticultural instructor, and managed an Open Learning Centre. She joined the Department of Primary Industries in Queensland as an extension horticulturist in tropical fruits, and served on the board of the Australian College of Tropical Agriculture. In 2003, Irene transferred to research management as the Director of Tropical Fruit and Value Chain Research Development and Extension with the Department of Agriculture and Fisheries.

Livestock Systems

The Livestock Systems Program brokers research partnerships that develop more productive, profitable and sustainable livestock systems for the benefit of humans, animals and the environment. The program takes a holistic view of livestock systems, considering animal health and production technologies within the broader sociocultural, policy and economic contexts. Animal welfare and gender-sensitive approaches are central to the research design. The program has the following three key areas of focus:

- Addressing the climate/livestock space—there is an urgent need to consolidate existing evidence (and identify gaps) in global research that demonstrates the greenhouse gas emissions reductions that occur with more efficient, climate-smart livestock production systems.
- Trade and market access—research into the transition from low-input to more market-oriented livestock systems has been a key ACIAR theme for many years. A whole-of-system approach that focuses on livestock production and biosecurity improvements within the relevant sociocultural, gender, policy and market aspects of the value chains will continue to be a key focus of the program.
- The role of animal-sourced foods in nutrition and food security—understanding and enhancing animal-sourced food, particularly for women and children, is a key focus in environments more prone to food insecurity, such as those experiencing recurring drought or higher-than-average malnutrition and/or stunting.

Social Sciences

The Social Sciences Program commissions research to address questions most effectively answered, or led primarily, by qualitative social scientists, with elements of quantitative social science, where relevant to the issue under investigation. All projects endeavour to conduct trans-disciplinary research to deliver innovation and speed up poverty reduction. The program's key research areas are:

- agricultural extension
- gendered social relations
- women's empowerment
- smallholder livelihoods
- climate adaptation.

Social science theories and methods can contribute significantly to systems research, particularly when considering systems as a descriptor of holistic approaches that encompass complex interactions. But the contribution of social science extends beyond systems thinking. In both research for, and in, agriculture-for-development and development more broadly, empirical research and development practice have clearly shown that engaging with people as active agents, rather than passive recipients of research and aid, results in far greater impact. An example of this is the success of farmer field schools, where farming is done by people for people, as opposed to a top-down flow of information from scientist to farmers.

The Social Sciences Program takes a people-centred approach to agricultural research-for-development to reduce poverty.

Dr Anna Okello is the Research Program Manager for Livestock Systems. Since graduating as a veterinarian from the University of Melbourne in 2002, Anna has spent the majority of her career working in international livestock development and public health programs in Africa and South-East Asia. This has included working in project management and technical advisory roles for international non-government organisations, the University of Edinburgh, the Australian Animal Health Laboratory, the World Health Organization and the Australian Government Department of Agriculture. Anna joined ACIAR in 2017 as an Associate Research Program Manager for One Health. Anna completed a PhD in political science at the University of Edinburgh's Centre for African Studies in 2012.

Dr Jayne Curnow is the Research Program Manager for Social Sciences. Jayne is an anthropologist with extensive leadership experience in international aid and research-for-development, spanning the water, agriculture, natural resource management, legal, economic and health sectors. Jayne chairs the ACIAR Gender Committee, and led the development of the ACIAR Gender Equity Strategy and Policy across the agency and its research programs. Jayne is fluent in Bahasa Indonesian and Malay.

Soil and Land Management

In complex systems of environmental, social and economic interactions, the Soil and Land Management Program aims to help smallholders boost productivity, while ensuring soil and food security are achieved, through sustainable use of limited resources in a changing climate. The program takes an integrated approach to identify promising practices within farming systems in specific agroecological zones. Intersecting with socioeconomic factors, it develops technologies that enable farmers to sustainably use resources and intensify production.

In some regions, the research aims to improve soil security, increase production, and achieve sustainability, by improving the efficiency of resource use, while maintaining and enhancing ecological services. In other regions, the goal is to improve livelihoods by raising yields and increasing profitability of agricultural enterprises.

Scarcity of resources, increasing population growth and climate change place huge burdens on smallholder farmers. Inappropriate farming systems and overexploitation of resources are degrading land, and affecting soil security, depleting nutrients, and speeding up soil acidification, salinisation and desertification. Ensuring that agricultural production is sustainable—and benefits smallholder farmers—is a key challenge for long-term food security.

Water and Climate

The Water and Climate Program addresses the challenge of efficient, sustainable water use to support agricultural production, in a context of increasingly uncertain climate, competition from other sectors and declining water quality. The program works to improve agricultural water management through innovative technical and policy approaches under the three main themes of:

- improving access to, and outcomes from, irrigation
- sustainable use of groundwater in agriculture
- risks and opportunities for safe productive use of low-quality water.

Climate change represents an acute threat to global food security and poverty eradication, and ACIAR supports research that aims to build adaptive capacity, and reduce vulnerability of smallholder agricultural systems. The Water and Climate Program works with partner countries to improve monitoring and reporting of agricultural greenhouse gas emissions, to find realistic ways to reduce or avoid emissions in the agricultural sector.

In South Asia, the Water and Climate Program coordinates ACIAR activities through the DFAT Sustainable Development Investment Portfolio, focusing on sustainable ways to intensify and diversify food systems in the Eastern Gangetic Plain, by examining the technical, policy and social dimensions of widespread agricultural change.

Dr James Quilty is the Research Program Manager for Soil and Land Management. Before joining ACIAR, James worked at the International Rice Research Institute, based in the Philippines, for seven years. After completing his PhD, James worked with Forests New South Wales, studying the impacts of managed pine forests on soil carbon and soil respiration in the central tablelands of New South Wales. He completed his PhD in Soil Science at the University of Sydney, studying the soil health implications of organic amendments in conventional irrigated cotton systems in central western New South Wales.

Dr Robyn Johnston is the Research Program Manager for Water and Climate. Before joining ACIAR, she was a Principal Researcher with the International Water Management Institute, including three years as International Water Management Institute representative in Myanmar. Robyn previously worked with the Murray–Darling Basin Commission and the Mekong River Commission, as Environment Advisor for AusAID, and with the Bureau of Rural Sciences and Geoscience Australia, working on science and policy of land and water management. She holds a Bachelor of Science (Honours) from the Australian National University, a Master of Science (Geochemistry) from University of Leeds and a PhD from the University of New England.

Crossing boundaries

The ACIAR research portfolio is designed and implemented on the basis of nine key research areas that address the gaps in knowledge, technology and capacity encountered in agricultural research-for-development. But many aspects of the research challenges associated with converging food, water and energy insecurities sit at the interface between our program areas.

ACIAR has identified 'cross-cutting' issues, and engaged Associate Research Program Managers to work with the research programs and projects, to connect areas of common focus and research. The Associate Research Program Managers have been appointed to support the following high-priority cross-cutting issues:

- climate change
- farming systems
- economics and policy
- gender
- One Health.

Climate Change

The Climate Change Program focuses on providing expertise and information across all ACIAR research investments, to improve our understanding of current risks from the impacts of climate change (including risks from extreme events), and how these will change in the future (2050–2100). Expertise and advice will be provided to:

- develop innovative transformational adaptation responses, that are country based, region based or commodity based, and include smallholder farmers
- maximise opportunities to increase farm system health, increase productivity, and develop new markets.

The program also focuses on options for emissions management, to reduce greenhouse gas emissions across ACIAR programs. This includes building regional capacity to reduce agricultural emissions, and to measure, report, verify and manage emissions to meet nationally determined contributions targets for each country under the Paris Agreement, as well as other emissions crediting options.

The program leads Australia's engagement in the Global Research Alliance on Agricultural Greenhouse Gases, and participates on other national and international climate change forums, working toward common goals, which enables scientists to achieve results that would be impossible if working in isolation. The forums also work to develop options and capacity for meaningful adaptation and emissions reductions in smallholder agriculture.

Mr Lee Nelson is the Associate Research Program Manager for Climate Change. Lee joined ACIAR from the Australian Government Department of Agriculture and Water Resources, where he worked in policy and research positions on climate change and natural resource management, including leading roles in the development of Australia's Climate Change Research program, the Carbon Farming Futures program and the agriculture component of the National Landcare Program, Phase 2. Lee holds degrees in science, law and business.

Economics and Policy

The Economics and Policy program focuses on research and initiatives that support sustainable and inclusive economic development. It addresses research on ways to manage profitable and sustainable food and resource systems from the level of smallholders up to that of policymakers.

Access to, and integration with, markets are essential to enable these systems to be developed, because they provide the means for smallholder communities to move from subsistence to commercial scales of production. Achieving sustainable development requires equipping managers at all levels with accessible information, digital technologies, decision tools and financial products to manage their systems effectively.

The program seeks to understand the trade-offs involved in management and policy decisions, and the opportunities to find balanced pathways for development. Key examples include:

- markets that fail to provide participants with conditions for equitable access
- competing demands on resources among alternative uses, both over time and under uncertainty
- production activities with the potential to create negative environmental or social externalities.

Each requires carefully designed management and policy solutions. This program is concerned with the processes that support the translation of scientific, social and economic knowledge into policy for sustainable and inclusive economic development.

Dr Todd Sanderson is the Associate Research Program Manager for Economics and Policy. Before joining ACIAR, Todd was a research scientist with CSIRO in the area of digital economics and markets. His research and teaching career covers a wide variety of economic and policy dimensions, in contexts ranging from agricultural trade to climate adaptation and smallholder decision-making under uncertainty. Todd has worked with ACIAR projects in Papua New Guinea and Laos, providing economic insights, and developing productive relationships with in-country research partners. He has a PhD in Agricultural Economics from the University of Sydney.

Farming Systems Analysis

In many of the agricultural contexts in which ACIAR project teams work, there is often a high degree of complexity, meaning many factors might be interacting to cause a problem.

Smallholders farmers do not just manage one crop type, but can be actively involved in growing many crops and vegetables, practising forestry, and producing livestock. They also produce food for home consumption, and sell products into local markets and processing chains, and they might produce internationally traded commodities.

A 'farming systems' approach can be used in these contexts, to help assess the costs and benefits of alternative crop rotations or the impacts of new farming practices.

ACIAR has recognised the importance of multidisciplinary research to provide solutions to agricultural problems in our partner countries. As such, the farming systems analysis can be used to address our objectives, and find ways to build capacity for 'systems thinking' in research teams.

Dr Sarina Macfadyen is the Associate Research Program Manager for Farming Systems Analysis. Before joining ACIAR, Sarina worked for CSIRO as an entomologist. She has many years of experience working on pest management issues in broadacre grain crops across southern Australia, and cassava production systems in east Africa. She holds a PhD from the University of Queensland, and completed her undergraduate science degree at Macquarie University in Sydney.

Gender

Gender equality is a key consideration in all the contexts in which ACIAR operates. Every ACIAR project trigger changes that have gender implications, whether explicitly acknowledged or not. Research on gendered social relations covers men and women, and might include norms, rules, resources, responsibilities and power. Women's empowerment is about creating more equal systems of access and recognition of women's agency, decision-making and participation. As more than half the world's women are farmers, ACIAR cannot credibly pursue its strategy around food security, human health, nutrition, climate change and ending poverty unless we also promote gender equality vigorously—internally and externally.

While the movement towards gender equality is everybody's business, the ACIAR Gender Program will create a gender focal point, and guide all ACIAR staff, partner agencies and program leaders to understand and identify opportunities for gender equity impact and transformation. The program will move ACIAR further towards meeting the indicator that, by 2020, 80% of ACIAR investments will reflect principles of gender equity in project design, consistent with the ACIAR Research Proposal Gender Guidelines.

Projects brokered by ACIAR strive to build and improve gender equity and inclusion. Understanding and building capacity to take a gender lens to agricultural research, and comprehensively integrating gender equity into the research portfolio will have impacts including boosting women's influence in setting the research agenda, making decisions, and opportunity to benefit from research and capacity building, and structural and agricultural transformation for women's empowerment.

Ms Jane Alver is the Associate Research Program Manager for Gender. Before joining ACIAR, Jane worked as a public servant and lawyer, including across the Pacific region. She has a Bachelor of Arts and a Bachelor of Laws (Honours) from the University of Sydney, a Master of Studies (Women's Studies) from the University of Oxford, and a Graduate Diploma of Legal Practice from the University of Technology Sydney. She is currently completing her PhD in Political Science at the University of Canberra.

One Health

One Health uses a trans-disciplinary approach to address issues at the human–animal–ecosystems interface. Such an approach in low- and middle-income countries can have a profound impact on human health, livestock productivity and trade. It has links with farming systems, livestock management, climate change and food security considerations. The Research for One Health Systems Strengthening program is a co-investment and partnership between ACIAR and DFAT, through the Indo-Pacific Centre for Health Security. The partnership is one of several programs under a Record of Understanding between ACIAR and DFAT.

The One Health program began as a portfolio of six interlinked year-long research projects that were designed to contribute to the current knowledge gaps around joint human–animal health system strengthening in the Indo-Pacific region. At the start of the 2019–20 year, three of these small projects have been expanded into three-year projects that will be investigate communicable disease in the context of land use changes, veterinary service systems strengthening and antimicrobial resistance.

The projects managed by the One Health program are described on page 57 (Pacific region) and page 81 (South-East Asia region).

Dr Francette Geraghty-Dusan is the Associate Research Program Manager for One Health. With degrees in agricultural science, veterinary science and public health management, Francette has an excellent understanding of food production systems (small- to large-scale), strong technical skills in disease epidemiology and biosecurity, an understanding of both animal health and human health systems, and expertise in developing and growing relationships with stakeholders built on collaboration and innovation. Before joining ACIAR, she worked on emergency animal disease preparedness with Animal Health Australia for five years, and before this as a zoonotic disease epidemiologist and One Health practitioner for the World Health Organization in Laos and China.

Planning and evaluation

The Portfolio Planning and Impact Evaluation Program helps us to refine our priorities, and to learn lessons from current and past projects, as well as enabling accountability to our Minister, the Australian Government and the Australian public.

An important aspect of ACIAR work lies in strategically planning for, and measuring, the impact of our investments. The Portfolio Planning and Impact Evaluation Program is responsible for the ongoing development of organisation-wide performance frameworks, and the evaluation of our investments in the medium and long term. The program engages with emerging thinking on designing effective research-for-development portfolios, and invests in developing methods to appropriately monitor and assess the contribution of our investment to development outcomes.

ACIAR investments are evaluated through a combination of medium-term adoption studies and longer-term impact assessments.

Adoption studies enable research teams to assess the extent to which research findings are taken up, and identify the effects of the project on the scientific community and next-users in partner countries and Australia. They also provide a deeper understanding about the pathways to change.

Impact assessments are done by independent consultants with specialist expertise in measuring the impact of agricultural research, by analysing economic return on investment, assessing social and environmental impacts and understanding the contribution that ACIAR has made to complex systems change processes. These assessments apply various methods to quantify impacts and findings from all studies, and are published in the ACIAR impact assessment series.

Consistent with the ACIAR 10-Year Strategy 2018–2027, the Portfolio Planning and Impact Evaluation Program has two key areas of focus during 2019–20.

Finalising a systematic portfolio planning, monitoring and reporting system

This system will explicitly link our bilateral, multilateral and capacity-building investments to our strategic objectives. It will enable us to clearly explain how, and to what scale, our current portfolio is anticipated to contribute to these objectives, provide a framework to demonstrate progress towards these, and facilitate adaptive management at the portfolio level in response to lessons learned and changing contexts.

To support this system, we will revise our existing planning and reporting documents, to ensure that projects are designed and budgeted in a way that enables effective project-level monitoring, evaluation and reflection throughout implementation and longer-term impact assessment after project completion.

Commissioning studies that will quantify our contribution and produce lessons relevant to the achievement of all ACIAR objectives

We will build on, and continue to develop, methods to understand and value the different contributions of agricultural research to human development and environmental sustainability. We will look for opportunities to undertake truly integrated impact assessments that explore the multiple values of our work. In response to the ACIAR Gender Equity Policy and Strategy 2017–2022, we will trial the application of both formative and ex-post gender integrated assessment methods.

We will also commission studies that will inform how we design and commission future work to deliver our objectives. These studies will aim to understand how and why research is influencing the knowledge, attitudes, behaviour and practices that support the achievement of longer-term development outcomes. This will include cross-cutting reviews of common strategies for translating knowledge to impact, and developing and/or applying analytical frameworks for systematic pathway assessment. We will also seek to develop ways to more accurately analyse the contribution of our work using methods that acknowledge the co-contributions of enabling innovation systems, policy environments and other aligned investments.

Ms Bethany Davies manages the ACIAR Portfolio Planning and Impact Evaluation Program. Bethany has extensive experience of practical and applied approaches to project planning, participatory program design, theory of change, monitoring and evaluation framework development and implementation, evaluation training and capacity building. Before joining ACIAR, she worked for five years specifically in research-for-development programs, including as the Research to Impact Team Leader for the Center for International Forestry Research, and as the Forest Trees and Agroforestry Monitoring Evaluation, Learning and Impact Assessment Coordinator. Bethany holds a Bachelor of International Relations and a Master in International Development from RMIT.

Nursery workers in Kiribati. Credit: ACIAR/Conor Ashleigh (2014)

5

ACIAR in the Indo-Pacific

ACIAR in the Indo-Pacific

ACIAR is well recognised and well regarded for its significant and diverse portfolio of work on productivity, resilience, sustainability, opportunity and equity of agriculture, forestry and fisheries systems throughout the Indo-Pacific region, to reduce poverty and improve livelihoods.

Our on-the-ground work in the Indo-Pacific region is dominated by research projects facilitated by bilateral country partnerships. During 2019–20, about 200 projects will be active in our operational regions. These projects are collaborations between Australian scientists and in-country partners, and brokered by our Research Program Managers, across nine fields of research.

In establishing research to address challenges and opportunities within agriculture, forestry and fisheries, ACIAR Research Program Managers work closely with ACIAR Country Programs to understand in-country priorities and needs, and to build connections and relationships with in-country organisations and institutions. Through our regional and country managers, Country Programs guide the development and regular adjustment of the strategic direction of our research investments with our bilateral country partners.

This chapter describes our on-the-ground work for the 2019–20 year. Our work is focused on the four regions of operation in the Indo-Pacific of:

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

Within each region, ACIAR facilitates a varied program of research, reflecting the challenges and opportunities of a region and individual countries. In addition to projects brokered by the Research Program Managers, the Global Program and Capacity Building Program have projects and partnerships operational within regions and countries—these are discussed in Chapter 2 ‘Global partnerships’ and Chapter 6 ‘Building capability’.

5.1 Pacific

Pearl culture, in Fiji. One of several industry sectors participating in the ACIAR project: Pacific agribusiness research in development initiative (PARDI) (AGB/2014/057). Credit: ACIAR/Conor Ashleigh

Pacific

Regional summary

Each ACIAR partner country in the Pacific region faces specific agricultural development challenges, and has specific opportunities to forge its own unique path to economic development. The challenges include economic shocks (such as abrupt changes in food and fuel prices), natural disasters (such as cyclones, floods, droughts, earthquakes and tsunamis), and high exposure to the impacts of changing climate patterns.

While many of the constraints are common to more than one country, they can affect each country or islands within countries differently, depending on local context. These constraints and uncertainties have limited the development of commercially-oriented agriculture, fisheries, and forestry sectors, and left some Pacific countries heavily dependent on imports of food and other commodities.

This vulnerability is increased by a narrow resource base (in the case of many Pacific island states), hot spots of vulnerability related to remoteness, and a depleted or poor resource base. In much of the region, economic growth is not keeping pace with population growth.

Pacific countries are also facing the consequences of a double burden of malnutrition with high prevalence of nutrition-related diseases—such as diabetes, obesity, heart diseases and some cancers—as well as micronutrient deficiencies. Unhealthy diets, lifestyles and environment are key risk factors contributing to this burden of malnutrition

ACIAR works with nine countries in the Pacific region: the Pacific island countries of Fiji, Kiribati, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu, and Papua New Guinea and Timor-Leste.

Drivers of regional collaboration

While acknowledging individual country-partner needs and research and development priorities, the scattered nature of the Pacific region and small populations mean that many countries cannot address all their challenges and opportunities in agriculture alone.

The ACIAR program in the region has a strong focus on enabling regional collaboration, especially through our close relationship with SPC. While our program focuses on eight countries in the region, SPC plays a key role in communicating research outcomes of relevance broadly across the region. Regional research programs and projects are implemented through agencies with regional capability (including SPC, the University of the South Pacific and CGIAR centres) and bilateral research and extension agencies.

ACIAR program in the region

One of the highest priorities of Australia's 2017 Foreign Policy White Paper, was a commitment to 'step up' Australia's engagement with the Pacific to support a more resilient region. This intensified approach is essential to building a Pacific region that is strategically secure and economically stable. In 2019–20, ACIAR is building on its long engagement with the Pacific, by establishing a new regional office in Fiji and developing new 10-year strategies with the Pacific island states and with Papua New Guinea. ACIAR is developing its medium-term priorities under both strategies through consultation with national and regional research and development agencies. These priorities will be revisited and adjusted through consultations with the heads of these agencies once every two years at Pacific Week of Agriculture.

A key focus of our program within the region will be enabling regional research collaboration in research and capacity building to address common issues and opportunities. This regional approach includes various projects addressing biosecurity, climate resilient livelihoods, and opportunities for stronger agribusiness development. Specific multi-country projects and linked programs include:

- 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.

During 2019–20, 64 ACIAR-supported projects will be active in the Pacific region (Table 5.1).

Table 5.1: Current and proposed projects in the Pacific region, 2019–20

Project title	Country	Project code
Agribusiness		
Policy drivers for public–private partnerships in Pacific organics: improving extension policy through an evidence-based approach	Fiji, Vanuatu	ADP/2018/131
Pacific agribusiness research in development initiative, Phase 2 (PARDI 2)	Fiji, Tonga, Vanuatu	AGB/2014/057
Crops		
Developing a foundation for the long-term management of basal stem rot of oil palm in Papua New Guinea and Solomon Islands	Papua New Guinea, Solomon Islands	CIM/2012/086
Agricultural innovations for communities for intensified and sustainable farming systems in Timor-Leste (AI-Com)	Timor-Leste	CIM/2014/082
Fisheries		
Developing pearl industry-based livelihoods in the western Pacific	Fiji, Papua New Guinea, Tonga	FIS/2014/060
Improving technical and institutional capacity to support development of mariculture-based livelihoods and industry in New Ireland, Papua New Guinea	Papua New Guinea	FIS/2014/061
Improving technologies for cost-effective fish feeding strategies, husbandry and fingerling production for inland aquaculture in Papua New Guinea	Papua New Guinea	FIS/2014/062
Half-pearl industry development in Tonga and Vietnam	Tonga, Vietnam	FIS/2016/126
Strengthening and scaling community-based approaches to Pacific coastal fisheries management in support of the New Song	Kiribati, Solomon Islands, Vanuatu	FIS/2016/300
A nutrition-sensitive approach to coastal fisheries management and development in Timor-Leste and Nusa Tenggara Timur Province, Indonesia	Timor-Leste, Indonesia	FIS/2017/032
Monitoring and evaluation of socioeconomic impacts of pearl-based livelihood development	Fiji, Tonga	FIS/2018/129
Institutional strengthening in Papua New Guinea: translating fisheries research into policy and management	Papua New Guinea	FIS/2018/151
Improving livelihoods and human nutrition through inland aquaculture in Papua New Guinea and Vanuatu	Papua New Guinea, Vanuatu	FIS/2018/154
Agriculture for improved nutrition: integrated agrifood systems for the Pacific region	Kiribati, Solomon Islands, South Pacific general, Vanuatu	FIS/2018/155
Forestry		
Improving returns from community teak plantings in Solomon Islands	Solomon Islands	FST/2014/066
Enhancing value-added products and environmental benefits from agroforestry systems in Papua New Guinea and the Pacific	Fiji, Papua New Guinea, Solomon Islands, Vanuatu	FST/2014/067
Improvement and management of teak and sandalwood in Papua New Guinea and Australia	Papua New Guinea	FST/2014/069
Building research capacity among ACIAR's sandalwood-focused projects through a regional sandalwood workshop and publication	Indonesia, Vanuatu, Fiji, Papua New Guinea, Timor-Leste, Australia	FST/2016/024
Improving agroforestry policy for sloping land in Fiji	Fiji	FST/2016/147
Enabling community forestry in Papua New Guinea	Papua New Guinea	FST/2016/153
Enhancing returns from high-value agroforestry species in Vanuatu	Vanuatu	FST/2016/154
Domestication and breeding of sandalwood in Fiji and Tonga	Fiji, Tonga	FST/2016/158
Enhancing private sector-led development of the canarium industry in Papua New Guinea, Phase 2	Papua New Guinea	FST/2017/038
Promoting smallholder teak and sandalwood plantations in Papua New Guinea and Australia	Papua New Guinea	FST/2018/178

Project title	Country	Project code
Horticulture		
Bogia coconut syndrome in Papua New Guinea: developing biological knowledge and a risk management strategy	Papua New Guinea	HORT/2012/087
Enhanced fruit production and post-harvest handling systems for Fiji, Samoa and Tonga	Fiji, Samoa, Tonga	HORT/2014/077
Aligning genetic resources, production and post-harvest systems to market opportunities for Pacific island and Australian cocoa	Fiji, Samoa, Solomon Islands, Vanuatu	HORT/2014/078
Integrating protected cropping systems into high-value vegetable value chains in the Pacific and Australia	Fiji, Samoa, Tonga	HORT/2014/080
Developing improved crop protection options in support of intensification of sweetpotato production in Papua New Guinea	Papua New Guinea	HORT/2014/083
Developing the cocoa value chain in Bougainville [Papua New Guinea]	Papua New Guinea	HORT/2014/094
Enterprise-driven transformation of family cocoa production in East Sepik, Madang, New Ireland and Chimbu Provinces of Papua New Guinea	Papua New Guinea	HORT/2014/096
Supporting commercial sweetpotato production and marketing in the Papua New Guinea highlands	Papua New Guinea	HORT/2014/097
Responding to emerging pest and disease threats to horticulture in the Pacific islands	Fiji, Papua New Guinea, Samoa, Solomon Islands, Tonga	HORT/2016/185
Coconuts for Pacific livelihoods	Fiji, Papua New Guinea, Samoa, Solomon Islands, Vanuatu	HORT/2017/025
Effective management of cocoa pod borer	Papua New Guinea	HORT/2018/114
Protecting the coffee industry from coffee berry borer in Papua New Guinea and Australia	Papua New Guinea	HORT/2018/194
Developing and deploying the diversity of root crops for greater climate resilience in the Pacific island countries	Fiji, Samoa, Solomon Islands, Tonga, Vanuatu	HORT/2018/195
Livestock Systems		
Increasing the productivity and market options of smallholder beef cattle farmers in Vanuatu	Vanuatu	LPS/2014/037
Smallholder cattle enterprise development in Timor-Leste	Timor-Leste	LPS/2014/038
Pig disease investigation in Timor-Leste	Timor-Leste	LS/2012/065
Increasing the productivity and profitability of smallholder beekeeping enterprises in Papua New Guinea and Fiji	Fiji, Papua New Guinea	LS/2014/042
Improving small ruminant production and supply in Fiji and Samoa	Fiji, Samoa	LS/2017/033
Trilateral support to smallholder cattle systems research in Timor-Leste	Timor-Leste	LS/2017/035
Establishing the linkages between foodborne bacterial enteropathies and malnutrition in Timor-Leste	Timor-Leste	LS/2018/184
Promoting business development pathways for more productive and profitable smallholder cattle systems in Vanuatu	Vanuatu	LS/2018/185
Supporting Fijian health and agricultural authorities implement the National antimicrobial resistance action plan (One Health)	Fiji	LS/2018/212
A One Health approach to establish surveillance strategies for Japanese encephalitis and zoonotic arboviruses in Papua New Guinea (One Health)	Papua New Guinea	LS/2018/213
Drug sensitive and resistant tuberculosis and zoonotic infections as causes of lymphadenitis in two provinces in Papua New Guinea (One Health)	Papua New Guinea	LS/2018/217
Enhancing the management of antimicrobial resistance in Fiji (One Health)	Fiji	LS/2019/119

Project title	Country	Project code
Social Sciences		
Identifying opportunities and constraints for rural women's engagement in small-scale agricultural enterprises in Papua New Guinea	Papua New Guinea	ASEM/2014/054
Improving livelihoods of smallholder coffee communities in Papua New Guinea	Papua New Guinea	ASEM/2016/100
Climate-smart landscapes for promoting sustainability of Pacific Island agricultural systems	Fiji, Tonga	ASEM/2016/101
Climate-smart agriculture opportunities for enhanced food production in Papua New Guinea	Papua New Guinea	ASEM/2017/026
The potential of International Landcare	Fiji, Indonesia, the Philippines, South Africa, Uganda	ASEM/2018/117
Improving agricultural development opportunities for female smallholders in rural Solomon Islands	Solomon Islands	SSS/2018/136
Gender equitable agricultural extension through institutions and youth engagement in Papua New Guinea	Papua New Guinea	SSS/2018/137
Soil and Land Management		
Sustaining soil fertility in support of intensification of sweetpotato cropping systems	Papua New Guinea	SMCN/2012/105
Optimising soil management and health in Papua New Guinea integrated cocoa farming systems	Papua New Guinea	SMCN/2014/048
Soil management in Pacific Islands: investigating nutrient cycling and development of the Soils Portal	Fiji, Kiribati, Samoa, Tonga, Tuvalu	SMCN/2016/111
Improving soil health, agricultural productivity and food security on atolls	Kiribati, Tuvalu	SMCN/2014/089
Water and Climate		
Agriculture based emission-reduction options to support nationally determined contributions in Vietnam and Fiji	Fiji, Vietnam	LWR/2017/029
Global Program		
Improving plant biosecurity in the Pacific islands	Fiji, Kiribati, Papua New Guinea, Samoa, Solomon Islands, Timor-Leste, Tonga, Tuvalu, Vanuatu	GP/2018/109
Reinvigorating the Coconut Genetic Resources Network (COGENT)	Fiji, Indonesia, Papua New Guinea, Samoa	GP/2018/193
Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific—Agricultural Science and Technology Indicators (ASTI) program	Cambodia, Indonesia, Malaysia, Myanmar, Papua New Guinea, the Philippines, Thailand, Vietnam, Laos, Timor-Leste	GP/2016/093

Note: More details (including project leader, commissioned organisation and partner organisations) are provided in the appendixes.

Pacific island countries

Budgeted funding

A$11.5
million

ACIAR-supported projects

35

Multilateral & co-investment programs

4

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 to economic and environmental shocks. The region is particularly prone to disasters, including cyclones, severe storms, flooding, droughts and earthquakes.

Overview of Australia's Pacific Regional aid program (DFAT 2019)

Agriculture is an important sector in the Pacific region, particularly for its contributions to the livelihoods of the population, gross domestic product (GDP) and food security.

According to the Food and Agriculture Organization of the United Nations, about 67% of the Pacific region's population depends on agriculture for livelihoods. Fisheries also plays an important role in the subsistence and cash economies of the region, with fish providing an important source of protein and income for most coastal communities. So, any improvements in the output of agriculture and fisheries benefits the population, by increasing its access to food, and improving its ability to meet dietary needs.

The Pacific's Multi-Country Programming Framework (2018–2022), developed by the Food and Agriculture Organization of the United Nations, identified common challenges that point to increasing vulnerability to economic shocks and natural disasters across the region. While many of the challenges are common throughout Pacific island countries, the impacts in each country and island might differ, depending on local context. Such constraints and uncertainties have limited the development of commercially-oriented agriculture, fisheries, and forestry sectors, and left many Pacific island countries heavily dependent on imports of food and other commodities.

This context of each country is different and not static. Population growth of more than 2% per year in Solomon Islands and Vanuatu, for example, is leading to mounting concerns about local food security and increasing pressure on the natural resource base. Elsewhere in the Pacific, populations are either stable (increasing at less than 1% per year) or even falling (due to emigration), leading to shortages of labour, and making it harder to develop profitable enterprises. Further, everywhere in the Pacific, there is a strong trend towards urbanisation, with more than one-third of the total population now living in cities. This has disrupted traditional food systems and diets, and is leaving some rural areas and outlying islands with declining populations, hampering economic development, and making it hard for governments to assure basic services.

Another widespread vulnerability for Pacific islands agriculture is invasive pests and diseases, such as coconut rhinoceros beetle (Guam biotype) and Bogia coconut syndrome. Island environments have inherently limited natural resilience in the face of aggressive invasive species (due to the limited local diversity of 'natural enemies'), and recent years have been marked with rapidly spreading outbreaks of several devastating invasive pest species. Emerging diseases of livestock (and potentially fisheries) might be equally destructive.

Pacific leaders have, on various occasions, identified concerns about the uncertain impact of climate change. All Pacific countries are concerned about the potential effects of rising sea levels, given that much of the population and most of the productive agriculture in the Pacific islands are in coastal areas or coastal plains. Climate models suggest that, over the longer term, some Pacific islands will become drier, on average, and others wetter. In the meantime, stronger periods of drought and wet weather (in some cases causing destructive flooding) are expected, associated with El Niño cycles. There is also a prediction that cyclones might become more severe, even though fewer in number.

While under-nutrition remains a problem in some poorer, rural areas of Pacific island countries, changes in diets and lifestyles associated with increasing incomes and urbanisation have led to Pacific island countries having some of the highest levels of obesity in the world, along with record levels of type 2 diabetes and heart disease. As well as taking a huge toll in terms of human wellbeing, this rise in the incidence of non-communicable diseases imposes a significant burden on health services and the economy of Pacific countries in general.

Regional priorities

Australia's *Pacific Step-up* foreshadowed in the 2017 Policy White Paper, committed Australia to an intensified engagement in the Pacific region to support a more resilient region. The *Pacific Step-up* emphasises the importance of our ongoing and diverse program with the region, involving all research programs.

Protecting the fragile natural resource base of the Pacific islands is a closely linked priority in ensuring the resilience of agrifood systems. The SPC emphasises integrated approaches to increasing resilience, including that:

- deploying a diversity of species and products in trees, crops, livestock and aquaculture offers a 'no regrets' approach to increasing resilience in the face of uncertainty
- growing a greater number and diversity of trees in forestry, agroforestry and horticulture systems contributes to more sustainable and resilient agricultural landscapes
- diversifying crops contributes in various ways to greater food security, nutrition and health
- better managing coastal fisheries and aquaculture underpins healthier nutrition and more resilient livelihoods
- strengthening market chains for greater equity and inclusion contributes to improved and more resilient livelihoods.

Across the board, inter-disciplinary approaches are needed to reduce the vulnerability of the natural resource base, and to create 'climate smart' agricultural landscapes. Using national policy, land-use planning and community engagement to manage water, soils, livestock, crops, forests, natural vegetation and coastal marine resources, from 'ridge to reef', in an integrated manner can increase resilience and sustainably improve livelihoods. But achieving this will require numerous and well-coordinated innovations in technology and ways of working.

Addressing issues of climate change is a very high priority, and includes research into climate-resilient livelihoods and climate-smart agricultural production systems. The region has also identified access to diverse crops and trees as a key resource in assuring resilience of food systems and livelihood facing these threats.

The report *Climate change and Pacific island food systems*, to which SPC and ACIAR were contributors, noted the need to develop more resilient food systems to reduce the dependence on imported rice and wheat, persuade people to eat tuna rather than coral reef fish, and develop the freshwater aquaculture systems that are expected to do well with warmer temperatures and higher rainfall.

Improving human nutrition and reducing risks to human health is of overwhelming concern to our Pacific partners. Addressing the consequences of the double burden of malnutrition and high prevalence of nutrition-related diseases is emerging as a new priority for ACIAR.

Strengthening regional biosecurity trade protocols and capacity to support the growth of export markets, increasing food security and conserving biodiversity is a priority throughout the Pacific region and for ACIAR.

Institutional capacity building remains a critical part of Australia's support to the Pacific region, but building and sustaining research capacity is an especially difficult challenge, with many small island states having low populations. ACIAR is developing a targeted capacity-building initiative at both individual and institutional levels.

2019–20 research program

ACIAR supports 36 projects in Pacific island countries, 23 of which are specific to one or more of these countries, and the remainder are part of regional projects. The projects address our high-level objectives, as outlined in the 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and partner organisations.

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

Agribusiness

The ACIAR agribusiness program in the Pacific region seeks to better understand market opportunities to improve livelihoods, and increase economic benefits for farmers and communities. In Fiji and Vanuatu, a small research activity, led by Associate Professor Katherine Warner of the University of the Sunshine Coast, will review policies, policy drivers and programs to understand how government and non-government groups can best deliver public–private partnerships in extension. The project focuses on opportunities for export in the established high-value markets of coffee, ginger, cocoa and coconut.[1]

The Pacific Agribusiness Research and Development Initiative (PARDI) was implemented during 2010–15 to promote sustainable livelihood outcomes for Pacific islands households through research and innovation, catalysing and informing a more vibrant, diverse and viable agribusiness sector on a regional scale.

Phase 2 (PARDI 2) is studying agribusiness developments to understand how and why they have succeeded. Led by Dr Lex Thomson of the University of the Sunshine Coast, this phase continues to document benefits to community livelihoods, and to investigate how economic benefits can be more inclusive and sustainable. The initiative aims to identify and overcome constraints and bottlenecks in value and supply chains for primary products in Pacific island countries, with Phase 2 focusing on Fiji, Tonga and Vanuatu. Additionally, PARDI links several ACIAR projects with other Pacific donor programs, such as the Pacific Horticultural and Agricultural Market Access program and the Market Development Facility.[2]

Taro plants in Kiribati. Credit:ACIAR/Conor Ashleigh (2014)

Crops

Oil palm is a long-term, perennial crop of economic importance to both large plantations and smallholders in South-East Asia and Pacific island countries. But the oil palm industry is threatened by basal stem rot, caused by the fungus *Ganoderma boninense*, the incidence of which increases with each successive planting. A project in Solomon Islands and Papua New Guinea, led by Associate Professor Ian Godwin of the University of Queensland, has established a trial plantation in an infected oil palm block on Guadalcanal (Solomon Islands), to monitor the progress of infection in a set of diverse breeding lines. The trial is in place for seven years (until 2021). The project, supported by the Papua New Guinea Oil Palm Research Association, has genotyped all the progenies in the trial, to identify resistant planting material and the genetic basis of resistance.[3]

Fisheries

Pearl culture provides opportunities for communities in several Pacific island countries to generate income, at several stages along the supply chain. Two projects, led by Professor Paul Southgate of the University of the Sunshine Coast, are increasing resilience, productivity, community engagement and livelihood opportunities from mabé pearl farming. One project is strengthening collaborative research to consolidate and expand a community-based spat collection program in Fiji, expand mabé pearl and mother-of-pearl handicraft production by community and women's groups in Fiji, Tonga and Papua New Guinea, and evaluate economic and socioeconomic impacts of pearl-based livelihood development.[4]

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.[5]

The impact of the two projects will be assessed in a small research activity that anticipates potential benefits related to local economies, livelihoods, lifestyle, culture and community. The assessment, to be done by Associate Professor Katja Mikhailovich of Sustineo Pty Ltd, will also look at the effects on opportunities for women and youth.[6]

Another project is working across the Pacific region to bring communities and fisheries agencies together to develop suitable co-management practices that influence fisheries sustainability. It is anticipated that a community-based approach will play a central role in securing the benefits of coastal resources in a sustainable way for Pacific coastal communities. The project, led by Professor Neil Andrew of the University of Wollongong, focuses on the adoption and scale-out of community-based fisheries management, 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 will provide critical knowledge for the implementation of community-based fisheries management.[7]

The Pacific food system is failing to provide the people of the region with nutritious food. The paradox of apparently abundant fish, vegetables and root crops in the region, but poor public health outcomes, presents a significant challenge for policymakers. A project starting in 2020, led by Professor Neil Andrew of the University of Wollongong, will support policies to promote healthier food supply and consumption by people in Pacific islands countries. This project spans all food production sectors (not just fisheries), and will use new integrated data sources to take a comprehensive food-system approach to address systemic issues in linking agriculture and nutrition in the region.[8]

Also with a view to improving nutrition, as well as livelihoods, another new project focuses on the potential and opportunities of inland aquaculture in Vanuatu and Papua New Guinea. Led by Associate Professor Jesmond Sammut of the University of New South Wales, the project will engage with Papua New Guinea's National Fisheries Authority and a network of local non-government organisations to focus on the adoption and scale-out of fish farming, and to strengthen farmer-level knowledge of fish husbandry. The project will also adapt and transfer fish farming knowledge from Papua New Guinea to Vanuatu, supporting tilapia farmers in Vanuatu to adopt effective farm management practices to support livelihoods and improve food security.[9]

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, led by Dr Tim Blumfield of Griffith University, explores the possibilities of milling and drying teak in plantations. In its final year, the project will conduct a cost–benefit analysis to determine the level of profitability to the grower, as well as the commercial viability of a contract harvesting and milling operation.[10]

Identifying processing techniques and new markets for value-added fruit and nut produce grown in agroforestry systems in Fiji, Solomon Islands, Vanuatu and Papua New Guinea is the aim of another project designed to help landowners receive early returns from these systems. The project, led by Professor Helen Wallace of the University of the Sunshine Coast, will build capacity in communities to operate businesses to market products.[11]

Most land in Fiji is relatively steep, and large areas are deforested, underused and typically degraded. Previous research showed that appropriately designed and managed agroforestry systems (crop–livestock–tree) on sloping land can be productive and sustainable. But policy, institutional and governance frameworks are needed to encourage adoption of these systems. Extension material reports and economic models will be developed in a project, led by Dr Tyron Venn of the University of Queensland, to provide information to government agencies, landholder communities and individual farmers on system design and expected financial and economic performance.[12]

In Vanuatu, a project, led by Dr Tony Page of the University of the Sunshine Coast, aims to advance the Vanuatu agroforestry sector, by increasing the availability of improved tree germplasm to support wider adoption by smallholders of three high-value forestry species—canarium nut *(Canarium indicum),* sandalwood *(Santalum austrocaledonicum)* and whitewood *(Endospermum medullosum)*, which yield nuts, oil and timber, respectively.[13]

In Fiji and Tonga, native sandalwood is commercially valuable, but the species has been overexploited in the wild, resulting in fragmentation and local extinction of natural populations. A short project, led by Dr David Bush of CSIRO National Research Collections, is improving the understanding of the species to increase conservation status in Fiji and Tonga, and develop strategies to improve the quality and availability of germplasm for smallholders and commercial investors.[14]

The high value of sandalwood on the international market has led to the decline of many natural sources of sandalwood around the world. This presents an opportunity for smallholders in sandalwood-producing countries of the Asia–Pacific region to capitalise on recognised future supply shortages, by planting local species. Led by Dr Tony Page of the University of the Sunshine Coast, a short research activity will leverage existing research investments by ACIAR in sandalwood, to improve capacity, scientific outputs and impacts among project partners. This will be achieved through a regional workshop and field tours, and publication of technical information.[15]

Horticulture

The Horticulture Program aims to increase the productivity, profitability, sustainability and resilience of fruit, vegetable and ornamental crop production systems, often with an integrated approach that focuses on the whole value chain.

In Fiji, Samoa and Tonga, a project is supporting the development of resilient value chains for five regionally-significant fruit crops: papaya, pineapple, mango, breadfruit and citrus. In its final year, the project, led by Professor Steven Underhill of the University of the Sunshine Coast, will focus on targeted capacity building of private sector and government extension services, and increased engagement of smallholder farmers and communities in functional supply chains.[16]

Cocoa is an important agricultural export for more than 50,000 households in Papua New Guinea, Solomon Islands and Vanuatu. Significant domestic and potentially useful export opportunities also exist in Samoa and Fiji. An ACIAR-supported project, led by Mr Yan Diczbalis of the Queensland Department of Agriculture and Fisheries, is strengthening cocoa value chains in the Pacific island countries, as well as in Australia. In 2019–20, the project will focus on further development of market-orientated strategies for exchange and dissemination of superior cocoa genetic resources, to create a niche Pacific cocoa industry methods to intensify production systems to meet market opportunities.[17]

Vegetable production in the Pacific islands does not match local demand, and vegetables are imported for high-value hospitality and food service markets. A project, led by Professor Phil Brown of Central Queensland University, continues its demonstration of 'protected cropping' systems, to improve the supply of high-value vegetables to domestic tourism and hospitality markets in Fiji, Samoa and Tonga. Value-chain analysis will also identify strengths and weaknesses of different markets, and help farmers to successfully produce and sell into demanding markets.[18]

Integrated pest and disease management strategies are required for the sustainable intensification of fruit and vegetable crop production in Pacific island countries and Papua New Guinea. A project, led by Dr Michael Furlong of the University of Queensland, aims to address the threats posed to smallholder livelihoods and their communities by inappropriate use of pesticides, emerging pests and diseases, and climate change. The project will generate new knowledge, resources and opportunities to encourage the adoption of integrated management strategies.[19]

While coconut enterprises in the Pacific island countries face economic and environmental challenges, diversifying the range of products made from coconuts could offer a path to more resilient livelihoods. But much of the coconut resource in the Pacific is ageing or already senile and unproductive. A new project, led by Mrs Logotonu Waqainabete of SPC, aims to support the first step in rejuvenating 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.[20]

Vegetatively propagated root crops are integral to food security in all Pacific island countries, and genetic diversity in root crops is dangerously narrow. A project, led by Mr Michael Hughes of the Queensland Department of Agriculture and Fisheries, endeavours to improve productivity and disaster relief readiness, by generating and distributing disease-free root crop planting material of traditional and improved varieties, and by appropriately increasing root crop genetic diversity across the Pacific region.[21]

Livestock Systems

The Government of the Republic of Vanuatu has a priority to increase smallholder cattle productivity, linkages in the commercial cattle sector and income from cattle sales. A project concluding during 2019–20, led by Dr Simon Quigley of the University of Queensland, will consolidate baseline information on livelihoods, cattle production and marketing of beef cattle, and will identify constraints and opportunities for improvements in the production and value chain.[22] A new project will begin in 2020, to build on outcomes of the previous project, and extend the area of influence of the project to make smallholder cattle systems in Vanuatu more productive and profitable.[23]

The productivity and profitability of small ruminant (sheep and goats) production could be improved in Pacific island countries if production was better aligned with market requirements and smallholder could more easily participate in value chains. Under the leadership of Dr Frances Cowley of the University of New England, a four-year project starting in 2019–20 will address constraints to production efficiency of breeding and weaner animals from smallholder and semi-commercial sheep and goat production systems in Fiji and Samoa, for the benefit of all stakeholders.[24]

Globally, antimicrobial resistance is an increasingly serious threat to human and animal health, as well as livestock productivity. A scoping study in Fiji is identifying the research, capability and capacity development needs for reducing antimicrobial resistance in humans, animals and the environment, to build Fiji as a leader in mitigation efforts in the Pacific region. Led by Dr Paul Debarro of CSIRO Health and Biosecurity, the study is part of the Research for One Health Systems Strengthening program.[25] The project will lead to a follow-on project focused on risk assessment, management and communication of antimicrobial resistance in Fiji.[26]

Enterprises based on beekeeping offer many opportunities for smallholder farmers in Fiji and Papua New Guinea. In both countries, there is strong domestic demand for honey, and there is potential to export honey and other by-products of honey production, including beeswax. The enterprise has potential to complement smallholder incomes, and promote an income-earning activity for women. A new project, led by Dr David Lloyd of Southern Cross University, starts in 2019–20 to develop and test appropriate technical and business practices, improve control of the diseases that constrain production and trade of bees, honey and other bee products, and build the capacity of extension and development agencies to support beekeeping as a sustainable small enterprise.[27]

Research for One Health Systems Strengthening

The Research for One Health Systems Strengthening program is a co-investment and partnership between ACIAR and DFAT, through the Indo-Pacific Centre for Health Security.

Projects in the Pacific region

- Supporting Fijian health and agricultural authorities implement the National Antimicrobial Resistance Action Plan (LS/2018/212)
- Enhancing the Management of Antimicrobial Resistance in Fiji (LS/2019/119)
- A One Health approach to establish surveillance strategies for Japanese encephalitis and zoonotic arboviruses in Papua New Guinea (LS/2018/213)
- Drug sensitive and resistant tuberculosis and zoonotic infections as causes of lymphadenitis in two provinces in Papua New Guinea (LS/2018/217)

Projects in South-East Asia

- Zoonotic malaria in Indonesia (LS/2018/214)
- Evaluating zoonotic malaria transmission and agricultural land use in Indonesia (LS/2019/116)
- Developing and testing processes and tools to generate connected and live health security knowledge in Mekong communities (LS/2018/215)
- Incentives for early declaration and effective prevention of avian influenza in the Mekong (LS/2018/216)
- Veterinary economics in Mekong Countries: advancing One Health (Cambodia, Laos, Vietnam) (LS/2019/118)

Social Sciences

The Social Sciences Program commissions trans-disciplinary research to deliver innovation and speed up poverty reduction. The program works across several key areas of agricultural research-for-development, with a people-centred approach being common to all projects.

A large proportion of the population in Fiji and Tonga relies on services from the landscape to support livelihoods. Agriculture is a sector for growth to support economic development and poverty alleviation, but smallholders are acutely vulnerable to the impacts of climate change and variability. A project, led by Dr Eloise Biggs of the University of Western Australia, is developing a geospatial platform, in collaboration with community and high-level stakeholders, to help find ways to make landscape climate-smart, and improve communication between multilevel stakeholders.[28]

Family Farm Teams is a peer education model of agricultural extension, and, in previous ACIAR-supported projects, benefited the economic development of women smallholders in nine areas of Papua New Guinea. Dr Deborah Hill of the University of Canberra leads a new project to improve agricultural development opportunities for female smallholders in rural Solomon Islands. The project will investigate the adaptability of the Family Farm Teams approach in Solomon Islands, and provide comparative learning to apply it to other Pacific island countries, to help communities move from semi-subsistence to planned farming in a gender-equitable way.[29]

Landcare is a grassroots community-led approach to sustainable land management. Dr Mary Johnson of RMIT University will study Landcare in five countries in the Indo-Pacific region, and analyse how sustainable agricultural land management mobilised through Landcare has contributed to development outcomes, including the ACIAR high-level objectives. The findings of the study will produce an evidence base for ACIAR to assess the role of Landcare for future agricultural research-for-development, and more broadly as an extension model in sustainable agriculture and natural resource management.[30]

Soil and Land Management

Pacific island atolls are among the most vulnerable communities on this planet in the face of climate change. Producing food on atolls is challenging for many reasons. A project, led by Mr Gibson Susumu of SPC, aims to improve the livelihoods of the of coral atolls communities—Kiribati and Tuvalu, in particular—through increased and diversified agricultural production and improved soil nutrition, by developing effective compost technologies. Concluding in 2019–20, the final activities will be to ensure that the upskilling research and extension staff, as well as farming communities, is successful. This will maintain the benefits of new growing techniques and market opportunities identified by the project.[31]

Agriculture in the Pacific is generally confined to smallholder farms and household gardens, and its sustainability is threatened by nutrient imbalances, erosion, declining soil fertility and carbon and soil sealing. Across five Pacific nations, a project, led by Dr Ben Macdonald of CSIRO Agriculture and Food, is developing a soil information system, and finding appropriate technologies for improved soil health and efficient water and nutrient use. The soil information system provides farmers, farm advisers and other stakeholders with spatially explicit guidance on how to achieve sustainable soil management and secure resilience to climate change.[32]

Water and Climate

A new project is assessing ways to reduce agricultural emissions in the Asia–Pacific region, as well as offset methods appropriate to developing countries (using Fiji and Vietnam as pilot examples). The project, led by Professor Peter Grace of Queensland University of Technology, 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 to enable user countries to identify, adopt and manage locally appropriate emission-reduction options. It will also provide a detailed analysis of potential co-benefits to food security, and existing capacity gaps to using carbon farming methods or emissionreduction options in Fiji and Vietnam, in delivering to their commitments under the Paris Agreement.[33]

Global Program

The Global Program manages several programs in the Pacific region addressing multidisciplinary challenges and/or opportunities, in partnership with international agricultural research-for-development agencies. The work of the Global Program is described in Chapter 2.

Global Program projects operational in Pacific island countries during 2019–20 are:

- Improving plant biosecurity in the Pacific islands[34]
- Reinvigorating the Coconut Genetic Resources Network (COGENT).[35]

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Current and proposed projects

1. Policy drivers for public–private partnerships in Pacific organics: improving extension policy through an evidence-based approach [Fiji, Vanuatu] (ADP/2018/131)
2. Pacific agribusiness research in development initiative, Phase 2 (PARDI 2) [Fiji, Tonga, Vanuatu] (AGB/2014/057)
3. 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)
4. Developing pearl industry-based livelihoods in the western Pacific [Fiji, Papua New Guinea, Tonga] (FIS/2014/060)
5. Half-pearl industry development in Tonga and Vietnam (FIS/2016/126)
6. Monitoring and evaluation of socioeconomic impacts of pearl-based livelihood development [Fiji, Tonga] (FIS/2018/129)
7. Strengthening and scaling community-based approaches to Pacific coastal fisheries management in support of the New Song [Kiribati, Solomon Islands, Vanuatu] (FIS/2016/300)
8. Agriculture for improved nutrition: integrated agrifood systems for the Pacific region [Kiribati, Solomon Islands, South Pacific general, Vanuatu] (FIS/2018/155)
9. Improving livelihoods and human nutrition through inland aquaculture in Papua New Guinea and Vanuatu (FIS/2018/154)
10. Improving returns from community teak plantings in Solomon Islands (FST/2014/066)
11. Enhancing value-added products and environmental benefits from agroforestry systems in Papua New Guinea and the Pacific [Fiji, Papua New Guinea, Solomon Islands, Vanuatu] (FST/2014/067)
12. Improving agroforestry policy for sloping land in Fiji (FST/2016/147)
13. Enhancing returns from high-value agroforestry species in Vanuatu (FST/2016/154)
14. Domestication and breeding of sandalwood in Fiji and Tonga (FST/2016/158)
15. Building research capacity among ACIAR's sandalwood-focused projects through a regional sandalwood workshop and publication [Indonesia, Vanuatu, Fiji, PNG, Timor-Leste, Australia] (FST/2016/024)
16. Enhanced fruit production and post-harvest handling systems for Fiji, Samoa and Tonga (HORT/2014/077)
17. Aligning genetic resources, production and post-harvest systems to market opportunities for Pacific island and Australian cocoa [Fiji, Samoa, Solomon Islands, Vanuatu] (HORT/2014/078)
18. Integrating protected cropping systems into high-value vegetable value chains in the Pacific and Australia [Fiji, Samoa, Tonga] (HORT/2014/080)
19. Responding to emerging pest and disease threats to horticulture in the Pacific islands [Fiji, Papua New Guinea, Samoa, Solomon Islands, Tonga] (HORT/2016/185)
20. Coconuts for Pacific livelihoods [Fiji, Papua New Guinea, Samoa, Solomon Islands, Vanuatu] (HORT/2017/025)
21. Developing and deploying the diversity of root crops for greater climate resilience in the Pacific island countries [Fiji, Samoa, Solomon Islands, Tonga, Vanuatu] (HORT/2018/195)
22. Increasing the productivity and market options of smallholder beef cattle farmers in Vanuatu (LPS/2014/037)
23. Promoting business development pathways for more productive and profitable smallholder cattle systems in Vanuatu (LS/2018/185)
24. Improving small ruminant production and supply in Fiji and Samoa (LS/2017/033)
25. Supporting Fijian health and agricultural authorities implement the National Antimicrobial Resistance Action Plan (One Health) (LS/2018/212)
26. Enhancing the management of antimicrobial resistance in Fiji (One Health) (LS/2019/119)
27. Increasing the productivity and profitability of smallholder beekeeping enterprises in Papua New Guinea and Fiji (LS/2014/042)
28. Climate-smart landscapes for promoting sustainability of Pacific Island agricultural systems [Fiji, Tonga] (ASEM/2016/101)
29. Improving agricultural development opportunities for female smallholders in rural Solomon Islands (SSS/2018/136)
30. The potential of International Landcare [Fiji, Indonesia, the Philippines, South Africa, Sri Lanka, Uganda] (ASEM/2018/117)
31. Improving soil health, agricultural productivity and food security on atolls [Kiribati, Tuvalu] (SMCN/2014/089)
32. Soil management in Pacific Islands: investigating nutrient cycling and development of the Soils Portal [Fiji, Kiribati, Samoa, Tonga, Tuvalu] (SMCN/2016/111)
33. Agriculture based emission-reduction options to support nationally determined contributions in Vietnam and Fiji (LWR/2017/029)
34. Improving plant biosecurity in the Pacific islands [Fiji, Kiribati, Papua New Guinea, Samoa, Solomon Islands, Timor-Leste, Tonga, Tuvalu, Vanuatu] (GP/2018/109)
35. Reinvigorating the Coconut Genetic Resources Network (COGENT) [Fiji, Indonesia, Papua New Guinea, Samoa] (GP/2018/193).

Papua New Guinea

Budgeted funding

A$8.8
million

ACIAR-supported projects

33

Multilateral & co-investment programs

5

Australia values its long-standing ties with Papua New Guinea, through a shared history and a shared geography. As our nearest neighbour and close regional partner, a stable and prosperous Papua New Guinea is in Australia's interest. We share a border, economic interests and common legal frameworks. Over time, our relationship has matured into one of economic and strategic partnership. Despite huge resource potential and proximity to Asian markets, Papua New Guinea faces economic challenges and fiscal pressures. Many factors challenge future prosperity, including lack of infrastructure, complex governance arrangements, inequality between men and women, and a rapidly growing population. Papua New Guinea also remains vulnerable to climate change and natural disasters, including earthquakes, volcanoes and tsunamis.

Overview of Australia's aid program to Papua New Guinea (DFAT 2019)

Agriculture in Papua New Guinea is performing below its potential. Although it constitutes up to 26% of GDP, and supports up to 80% of the population, there is an imperative for the sector to expand, to accommodate Papua New Guinea's rapidly-growing population.

The high annual population growth of 3.1% is a significant issue for the country's long-term economic development, and compounds existing problems, such as food and nutritional security. The growth of the sector would negate these effects, by securing a needed supply of food produce.

Most agriculture remains at subsistence level, and the main exported cash crops are oil palm, coffee, cocoa, copra, tea and rubber. But levels of production from commercial plantations have declined, due to fluctuating world prices, rising labour and overhead costs, poor management and land tenure issues. Additionally, challenges associated with climate change pose a longer-term threat to resource shortages related to food supply and consumption.

The majority of subsistence farmers have limited, and often costly, access to markets. Local market prices are often strongly influenced by local gluts, due to limited connections to more distant demand centres. This causes local prices to be low, affecting income-generating opportunities for those who depend on subsistence and semi-subsistence agriculture.

Although agricultural productivity is closely linked with overall food consumption and nutrition outcomes, according to the International Food Policy Research Institute (2019), the local food systems need improving to sufficiently meet the dietary needs of the rural communities—particularly communities with very high prevalence of stunting and wasting in children aged less than five years.

The agriculture sector is affected by invasive pests and diseases, including Bogia coconut syndrome, coffee berry borer and cocoa pod borer, which adversely affect the level of production of copra, cocoa and coffee.

The Papua New Guinea Government, under the new Medium-Term Development Plan 3 (2018–2022), remains focused on promoting economic growth through sustainable agriculture, fisheries and forestry management. Under the plan, the Papua New Guinea Government is also promoting growth opportunities for the rubber industry, and developing rice for domestic consumption. At the same time, the Australian Government, through the *Pacific Step-up*, seeks to support a more resilient Papua New Guinea.

Australia's support to agricultural research through ACIAR, plays a significant role in building resilience, and will continue to support Papua New Guinea in moving towards more sustainable agriculture, fisheries and forestry livelihood systems.

Within the national landscape, Papua New Guinea's National Research Agenda places a spotlight on the role of science and research in creating wealth, including by promoting research and innovation to improve agricultural systems and natural resource management, and to increase the resilience of livelihoods.

According to the World Bank, women in Papua New Guinea do 70% of the work in subsistence agriculture, fisheries and forestry, and traditionally women are responsible for food production and marketing, while men work on commodity crops. Women's contribution in the agriculture sector is significant. The Papua New Guinea Government has set out policies embedding gender in the agriculture and fisheries sector, to improve the livelihoods of women in rural areas, and push more women to engage in the sector.

Sweetpotato for sale, Papua New Guinea. TADEP program (page 62) and ACIAR project: Supporting commercial sweetpotato production and marketing in the Papua New Guinea highlands (HORT/2014/097). Credit: ACIAR/Conor Ashleigh (2018)

Country priorities

In 2019–20, as in previous years, ACIAR priorities for research collaboration with Papua New Guinea are to:

- overcome social, cultural and policy constraints to gain benefits from agricultural technologies, particularly in terms of gender equity and the role of women
- improve smallholder vegetable and starchy staple systems
- analyse commodity and market chain to guide policy and improve production and marketing for cocoa, coffee, coconut and oil palm crops
- improve germplasm quality for high-value tree species
- improve community forestry and agroforestry systems
- develop market opportunities for smallholder agricultural products
- add value to wood and non-wood products, by working with private-sector partners and farmers to scale-up the adoption of promising agricultural technologies
- improve livelihoods from smallholder coastal fisheries, and both inland and marine aquaculture
- increase household income, through enterprise diversification
- increase the sustainability and resilience of production systems, including livestock health and production
- build capacity at both research and institutional levels
- influence policy through research outcomes.

Institutional capacity building remains a critical part of Australia's support, but its development cooperation is now more targeted, precise and reflective of genuine partnerships. Australia's partnership with Papua New Guinea aims to improve the environment for investment, and to enable sustainable economic growth and better social outcomes.

Through this approach, ACIAR plays a significant role in helping Papua New Guinea move towards its goals on sustainable agriculture, fisheries and forestry development, and inclusive economic growth. A flagship program in this effort is the DFAT and ACIAR co-funded Transformative Agriculture and Enterprise Development Program (TADEP).

In 2020, working with key national partners and the Papua New Guinea Science and Technology Council, ACIAR will develop a 10-year strategy for research collaboration with Papua New Guinea (2020–2029) to align with a parallel strategy being developed with Pacific island countries.

Transformative Agriculture and Enterprise Development Program

TADEP is a multidisciplinary research program, co-funded by DFAT and ACIAR, which aims to improve the livelihoods of rural men and women in Papua New Guinea.

The program focuses on opportunities to scale-up successful innovations from previous ACIAR projects, with private sector involvement, to extend benefits over larger areas and for more people. The program aims to facilitate economic benefits, especially increased employment and incomes in rural areas, and improved rural–urban supply chains. It works in the sectors that will have the greatest benefit to rural communities, and has a particular focus on the empowerment of women, and the development of commodities that can be brought to market.

Valued at a $23 million over six years, the program is developing the following innovations:

- 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.

2019–20 research program

ACIAR supports 33 projects in Papua New Guinea, 23 of which are specific to this country, and the remainder are part of regional projects. The projects address our high-level objectives, as outlined in the 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and partner organisations.

The following sections briefly describe individual ACIAR-supported projects and anticipated outputs in Papua New Guinea, grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

Crops

Oil palm is a long-term, perennial crop of economic importance to both large plantations and smallholders in South-East Asia and Pacific island countries. But the oil palm industry is threatened by basal stem rot, caused by the fungus *Ganoderma boninense*, the incidence of which increases with each successive planting. A project in Solomon Islands and Papua New Guinea, led by Associate Professor Ian Godwin of the University of Queensland, has established a trial plantation in an infected oil palm block on Guadalcanal (Solomon Islands), to monitor the progress of infection in a set of diverse breeding lines. The trial is in place for seven years (until 2021). The project, supported by the Papua New Guinea Oil Palm Research Association, has genotyped all the progenies in the trial, to identify resistant planting material and the genetic basis of resistance.[1]

Fisheries

Pearl culture provides opportunities for communities in several Pacific island countries to generate income, at several stages along the supply chain. A project in Fiji, Tonga and Papua New Guinea, led by Professor Paul Southgate of the University of the Sunshine Coast, is increasing the resilience, productivity, community engagement and livelihood opportunities from mabé pearl farming. The project is strengthening collaborative research to consolidate and expand a community-based spat collection program in Fiji, expand pearl and mother-of-pearl handicraft production by community and women's groups in Fiji, Tonga and Papua New Guinea, and evaluate economic and socioeconomic impacts of pearl-based livelihood development.[2]

Mariculture enterprises have the potential to provide an alternative source of income for both men and women in coastal communities of the New Ireland province. Although the region enjoys healthy fish stocks, the local sea cucumber fishery has collapsed from overharvesting, with the associated loss of an important income source for communities.

A project, led Professor Paul Southgate of the University of the Sunshine Coast, supports staff at the Nago Island Marine Research Facility in Kavieng to develop 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.[3]

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, led by Associate Professor Jesmond Sammut of the University of New South Wales, is targeting technical and husbandry improvements, and identifying the social and economic benefits of increased fish production. In Goroka, the project works with low-security prisoners as a rehabilitation strategy, teaching new skills in fish farming to improve domestic food security. The project will also continue its 'fish in schools' element, to promote the uptake of aquaculture in highland areas.[4]

Aquaculture and capture fisheries are increasingly important in Papua New Guinea for providing livelihoods and meeting the nutritional needs of a rapidly growing population. But fisheries are challenged by overexploitation, lack of adoption of new technologies and lack of information in some sectors. The National Fisheries Authority of Papua New Guinea recognises the need to integrate livelihood goals into management plans and policies, and the need to revise and introduce new policies and strategies to sustainably manage aquaculture and capture fisheries.

ACIAR is supporting a new project, led by Associate Professor Jesmond Sammut of the University of New South Wales, to strengthen the research and management capability of the National Fisheries Authority, by building core skills in research and management, to translate scientific findings into policy and management plans.[5]

Also with a view to improving nutrition as well as livelihoods, another new project focuses on the potential and opportunities of inland aquaculture in Vanuatu and Papua New Guinea. Led by Associate Professor Jesmond Sammut of the University of New South Wales, the project will engage with Papua New Guinea's National Fisheries Authority and a network of local non-government organisations to focus on the adoption and scale-out of fish farming, and to strengthen farmer-level knowledge of fish husbandry. The project will also adapt and transfer fish farming knowledge from Papua New Guinea to Vanuatu, supporting tilapia farmers in Vanuatu to adopt effective farm management practices to support livelihoods and improve food security.[6]

Forestry

Forestry in Papua New Guinea has developed from a small domestic processing industry in the 1950s to a large log export-oriented industry. The Papua New Guinea 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 Program focuses on the processing and value-adding of timber and non-timber products, increasing the availability of improved germplasm for tree growing and promoting community-based forestry.

Identifying processing techniques and new markets for value-added fruit and nut produce grown in agroforestry systems in Fiji, Solomon Islands, Vanuatu and Papua New Guinea is the aim of a project designed to help landowners receive early returns from these systems. The project, led by Professor Helen Wallace of the University of the Sunshine Coast, will build capacity in communities to operate businesses to market products.[7]

Strong international demand for forest products has substantially depleted timber resources in lowland Papua New Guinea. A project, led by Dr Tony Page of the University of the Sunshine Coast, successfully developed germplasm sources and smallholder-friendly silviculture systems for teak (Papua New Guinea) and sandalwood (Papua New Guinea and Cape York Peninsula) to improve smallholder livelihoods. In its final months, the project will continue to develop skills for ongoing genetic improvement of sandalwood in Papua New Guinea, and communicate and disseminate research outputs to improve uptake and impact.[8] A follow-on project, starting in 2020, will help advance the development of smallholder planted forests, by aligning smallholder and investor requirements.[9]

The high value of sandalwood on the international market has led to the decline of many natural sources of sandalwood around the world. This presents an opportunity for smallholders in sandalwood-producing countries of the Asia–Pacific region to capitalise on recognised future supply shortages, by planting local species. Led by Dr Tony Page of the University of the Sunshine Coast, a short research activity will leverage existing research investments by ACIAR in sandalwood, to improve capacity, scientific outputs and impacts among project partners. This will be achieved through a regional workshop and field tours, and publication of technical information.[10]

A project in the Eastern Highlands province, the Ramu–Markham valleys and the Lae region aims to improve rural livelihoods, through family-focused community reforestation and ecoforestry in community-owned natural forests. Led by Mr Grahame Applegate of the University of the Sunshine Coast, the project will implement family-focused community reforestation activities, identify methods for scaling out community-based reforestation to landscape scale, and identify institutional arrangements and policy recommendations that improve access to formal timber markets.[11]

In East New Britain, an earlier project 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*), which will become available around 2020. The project, led by Professor Helen Wallace of the University of the Sunshine Coast, provided market research, technical advice, capacity building, business mentoring and access to infrastructure for both private and public-sector stakeholders. It also provided opportunities to improve livelihoods and women's empowerment in the region. Phase 2 of the project will build on achievements of the first project, and foster private sector-led development of the galip nut industry, increase the efficiency of value chains, and establish commercially viable business prospects for private sector investment at different scales.[12]

Horticulture

Bogia coconut syndrome has killed hundreds of coconut palms in Madang Province. A related pathogen affects bananas in the same region. A project, led by Dr Geoff Gurr of Charles Sturt University, is describing the biology of Bogia coconut syndrome, and quantifying the risk of the disease to different crops, industry sectors and smallholders. The project has developed a containment and management strategy, to protect the Pacific regional coconut gene bank, which is immediately threatened by the disease. In the final stages of the project, a whole genome analysis will be done on Bogia coconut syndrome and banana wilt-associated phytoplasmas, to distinguish between the two diseases.[13]

While coconut enterprises in Pacific island countries face economic and environmental challenges, diversifying the range of products made from coconuts could offer a path to more resilient livelihoods. But much of the coconut resource in the Pacific is ageing or already senile and unproductive. A new project, led by Mrs Logotonu Waqainabete of SPC, aims to support the first step in 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.[14]

About 90% of Papua New Guinea's population consists of semi-subsistence smallholder farmers for whom sweetpotato is a major crop species. A project, led by Dr Geoff Gurr of Charles Sturt University, is supporting the intensification of sweetpotato production, and developing sustainable solutions to protect crops.[15] This project and another project on soil management and crop nutrition for sweetpotato[29] provide technical support for a larger project, led by Professor Phil Brown of Central Queensland University, under TADEP, which seeks to strengthen the entire value chain for sustainable and market-oriented sweetpotato-based production systems in the highlands.[16]

Cocoa is a profitable smallholder crop, and has the potential to drive rural development. It accounts for 18% of agricultural exports in Papua New Guinea, but production systems in some regions now need rejuvenation. 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, led by Professor David Guest of the University of Sydney, 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.[17]

In East Sepik, Madang, New Ireland and Chimbu provinces, old cocoa plantings are overgrown, low yielding, underharvested, and susceptible to pests and diseases. Another project, led by Dr Phil Keane of La Trobe University, is underway to help smallholder farmers adopt new cocoa varieties and plant management methods to drive rural development.[18]

The cocoa pod borer is widely distributed and indigenous throughout South-East Asia and the western Pacific, and is a pest of cocoa and tropical fruits in several countries, including Papua New Guinea. Mitigation of this pest is a priority for the Cocoa Board of Papua New Guinea. A short research activity, led by Dr Leigh Pilkington of the New South Wales Department of Primary Industries, will conduct several fundamental studies to enable the cocoa pod borer to be effectively and sustainably managed.[19]

A project starting during 2019–20 aims to protect the coffee industry in Papua New Guinea and Australia from coffee berry borer. The project, led by Dr Ian Newton of the Queensland Department of Agriculture and Fisheries, aims to limit damage and protect the industry by managing infestations with world's best practices, and to find long-term sustainable integrated pest management solutions. In the first year of the project, current local and global management strategies will be reviewed to determine a 'best-bet' management package, and identify research priorities.[20]

Integrated pest and disease management strategies are required for the sustainable intensification of fruit and vegetable crop production in Pacific island countries and Papua New Guinea. A project, led by Dr Michael Furlong of the University of Queensland, aims to address the threats posed to smallholder livelihoods and their communities by inappropriate use of pesticides, emerging pests and diseases, and climate change. The project will generate new knowledge, resources and opportunities to encourage the adoption of integrated management strategies.[21]

Livestock Systems

Enterprises based on beekeeping offer many opportunities for smallholder farmers in Fiji and Papua New Guinea. In both countries, there is strong domestic demand for honey, and there is potential to export honey other by-products of honey production, including beeswax. The enterprise has potential to complement smallholder incomes, and promote an income-earning activity for women. A new project, led by Dr David Lloyd of Southern Cross University, starts in 2019–20 to develop and test appropriate technical and business practices, improve control of diseases that constrain production and trade of bees, honey and other bee products, and build the capacity of extension and development agencies to support beekeeping as a sustainable small enterprise.[22]

Two small research activities are underway in Papua New Guinea, as part of the Research for One Health Systems Strengthening program (page 57).

Japanese encephalitis virus is an important cause of human viral encephalitis in South-East Asia. The virus is mosquito borne, with pigs and waterbirds acting as hosts, and is of public health importance. In Papua New Guinea, Japanese encephalitis has the potential to be an economically important disease of pigs. A short research activity, done by Dr David Williams of the CSIRO Australian Animal Health Laboratory, is using a One Health approach to establish surveillance strategies for Japanese encephalitis and zoonotic arboviruses in Papua New Guinea.[23]

Tuberculosis is a leading cause of death in Papua New Guinea, and, presently, a leading cause of death among infectious diseases worldwide. In addition to pulmonary tuberculosis, there is a high burden of suspected extra-pulmonary tuberculosis in the Pacific, which can be a sign that zoonotic and environmental strains of tuberculosis are also circulating, requiring different approaches to management and prevention. Dr Philipp Du Cros of the Burnet Institute is conducting a short research activity to determine the types of bacteria causing tuberculosis lymphadenitis, with a particular focus on risk factors associated with exposure to animals, by assessing consenting patients with suspected tuberculosis lymphadenitis.[24]

Social Sciences

A project, led by Dr Gina Koczberski of Curtin University of Technology, studied the socioeconomic and cultural factors that influence smallholders' farming and livelihood systems, and their capacity to adapt and respond to stress on cocoa and oil palm production systems. During 2019–20, the study will assess programs the help women engage in agribusiness, and will identify pathways for entrepreneurialism. Researchers will collaborate with extension and private sector organisations and non-government organisations in cocoa, coffee, oil palm and fresh food produce to develop policies and programs that empower rural women to create agribusiness opportunities.[25]

Coffee is economically important for rural livelihoods in Papua New Guinea, but national production is declining, despite a rapidly growing population in the highland coffee-growing areas. A project, led by Professor George Curry of Curtin University, 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.[26]

Communities reliant on agriculture-based livelihood systems in Papua New Guinea have been identified as being particularly at risk from climate variability and change. A project, led by Dr Steven Crimp of the Australian National University, aims 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.[27]

Another project, led by Dr Josephine Caffery of the University of Canberra, will adapt and apply the successful Family Farm Teams approach to develop the capacity of churches in Papua New Guinea to work in a gender inclusive way when engaging rural agricultural communities in smallholder farm development. The project will also provide pathways for increasing youth involvement in family farm teams and sustainable farming futures.[28]

Soil and Land Management

Intensifying food production systems is necessary to feed the burgeoning population of Papua New Guinea, which has doubled in the past 30 years. This population growth is putting unprecedented pressure on the limited land available for agricultural production, and has resulted in the adoption of unsustainable agronomic practices. A project, led by Professor Neal Menzies of the University of Queensland, aims to identify soil and land management techniques to sustainably intensify the semi-commercial sweetpotato cropping system.[29]

This project operates in parallel with another that is supporting the intensification of sweetpotato production by developing sustainable solutions for crop protection.[16]

Yields of cocoa can be increased with improved soil management and better soil fertility, which in turn can lift incomes and result in healthier communities. A project, led by Associate Professor Damien Field of the University of Sydney, is evaluating opportunities to use green waste composts produced from smallholder cocoa farming systems, to supply nutrients to the soil and improve the management of cocoa plantations. The project is evaluating the influence of composts on soil health and nutrient content in cocoa produced in diversified cocoa farming systems, and is developing region-specific soil management strategies for smallholdings.[30]

Global Program

The Global Program manages several programs in the Pacific region addressing multidisciplinary challenges and/or opportunities, in partnership with international agricultural research-for-development agencies. The work of the Global Program is described in Chapter 2.

Global Program projects operational in Papua New Guinea during 2019–20 are:

- Improving plant biosecurity in the Pacific islands[31]
- Reinvigorating the Coconut Genetic Resources Network (COGENT)[32]
- Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific—Agricultural Science and Technology Indicators (ASTI) program.[33]

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Current and proposed projects

1. 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)
2. Developing pearl industry-based livelihoods in the western Pacific [Fiji, Papua New Guinea, Tonga] (FIS/2014/060)
3. Improving technical and institutional capacity to support development of mariculture-based livelihoods and industry in New Ireland, Papua New Guinea (FIS/2014/061)
4. Improving technologies for cost-effective fish feeding strategies, husbandry and fingerling production for inland aquaculture in Papua New Guinea (FIS/2014/062)
5. Institutional strengthening in Papua New Guinea: translating fisheries research into policy and management (FIS/2018/151)
6. Improving livelihoods and human nutrition through inland aquaculture in Papua New Guinea [Papua New Guinea, Vanuatu] (FIS/2018/154)
7. Enhancing value-added products and environmental benefits from agroforestry systems in Papua New Guinea and the Pacific [Fiji, Papua New Guinea, Solomon Islands, Vanuatu] (FST/2014/067)
8. Improvement and management of teak and sandalwood in Papua New Guinea and Australia (FST/2014/069)
9. Promoting smallholder teak and sandalwood plantations in Papua New Guinea and Australia (FST/2018/178)
10. Building research capacity among ACIAR's sandalwood-focused projects through a regional sandalwood workshop and publication [Indonesia, Vanuatu, Fiji, PNG, Timor-Leste, Australia] (FST/2016/024)
11. Enabling community forestry in Papua New Guinea (FST/2016/153)
12. Enhancing private sector-led development of the canarium industry in Papua New Guinea, Phase 2 (FST/2017/038)
13. Bogia coconut syndrome in Papua New Guinea: developing biological knowledge and a risk management strategy (HORT/2012/087)
14. Coconuts for Pacific livelihoods [Fiji, Papua New Guinea, Samoa, Solomon Islands, Vanuatu] (HORT/2017/025)
15. Developing improved crop protection options in support of intensification of sweetpotato production in Papua New Guinea (HORT/2014/083)
16. Supporting commercial sweetpotato production and marketing in the Papua New Guinea highlands (HORT/2014/097)
17. Developing the cocoa value chain in Bougainville (HORT/2014/094)
18. Enterprise-driven transformation of family cocoa production in East Sepik, Madang, New Ireland and Chimbu Provinces of Papua New Guinea (HORT/2014/096)
19. Effective management of cocoa pod borer [Papua New Guinea] (HORT/2018/114)
20. Protecting the coffee industry from coffee berry borer in Papua New Guinea and Australia (HORT/2018/194)
21. Responding to emerging pest and disease threats to horticulture in the Pacific islands [Fiji, Papua New Guinea, Samoa, Solomon Islands, Tonga] (HORT/2016/185)
22. Increasing the productivity and profitability of smallholder beekeeping enterprises in Papua New Guinea and Fiji (LS/2014/042)
23. A One Health approach to establish surveillance strategies for Japanese encephalitis and zoonotic arboviruses in Papua New Guinea (LS/2018/213)
24. Drug sensitive and resistant tuberculosis and zoonotic infections as causes of lymphadenitis in two provinces in Papua New Guinea (One Health) (LS/2018/217)
25. Identifying opportunities and constraints for rural women's engagement in small-scale agricultural enterprises in Papua New Guinea (ASEM/2014/054)
26. Improving livelihoods of smallholder coffee communities in Papua New Guinea (ASEM/2016/100)
27. Climate-smart agriculture opportunities for enhanced food production in Papua New Guinea (ASEM/2017/026)
28. Gender equitable agricultural extension through institutions and youth engagement in Papua New Guinea (SSS/2018/137)
29. Sustaining soil fertility in support of intensification of sweetpotato cropping systems (SMCN/2012/105)
30. Optimising soil management and health in Papua New Guinea integrated cocoa farming systems (SMCN/2014/048)
31. Improving plant biosecurity in the Pacific islands [Fiji, Kiribati, Papua New Guinea, Samoa, Solomon Islands, Timor-Leste, Tonga, Tuvalu, Vanuatu] (GP/2018/109)
32. Reinvigorating the Coconut Genetic Resources Network (COGENT) [Fiji, Indonesia, Papua New Guinea, Samoa] (GP/2018/193)
33. Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific—Agricultural Science and Technology Indicators (ASTI) program [Cambodia, Indonesia, Malaysia, Myanmar, Papua New Guinea, the Philippines, Thailand, Vietnam, Laos, Timor-Leste] (GP/2016/093).

Timor-Leste

Budgeted funding

A$2.3
million

ACIAR-supported projects

9

Multilateral & co-investment programs

2

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, particularly 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 (DFAT)

With 80% of the population of Timor-Leste engaged in low input–output subsistence farming, most rural households suffer medium to very high vulnerability to 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 how to sustainably increase production of the main staples and diversify into crops with higher nutritional value, especially legumes. An additional challenge is achieving this transition in the face of increasingly variable climatic conditions. 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 substantial, there are many opportunities to improve rural livelihoods through research addressing productivity, sustainability and marketing of agricultural and livestock products.

The ACIAR research program, Seeds of Life, 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 varieties of mungbeans and climbing beans released in 2016. These results show what can be achieved through long-term research partnerships with Timor-Leste.

Country priorities

ACIAR is maintaining a program of research collaboration with Timor-Leste. It is characterised by projects with a long-term view and a strong focus on capacity and partnership development. ACIAR does not currently have a formal agreement with Timor-Leste for research collaboration, but aims to start developing one during 2019–20.

Discussions on future priorities will likely focus on opportunities in aquaculture (inland and coastal), agroforestry, livestock (especially cattle and poultry) and cropping systems, as well as seeking opportunities for trilateral research collaboration with Indonesia.

2019–20 research program

ACIAR supports nine projects and programs in Timor-Leste, five of which are specific to this country, and the remainder are part of regional projects. The projects address our high-level objectives, as outlined in the 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and partner organisations.

The following sections briefly describe individual ACIAR-supported projects and anticipated outputs in Timor-Leste, grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

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

Crops/Soil and Land Management

A project managed under two ACIAR research programs is helping farmers in Timor-Leste change from subsistence farming to income-generating farming. The project aims to improve agricultural productivity and profitability in pilot communities, by addressing technical and social impediments to intensifying annual cropping and establishing fodder tree legumes and sandalwood. This will help provide a sustainable income source, while sustainable land management will halt or reverse land degradation. Led by Professor William Erskine of the University of Western Australia, the research focuses 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). This will help diversify farm income, and act as a buffer to climate variability. The research is being undertaken in two agroecological zones, covering a quarter of the country's population, and cropping systems and crop management packages are being be developed.[1]

Fisheries

A new project in 2019–20 aims to identify the livelihood and nutrition benefits of fisheries in Timor-Leste and the Nusa Tenggara Timur province of Indonesia. It will test approaches to nutrition-sensitive co-management systems for inshore fisheries, and look at ways to promote nutrition-sensitive fisheries management policy in each country context. The project, led by Dr David Mills of the WorldFish Center, will determine the importance of fish for the livelihoods of women and men, by focusing on two fishery case studies—fish-aggregating device fishing and intertidal gleaning. By evaluating the nutritional value of fisheries to households, and working to identify the factors enabling or limiting the consumption of fish, the project will 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.[2]

Forestry

The high value of sandalwood on the international market has led to the decline of many natural sources of sandalwood around the world. This presents an opportunity for smallholders in sandalwood-producing countries of the Asia–Pacific region to capitalise on recognised future supply shortages, by planting local species. Led by Dr Tony Page of the University of the Sunshine Coast, a short research activity will leverage existing research investments by ACIAR in sandalwood, to improve capacity, scientific outputs and impacts among project partners. This will be achieved through a regional workshop and field tours, and publication of technical information.[3]

Livestock Systems

ACIAR supports a medium-term livestock research-for-development program in Timor-Leste, 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, led by Dr Geoffry Fordyce of the University of Queensland, 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.[4]

A new small research activity focuses on improving the diagnostic pathways from the field into the central veterinary laboratory in Dili, particularly around the management of classical swine fever, which is endemic in Timor-Leste and most of Indonesia. This project, led by Dr Jenny-Ann Toribio of the University of Sydney, aims to increase the understanding of causes of pig mortality, which will contribute to better smallholder pig husbandry and production techniques.[5]

A short project aims to further develop a vision and direction for ACIAR to support sustainable development of the smallholder livestock sector in Timor-Leste over the coming 5–10 years. Led by Dr Dominic Smith of the University of Queensland, the project will: evaluate the business case for ACIAR supporting research into smallholder pig production; evaluate key constraints and influencing factors related to formalising cross-border trade in livestock between Timor-Leste and Nussa Tengara Timur; and conduct a comparative analysis of key smallholder livestock sectors, to identify best use of ACIAR resources.[6]

Since independence in 2002, Timor-Leste has moved from a post-conflict country to a lower- to middle-income country. In 2013, it was reported that, for children under five years of age, the prevalence of stunting, wasting and underweight had significantly decreased since 2009–10, but it remained among the highest in the world. A pilot project, led by Dr Ben Polkinghorne of Australian National University, will seek to understand possible infection pathways, to establish linkages between foodborne bacterial enteropathies and malnutrition in Timor-Leste.[7]

Global Program

The Global Program manages several programs in the East and South-East Asia region addressing multidisciplinary challenges and/or opportunities, in partnership with international agricultural research-for-development agencies. The work of the Global Program is described in Chapter 2.

Global Program projects operational in Timor-Leste during 2019–20 are:

- Improving plant biosecurity in the Pacific islands[8]
- Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific—Agricultural Science and Technology Indicators (ASTI) program.[9]

Current and proposed projects

1. Agricultural innovations for communities for intensified and sustainable farming systems in Timor-Leste (AI-Com) (CIM/2014/082)
2. A nutrition-sensitive approach to coastal fisheries management and development in Timor-Leste and Nusa Tenggara Timur Province, Indonesia (FIS/2017/032)
3. Building research capacity among ACIAR's sandalwood-focused projects through a regional sandalwood workshop and publication [Indonesia, Vanuatu, Fiji, PNG, Timor-Leste, Australia] (FST/2016/024)
4. Smallholder cattle enterprise development in Timor-Leste (LPS/2014/038)
5. Pig disease investigation in Timor-Leste (LS/2012/065)
6. Trilateral support to smallholder cattle systems research in Timor-Leste (LS/2017/035)
7. Establishing the linkages between foodborne bacterial enteropathies and malnutrition in Timor-Leste (LS/2018/184)
8. Improving plant biosecurity in the Pacific islands [Fiji, Kiribati, Papua New Guinea, Samoa, Solomon Islands, Timor-Leste, Tonga, Tuvalu, Vanuatu] (GP/2018/109)
9. Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific—Agricultural Science and Technology Indicators (ASTI) program [Cambodia, Indonesia, Malaysia, Myanmar, Papua New Guinea, the Philippines, Thailand, Vietnam, Laos, Timor-Leste] (GP/2016/093)

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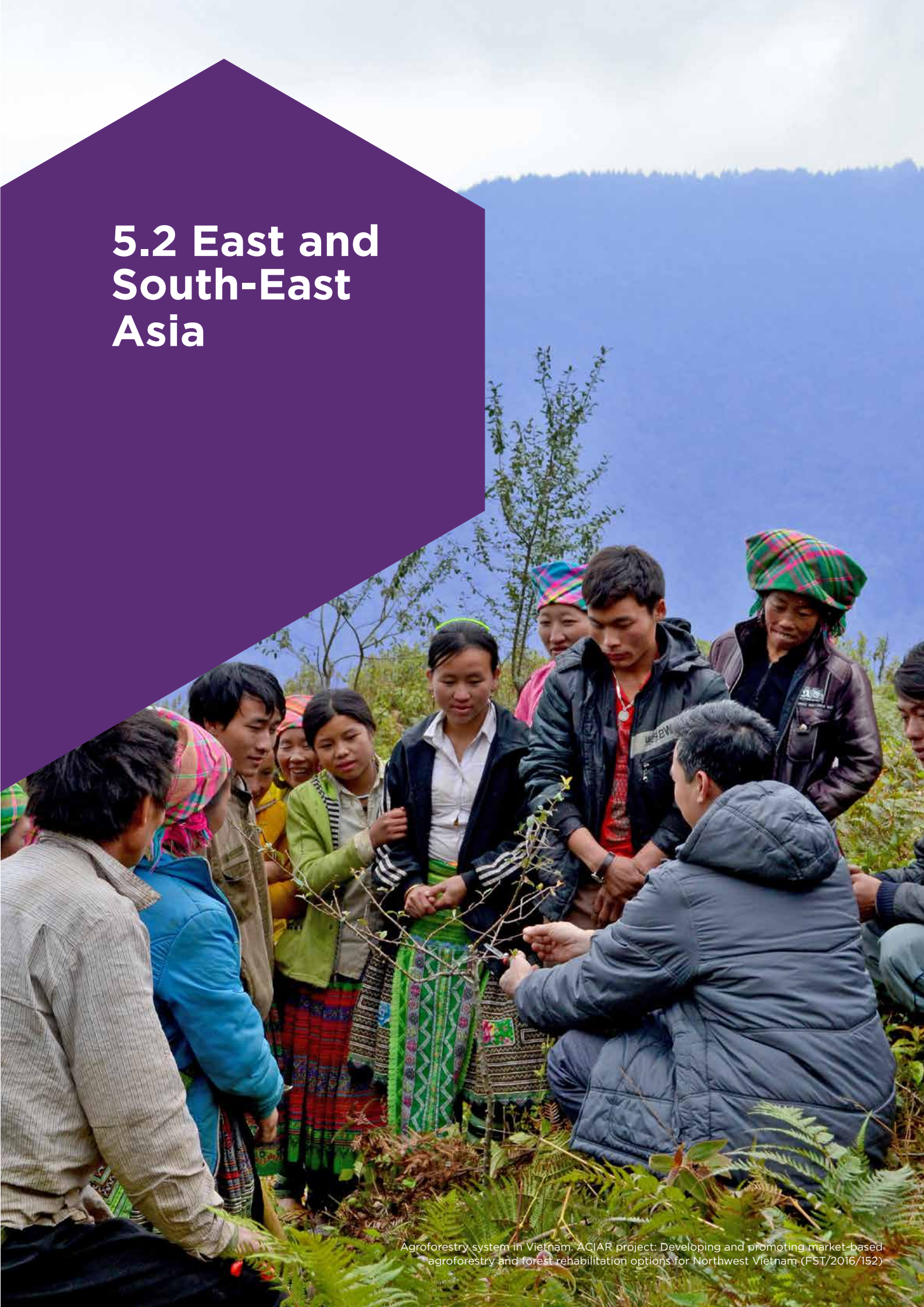
5.2 East and South-East Asia



Agroforestry system in Vietnam. ACIAR project: Developing and promoting market-based agroforestry and forest rehabilitation options for Northwest Vietnam (FST/2016/152)

East and South-East Asia

Regional summary

The regional economy of East and South-East Asia remained buoyant in 2018, building on faster-than-expected growth in 2017, with 6.4% in growth. This was underpinned by strong investment in advanced economies, coupled with robust domestic demand and consumer confidence across the economies of ASEAN. Consumption was supported by a strong demand for labour and healthy wage growth.

The ASEAN region offers a growing market of more than 600 million consumers, and the region's GDP per capita is about US$6,500—excluding Singapore, which is the region's most advanced economy. The income levels of the 10 ASEAN member states span a wide range, from Singapore's GDP per capita of US$57,714 to Cambodia's US$1,384 and Myanmar's US$1,298 in 2017.

The strategy of export-orientated growth and trade openness of the ASEAN nations has resulted in rapid rates of economic progress in the past few decades, lifting millions out of poverty, and winning many admirers in the process. But regional economic gains have fallen short of erasing significant differences between member states, which have widely different degrees of economic transformation. There is an obvious gap between the richest members of ASEAN, and those still in early stages of development, including Cambodia, Laos, Myanmar and Vietnam. As the region moves towards becoming a single market under the ambitious program of the ASEAN Economic Community, long-standing issues on inequality remain a major challenge for inclusive growth.

Inequality within countries is also a significant problem for many ASEAN members. The Bertelsmann Stiftung's Transformation Index notes that in Laos, Cambodia, Vietnam, the Philippines and Indonesia, poverty and inequality are still 'pronounced and partly structurally ingrained'. Not a single ASEAN nation is considered to be one of the more equitable economies globally. With the ASEAN Economic Community in its third year of implementation, the question of how inequalities in each country will be affected by further economic integration remains unanswered.

Drivers of regional collaboration

Some common trends across the region are creating opportunities for greater regional cooperation and trilateral collaboration in research, including that:

- many East and South-East Asia partner countries are developing research capability that requires a new approach to partnerships with ACIAR
- rapid urbanisation and globalisation of agrifood chains are focusing ACIAR research increasingly on capitalising on market opportunities that can transform smallholder systems
- discrete areas within some countries still experience challenging issues with poverty, which require ongoing targeting by ACIAR research collaborations
- addressing the impacts of climate change on agriculture is becoming a high priority across the East and South-East Asia region.

ACIAR program in the region

East and South-East Asia remains the largest of the four regions in which ACIAR operates. There are fewer regional projects, compared with other regions, reflecting the strong bilateral relationships that ACIAR has with individual countries in the region and the strength and individuality of each country's research agencies. But several factors drive the continued development of regional projects.

Increasingly, there are issues and opportunities for smallholder agriculture that benefit from, and in some cases necessitate, a regional research approach. Regional trade in smallholder-sourced commodities, for example, is changing rapidly, especially with growing demand from China. Coordinated effort is also identifying options for smallholder systems to tackle the impacts of climate change, with potential multi-country benefits. Biosecurity issues are increasingly important, with growing regional trade and the emergence of new biosecurity threats, such as diseases in cassava and citrus.

There are cases where research in one country addresses issues that have a regional reach. For example, a new long-term collaboration with Indonesia on peatland fire management is addressing an issue that affects smallholders across the region. So, there will be regional communication of the results and output of this research effort.

ACIAR is actively pursuing opportunities for trilateral collaboration to support third countries, with co-funding by both ACIAR and one of the more developed economies in the region. For example, there is potential for trilateral collaboration between Indonesia, Timor-Leste and Australia, to improve smallholder livelihoods in Timor-Leste through better fisheries, livestock and cropping systems and cross-border trade.

The ASEAN drive towards regional integration and connectivity is likely to increase 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).

Our new lead role in the regional research body, APAARI, provides an opportunity to better coordinate our efforts in research across the region.

During 2019–20, ACIAR will support 114 projects in the East and South-East Asia region (Table 5.2).

Table 5.2: Current and proposed projects in the East and South-East Asia region, 2019–20

Project title	Country	Project code
Agribusiness		
Policy and institutional reforms to improve horticultural markets in Pakistan	China, Pakistan	ADP/2014/043
Agricultural policy research to support natural resource management in Indonesia's upland landscapes	Indonesia	ADP/2015/043
Policy analysis of food safety and trade in Vietnam	Vietnam	ADP/2016/140
Understanding the drivers of successful and inclusive rural regional transformation: sharing experiences and policy advice in Bangladesh, China, Indonesia and Pakistan	China, Indonesia, Bangladesh, Pakistan	ADP/2017/024
Evaluating smallholder livelihoods and sustainability in Indonesian coffee and cocoa value chains	Indonesia	AGB/2010/099
Improving smallholder farmer incomes through strategic market development in mango supply chains in southern Vietnam	Vietnam	AGB/2012/061
Developing value-chain linkages to enhance the adoption of profitable and sustainable cassava production systems in Vietnam and Indonesia	Indonesia, Vietnam	AGB/2012/078
Improving milk supply, competitiveness and livelihoods in smallholder dairy chains in Indonesia	Indonesia	AGB/2012/099
Improving livelihoods in Myanmar and Vietnam through vegetable value chains	Myanmar, Vietnam	AGB/2014/035
Inclusive agriculture value-chain financing	Indonesia, Myanmar, Vietnam	AGB/2016/163
Sustainable and inclusive development of the cattle and beef industry in Vietnam and trade relationships with other countries in the region	Vietnam	AGB/2016/196
Enhancing smallholder linkages to markets by optimising transport and logistics infrastructure	Indonesia, Vietnam	AGB/2017/036
Developing vegetable and fruit value chains and integrating them with community development in the southern Philippines	The Philippines	AGB/2017/039
Revision and update of *Markets for the poor* and *Agribusiness masterclass*	Indonesia, Vietnam	AGB/2018/121
Strengthening leadership, coordination and economic development of the temperate fruit industry in northern Vietnam	Vietnam	AGB/2018/171
Establishing sustainable solutions to cassava diseases in mainland South-East Asia	Cambodia, Laos, Myanmar, Vietnam	AGB/2018/172
Enhancing the livelihoods of coffee and pepper smallholders in the Central Highlands of Vietnam through improving stakeholders' participation in agribusiness-led value chains	Vietnam	AGB/2018/208
A Theory of Change for inclusive value chains in the Philippines	The Philippines	AGB/2019/100
Agribusiness Masterclass, The Philippines	The Philippines	AGB/2019/101
Crops		
Establishing the International Mungbean Improvement Network	Myanmar, Bangladesh, India	CIM/2014/079
Improved mungbean harvesting and seed production systems for Bangladesh, Myanmar and Pakistan	Myanmar, Bangladesh, Pakistan	CIM/2016/174
Understanding drill seeding of rice techniques and business models	Laos	CIM/2018/113
Plant health—a major challenge to achieving sustainable 'green' agriculture in Myanmar	Myanmar	CROP/2019/103
Extension of International Mungbean Improvement Network project	Myanmar, Bangladesh, India, Kenya, Tanzania, Uganda	CROP/2018/133
Sustainable intensification and diversification in the lowland rice system in north-west Cambodia	Cambodia	CSE/2015/044

Project title	Country	Project code
Fisheries		
Improving the design of irrigation infrastructure to increase fisheries production in floodplain wetlands of the Lower Mekong and Murray–Darling basins	Laos	FIS/2012/100
Developing technologies for giant grouper (*Epinephelus lanceolatus*) aquaculture in Vietnam, the Philippines and Australia	Vietnam, the Philippines	FIS/2012/101
Quantifying biophysical and community impacts of improved fish passage in Lao PDR and Myanmar	Laos, Myanmar	FIS/2014/041
Expanding spiny lobster aquaculture in Indonesia	Indonesia	FIS/2014/059
Restoring damaged coral reefs using mass coral larval reseeding	The Philippines	FIS/2014/063
Improving seaweed production and processing opportunities in Indonesia	Indonesia	FIS/2015/038
Improving fishery management in support of better governance of Myanmar's inland and delta fisheries	Myanmar	FIS/2015/046
Harvest strategies for Indonesian tropical tuna fisheries to increase sustainable benefits	Indonesia	FIS/2016/116
Increasing technical skills supporting community-based sea cucumber production in Vietnam and the Philippines	The Philippines, Vietnam	FIS/2016/122
Half-pearl industry development in Tonga and Vietnam	Vietnam, Tonga	FIS/2016/126
Accelerating the development of finfish mariculture in Cambodia through south–south research cooperation with Indonesia	Cambodia, Indonesia	FIS/2016/130
Development of rice–fish systems in the Ayeyarwady Delta, Myanmar	Myanmar	FIS/2016/135
Assessing fisheries mitigation measures at Xayaburi Dam in Laos	Laos	FIS/2017/016
Assessing fisheries mitigation measures at Xayaburi Dam in Laos	Laos	FIS/2017/017
A nutrition-sensitive approach to coastal fisheries management and development in Timor-Leste and Nusa Tenggara Timur Province, Indonesia	Indonesia, Timor-Leste	FIS/2017/032
Evaluating processes and outcomes in south–south research collaboration: finfish mariculture development in Cambodia through cooperation with Indonesia	Cambodia, Indonesia	FIS/2018/115
Baseline monitoring and evaluation of long-term impacts on fish stocks from coral restoration	The Philippines	FIS/2018/128
Translating fish passage research outcomes into policy and legislation across South-East Asia	Cambodia, Indonesia, Laos	FIS/2018/153
Forestry		
Biological control of galling insect pests of eucalypt plantations in the Mekong region	Cambodia, Thailand, Vietnam, Laos	FST/2012/091
Enhancing community-based commercial forestry in Indonesia	Indonesia	FST/2015/040
Building research capacity among ACIAR's sandalwood-focused projects through a regional sandalwood workshop and publication	Indonesia, Vanuatu, Fiji, Papua New Guinea, Timor-Leste, Australia	FST/2016/024
Developing and promoting market-based agroforestry options and integrated landscape management for smallholder forestry in Indonesia (Kanoppi 2)	Indonesia	FST/2016/141
Improving community fire management and peatland restoration in Indonesia	Indonesia	FST/2016/144
Advancing enhanced wood manufacturing industries in Laos and Australia	Laos	FST/2016/151
Developing and promoting market-based agroforestry and forest rehabilitation options for Northwest Vietnam	Vietnam	FST/2016/152
Reducing forest biosecurity threats in South-East Asia	Indonesia, Laos, Vietnam	FST/2018/179
Enhanced adoption of agroforestry systems in Laos	Laos	FST/2018/180

Project title	Country	Project code
Horticulture		
Integrated management of *Fusarium* wilt of bananas in the Philippines and Australia	The Philippines	HORT/2012/097
Improved post-harvest management of fruit and vegetables in the southern Philippines and Australia	The Philippines	HORT/2012/098
Development of area-wide management approaches for fruit flies in mango for Indonesia, the Philippines, Australia and the Asia–Pacific region	Indonesia, the Philippines	HORT/2015/042
Developing vegetable value chains to meet evolving market expectations in the Philippines	The Philippines	HORT/2016/188
Integrated crop management for mango in Cambodia and the Philippines to meet market quality standards	Cambodia, the Philippines	HORT/2016/190
An integrated management response to the spread of *Fusarium* wilt of banana in South-East Asia	Indonesia, Laos, the Philippines	HORT/2018/192
Impact Evaluation		
Development of mixed method approaches to impact assessments of Philippines research projects	The Philippines	IAP/2017/010
Livestock Systems		
Strengthening incentives for improved grassland management in China and Mongolia	China, Mongolia	ADP/2012/107
Enhancing transboundary livestock disease risk management in Laos	Laos	AH/2012/067
Development of a market-driven biosecure beef production system in Laos	Laos	AH/2012/068
Integrating herbaceous forage legumes into crop and livestock systems in East Nusa Tenggara, Indonesia	Indonesia	LPS/2012/064
Profitable feeding strategies for smallholder cattle in Indonesia	Indonesia	LPS/2013/021
Developing profitable dairy and sheep meat production systems in the central Tibet Autonomous Region, China	China	LPS/2014/036
Intensification of beef cattle production in upland cropping systems in Northwest Vietnam	Vietnam	LPS/2015/037
Interventions to mitigate disease risk and add value to cross-border pig trade between Laos and Vietnam	Laos, Vietnam	LS/2014/055
Improving farmer livelihoods by developing market-oriented small ruminant production systems in Myanmar	Myanmar	LS/2014/056
Improving smallholder beef value chains in rainfed cropping systems in Indonesia	Indonesia	LS/2015/047
Improving smallholder beef supply and livelihoods through cattle–palm system integration in Indonesia	Indonesia	LS/2015/048
Improving cattle production in the Central Dry Zone of Myanmar through improved animal nutrition, health and management	Myanmar	LS/2016/132
Safe Pork: market-based approaches to improving the safety of pork in Vietnam	Vietnam	LS/2016/143
Goat production systems and marketing in Laos and Vietnam	Laos, Vietnam	LS/2017/034
Smallholder livestock futures in South-East Asia	Indonesia	LS/2018/107
Forages—taking stock and identifying research needs	Cambodia, Laos, Vietnam	LS/2018/186
Impact assessment of *Taenia solium* control in Phongsali province, Laos and development of future opportunities for the control of zoonotic parasitic infections	Laos	LS/2018/201
Assessing the potential of point-of-care diagnostic tools for developing countries	Cambodia, Laos	LS/2018/203
Zoonotic malaria in Indonesia (One Health)	Indonesia	LS/2018/214

Project title	Country	Project code
Developing and testing processes and tools to generate connected and live health security knowledge in Mekong communities (One Health)	Cambodia, Laos	LS/2018/215
Incentives for early declaration and effective prevention of avian influenza in the Mekong (One Health)	Cambodia, Laos	LS/2018/216
Evaluating zoonotic malaria transmission and agricultural land use in Indonesia (One Health)	Indonesia	LS/2019/116
Veterinary economics in Mekong countries: advancing One Health	Cambodia, Laos, Vietnam	LS/2019/118
Social Sciences		
Improving the methods and impacts of agricultural extension in Western Mindanao, the Philippines	The Philippines	ASEM/2012/063
Improving food security in the northern uplands of Laos: identifying drivers and overcoming barriers	Laos	ASEM/2012/073
Improving market engagement, post-harvest management and productivity of the Cambodian and Laos vegetable industries	Cambodia, Laos	ASEM/2012/081
Uptake of agricultural technologies among farmers in Battambang and Pailin provinces, Cambodia	Cambodia	ASEM/2013/003
Action-ready climate knowledge to improve disaster risk management for smallholder farmers in the Philippines	The Philippines	ASEM/2014/051
Smallholder farmer decision-making and technology adoption in southern Laos: opportunities and constraints	Laos	ASEM/2014/052
Developing cassava production and marketing systems to enhance smallholder livelihoods in Cambodia and Laos	Cambodia, Laos	ASEM/2014/053
Enhancing livelihoods through forest and landscape restoration	The Philippines	ASEM/2016/103
The potential of International Landcare	Indonesia, the Philippines, Fiji, South Africa, Uganda	ASEM/2018/117
Building institutions for the sustainable management of artesian groundwater in Myanmar	Myanmar	SSS/2018/135
Analysing gender transformative approaches to agricultural development with ethnic minority communities in Vietnam	Vietnam	SSS/2018/139
Soil and Land Management		
Land management of diverse rubber-based systems in the southern Philippines	The Philippines	SLAM/2017/040
Mainstreaming research in Myanmar's agricultural and veterinary universities	Myanmar	SLAM/2017/041
Synthesis of learnings on sustainable intensification of agriculture in Cambodia from ACIAR research investments to inform the future and support impact	Cambodia	SLAM/2018/127
Farmer options for crops under saline conditions (FOCUS) in the Mekong Delta, Vietnam	Vietnam	SLAM/2018/144
Crop health and nutrient management of shallot–chilli–rice cropping systems in coastal Indonesia	Indonesia	SLAM/2018/145
Soil-based challenges for cropping in Shan State, Myanmar (nutrient acquisition)	Myanmar	SLAM/2018/190
Farmer participatory crop benchmarking in the Central Dry Zone of Myanmar	Myanmar	SLAM/2018/206
Identifying entry points for black pepper (*Piper* sp.) production and value-chain development in the Central Highlands in Vietnam	Vietnam	SLAM/2018/209
Improving the sustainability of rice–shrimp farming systems in the Mekong River Delta, Vietnam	Vietnam	SMCN/2010/083
Integrated water, soil and nutrient management for sustainable farming systems in South Central Coast region of Vietnam and Australia	Vietnam	SMCN/2012/069

Project title	Country	Project code
Management practices for profitable crop–livestock systems for Cambodia and Laos	Cambodia, Laos	SMCN/2012/075
Management of nutrients for improved profitability and sustainability of crop production in central Myanmar	Myanmar	SMCN/2014/044
Improving maize-based farming systems on sloping lands in Vietnam and Laos	Laos, Vietnam	SMCN/2014/049
Land resource evaluation for productive and resilient landscapes in the Central Dry Zone of Myanmar	Myanmar	SMCN/2014/075
Integrated resource management for vegetable production in Laos and Cambodia	Cambodia, Laos	SMCN/2014/088
Land suitability assessment and site-specific soil management for Cambodian uplands	Cambodia	SMCN/2016/237
Water and Climate		
Agriculture based emission-reduction options to support nationally determined contributions in Vietnam and Fiji	Vietnam, Fiji	LWR/2017/029
Expanding opportunities to use groundwater for poverty alleviation and climate change adaption in Laos	Laos	WAC/2018/167
Global Program		
Improving plant biosecurity in the Pacific islands	Timor-Leste, Fiji, Kiribati, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu	GP/2018/109
Reinvigorating the Coconut Genetic Resources Network (COGENT)	Fiji, Indonesia, Papua New Guinea, Samoa	GP/2018/193
Monitoring agricultural research investments, capacity and impact in South-east Asia and the Pacific—Agricultural Science and Technology Indicators (ASTI) program	Cambodia, Indonesia, Malaysia, Myanmar, Papua New Guinea, the Philippines, Thailand, Vietnam, Laos, Timor-Leste	GP/2016/093

Note: More details (including project leader, commissioned organisation and partner organisations) are provided in the appendixes.

Cambodia

Budgeted funding

A$2.9
million

ACIAR-supported projects

20

Multilateral & co-investment programs

2

Cambodia has one of the fastest growing economies in the world, but unequal distribution of economic gains means many Cambodians still struggle to access quality, affordable essential services. While poverty continues to fall, the rate of fall has slowed significantly. The UN estimates that 13.5% of Cambodians live below the national poverty line, down from 53% in 2004. However, many Cambodian households, especially in rural areas, remain highly vulnerable. About 4.5 million people (approximately 28% of the population) remain near poor and vulnerable to falling back into poverty when exposed to economic and other shocks. … Australian aid will continue to deliver development programs to improve infrastructure, increase farmers' incomes and deliver better quality health and education outcomes.

Overview of Australia's aid program in Cambodia (DFAT 2019)

Cambodia's economy, like many other countries in the region, continued to expand (7% per year) throughout 2018.

Steady growth is driven by the agriculture, garment, tourism, and construction sectors. The expanding foreign direct investment inflows to manufacturing and agriculture, together with better supply-chain linkages between foreign direct investment and Cambodian firms, improves the country's positive longer-term economic outlook.

Cambodia's population is growing rapidly (1.6% annually), which means that its domestic market is constantly expanding. Rising income and urbanisation, mixed with a stronger tourism sector, are changing food consumption, particularly of animal products. But despite the increasing urbanisation, the majority of Cambodians still live in the country, where agriculture employs 42% of the country's total workforce, yet represents only 23% of GDP.

In 2018, Cambodia experienced favourable weather conditions that contributed to stronger performance of the agriculture sector than in previous years. Since 2017, rice production, surpluses and exports have been growing. A gradual recovery of agriculture commodity prices in recent times has helped increase agricultural production. But agricultural growth remains much lower than before 2013, because land expansion, which had been the main driver of strong agricultural performance, might have reached its limit.

Further increases in agricultural production will come from increased land and labour productivity, through diversification, intensification and provision of inputs, especially seed systems. The recovery in agricultural production in 2016 and 2017 stimulated agriculture-related jobs and businesses, although jobs directly in farm-based agriculture continued to decline. Improving economic prospects in rural areas is believed to have contributed to the return of some migrants, especially from Thailand.

Women's contribution to the agriculture sector is significant, especially since increased labour migration. 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 comprise 56% of subsistence farmers and 54% of workers in market-oriented agriculture.

The Royal Government of Cambodia continues to prioritise agriculture as a key sector for national growth. The third version of the Rectangular Strategy promotes agricultural investment beyond strengthening rural incomes, into improved technology, research and development, crop diversification and support for commercial production and agri-industries.

Country priorities

Australia's aid investments with Cambodia focus on three priorities, one of which is increasing agricultural productivity. Under a new 10-year agreement with Cambodia, yet to be formalised, ACIAR has signalled its intent to broker and invest in research partnerships that have 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 that will further target ACIAR investments with Cambodia in 2019–20 are:

- integrating the potential to economically empower women and girls as a component of research collaboration
- addressing climate change mitigation and adaptation.

2019–20 research program

ACIAR supports 20 projects in Cambodia, three of which are specific to this country, and the remainder are part of regional projects. The projects address our high-level objectives, as outlined in the 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and partner organisations.

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

Agribusiness

A new project in Cambodia, Laos, Myanmar and Vietnam aims to improve the resilience of cassava production systems and value chains, by addressing rapidly evolving disease constraints, cassava witches broom disease and Sri Lanka cassava mosaic virus. The project, led by Dr Jonathan Newby of the International Center for Tropical Agriculture, will develop technically viable and economically and socially sustainable solutions, including resistant varieties and the production of virus free planting material. It will test and evaluate methods for slowing the spread of the diseases, through planting material, explore scaling solutions, strengthen capacity and regional networks to address new pest and disease incursions, and investigate opportunities for public–private funding models to support a resilient cassava industry.[1]

Crops

A project, led by Associate Professor Daniel Tan of the University of Sydney, is helping farmers adopt innovative crop production methods to sustainably intensify the rainfed lowland rice system in north-western Cambodia, and to develop market links within the value-chain network. The most effective innovations and approaches for farmer adoption of sustainable intensification and diversification will be evaluated halfway through the project. Comparative evaluation of scale-up and scale-out models for adoption at village and community level will start, and training materials and forums will be prepared and implemented.[2]

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. The Fisheries Program supports projects to improve food security and livelihoods.

Finding ways to speed up the development of finfish mariculture in Cambodia is the endeavour of a south–south cooperative research partnership with Indonesia. In a project, led by Associate Professor Nicholas Paul and Dr Mike Rimmer of the University of the Sunshine Coast, partners from Cambodian and Indonesian research organisations will use established research and development capability in Indonesia to train Cambodian researchers. The researchers will gain skills in fish nutrition, hatchery production and fish health to a standard that can support marine finfish aquaculture development in Cambodia. The use of south–south collaboration as a capacity-building approach will be assessed, and a framework will be proposed for application in future ACIAR projects.[3]

Another project, led by Professor Janelle Allison of the University of Tasmania complements the finfish mariculture development project, by facilitating and documenting teaching approaches and structures for innovative and effective south–south collaboration that are applicable to agricultural research and development in the Indo-Pacific region.[4]

As floodplains are developed for irrigation, and river flows are regulated across South-East Asia, river communities are at risk of losing fishing income and an important source of protein and essential nutrients. Previous ACIAR projects have shown that fishways, which facilitate passage of fish up and down regulated rivers, can have lasting economic and social benefits for river communities. A new project, led by Dr Lee Baumgartner of Charles Sturt University, will develop: a platform for sound decision-making on fish passage construction programs across South-East Asia; a targeted capacity-building program to address long-term institutional needs in the field of fish passage; and guidelines for developing fish passage policy and legislation in Cambodia, Laos and Indonesia.[5]

Forestry

The impacts of Australian-origin insects on eucalypt plantations is a rapidly increasing problem globally. In the Mekong region, scientists and forest managers are collaborating to control and manage these pests. A research project, led by Dr Simon Lawson of the University of the Sunshine Coast, aims to develop appropriate biological controls for gall wasp by importing and testing natural enemies of the pest from Australia. The project concludes in 2019–20, with follow-up release and monitoring of biological control agents.[6]

Fisheries researcher, Cambodia. ACIAR project: Accelerating the development of finfish mariculture in Cambodia through cooperation with Indonesia (FIS/2016/130)

Horticulture

Mango production in the Asia–Pacific region accounts for about two-thirds of global production. Much of the crop is produced by smallholders, who achieve relatively modest yields, and participate in traditional value-chain arrangements that offer producers little incentive to innovate or pursue higher quality. Some producers seek better returns by supplying higher-value export markets (such as Korea), but they have struggled to deliver fruit that meets market or regulatory standards. A new project in Cambodia and the Philippines, led by Dr Cameron McConchie of the Northern Territory Department of Primary Industry and Fisheries, aims to improve the ability of selected mango supply chains to deliver fruit that better meets consumer expectations of quality and value, as well as provide smallholder growers a better return on investment.[7]

Livestock Systems

The potential of forage production by smallholders is the focus of a new small research activity. Professor Rob Cramb of the University of Queensland will conduct a stocktake in Cambodia, Laos and Vietnam to analyse factors that contribute to, and constrain, forage development. If a clear demand for further forage development is shown, the project will analyse constraints and opportunities for more effective uptake and use of forages, and identify potential business models for more demand driven development. Critical issues that can be addressed through research will be identified and used to guide future ACIAR investment.[8]

'Point-of-care' diagnostics can improve the traditional methods of animal health surveillance, especially in remote areas, where storing and transporting cold chain samples collected in the field to the nearest capable laboratory is challenging. Dr John Allen of CSIRO Australian Animal Health Laboratory will undertake a scoping study to: provide direction to government animal health agencies on best-practice use of point-of-care tests; provide guidance for private sector test manufacturers; and facilitate public–private partnerships to bring new tests to the market that are 'fit for their intended purpose'.[9]

Many health security threats, including threats arising from interactions between humans and animals, have arisen in remote areas of South-East Asia. These areas are home to many minority language groups. Professor Richard Osborne of Swinburne University of Technology will develop and test health literacy processes and tools to engage small communities in Cambodia and Laos around 'live and connected health knowledge'. The project, which is part of the Research for One Health Systems Strengthening program, will help researchers identify available knowledge resources, and link this to the management of health risks via regular conversations, routines, activities and relationships.[10]

Also part of the One Health program, a short research activity in Cambodia and Laos, led by Professor Barbara McPake of the Nossal Institute, will: gain a better understanding of the policy opportunities and challenges for human and animal disease promotion and surveillance; establish the extent of existing knowledge around policy development processes, socioeconomic factors and regulatory capacity of poultry production; host a stakeholder workshop to share results and experiences with decision-makers; and identify questions for future research.[11] This will lead into a research project in early 2020, to investigate veterinary economics to advance One Health in Mekong Countries (Cambodia, Laos and Vietnam).[12]

Research for One Health Systems Strengthening

The Research for One Health Systems Strengthening program is a co-investment and partnership between ACIAR and DFAT, through the Indo-Pacific Centre for Health Security.

Projects in the Pacific region

- Supporting Fijian health and agricultural authorities implement the National Antimicrobial Resistance Action Plan (LS/2018/212)
- Enhancing the Management of Antimicrobial Resistance in Fiji (LS/2019/119)
- A One Health approach to establish surveillance strategies for Japanese encephalitis and zoonotic arboviruses in Papua New Guinea (LS/2018/213)
- Drug sensitive and resistant tuberculosis and zoonotic infections as causes of lymphadenitis in two provinces in Papua New Guinea (LS/2018/217)

Projects in South-East Asia

- Zoonotic malaria in Indonesia (LS/2018/214)
- Evaluating zoonotic malaria transmission and agricultural land use in Indonesia (LS/2019/116)
- Developing and testing processes and tools to generate connected and live health security knowledge in Mekong communities (LS/2018/215)
- Incentives for early declaration and effective prevention of avian influenza in the Mekong (LS/2018/216)
- Veterinary economics in Mekong Countries: advancing One Health (Cambodia, Laos, Vietnam) (LS/2019/118)

Social Science

The Social Sciences Program commissions trans-disciplinary research to deliver innovation and speed up poverty reduction. The program works across several key areas of agricultural research-for-development, with a people-centred approach being common to all projects. Two projects in Cambodia focus on the uptake of new technologies.

A project, led by Dr Brian Cook of the University of Melbourne, will investigate how farmers in Battambang and Pailin provinces decide whether or not to uptake of agricultural technologies and best practices. The research will strive to understand why farmers make decisions, identify connections between needs and technologies, test extension adoption using partnerships and demonstration sites, and measure adoption.[13]

A second project, led by Dr Dominic Smith of the University of Queensland, focuses on the uptake of new technologies. This project is identifying ways to increase the adoption of profitable and sustainable technologies for cassava production, and is evaluating opportunities for production and marketing systems, to improve smallholder livelihoods in Cambodia and Laos.[14]

Opportunities for vegetable production in Cambodia and Laos are expanding, including to participate in the ASEAN Economic Community. For producers to realise the full economic benefits available, they must comply with ASEAN Good Agricultural Practices standards. A project, led by Mr Jeremy Badgery-Parker of the University of Adelaide, aims to develop innovative production and supply chain systems that enable the vegetable industry to meet year-round consumer demand for vegetables in the two countries. The project concludes in 2019, with activities to foster communication and collaboration between government, non-government organisations and industry stakeholders.[15]

Soil and Land Management

A four-year project, led by Dr Matthew Denton of the University of Adelaide, has investigated practices to increase the overall productivity of crop–livestock systems in rice-growing areas of Cambodia and Laos. Innovations and technologies to improve forage and fodder production, as well as better management of water, nutrients and soil have been developed. The project will report on soil and water management practices to improve productivity and profitability, and on social and economic impacts of adoption of forages. Farmers will be provided with practical information and technologies from the research, and local scientists and extension officers are being trained to conduct ongoing research, and promote outcomes.[16]

Focused on vegetable production in Cambodia and Laos, a project, led by Dr Alice Melland of the University of Southern Queensland, aims to improve soil and irrigation water management to achieve sustainable increases in vegetable yields and household incomes. The research investigated the impact of soil ameliorants and timing of irrigation on soil water status and crop development. The project will apply learnings to develop and improve supply chain performance, help smallholders understand and adopt improved practices, and extend experimental findings to private input suppliers and regional extension officers.[17]

The Royal Government of Cambodia has recognised that continued expansion of cultivation into unused or degraded land is not environmentally sustainable, and has prioritised sustainable intensification, improved yields and diversification of cropping in areas where upland farming is being developed. A project, led by Dr Wendy Vance of Murdoch University, focuses on understanding soil types and suitable land use to determine site-specific soil management. In 2019–20, the project will continue to develop simple tools to identify soil types and constraints, and improve stakeholders' understanding of soil-related constraints to crop production and soil management practices.[18]

Dr Davina Boyd of Murdoch University will bring together the learnings of various ACIAR research projects in Cambodia related to sustainable intensification. The project aims to clarify the major insights from ACIAR investments at the program and cross-program levels, to yield cross-disciplinary lessons, support selected cross-project activities and analyse project outputs.[19]

Global Program

The Global Program manages several programs in the East and South-East Asia region addressing multidisciplinary challenges and/or opportunities, in partnership with international agricultural research-for-development agencies. The work of the Global Program is described in Chapter 2.

The Global Program project operational in Cambodia during 2019–20 is Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific—Agricultural Science and Technology Indicators (ASTI) program.[20]

Current and proposed projects

1. Establishing sustainable solutions to cassava diseases in mainland South-East Asia [Cambodia, Laos, Myanmar, Vietnam] (AGB/2018/172)
2. Sustainable intensification and diversification in the lowland rice system in north-west Cambodia (CSE/2015/044)
3. Accelerating the development of finfish mariculture in Cambodia through south–south research cooperation with Indonesia (FIS/2016/130)
4. Evaluating processes and outcomes in south–south research collaboration: finfish mariculture development in Cambodia through cooperation with Indonesia (FIS/2018/115)
5. Translating fish passage research outcomes into policy and legislation across South-East Asia [Cambodia, Indonesia, Laos] (FIS/2018/153)
6. Biological control of galling insect pests of eucalypt plantations in the Mekong region [Cambodia, Laos, Thailand, Vietnam] (FST/2012/091)
7. Integrated crop management for mango in Cambodia and the Philippines to meet market quality standards (HORT/2016/190)
8. Forages—taking stock and identifying research needs [Cambodia, Laos, Vietnam] (LS/2018/186)
9. Assessing the potential of point-of-care diagnostic tools for developing countries [Cambodia, Laos] (LS/2018/203)
10. Developing and testing processes and tools to generate connected and live health security knowledge in Mekong communities (One Health) [Cambodia, Laos] (LS/2018/215)
11. Incentives for early declaration and effective prevention of avian influenza in the Mekong [Cambodia, Laos] (One Health) (LS/2018/216)
12. Veterinary economics in Mekong countries: advancing One Health [Cambodia, Laos, Vietnam] (LS/2019/118)
13. Uptake of agricultural technologies among farmers in Battambang and Pailin provinces, Cambodia (ASEM/2013/003)
14. Developing cassava production and marketing systems to enhance smallholder livelihoods in Cambodia and Laos (ASEM/2014/053)
15. Improving market engagement, post-harvest management and productivity of the Cambodian and Laos vegetable industries (ASEM/2012/081)
16. Management practices for profitable crop–livestock systems for Cambodia and Laos (SMCN/2012/075)
17. Integrated resource management for vegetable production in Laos and Cambodia (SMCN/2014/088)
18. Land suitability assessment and site-specific soil management for Cambodian uplands (SMCN/2016/237)
19. Synthesis of learnings on sustainable intensification of agriculture in Cambodia from ACIAR research investments to inform the future and support impact (SLAM/2018/127)
20. Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific—Agricultural Science and Technology Indicators (ASTI) program [Cambodia, Indonesia, Malaysia, Myanmar, Papua New Guinea, the Philippines, Thailand, Vietnam, Laos, Timor-Leste] (GP/2016/093)

Regional Manager, East and South-East Asia
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See page 200 for contact details

China

Budgeted funding

A$0.4
million

ACIAR-supported projects

4

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, and renewed it 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 in 2014, which provides for an annual ministerial dialogue and practical, collaborative projects in areas of mutual interest.

China Country Brief (DFAT)

ACIAR research collaboration with China began in 1984. For more than 10 years it was the largest country program, reflecting the significant challenges in addressing the rural poverty that affected hundreds of millions of people.

By 2007, 175 projects had been completed, and the budget at that time constituted about 15% of the ACIAR research program. Significant programs from this time still resonate today through lasting impacts on researchers, farmers and systems. The dramatic transformation of the Chinese economy resulted in a re-orientation of the ACIAR program in the mid-2000s, to focus on the geographies and themes where collaboration with Australian researchers could have the greatest impacts.

China lifted more than 10 million farmers out of poverty during 2018, reducing the number of people living in extreme poverty to 16.6 million. The Chinese Government announced in previous years that it will eradicate extreme poverty by the end of 2020 to make China a moderately well-off country. The Government will work towards cutting the number of people living in poverty by another 10 million in 2019.

China released the *Central Government No. 1 Document* in February 2019, which focuses on agriculture, rural community and farmer-related issues. The document specifically emphasises food security, restructuring the supply side of market chains to ensure quality, developing new industries in rural areas to create more employment for farmers and increase their incomes, and green development by using less fertilisers and herbicides.

In light of these substantial achievements by China we are moving to transition our relationship to become substantially or totally focused on trilateral collaboration. In 2019–20, we will discuss opportunities with Chinese research agencies, among them the Chinese Academy of Agricultural Sciences Center and the Chinese Academy of Tropical Agricultural Sciences. Opportunities for trilateral collaboration include varietal development to manage devastating new diseases in banana, cassava and citrus, machinery innovation for conservation agriculture among smallholder farmers, and research to develop perennial rice varieties.

Country priorities

The current 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 in China, as well as the Chinese Academy of Sciences, the Chinese Academy of Agricultural Sciences, universities and provincial authorities. The medium-term priorities for the ACIAR China program 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.

2019–20 research program

ACIAR supports four projects in China, two of which are specific to this country, and the remainder are part of regional projects. The projects address our high-level objectives, as outlined in the 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and partner organisations. Each project description is referenced in a list at the end of this section, which provides the project title and code.

Agribusiness

A detailed study of horticultural markets in China will be conducted as part of a broader project to design practical horticulture marketing policy reforms in Pakistan. China's experience in agricultural market reform is valuable to the project, and the China–Pakistan Economic Corridor will provide Pakistan with preferential access to the world's fastest growing horticulture market. The project, led by Dr Thilak Mallawaarachchi of the University of Queensland, aims to increase growth, employment and productivity for Pakistan's agricultural markets. In the concluding stages of the project, the assessment of markets in China will support the development of commodity market models, and provide an analysis of domestic and export market potential.[1]

As development proceeds throughout the Indo-Pacific region, countries will undergo rural transformation. A new project in China, Bangladesh, Indonesia and Pakistan, led by Dr Chunlai Chen of the Australian National University, endeavours to understand the nature and drivers of rural transformation, to provide better policy advice that will underpin the success of transformation. In 2019–20, the project will review literature, collect data and conduct interviews and workshops to explain and describe rural transformation, and form the basis for future research.[2]

Livestock Systems

China and Mongolia have more than 520 million hectares of inter-connected grasslands that support the livelihoods of more than five million low-income pastoral households. The grasslands also support various ecosystem services, from improving air and water quality to providing a carbon sink. A project, led by Dr Colin Brown of the University of Queensland, has sought to address concerns over the condition of these grasslands and the livelihoods of herders in China and Mongolia. The project identified incentives driving the grassland grazing systems, and, in its final year, it will design incentive-based policies to improve grassland management practices and pastoral livestock systems.[3]

In the central Tibet Autonomous Region, agriculture is concentrated in the river valleys, at altitudes between 3,500 and 3,900 metres and latitudes of 29 degrees north. Winters are so cold that plant production is limited to between April and September. A project, led by Dr Dianne Mayberry of CSIRO Agriculture and Food, aims to improve the livelihoods of smallholder livestock farmers in the cropping and agropastoral areas of the 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.[4]

Current and proposed projects

1. Policy and institutional reforms to improve horticultural markets in Pakistan [China, Pakistan] (ADP/2014/043)
2. Understanding the drivers of successful and inclusive rural regional transformation: sharing experiences and policy advice in Bangladesh, China, Indonesia and Pakistan (ADP/2017/024)
3. Strengthening incentives for improved grassland management in China and Mongolia (ADP/2012/107)
4. Developing profitable dairy and sheep meat production systems in the central Tibet Autonomous Region, China (LPS/2014/036)

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See page 200 for contact details

Indonesia

Budgeted funding

A$15.8
million

ACIAR-supported projects

33

Multilateral & co-investment programs

3

While Indonesia has experienced steady economic growth in recent years and achieved substantial development progress, development across the country is uneven—poverty rates are seven times higher in Papua than in Java—and inequality remains a pressing challenge for the government. More than 72 million people in Indonesia continue to live under the World Bank $3.20 per day poverty line. This context makes our work in Indonesia all the more important because sustainable and inclusive economic growth in Indonesia benefits Australia and contributes to regional growth and stability … Australia works in an economic partnership with Indonesia, supporting Indonesia's efforts to tackle inequality and maintain social stability, promote tolerance and pluralism, and counter violent extremism.

Overview of Australia's aid program in Indonesia (DFAT 2019)

Indonesia is an enormously diverse country on Australia's doorstep. With more than 10,000 islands and 265 million people, it is one of the fastest growing economies in the Indo-Pacific region.

Indonesia is predicted to become the world's seventh largest economy by 2030, by which time, the purchasing middle class will be triple the 2015 levels, to 145 million. Despite these gains, the benefits have not been shared evenly throughout the country, and unequal development and regions of high poverty levels remain a major challenge and priority for the Indonesian Government.

With a highly diverse landscape and almost 60 million hectares of agricultural land, as well as extensive offshore and inshore fisheries resources, Indonesia's agriculture sector has long been the backbone of the country's economy. As the sector employs about one-third of the workforce, it is a vital source of income for households.

Despite this macro-level achievement, the agriculture sector in Indonesia is yet to achieve its full potential. Smallholder farmers, who dominate the sector, do not have sufficient access to finance, knowledge and the incentives to drive a wholesale shift towards more-commercial systems.

In March 2019, Indonesia and Australia concluded a Comprehensive Economic Partnership Agreement aimed at deepening economic and security cooperation. The agreement re-affirmed the importance of economic cooperation between the two countries and committed to expanded skills exchange. ACIAR supports the intent of the agreement by facilitating collaboration with Indonesia's vibrant research and innovation sector in three ministries—Agriculture, Marine Affairs and Fisheries, and Forestry and Environment.

Country priorities

The Indonesian Government continues to focus its research and development efforts in the agriculture sector on:

- improving the productivity and marketing of rice, soybeans, corn, sugar, beef, chilli and shallots
- expanding the total land area of farming
- revitalising and improving agriculture infrastructure
- boosting the use of mechanised agricultural technology.

In the marine and fisheries sector, the Indonesian Government has prioritised efforts towards:

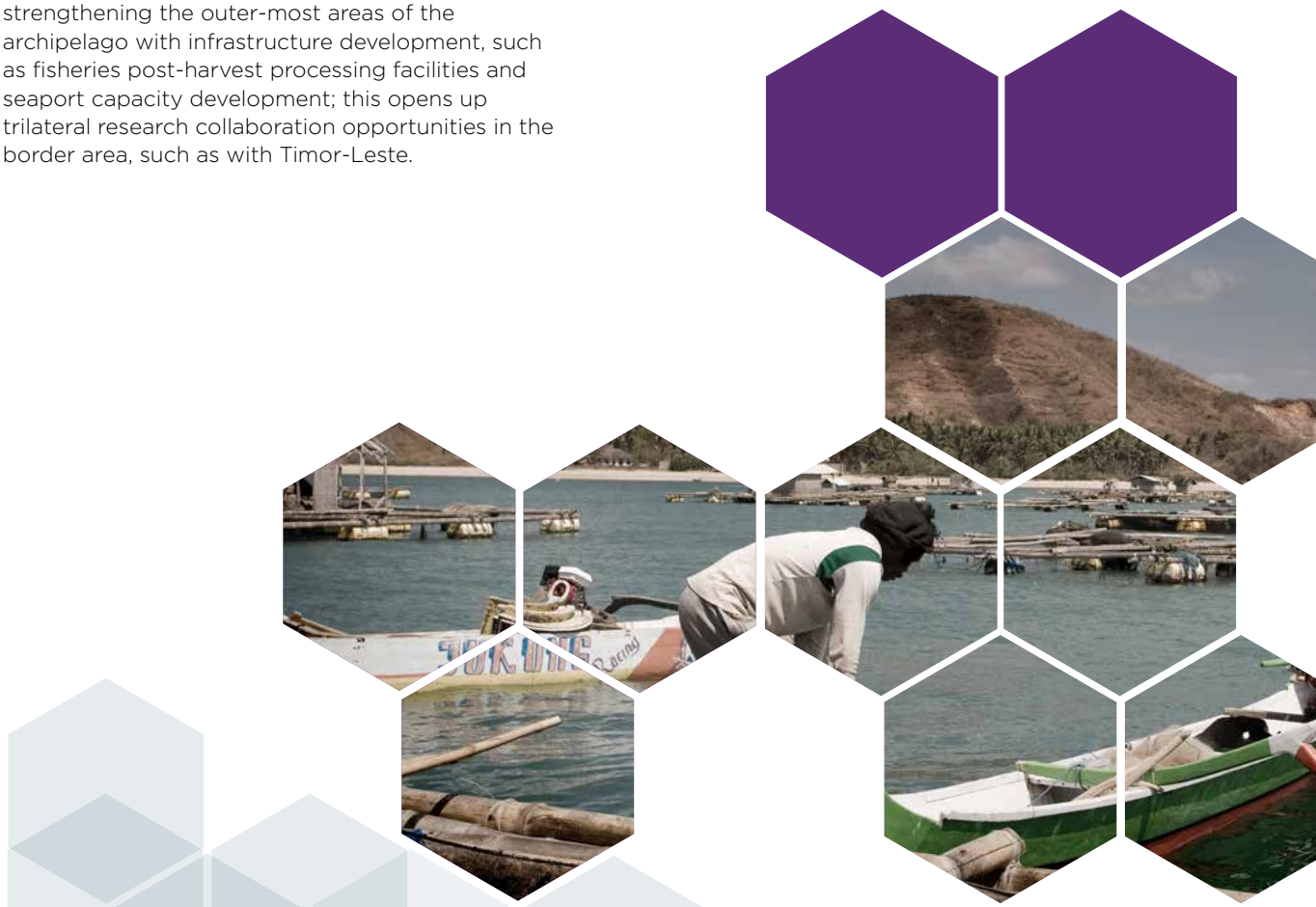
- improving sustainable management of marine and fisheries resources
- strengthening the outer-most areas of the archipelago with infrastructure development, such as fisheries post-harvest processing facilities and seaport capacity development; this opens up trilateral research collaboration opportunities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

In the forestry sector, the highest priorities are:

- 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 to rehabilitate two million hectares of peatland degraded by drainage and fire.

ACIAR programs in Indonesia are spread across 19 of 34 provinces, working with less-developed communities in areas such as East and West Nusa Tenggara, South Sumatra, Central Sulawesi, and East, Central and South Kalimantan.

With the recent conclusion of the Indonesia–Australia Comprehensive Economic Partnership Agreement, ACIAR continues to explore the opportunity for synergies with Australia's whole-of-government approach to aid, in particular with DFAT and the Australian Government Department of Agriculture and Water Resources.



2019–20 research program

ACIAR supports 33 projects in Indonesia, 16 of which are specific to this country, and the remainder are part of regional projects. The projects address our high-level objectives, as outlined in the 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and partner organisations.

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

Agribusiness

The Agribusiness Program strives to better understand value chains and market opportunities to improve livelihoods, and increase economic benefits of farmers and communities, and to increase economic development in South-East Asia. The portfolio of agribusiness projects in Indonesia has a strong focus on value-chain linkages with regional neighbours.

Recent studies conclude that agricultural policies and decentralised administrative systems are contributing to a permanent decline in productivity in Indonesia's upland catchments. A project, led by Professor Randy Stringer of the University of Adelaide, aims to provide alternative policy pathways to improve the environmental and long-term performance of agriculture in these catchments. In 2019–20, the project will evaluate existing policies, establish the connection between existing policies, farm-level decisions and off-farm impacts, and evaluate the economic, social and environmental impacts of a participatory research activity within a coffee-producing catchment.[1]

As development proceeds throughout the Indo-Pacific region, countries will undergo rural transformation. A new project in China, Bangladesh, Indonesia and Pakistan, led by Dr Chunlai Chen of the Australian National University, endeavours to understand the nature and drivers of rural transformation, to provide better policy advice that will underpin the success of transformation. In 2019–20, the project will review literature, collect data and conduct interviews and workshops to explain and describe rural transformation, and form the basis for future research.[2]

A project, led by Dr Jeff Neilson of the University of Sydney, is exploring market development for coffee and cocoa with Indonesian and global coffee and cocoa certification companies. The project will be completed in 2019–20, and will describe the impacts of certification schemes, buyer linkages, geographical indicators and downstream processing on smallholder livelihoods and environmental sustainability.[3]

Cassava is an increasingly important crop in terms of both rural livelihoods and regional economic development, and it remains an important food-security crop in specific subregions. The market outlook for cassava, and the prospects for smallholder producers are strongly linked to supply and demand in global starch, grain and energy markets. A project in Indonesia and Vietnam, led by Dr Dominic Smith of the University of Queensland, aims to make smallholder cassava production more profitable and sustainable, by linking value-chain actors to increase the adoption of improved technologies. In its final year, the project will develop policy recommendations and support learning alliances through better agribusiness arrangements.[4]

Indonesia currently supplies only 20% of its domestic milk needs from local sources—almost all the milk produced in Java is produced by smallholder producers who have only three or four dairy cows. A project, led by Dr Wendy Umberger of the University of Adelaide, aims to increase production, efficiency and household income of smallholder dairy farmers in Java and other provinces. In its final year, the project will encourage development, policy dialogue and industry advocacy to improve research capacity of lead agencies. The project will also identify profitable management practices, and business and extension models to develop strategies to increase on-farm profitability.[5]

Smallholder farmers in South-East Asia often cannot access credit to invest in new crops or technologies, deal with risks and shocks, and safely carry wealth from harvest to planting. To help smallholders reach their production potential, a project, led by Dr Alan de Brauw of the International Food Policy Research Institute, will review and research financing models for agricultural value chains, and evaluate specific interventions in Indonesia, Myanmar and Vietnam. In 2019–20, a rigorous impact evaluation of agricultural value-chain financing models will be designed, for implementation by project partners.[6]

A small research activity, led by Dr Chris Chilcott of CSIRO Land and Water, will evaluate opportunities to reduce logistics costs to small-scale farmers, and contribute to more informed policy on infrastructure that promotes development and access to markets in Indonesia and Vietnam. The project will further develop an adapted logistics model to better understand links, stakeholders and requirements to operate the model in the two countries.[7]

Also focused on Indonesia and Vietnam, another small research activity, led by Dr Wendy Umberger of the University of Adelaide, will review, update and develop innovative new content, learning resources and delivery models for the *Making value chains work better for the poor* toolkit and the ACIAR *Agribusiness Masterclass*. The activity aims to develop innovative agribusiness research learning resources and delivery models for the Asia–Pacific region, which mainstream contemporary gender equity, social inclusion and women's economic empowerment principles and approaches.[8]

Fisheries

The Fisheries 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.

To grow wild-caught lobster juveniles to legal harvest size, a project, led by Dr Clive Jones of James Cook University, planned to investigate the final components of commercially relevant production technology, including improved and defined formulated diets for lobster nurseries. But due to a policy change in 2018 that banned the harvest of wild-caught juveniles, the project reduced its focus on rearing protocols for lobsters weighing more than 200 grams, and removed all engagement with industry and communities.[9]

Indonesia is the world's second largest producer of seaweed, and the industry is one of the few income-generating opportunities for coastal communities in eastern Indonesia. A project, led by Associate Professor Nicholas Paul of the University of the Sunshine Coast, aims to provide a scientific basis to transform and modernise the seaweed industry with a whole-of-value-chain approach. In its final year, research to improve the quality of seaweeds produced at the farm level will be consolidated, and opportunities to create innovative products from seaweeds and processing waste streams will be identified and developed.[10]

Indonesia is the world's largest producer of tuna, and its fishing fleet is large and diverse—spanning the eastern Indian Ocean and the western and central Pacific Ocean. A project, led by Dr Campbell Davies of CSIRO Oceans and Atmosphere, is working with Indonesian fisheries scientists, industry and managers to better understand tuna population biology and the effectiveness of monitoring and management systems. The project contributes to the longer-term goal of improving the economic and social benefits of Indonesian tuna fisheries, while reducing the conservation risks to regionally important fish stock.[11]

Fisheries scientists from Indonesia will collaborate with scientists from Cambodia to support the development of finfish mariculture in Cambodia. Led by Associate Professor Nicholas Paul and Dr Mike Rimmer of the University of the Sunshine Coast, the project is finding ways to speed up the development of finfish mariculture in Cambodia, by using established research and development capability in Indonesia to train Cambodian researchers to develop their marine finfish aquaculture industry. The use of south–south collaboration as a capacity-building approach will be assessed, and a framework proposed for application in future ACIAR projects.[12]

Another project, led by Professor Janelle Allison of the University of Tasmania, complements the finfish mariculture development project by facilitating and documenting teaching approaches and structures for innovative and effective south–south collaboration that are applicable to agricultural research and development in the Indo-Pacific region.[13]

A new project in 2019–20 aims to identify the livelihood and nutrition benefits of fisheries in the Nusa Tenggara Timur province of Indonesia and Timor-Leste. It will test approaches to nutrition-sensitive co-management systems for inshore fisheries, and look at ways to promote nutrition-sensitive fisheries management policy in each country context. The project, led by Dr David Mills of the WorldFish Center, will determine the importance of fish for the livelihoods of women and men, by focusing on two fishery case studies—fish-aggregating device fishing and intertidal gleaning. By evaluating the nutritional value of fisheries to households, and working to identify the factors enabling or limiting the consumption of fish, the project will 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 household.[14]

As floodplains are developed for irrigation, and river flows are regulated across South-East Asia, river communities are at risk of losing fishing income and an important source of protein and essential nutrients. Previous ACIAR projects have shown that fishways, which facilitate passage of fish up and down regulated rivers, can have lasting economic and social benefits for river communities. A new project, led by Dr Lee Baumgartner of Charles Sturt University, will develop: a platform for sound decision-making on fish passage construction programs across South-East Asia; a targeted capacity-building program to address long-term institutional needs in the field of fish passage; and guidelines for the development of fish passage policy and legislation in Cambodia, Laos and Indonesia.[15]

Forestry

ACIAR forestry projects in Indonesia support programs to improve and sustain values from forest plantations, agroforestry systems and natural forests, including through better smallholder plantation management and investment decisions.

The high value of sandalwood on the international market has led to the decline of many natural sources of sandalwood around the world. This presents an opportunity for smallholders in sandalwood-producing countries of the Asia–Pacific region to capitalise on recognised future supply shortages, by planting local species. Led by Dr Tony Page of the University of the Sunshine Coast, a short research activity will leverage existing research investments by ACIAR in sandalwood to improve capacity, scientific outputs and impacts among project partners. This will be achieved through a regional workshop and field tours, and publication of technical information.[16]

A project, led by Dr Digby Race of the University of the Sunshine Coast, is helping to develop 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.[17]

Diversification of market-based integrated agroforestry systems is being investigated in Gunungkidul, Sumbawa, Central Lombok and South-Central Timor regencies. The project, led by Mr Aulia Perdana of the World Agroforestry Centre, will improve the production and marketing of timber and non-timber forest products, and foster better extension and policy approaches. The project is also conducting new research in support of Indonesia's Thousand Bamboo Villages initiative on the island of Flores.[18]

A multidisciplinary program of research, led by Dr Daniel Mendham of CSIRO Land and Water, is underway to support 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 enabling 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.[19]

Dairy farmer in Indonesia. ACIAR project: Improving milk supply, competitiveness and livelihoods in smallholder dairy chains in Indonesia (AGB/2012/099)

Regional collaboration in South-East Asia is urgently needed to reduce the risk of pest and disease incursion, and the impacts of established pests and diseases. A new project in 2019–20, with activities based in Indonesia, Vietnam and Laos, aims to implement best-practice forest biosecurity and pest management for sustainable productivity. With government and industry partners, the project led by Dr Caroline Mohammed of the University of Tasmania, will establish pilot forest surveillance networks, co-develop essential pest risk analyses and biosecurity plans, continue taxa screening and tree breeding that started in previous research projects for pest and disease tolerance and resistance, and examine silvicultural practices to reduce pest and disease spread and impact.[20]

Horticulture

The Horticulture Program supports the development of environmentally and socially sustainable integrated production systems, to improve the market competitiveness of horticultural industries. In 2019–20, research projects in Indonesia will focus on regional management of significant risks to horticultural crops.

About 40 species of tropical fruit flies damage horticultural crops, and impede trade throughout South-East Asia. A new project in Indonesia and the Philippines builds on the success of previous ACIAR projects, and links to fruit fly work in other ACIAR partner countries and Australia. The project, led by Mr Stefano De Faveri of the Queensland Department of Agriculture and Fisheries, aims to reduce fruit fly infestation of mango crops through area-wide management of the pest, and to improve pre-harvest and post-harvest practices. The ultimate aim is to improve yield and quality of crops, to improve livelihoods and trade opportunities.[21]

Fusarium wilt (tropical race 4) of bananas, also known as Panama disease, has become widespread throughout South-East Asia. The disease is threatening smallholder banana production in countries including Indonesia, the Philippines and more recently Laos. A new project aims to develop an integrated management response to the spread of the disease. Led by Dr Anthony Pattison of the Queensland Department of Agriculture and Fisheries, the project will investigate the effects on banana production of altering the banana microbiome to suppress disease and increase plant resistance to *Fusarium* wilt.[22]

Livestock Systems

A project focused on integrating herbaceous tropical legumes into grain cropping systems in East Nusa Tenggara province will conclude in 2019–20. Led by Dr Lindsay Bell of CSIRO Agriculture and Food, the research team examined the benefits of legume-based cropping systems, both for subsequent crops and associated livestock. With experimental activities complete and best-bet management guidelines developed, extension materials will be distributed, and training and demonstrations will take place.[23]

The development of simple, low-cost feed rations for cow–calf and cattle-fattening operations is the aim of a project, led by Dr Karen Harper of the University of Queensland, that will markedly increase the profitability of smallholder and small-scale feedlot systems in Indonesia. It is envisaged that supplementary feeds will complement local feed resources, and be based on a small number of low-cost, locally-available ingredients.[24]

Two projects are part of the IndoBeef Program, which aims to significantly improve beef supply and the livelihoods of smallholders and other beef value-chain participants. Rapid income growth, population growth and urbanisation have increased the demand for beef in Indonesia, but domestic production of beef cattle has not increased enough to match this demand. The CropCow[25] and PalmCow[26] projects are working to increase cattle production in rice-based systems and oil palm enterprises, respectively.

Dr Mario Herrero of CSIRO Agriculture and Food will lead a small research activity in 2019–20 that will assess the likely competitiveness, resilience, and adaptability of smallholder livestock production systems into the future. The objectives will be to identify development pathways and review findings with key stakeholders, so that these production systems remain an engine of agricultural and human development in the region.[27]

Substantial gains have been made towards eliminating two major parasites (*Plasmodium* spp.) that cause malaria in humans in South-East Asia. But, at the same time, there are increasing cases of malaria in humans, due to the transmission of a *Plasmodium* sp. parasite from macaques by certain species of mosquitoes. As part of the Research for One Health Systems Strengthening program (page 81), a small research activity, led by Professor Nicholas Anstey of the Menzies School of Health Research, aims to establish surveillance for zoonotic *Plasmodium* species of public health importance in Kalimantan and Sumatra, Indonesia.[28] This will lead into a research project in early 2020, evaluating zoonotic malaria transmission and agricultural land use in Indonesia.[29]

Social Sciences

Landcare is a grassroots community-led approach to sustainable land management. Dr Mary Johnson of RMIT University will study Landcare in five countries in the Indo-Pacific region, and analyse how sustainable agricultural land management mobilised through Landcare has contributed to development outcomes, including the ACIAR high-level objectives. The findings of the study will produce an evidence base for ACIAR to assess the role of Landcare for future agricultural research-for-development, and more broadly as an extension model in sustainable agriculture and natural resource management.[30]

Soil and Land Management

Coastal and upland agricultural systems support the livelihoods of the majority of rural people in Indonesia. These systems vary in intensity, from predominantly low-value rice production to highly intensive mixed rotations that particularly include shallot and chilli. Shallot and chilli are Indonesia's most significant vegetable commodities and are integral components of Indonesia's unique cuisine. A new project, led by Dr Stephen Harper of the University of Queensland, addresses key issues and challenges associated with the safe and sustainable production and intensification of high-value vegetable cropping options (particularly shallot and chilli) in the sensitive coastal agroecosystems. Some of the issues and challenges in these production systems are pepper yellow leaf curl virus, excessive fertiliser application, soil fertility decline, key soil pathogens, and the prevalence of virus and fungal pathogens due to clonal (seed-bulb) propagation of allium crops (shallot and garlic).[31]

Global Program

The Global Program manages several programs in the East and South-East Asia region addressing multidisciplinary challenges and/or opportunities, in partnership with international agricultural research-for-development agencies. The work of the Global Program is described in Chapter 2.

Global Program projects operational in Indonesia during 2019–20 are:

- Reinvigorating the Coconut Genetic Resources Network (COGENT)[32]
- Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific—Agricultural Science and Technology Indicators (ASTI) program.[33]

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See page 200 for contact details

Field of shallots, Indonesia

Current and proposed projects

1. Agricultural policy research to support natural resource management in Indonesia's upland landscapes (ADP/2015/043)
2. Understanding the drivers of successful and inclusive rural regional transformation: sharing experiences and policy advice in Bangladesh, China, Indonesia and Pakistan (ADP/2017/024)
3. Evaluating smallholder livelihoods and sustainability in Indonesian coffee and cocoa value chains (AGB/2010/099)
4. Developing value-chain linkages to enhance the adoption of profitable and sustainable cassava production systems in Vietnam and Indonesia (AGB/2012/078)
5. Improving milk supply, competitiveness and livelihoods in smallholder dairy chains in Indonesia (AGB/2012/099)
6. Inclusive agriculture value-chain financing [Indonesia, Myanmar, Vietnam] (AGB/2016/163)
7. Enhancing smallholder linkages to markets by optimising transport and logistics infrastructure [Indonesia, Vietnam] (AGB/2017/0360
8. Revision and update of *Making value chains work better for the poor* toolkit and the ACIAR *Agribusiness Masterclass* [Indonesia, Vietnam] [Indonesia, Vietnam] (AGB/2018/121)
9. Expanding spiny lobster aquaculture in Indonesia (FIS/2014/059)
10. Improving seaweed production and processing opportunities in Indonesia (FIS/2015/038)
11. Harvest strategies for Indonesian tropical tuna fisheries to increase sustainable benefits (FIS/2016/116)
12. Accelerating the development of finfish mariculture in Cambodia through south–south research cooperation with Indonesia (FIS/2016/130)
13. Evaluating processes and outcomes in south–south research collaboration: finfish mariculture development in Cambodia through cooperation with Indonesia (FIS/2018/115)
14. A nutrition-sensitive approach to coastal fisheries management and development in Timor-Leste and Nusa Tenggara Timur Province, Indonesia (FIS/2017/032)
15. Translating fish passage research outcomes into policy and legislation across South-East Asia [Cambodia, Indonesia, Laos] (FIS/2018/153)
16. Building research capacity among ACIAR's sandalwood-focused projects through a regional sandalwood workshop and publication [Indonesia, Vanuatu, Fiji, PNG, Timor-Leste, Australia] (FST/2016/024)
17. Enhancing community-based commercial forestry in Indonesia (FST/2015/040)
18. Developing and promoting market-based agroforestry options and integrated landscape management for smallholder forestry in Indonesia (Kanoppi 2) (FST/2016/141)
19. Improving community fire management and peatland restoration in Indonesia (FST/2016/144)
20. Reducing forest biosecurity threats in South-East Asia [Indonesia, Laos, Vietnam] (FST/2018/179)
21. Development of area-wide management approaches for fruit flies in mango for Indonesia, the Philippines, Australia and the Asia–Pacific region (HORT/2015/042)
22. An integrated management response to the spread of *Fusarium* wilt of banana in South-East Asia [Indonesia, Laos, the Philippines] (HORT/2018/192)
23. Integrating herbaceous forage legumes into crop and livestock systems in East Nusa Tenggara, Indonesia (LPS/2012/064)
24. Profitable feeding strategies for smallholder cattle in Indonesia (LPS/2013/021)
25. Improving smallholder beef value chains in rainfed cropping systems in Indonesia (LS/2015/047)
26. Improving smallholder beef supply and livelihoods through cattle–palm system integration in Indonesia (LS/2015/048)
27. Smallholder livestock futures in South-East Asia [Indonesia] (LS/2018/107)
28. Zoonotic malaria in Indonesia (One Health) (LS/2018/214)
29. Evaluating zoonotic malaria transmission and agricultural land use in Indonesia (One Health) (LS/2019/116)
30. The potential of International Landcare [Fiji, Indonesia, the Philippines, South Africa, Sri Lanka, Uganda] (ASEM/2018/117)
31. Crop health and nutrient management of shallot–chilli–rice cropping systems in coastal Indonesia (SLAM/2018/145)
32. Reinvigorating the Coconut Genetic Resources Network (COGENT) [Fiji, Indonesia, Papua New Guinea, Samoa] (GP/2018/193)
33. Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific—Agricultural Science and Technology Indicators (ASTI) program [Cambodia, Indonesia, Malaysia, Myanmar, Papua New Guinea, the Philippines, Thailand, Vietnam, Laos, Timor-Leste] (GP/2016/093)

Laos

Budgeted funding

A$4.5
million

ACIAR-supported projects

31

Multilateral & co-investment programs

2

Australia has a strong interest in ensuring Laos continues to develop as a stable neighbour that is increasingly well positioned to contribute to regional security and prosperity. Our aid to Laos aims to build prosperity and reduce poverty, while helping Laos to take advantage of economic integration with the region. A growing economy and improved business environment will foster opportunities for economic partnership in the future.

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

Even though 2018 represented the fifth year of easing in GDP growth rates, economic expansion in Laos remains strong.

Despite the steady decline in mining output and a weaker tourism sector, Laos oversaw a continuing expansion in power generation, manufacturing and the agriculture sector. Foreign direct investment rose by almost 70% in 2017, after contracting by 13% in 2016. China accounts for almost 80% of foreign investment inflows, followed by Thailand.

Exports continued to grow, driven by higher world commodity prices, upbeat regional demand, and some changes in the country's export structure. Along with increases in power and mining exports, manufactured goods climbed to 17% of total exports, while agriculture exports (the sector that engages two-thirds of the labour force) increased from 7% to 15%. According to World Bank, all these developments suggest signs of growing economic diversification.

Growth in agricultural exports in recent years has been due to increased participation of small-scale farming households in the production of export-linked commodities. The top three export items (rubber, fruit and vegetables and coffee) accounted for 50% of total agriculture exports in 2017. Rice remains the biggest agricultural commodity in Laos, in terms of number of farmers involved in production, cropland area allocated and food consumption.

Lao rural women play a significant role in agriculture, doing most of the planting, weeding and harvesting of crops, as well as tending livestock and off-farm and household activities such as collecting firewood, preparing meals and caring for children.

Forestry is another area that has strong potential to bring about inclusive growth. To ensure sustainable expansion of the forestry sector, the Lao Government is seeking systems for certification, which are increasingly being required by high-end markets. Further developing production forests will provide opportunities for value-adding, through industries like wood processing.

Rural communities in Laos are heavily dependent on capture fisheries as a source of protein. These fishery resources are under threat from over-use, and the very large number of irrigation structures that block migration patterns.

The Lao Government's Agricultural Development Strategy 2025 and Vision 2030 aims to grow the revenue from agriculture, such that it accounts for 19% of overall GDP (Ministry of Agriculture and Forestry 2015). The sectoral priorities include 'ensuring food security, producing comparative and competitive agricultural commodities, developing clean, safe and sustainable agriculture and shifting gradually to the modernisation of a resilient and productive agriculture economy linking with rural development contributing to the national economic basis'. With this vision, the emphasis will be on: ensuring food security, safety and nutritional security; commercialising agricultural products with high-value addition; and the sustainable use and management of natural resources.

Australian support to Laos in 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 invested more than A$50 million on these research partnerships.

Country priorities

The ACIAR Program in Laos is being reviewed, and will be subject to a discussion with the Lao PDR Government, as a new set of strategic priorities are defined in the coming year. In the meantime, the current strategic priority outcomes guiding ongoing research initiatives are:

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

2019–20 research program

ACIAR supports 31 projects in Laos, 10 of which are specific to this country, and the remainder are part of regional projects. The projects address our high-level objectives, as outlined in the 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and partner organisations.

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

Agribusiness

A new project in Cambodia, Laos, Myanmar and Vietnam aims to improve the resilience of cassava production systems and value chains by addressing rapidly evolving disease constraints, cassava witches broom disease and Sri Lanka cassava mosaic virus. The project, led by Dr Jonathan Newby of the International Center for Tropical Agriculture, will develop technically viable and economically and socially sustainable solutions, test and evaluate methods for scaling solutions, strengthen capacity and regional networks to address new pest and disease incursions, and investigate opportunities for public–private funding models to support a resilient cassava industry.[1]

Crops

Drill seeding of rice is being adopted quickly in southern Laos for labour savings, earlier crop establishment and some drought adaptation. Building on the success of past ACIAR projects, a small research activity in Savannakhet Province will engage with 15–20 villages in five districts, to analyse the rapid adoption of direct seeding of rice. This will help better understand the constraints and drivers of adoption, and identify the most effective business models. The project, led by Dr John Hornbuckle and Dr Leigh Vial of Deakin University, will provide information to district, provincial and national governments, as well as policy recommendations developed with the Government of Lao PDR, in line with its 'clean agriculture' focus.[2]

Fisheries

Rice and fish are two of the most essential components for sustaining life in the Lower Mekong Basin. Fish from the Mekong River system is the main source of animal protein for Lao people. Thousands of low-level irrigation barriers have been installed in the Lower Mekong Basin to regulate 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.

The success of fish ladders for upstream fish passage, based on designs used in the Murray–Darling Basin in Australia, has been demonstrated for use in the Mekong system. This project has led to significant investment by the World Bank and Asia Development Bank to build permanent fish ladders, which have helped fish recolonise wetland habitat. In its final stages, the project, led by Dr Craig Boys of the New South Wales Department of Primary Industries, will produce regulator design and operation guidelines for fish ladders in both Lao and English languages.[3]

A related project, led by Dr Lee Baumgartner of Charles Sturt University, focuses on downstream fish migration, by developing regulator designs for fish-friendly downstream passage. These new designs improve fish survival and allow fish to pass back to the main river systems without injury.[4]

A complex fishway system was devised at the Xayaburi Dam in Laos to enable upstream migration of more than 100 species of fish, which vary in size from a few centimetres to more than one metre. In a two-stage process, a project team, led by Dr Lee Baumgartner of Charles Sturt University, will implement a research program in conjunction with Xayaburi Power Company Limited. This will contribute significantly to the body of knowledge required to mitigate the impacts of large dams in the Lower Mekong Basin. The first step is to refine and develop robust research methods that can be applied at the dam site.[5] This will be followed by a three-year program, starting in 2019, to develop robust techniques to assess performance and effectiveness of the Xayaburi Dam fish passage facilities, and provide a standard for fishways in the Mekong catchment.[6]

Previous ACIAR projects have shown that fishways, which facilitate passage of fish up and down regulated rivers, can have lasting economic and social benefits for river communities. A new project, led by Dr Lee Baumgartner of Charles Sturt University, will develop: a platform for sound decision-making on fish passage construction programs across South-East Asia; a targeted capacity-building program to address long-term institutional needs in the field of fish passage; and guidelines for developing fish passage policy and legislation in Cambodia, Laos and Indonesia.[7]

Forestry

The Government of Lao PDR has a target forest coverage of 70% by 2020, to safeguard the country's water resources and enhance rural livelihoods. To this end, the Government encourages the planting of high-value trees such as teak and eucalypts.

The impacts of Australian-origin insects on eucalypt plantations is a rapidly increasing problem, globally. In the Mekong region there is a collaborative effort of scientists and forest managers to control and manage these pests. A research project, led by Dr Simon Lawson of the University of the Sunshine Coast, aims to develop appropriate biological controls for gall wasp by importing and testing natural enemies of the pest from Australia. The project concludes in 2019–20 with follow-up release and monitoring of biological control agents.[8]

Lao wood manufacturing industries are in their infancy, and have not adopted new processing technologies widely used in Vietnam and China. Research, led by Associate Professor Barbara Ozarska of the University of Melbourne, will 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 will support business cases for investment in new processing facilities. 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.[9]

Regional collaboration in South-East Asia is urgently needed to reduce the risk of pest and disease incursion, and the impacts of established pests and diseases. A new project in 2019–20, with activities based in Indonesia, Vietnam and Laos, aims to implement best-practice forest biosecurity and pest management for sustainable productivity. With government and industry partners, the project led by Dr Caroline Mohammed of the University of Tasmania, will establish pilot forest surveillance networks, co-develop essential pest risk analyses and biosecurity plans, continue taxa screening and tree-breeding that started in previous research projects for pest and disease tolerance and resistance, and examine silvicultural practices to reduce pest and disease spread and impact.[10]

Landscape-scale adoption of agroforestry systems has the potential to diversify rural livelihoods, increase forest cover, and reduce shifting agriculture and environmental degradation. A new project in 2019, led by Dr Mark Dieters of the University of Queensland, aims to increase adoption of agroforestry systems, and evaluate their impacts on smallholder farmers in Laos. This project will provide evidence to support the adoption of agroforestry systems in the three agroecological areas of Laos of:

- northern Laos, on sites 300–800 m, where teak can be grown successfully
- northern Laos, on sites above 800 m, where there is strong demand for fodder and are favoured for coffee production
- central and southern Laos, in collaboration with forestry companies and out-grower schemes.[11]

Wood processing workshop, National University of Laos. ACIAR project: Advancing enhanced wood manufacturing industries in Laos and Australia (FST/2016/151)

Horticulture

Fusarium wilt (tropical race 4) of bananas, also known as Panama disease, has become widespread throughout South-East Asia. The disease is threatening smallholder banana production in countries including Indonesia, the Philippines and more recently Laos. A new project aims to develop an integrated management response to the spread of the disease. Led by Dr Anthony Pattison of the Queensland Department of Agriculture and Fisheries, the research will investigate the effects on banana production of altering the banana microbiome to suppress disease and increase plant resistance to *Fusarium* wilt.[12]

Livestock Systems

Diseases of livestock severely reduce village incomes in Laos, and farmers often lack the tools and support to manage livestock diseases. Control of rapidly spreading diseases is important, especially given the position of Laos as a major livestock transit route within the Mekong region. Assessing biosecurity hazards and practices to reduce risk in livestock market chains, so that livestock trading can be sustainably expanded in Laos and beyond is an important focus of the Livestock Systems Program.

The development and delivery of livestock health, biosecurity and productivity interventions at the village level has been the focus of a project, led by Dr Russell Bush of the University of Sydney, since 2015. The project aims to improve smallholder livelihoods through better disease risk management and increased public awareness of biosecurity, with the view of establishing foot and mouth disease-free zones. In its final year, the project will conduct a final survey of farmers, village veterinary workers and extension staff to assess intervention impacts.[13]

This project complements another that has run for the same period, which aims to assist the development of a biosecure, market-driven beef production system in Laos. Also led by Dr Russell Bush of the University of Sydney, the second project focuses on increasing the supply of disease-free beef, by gaining market access for a quality product. In its final year, the project will deliver training materials, report on intervention impacts, monitor and evaluate 'clean market chain' interventions and deliver breeding improvement practices.[14]

Laos is a comparatively smaller producer of pork compared with Vietnam and China, but pork production has grown significantly in recent years, including a growing cross-border trade into Vietnam. Improved safety of animal source foods, including pork that is free from zoonotic parasites such as *Taenia solium*, is gaining greater attention in the region. A new project, led by Dr Amanda Ash of Murdoch University, aims to identify and recommend interventions to mitigate the risk of disease from foodborne parasites in pigs, adding value to cross-border pig trade between northern Laos and Vietnam.[15]

Dr Ash is also leading a small research activity to evaluate the impact of a previous ACIAR project in this area that concluded in 2015, demonstrating effective control of *Taenia solium* through a two-pronged intervention in humans and pigs. The study will focus on both the biological results (level of the parasite) and the socioeconomic results (pig production, village infrastructure).[16]

Similarly, goat production in Laos has more than doubled over the past 10 years, largely driven by high demand for goat meat from Vietnam. A project, led by Dr Stephen Walkden-Brown of the University of New England, 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.[17]

The potential of forage production by smallholder farmers is the focus of a new short research activity. Professor Rob Cramb of the University of Queensland will conduct a stocktake in Cambodia, Laos and Vietnam to analyse factors that contribute to, and constrain, forage development. If a clear demand for further forage development is shown, analysis of constraints and opportunities for more effective uptake and use of forages, and identification of potential business models for more demand-driven development, will be done. Critical issues that can be addressed through research will be identified and used to guide future investment by ACIAR.[18]

'Point-of-care' diagnostics can improve the traditional methods of animal health surveillance, especially in remote areas, where storing and transporting cold chain samples collected in the field to the nearest capable laboratory is challenging. Dr John Allen of CSIRO Australian Animal Health Laboratory will undertake a scoping study to: provide direction to government animal health agencies on best-practice usage of point-of-care tests; provide guidance for private sector test manufacturers; and facilitate public–private partnerships to bring new tests to the market that are 'fit for their intended purpose'.[19]

Many health security threats, including threats arising from interactions between humans and animals, have arisen in remote areas of South-East Asia. These areas are home to many minority language groups. Professor Richard Osborne of Swinburne University of Technology will develop and test health literacy processes and tools to engage small communities in Cambodia and Laos around 'live and connected health knowledge'. The project, which is part of the Research for One Health Systems Strengthening program (page 81), will help researchers identify available knowledge resources, and link this to the management of health risks via regular conversations, routines, activities and relationships.[20]

Also part of the One Health program, a short research activity in Cambodia and Laos, led by Professor Barbara McPake of the Nossal Institute, will: gain a better understanding of the policy opportunities and challenges for human and animal disease promotion and surveillance; establish the extent of existing knowledge around policy development processes, socioeconomic factors and regulatory capacity of poultry production; host a stakeholder workshop to share results and experiences with decision-makers; and identify questions for future research.[21] This will lead into a research project in early 2020, to investigate veterinary economics to advance One Health in Mekong Countries (Cambodia, Laos and Vietnam).[22]

Social Sciences

The prevalence of food insecurity in Laos 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 in a project, led by Dr Paulo Santos of Monash University, to provide evidence to guide the scaling-up of interventions aimed at improving food security status of vulnerable households. In the final year of the project, pilot interventions to improve food security will be implemented and evaluated.[23]

Opportunities for vegetable production in Cambodia and Laos are expanding, including to participate in the ASEAN Economic Community. For producers to realise the full economic benefits available, they must comply with ASEAN Good Agricultural Practices standards. A project, led by Mr Jeremy Badgery-Parker of the University of Adelaide, aims to develop innovative production and supply chain systems that enable the vegetable industry to meet year-round consumer demand for vegetables in the two countries. The project concludes in 2019, with activities to foster communication and collaboration between government, non-government organisations and industry stakeholders.[24]

A review of the factors that influence smallholder farmers' decisions to adopt proven technologies and management systems to improve farm productivity is the focus of a project led by Dr Kim Alexander of James Cook University. 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.[25]

Another project, led by Dr Dominic Smith of the University of Queensland, focuses on the uptake of new technologies. This project is identifying ways to increase the adoption of profitable and sustainable technologies for cassava production, and is evaluating opportunities for production and marketing systems to improve smallholder livelihoods in Cambodia and Laos.[26]

Soil and Land Management

A four-year project, led by Dr Matthew Denton of the University of Adelaide, has investigated practices to increase the overall productivity of crop–livestock systems in rice growing areas of Cambodia and Laos. Innovations and technologies to improve forage and fodder production, as well as better management of water, nutrients and the soil, have been developed. The project will report on soil and water management practices to improve productivity and profitability, and on social and economic impacts of adoption of forages. Farmers will be provided with practical information and technologies from the research, and local scientists and extension officers are being trained to conduct ongoing research and promote outcomes.[27]

Increasing numbers of smallholder farmers in Laos and northern Vietnam are growing maize on sloping land to meet demand for livestock feeds by Chinese and South-East Asian poultry, pig and cattle industries. A project, led by Professor Michael Bell of the University of Queensland, is helping farmers adopt maize-based farming systems that supply livestock feed markets, reduce soil degradation and improve smallholder livelihoods and economic viability.[28]

A project, led by Dr Alice Melland of the University of Southern Queensland, aims to improve soil and irrigation water management to achieve sustainable increases in vegetable yields and household incomes in Cambodia and Laos. The research investigated the impact of soil ameliorants and timing of irrigation on soil water status and crop development. It will apply learnings to develop and improve supply-chain performance, support understanding and adoption of improved practices by smallholders and extend experimental findings to private input suppliers and regional extension officers.[29]

Water and Climate

Previous research in ACIAR-funded projects found substantial promise for groundwater development in Laos. But further work is needed to better understand how groundwater irrigation can support agricultural development in drought-prone southern Laos. A small research activity in 2019–20, led by Dr Paul Pavelic of the International Water Management Institute, will examine the three most promising aquifer systems in the lowlands of southern Laos, by conducting: surveys to establish groundwater development potential; a review of groundwater planning and development practices; and analysis of opportunities and constraints to applying small-scale solar powered pumped irrigation from groundwater.[30]

Global Program

The Global Program manages several programs in the East and South-East Asia region addressing multidisciplinary challenges and/or opportunities, in partnership with international agricultural research-for-development agencies. The work of the Global Program is described in Chapter 2.

The Global Program project operational in Laos during 2019–20 is Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific—Agricultural Science and Technology Indicators (ASTI) program.[31]

Current and proposed projects

1. Establishing sustainable solutions to cassava diseases in mainland South-East Asia [Cambodia, Laos, Myanmar, Vietnam] (AGB/2018/172)
2. Understanding drill seeding of rice techniques and business models [Laos] (CIM/2018/113)
3. Improving the design of irrigation infrastructure to increase fisheries production in floodplain wetlands of the Lower Mekong and Murray–Darling basins [Laos] (FIS/2012/100)
4. Quantifying biophysical and community impacts of improved fish passage in Laos and Myanmar (FIS/2014/041)
5. Assessing fisheries mitigation measures at Xayaburi Dam in Laos (FIS/2017/016)
6. Assessing fisheries mitigation measures at Xayaburi Dam in Laos (FIS/2017/017)
7. Translating fish passage research outcomes into policy and legislation across South-East Asia [Cambodia, Indonesia, Laos] (FIS/2018/153)
8. Biological control of galling insect pests of eucalypt plantations in the Mekong region [Cambodia, Thailand, Vietnam, Laos] (FST/2012/091)
9. Advancing enhanced wood manufacturing industries in Laos and Australia (FST/2016/151)
10. Reducing forest biosecurity threats in South-East Asia [Indonesia, Laos, Vietnam] (FST/2018/179)
11. Enhanced adoption of agroforestry systems in Laos (FST/2018/180)
12. An integrated management response to the spread of *Fusarium* wilt of banana in South-East Asia [Indonesia, Laos, the Philippines] (HORT/2018/192)
13. Enhancing transboundary livestock disease risk management in Laos (AH/2012/067)
14. Development of a market-driven biosecure beef production system in Laos (AH/2012/068)
15. Interventions to mitigate disease risk and add value to cross-border pig trade between Laos and Vietnam (LS/2014/055)
16. Impact assessment of *Taenia solium* control in Phongsali province, Laos, and development of future opportunities for the control of zoonotic parasitic infections (LS/2018/201)
17. Goat production systems and marketing in Laos and Vietnam (LS/2017/034)
18. Forages—taking stock and identifying research needs [Cambodia, Laos, Vietnam] (LS/2018/186)
19. Assessing the potential of point-of-care diagnostic tools for developing countries [Cambodia, Laos] (LS/2018/203)
20. Developing and testing processes and tools to generate connected and live health security knowledge in Mekong communities (One Health) (LS/2018/215)
21. Incentives for early declaration and effective prevention of avian influenza in the Mekong [Cambodia, Laos] (One Health) (LS/2018/216)
22. Veterinary economics in Mekong countries: advancing One Health [Cambodia, Laos, Vietnam] (LS/2019/118)
23. Improving food security in the northern uplands of Laos: identifying drivers and overcoming barriers (ASEM/2012/073)
24. Improving market engagement, post-harvest management and productivity of the Cambodian and Laos vegetable industries (ASEM/2012/081)
25. Smallholder farmer decision-making and technology adoption in southern Laos: opportunities and constraints (ASEM/2014/052)
26. Developing cassava production and marketing systems to enhance smallholder livelihoods in Cambodia and Laos (ASEM/2014/053)
27. Management practices for profitable crop–livestock systems for Cambodia and Laos (SMCN/2012/075)
28. Improving maize-based farming systems on sloping lands in Vietnam and Laos (SMCN/2014/049)
29. Integrated resource management for vegetable production in Laos and Cambodia (SMCN/2014/088)
30. Expanding opportunities to use groundwater for poverty alleviation and climate change adaption in Laos (WAC/2018/167)
31. Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific—Agricultural Science and Technology Indicators (ASTI) program [Cambodia, Indonesia, Malaysia, Myanmar, Papua New Guinea, the Philippines, Thailand, Vietnam, Laos, Timor-Leste] (GP/2016/093)

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See page 200 for contact details

Myanmar

Budgeted funding

A$4.9
million

ACIAR-supported projects

19

Multilateral & co-investment program

1

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, Myanmar, 2015–16 to 2019–20 (DFAT)

Agriculture is the leading employer in the economy of Myanmar, with about 60% of jobs being in this sector. Agriculture contributes 38% of GDP and 23% to export income. Its growth was stable at 1.2% in 2018–19.

Out of 67.6 million hectares of land in Myanmar, 12.8 million hectares are cultivated. Rice is the dominant commodity, accounting for 43% of production value, which is almost five times as high as the second highest value commodity (poultry). Crop production, which constitutes 69% of value-adding in the agriculture sector, grew at 0.1% during 2018–19 and is expected to grow at the same rate onwards. Paddy output is estimated to increase by 3% annually in coming years and its output growth has been supported by rising external demand for rice, especially from the European Union.

More than 80% of Myanmar's poor are in rural areas, and are mostly casual labourers and smallholder farmers. Most do 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. Migration has become a common coping strategy for family survival, and remittances have become a major off-farm source of income.

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.

Australia has a long-standing 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, which 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 agricultural development goals of the Government of Myanmar, and consistent with Australia's strategic objective on inclusive economic growth, a long-term country program strategy is expected to be finalised in 2019–20. At present, research priorities for the ACIAR program in Myanmar focus on:

- increasing net production of food and cash incomes of rural households in the Central Dry Zone and Ayeyarwady Delta, through improvements in, and adoption of, production and post-harvest 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 Government of Myanmar departments.

2019–20 research program

ACIAR supports 19 projects in Myanmar, 11 of which are specific to this country, and the remainder are part of regional projects. The projects address our high-level objectives, as outlined in the 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and partner organisations.

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

Agribusiness

Improving the agricultural value chain, and developing trade models is a means of improving the livelihoods of farmers across many industries. In Myanmar and Vietnam, a project, led by Dr Gordon Rogers of Applied Horticultural Research, aims to develop an understanding of vegetable markets and value chains, and identify opportunities for safe and off-season vegetable production for urban, wholesale and retail markets. In 2019–20, the project will recommend a suitable governance model for a sustainable and inclusive smallholder farmer group. A scalable model for production, marketing and supply of high-quality vegetables in Myanmar will be documented and published.[1]

Researcher in a rice crop at the Dar Central facility, Myanmar

Smallholder farmers in South-East Asia often cannot access credit to invest in new crops or technologies, deal with risks and shocks, and safely carry wealth from harvest to planting. To help smallholders reach their production potential, a project, led by Dr Alan de Brauw of the International Food Policy Research Institute, will review and research financing models for agricultural value chains, and evaluate specific interventions in Indonesia, Myanmar and Vietnam. In 2019–20, a rigorous impact evaluation of agricultural value-chain financing models will be designed, for implementation by project partners.[2]

A new project in Cambodia, Laos, Myanmar and Vietnam aims to improve the resilience of cassava production systems and value chains, by addressing rapidly evolving disease constraints, cassava witches broom disease and Sri Lanka cassava mosaic virus. The project, led by Dr Jonathan Newby of the International Center for Tropical Agriculture, will develop technically viable and economically and socially sustainable solutions, test and evaluate methods for scaling solutions, strengthen capacity and regional networks to address new pest and disease incursions, and investigate opportunities for public–private funding models to support a resilient cassava industry.[3]

Crops

Mungbean is an important food and cash crop of South and South-East Asia. Its short growing season, low input requirement and high global demand make mungbean an ideal rotation crop for smallholder farmers, particularly in rice-based farming systems. The establishment of the International Mungbean Improvement Network, through an ACIAR-supported project, led by Dr Ramakrishnan Nair of the World Vegetable Center, has helped realise the potential of mungbean to improve cropping system productivity and livelihoods. The centre continues to improve researchers' access to genetic material, and to coordinate and provide technical support to crop variety work in Bangladesh, India, Myanmar and Australia.[4] In 2019–20, the network will be extended, to Kenya, Tanzania and Uganda, providing access to new genetic material, and improving cropping opportunities for smallholders in Africa.[5]

A project led by Dr Ramakrishnan Nair of The World Vegetable Center, continues to trial combine harvesting management and methods with progressive mungbean growers and contractors in Pakistan, Bangladesh and Myanmar, and to establish community-based agri-enterprise for harvesting services to smallholder farmers. Throughout 2019, the project will explore how women can engage in, and benefit from, the business models identified for mechanised harvesting services.[6]

As rice systems intensify throughout Asia, new production challenges arise. While pesticide use (and misuse) have been comparatively low in Myanmar, increasing pesticide-related poisoning in rural communities is a major national concern. Globally, it is widely accepted that pesticide affects food security and safety, human health, water and soil, and non-target organisms, including pollinators. A small research activity, led by Dr Sivapragasam Annamalai of the Centre for Agriculture and Bioscience International, aims to benchmark current pest management practices and pesticide use/misuse in food crops, with rice and vegetables as exemplars. It will then develop practical recommendations and actions to address current and potential future problems.[7]

Fisheries

The success of fish ladders for upstream fish passage, based on designs used in the Murray–Darling Basin in Australia, has been demonstrated for use in the Mekong system. A project in Laos and Myanmar, led by Dr Lee Baumgartner of Charles Sturt University, focuses on downstream fish migration, by developing regulator designs for fish friendly downstream passage. These new designs improve fish survival and allow fish to pass back to the main river systems without injury. This project will deliver the first fishway in Myanmar, which will be a demonstration unit before more widespread application.[8]

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, led by Mr Michael Akester of the WorldFish Center, will help Myanmar's Department of Fisheries identify suitable co-management 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.[9]

Rice and fish are key elements of diets 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, led by Dr Michael Phillips of the WorldFish Center, seeks to characterise rice–fish systems in the Ayeyarwady Delta to find ways to improve rice–fish production and management, and optimise income, food and nutritional outcomes for households, with a focus on women. The project will also help policymakers develop policy for land use, rice production and fisheries.[10]

Livestock Systems

Goats and sheep (small ruminants) are an important income source and asset for rural and peri-urban 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 project, led by Dr Angus Campbell of the University of Melbourne, aims to help farmers in Myanmar 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.[11]

About half of Myanmar's 15 million cattle are in the Central Dry Zone, and their primary use is to provide draught power, transportation and manure for fertiliser. Myanmar is undergoing significant transformation, and mechanisation is expected to 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. A new project, led by Dr Dianne Mayberry of CSIRO Agriculture and Food, will support smallholder farmers, by identifying the opportunities and constraints for developing a beef enterprise, developing management systems to meet production goals, and quantifying potential impacts of improved forage and animal management packages on livelihoods.[12]

Social Sciences

The Social Sciences Program commissions trans-disciplinary research to deliver innovation and speed up poverty reduction. About 300,000 people derive their livelihoods within artesian groundwater zones of the Central Dry Zone of Myanmar. But pressure and flow rate of this naturally flowing water source are declining due to overexploitation. The Irrigation and Water Utilization Management Department has highlighted the urgent need to rehabilitate both private and public free-flowing artesian tube wells.

A project, led by Dr Sonali Senaratna-Sellamuttu of the International Water Management Institute, will develop and test socially inclusive and technically appropriate institutional arrangements, and support targeted communication strategies to restore artesian pressure in the Central Dry Zone.[13]

Soil and Land Management

Farmers could improve yields, profitability and sustainability in central Myanmar by adopting improved fertiliser use and associated crop management practices. A project, led by Professor Deli Chen of the University of Melbourne, aims to increase the productivity and profitability of rice and maize-based production systems, while ensuring environmental preservation through correct use of fertiliser. In its final year, the project will report on the economics of fertiliser use in central Myanmar, and focus on building the capacity of agricultural scientists and extension officers to sustain and promote improved management practices.[14]

A project, led by Dr Anthony Ringrose-Voase of CSIRO Agriculture and Food, aims to contribute to national food security, improve the livelihoods of farmers and provide ecosystem services, to develop land evaluation methods and capacity, and improve planning of agricultural development in Myanmar's Central Dry Zone. In its final year, the project will complete and deliver reports on the suitability of land in the Central Dry Zone for agricultural or conservation uses. It will also deliver approaches to integrate participatory land use planning into existing processes for rural development.[15]

Agriculture in Shan State of Myanmar has enormous potential to help people out of poverty, but productivity and efficiency are constrained by many factors, in particular, soil constraints such as declining soil fertility and high rates of erosion. Dr Terry Rose of Southern Cross University leads a small research activity to understand key soil constraints, and implement on-farm research trials to address soil fertility decline and soil erosion. If successful, the model trial and demonstration approach used in this project could be implemented across a wider number of township areas in the Shan State in subsequent projects.[16]

Also addressing the issue of lifting productivity, another short research activity, led by Professor David Herridge of Southern Cross University, will develop a training module on farmer participatory crop benchmarking in Myanmar's Central Dry Zone. Training will be provided to up to 25 staff from the Departments of Agriculture and Agricultural Research. The project will build on activities in previous ACIAR work in Myanmar, and harness the experience of Australian farmers through the Farmers Without Borders Program.[17]

The only providers of agricultural and veterinary tertiary education in Myanmar are Yezin Agricultural University and the University of Veterinary Science. A project, led by Professor Kaye Basford of the University of Queensland, will address this low productivity, by increasing the capacity of both universities, so that they can deliver graduates with the research skills and knowledge to identify constraints to agricultural production, and to develop pragmatic solutions.[18]

Global Program

The Global Program manages several programs in the East and South-East Asia region addressing multidisciplinary challenges and/or opportunities, in partnership with international agricultural research-for-development agencies. The work of the Global Program is described in Chapter 2.

The Global Program project operational in Myanmar during 2019–20 is Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific—Agricultural Science and Technology Indicators (ASTI) program.[19]

Current and proposed projects

1. Improving livelihoods in Myanmar and Vietnam through vegetable value chains (AGB/2014/035)
2. Inclusive agriculture value-chain financing [Indonesia, Myanmar, Vietnam] (AGB/2016/163)
3. Establishing sustainable solutions to cassava diseases in mainland South-East Asia [Cambodia, Laos, Myanmar, Vietnam] (AGB/2018/172)
4. Establishing the International Mungbean Improvement Network [Bangladesh, India, Myanmar] (CIM/2014/079)
5. Extension of International Mungbean Improvement Network extension project [Bangladesh, India, Kenya, Myanmar, Tanzania, Uganda] (CROP/2018/133)
6. Improved mungbean harvesting and seed production systems for Bangladesh, Myanmar and Pakistan (CIM/2016/174)
7. Plant health: a major challenge to achieving sustainable 'green' agriculture in Myanmar (CROP/2019/103)
8. Quantifying biophysical and community impacts of improved fish passage in Laos and Myanmar (FIS/2014/041)
9. Improving fishery management in support of better governance of Myanmar's inland and delta fisheries (FIS/2015/046)
10. Development of rice–fish systems in the Ayeyarwady Delta, Myanmar (FIS/2016/135)
11. Improving farmer livelihoods by developing market-oriented small ruminant production systems in Myanmar (LS/2014/056)
12. Improving cattle production in the Central Dry Zone of Myanmar through improved animal nutrition, health and management (LS/2016/132)
13. Building institutions for the sustainable management of artesian groundwater in Myanmar (SSS/2018/135)
14. Management of nutrients for improved profitability and sustainability of crop production in central Myanmar (SMCN/2014/044)
15. Land resource evaluation for productive and resilient landscapes in the Central Dry Zone of Myanmar (SMCN/2014/075)
16. Soil-based challenges for cropping in Shan State, Myanmar (nutrient acquisition) (SLAM/2018/190)
17. Farmer participatory crop benchmarking in the Central Dry Zone of Myanmar (SLAM/2018/206)
18. Mainstreaming research in Myanmar's agricultural and veterinary universities (SLAM/2017/041)
19. Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific—Agricultural Science and Technology Indicators (ASTI) program [Cambodia, Indonesia, Malaysia, Myanmar, Papua New Guinea, the Philippines, Thailand, Vietnam, Laos, Timor-Leste] (GP/2016/093)

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See page 200 for contact details

The Philippines

Budgeted funding

A$3.5
million

ACIAR-supported projects

20

Multilateral & co-investment program

1

By working together as partners, PCAARRD and ACIAR continue to share interest and commitment in identifying and providing solutions to the agricultural, aquatic, and natural resources problems in the Philippines through research and development. A key aspect of the partnership is that we will continue to work together in a respectful, open and trusting manner with mutual accountability and commitment to produce and deliver good science, build capacities and communicate research results to partners in the agriculture, aquatic and natural resources sector.

ACIAR–PCAARRD Partnering Agreement, December 2018

The agricultural sector in the Philippines is vital to achieving the growth and poverty reduction targets set in the Government's Philippine Development Plan 2017–2022.

The agriculture sector, which accounts for 10% of the national income, employs about 11 million people (almost one-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 of low productivity, limited access to markets, climate variability and disasters.

Many farmers and fishers are smallholders with insecure land tenure, who are cultivating already marginal lands. Farming and fisher households are also unable to increase their production and take advantage of market opportunities, due to 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.

Country priorities and partnerships

Our work in the Philippines is enabled through its partnership with the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD). This 35-year partnership continues to grow, and in December 2018, ACIAR and PCAARRD signed a new partnering agreement. This formalises the commitment of both agencies to revitalise and strengthen scientific and technical cooperation, through substantial co-investment in research and capacity building, particularly research projects, scholarships and knowledge exchange. It sets the strategic direction for the Philippines program in the next five years.

Under the new partnering agreement, ACIAR work in the Philippines will focus on:

- making agricultural and fisheries systems more productive
- making products more marketable and internationally competitive
- managing land and water resources for profitable and sustainable agriculture
- mitigating the effects of climate change on the rural poor
- helping conflict-vulnerable communities in the southern Philippines to adopt improved farming methods.

New priorities emerging from recent discussions include research on banana panama disease control and management, mango breeding and varietal improvement, biotechnology governance and regulation and innovative technology transfer and extension models. The partnering agreement also highlights new partnership models for capacity building and impact assessment.

In recent years, the ACIAR Philippines program has had a greater focus on Mindanao and Visayas, where low productivity, natural resource degradation, high poverty incidence, and vulnerability to disasters and conflict represent more serious constraints to agricultural development than in other regions. In 2019–20, ACIAR will continue to focus its research investments in Mindanao, to build livelihood resilience and strengthen social cohesion in the communities.

2019–20 research program

ACIAR supports 20 projects and programs in the Philippines, 11 of which are specific to this country, and the remainder are part of regional projects. The projects address our high-level objectives, as outlined in the 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and partner organisations.

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

Agribusiness

Fruit and vegetable production is an important economic activity in the southern Philippines, but is limited by small farm size, poor adoption of technology, low productivity and product quality, and high post-harvest losses. Improving the performance of smallholder value chains for fruit and vegetables, and building community capacity is the focus of a project led by Dr Gomathy Palaniappan of the University of Queensland. The project concludes during 2019–20, with ongoing facilitation of learning alliances with private sector and grower groups, community, government and research stakeholders to improve smallholders' income, livelihoods and community wellbeing through value-chain improvements.[1]

A *Theory of Change* for inclusive value chains in the Philippines will be developed in a small research activity, led by Dr Oleg Nicetic of the University of Queensland. The project will communicate learnings and maximise impact of previous ACIAR projects, as well as inform the design of a new agribusiness project, which will develop inclusive agribusiness models for high-value fruit and vegetable value chains in the southern Philippines. The project also aligns directly with two specific research priorities of PCAARRD to increase market competitiveness and foster technology adoption by poor indigenous households in the southern Philippines.[2]

Complementing the *Theory of Change* project, will be another small research activity to develop capabilities in inclusive agribusiness research, leadership and collaboration with selected researchers, policymakers and private sector managers associated with PCAARRD and the ACIAR agribusiness research and innovation in the Philippines. The project, led by Dr Lilly Lim-Camacho of CSIRO, will bring togther regional expertise from the long-running Agribusiness Masterclass program in the region and build on outcomes of agribusiness projects in the Phillippines.[3]

Fisheries

Groupers form the basis of the live reef food-fish trade in South-East Asia. The giant grouper (*Epinephelus lanceolatus*) is a high-value fast-growing grouper species with significant aquaculture potential. A five-year project has successfully established a sustainable aquaculture industry for grouper in Vietnam and the Philippines, by developing captive breeding and larval-rearing technologies. The project, led by Professor Abigail Elizur of the University of the Sunshine Coast, will conclude in 2019, delivering molecular methods to advance sexual maturation, and induce spawning and sex reversal, and implementing a genetic program for selecting improved giant grouper.[4]

Dried sea cucumbers are highly valued in China and South-East Asian markets, but overfishing throughout the Asia–Pacific region, and poor fisheries management have resulted in severe declines in sea cucumber stocks and even fishery closures, reducing income-generating opportunities for coastal communities. Building on previous ACIAR-supported projects, a project, led by Professor Paul Southgate of the University of the Sunshine Coast, will develop technical skills to improve the reliability of culture methods. This will support increased production capacity and further expansion of community-based sea cucumber farming in Vietnam and the Philippines.[5]

An innovative conservation project in the northern Luzon region of the Philippines, led by Professor Peter Harrison of the Southern Cross University, has successfully developed methods to restore coral reefs damaged by past dynamite fishing practices. In its final year, the project will continue to assess mass larval reseeding methods, and determine preferred settlement surfaces (natural or artificial), to understand requirements for survival and growth of juvenile branching and massive corals. The project will continue stakeholder training for evaluating the socioeconomic benefits of reef restoration to coastal communities. It will also develop policy and advice on alternative reef management strategies in the Philippines, and potentially in Australia.[6]

The successful restoration of coral in experimental plots has resulted in notable increases in reef fish abundance and fish species richness, compared with control plots where coral has not been restored. Another project, led by Professor Harrison, will establish rigorous protocols and long-term monitoring and evaluation of the impacts on fish communities and other reef resources of coral restoration in the northern Luzon region.[7]

A giant grouper being inspected by fisheries staff, the Philippines. ACIAR project: Developing techniques for giant grouper (*Epinephelus lanceolatus*) aquaculture in Vietnam, the Philippines and Australia (FIS/2012/101)

Horticulture

In 2019–20, research projects in the Philippines will focus on regional management of significant risks to horticultural crops. *Fusarium* wilt (also known as Panama disease) has devastated commercial banana production in many countries throughout Asia, and threatens crops in the southern Philippines, where banana exports are a major contributor to employment and the economy. The disease is also a serious threat to the Australian banana industry. A project, led by Dr Anthony Pattison of the Queensland Department of Agriculture and Fisheries, is investigating a novel approach, where groundcover plants are grown in plantations to encourage biological suppression of this soil-borne disease. The project is in its final year, and, combined with appropriate containment measures, the approach shows considerable potential to sustain profitable banana production.[8]

Another project, starting in 2019, also led by Dr Pattison, aims to develop an integrated management response to the spread of *Fusarium* wilt of banana in South-East Asia. With sites in the Philippines, Indonesia and Laos, the project will investigate the effects on banana production of altering the banana microbiome to suppress disease and increase plant resistance to *Fusarium* wilt.[9]

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 $1 a day—well below the poverty line. Post-harvest losses in vegetable production chains are a major problem for producers, reducing farmers' incomes and the amount of fruit and vegetables purchased and consumed. Up to 40% of harvested vegetables are wasted before they reach the consumer. A project, led by Dr Jenny Ekman of Applied Horticultural Research, will conclude in 2019 having determined where and why post-harvest losses occur, and developed strategies to reduce losses and improve product quality.[10]

Vegetable consumption is low in the Philippines for reasons such as availability, affordability and cultural and dietary factors, including the perception of poor quality and safety of vegetables. Vegetable farmers are not well trained in the appropriate use of pesticides, and this results in pesticide residues above permissible limits in harvested crops, exposure of farm workers to pesticide poisoning and contamination of soil and water. A new project, led by Dr Gordon Rogers of Applied Horticultural Research, aims to improve the capacity of selected vegetable supply chains in the Philippines to deliver vegetables that better meet consumer expectations in terms of quality, food safety, nutritional value and price.[11]

About 40 species of tropical fruit flies damage horticultural crops, and impede trade throughout South-East Asia. A new project in Indonesia and the Philippines builds on the success of previous ACIAR projects, and links with fruit fly work in other ACIAR partner countries and Australia. The project, led by Mr Stefano De Faveri of the Queensland Department of Agriculture and Fisheries, aims to reduce fruit fly infestation of mango crops through area-wide management of the pest, and to improve pre-harvest and post-harvest practices. The ultimate aim is to improve yield and quality of crops, to improve livelihoods and trade opportunities.[12]

Mango production in the Asia–Pacific region accounts for about two-thirds of global production. Much of the crop is produced by smallholders, who achieve relatively modest yields, and participate in traditional value-chain arrangements that offer producers little incentive to innovate or pursue higher quality. Some producers seek better returns by supplying higher-value export markets (such as Korea), but they have struggled to deliver fruit that meets market or regulatory standards. A new project in Cambodia and the Philippines, led by Dr Cameron McConchie of the Northern Territory Department of Primary Industry and Fisheries, aims to improve the ability of selected mango supply chains to deliver fruit that better meets consumer expectations of quality and value, as well as provide smallholder growers a better return on investment.[13]

Impact Assessment

As part of its research portfolio, ACIAR undertakes regular assessment of adoption and impact of project outputs, to understand the effectiveness and value of research for smallholders and communities in partner countries and Australia. The PCAARRD is a long-term partner of ACIAR in research-for-development, and has a keen interest in measuring the impact of research projects. ACIAR and PCAARRD have jointly invested in the development of an integrated, mixed-methods approach to assessing project impacts. The framework development was led by a team from CSIRO Agriculture and Food, and trialled on the ACIAR Landcare projects in the Philippines, in partnership with University of the Philippines Los Baños and Visayas State University. The study will conclude in 2019, and final activities will include impact assessments of the approach, as well as reporting of capacity built among the key research partners in the Philippines.[14]

Social Sciences

Previous ACIAR investment in Mindanao highlighted how certain types of community-based extension methods can rapidly improve agricultural livelihoods. A project, led by Dr Mary Johnson of RMIT University, is comprehensively testing and evaluating these improved extension methods in conflict-vulnerable areas in the southern and western Philippines. In 2019–20, the project team will provide specialist ongoing mentoring and support to PCAARRD in their research to validate the LIFE Extension Model (developed by the project), and understand its potential for scaling-up at the national government level.[15]

Landcare is a grassroots community-led approach to sustainable land management. Dr Mary Johnson of RMIT University will study the Landcare approach in five countries in the Indo-Pacific region, and analyse how sustainable agricultural land management mobilised through Landcare has contributed to development outcomes, including the ACIAR high-level objectives. The findings of the study will produce an evidence base for ACIAR to assess the role of Landcare for future agricultural research-for-development, and more broadly as an extension model in sustainable agriculture and natural resource management.[16]

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, Dr Peter Hayman of the South Australian Research and Development Institute, leads a project to improve the exchange of information between the provider of climate and weather information and decision-makers involved in managing climate and weather risk of smallholder farmers. In its final year, the project will consolidate research findings and pilot communication material, and scale-up the project findings to other local government units and community-based organisations.[17]

Improving livelihoods of poor residents of rural area remains a critical issue in the Philippines, especially in the country's rural uplands. 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. A project, led by Dr John Herbohn of the University of the Sunshine Coast, will research forest landscape restoration. In 2019–20, assessment and data collection will continue in field trials, testing smallholder-based tree–crop farming systems to improve food security and livelihoods. Pilot testing of changes to policy at the local and provincial levels to address social, institutional and political problems will also continue.[18]

Soil and Land Management

Agusan del Sur Province is considered the poorest province in the southern Philippines. A project starting in 2019 aims to boost household incomes for Indigenous smallholder farmers in the province, by introducing improved profitable rubber intercropping systems and sustainable management regimes, and build capacity. The project, led by Professor Chengrong Chen of Griffith University, will: start identifying economic opportunities, market access and risk for rubber and key intercrops; characterise key soil constraints and identify the most suitable lands for rubber-based cropping systems in Agusan del Sur; and begin the development nutrient diagnostic tools and fertiliser regimes for rubber and companion crops.[19]

Global Program

The Global Program manages several programs in the East and South-East Asia region addressing multidisciplinary challenges and/or opportunities, in partnership with international agricultural research-for-development agencies. The work of the Global Program is described in Chapter 2.

The Global Program project operational in the Philippines during 2019–20 is Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific—Agricultural Science and Technology Indicators (ASTI) program.[20]

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See page 200 for contact details

Current and proposed projects

1. Developing vegetable and fruit value chains and integrating them with community development in the southern Philippines (AGB/2017/039)
2. A Theory of Change for inclusive value chains in the Philippines (AGB/2019/100)
3. Agribusiness Masterclass, The Philippines (AGB/2019/101)
4. Developing technologies for giant grouper (*Epinephelus lanceolatus*) aquaculture in Vietnam, the Philippines and Australia (FIS/2012/101)
5. Increasing technical skills supporting community-based sea cucumber production in Vietnam and the Philippines (FIS/2016/122)
6. Restoring damaged coral reefs using mass coral larval reseeding [the Philippines] (FIS/2014/063)
7. Baseline monitoring and evaluation of long-term impacts on fish stocks from coral restoration [the Philippines] (FIS/2018/128)
8. Integrated management of *Fusarium* wilt of bananas in the Philippines and Australia (HORT/2012/097)
9. An integrated management response to the spread of *Fusarium* wilt of banana in South-East Asia [Indonesia, Laos, the Philippines] (HORT/2018/192)
10. Improved post-harvest management of fruit and vegetables in the southern Philippines and Australia (HORT/2012/098)
11. Developing vegetable value chains to meet evolving market expectations in the Philippines (HORT/2016/188)
12. Development of area-wide management approaches for fruit flies in mango for Indonesia, the Philippines, Australia and the Asia–Pacific region (HORT/2015/042)
13. Integrated crop management for mango in Cambodia and the Philippines to meet market quality standards (HORT/2016/190)
14. Development of mixed-method approaches to impact assessments of Philippines research projects (IAP/2017/010)
15. Improving the methods and impacts of agricultural extension in Western Mindanao, the Philippines (ASEM/2012/063)
16. The potential of International Landcare [Fiji, Indonesia, the Philippines, South Africa, Sri Lanka, Uganda] (ASEM/2018/117)
17. Action-ready climate knowledge to improve disaster risk management for smallholder farmers in the Philippines (ASEM/2014/051)
18. Enhancing livelihoods through forest and landscape restoration [the Philippines] (ASEM/2016/103)
19. Land management of diverse rubber-based systems in the southern Philippines (SLAM/2017/040)
20. Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific—Agricultural Science and Technology Indicators (ASTI) program [Cambodia, Indonesia, Malaysia, Myanmar, Papua New Guinea, the Philippines, Thailand, Vietnam, Laos, Timor-Leste] (GP/2016/093)

Seedling nursery, Billran, the Philippines. ACIAR project (ASEM/2016/103)

Thailand

ACIAR-supported projects

2

Multilateral & co-investment program

1

Australia and Thailand have longstanding and deep connections. Formal diplomatic relations commenced in 1952. We cooperate in a broad range of areas of mutual interest, including trade and investment, law enforcement, counter-terrorism, education, security, migration and tourism. The bilateral relationship is supported by mutual membership of international and regional organisations. In November 2003, the Royal Thai Government announced that Thailand would move from being an aid recipient to an aid donor. Thailand's overseas aid program is focused on technical cooperation and training.

DFAT country brief 2019

Thailand is an upper-middle income country, with low levels of extreme poverty compared with other countries in South-East Asia.

Public investment in infrastructure and cementing key policies are expected to drive Thailand's economy in 2019, as will a focus on businesses in next generation cars, smart electronics, affluent, medical and wellness tourism, agriculture, biotechnology and food.

Thailand's agriculture sector remains important, particularly in rural areas, with export products including agricultural commodities such as rice, sugar and rubber. Almost 40% of Thai people work in agriculture, but the sector accounts only for 8%–10% of Thailand's GDP.

Thailand is strengthening its economy with research and development, creativity, innovation and investment programs. Agriculture remains a strong focus, and the Thai Government is focusing on increasing returns from the country's abundant resources, both for local and international use, by reducing inefficiencies, water consumption, fertilisers, insecticides, and other chemicals.

Country priorities

Since moving from aid recipient to aid donor, Thailand maintains a strong technical cooperation program that includes development projects, volunteer and expert programs, fellowships, scholarship and training courses. Thailand works with ACIAR to share technical expertise with its neighbouring countries and support regional economic growth.

2019–20 research program

ACIAR works with Thailand on two regional-scale projects that address our high-level objectives, as outlined in the 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and partner organisations. Each project description is referenced in a list at the end of this section, which provides the project title and code.

Forestry

The impacts of Australian-origin insects on eucalypt plantations is a rapidly increasing problem globally. In the Mekong region, scientists and forest managers are collaborating to control and manage these pests. A research project, led by Dr Simon Lawson of the University of the Sunshine Coast, aims to develop appropriate biological controls for gall wasp by importing and testing natural enemies of the pest from Australia. The project concludes in 2019–20, with follow-up release and monitoring of biological control agents.[1]

Global Program

The Global Program manages several programs in the East and South-East Asia region addressing multidisciplinary challenges and/or opportunities, in partnership with international agricultural research-for-development agencies. The work of the Global Program is described in Chapter 2.

The Global Program project operational in Thailand during 2019–20 is Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific—Agricultural Science and Technology Indicators (ASTI) program.[2]

Current and proposed projects

1. Biological control of galling insect pests of eucalypt plantations in the Mekong region [Cambodia, Laos Thailand, Vietnam] (FST/2012/091)
2. Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific—Agricultural Science and Technology Indicators (ASTI) program [Cambodia, Indonesia, Malaysia, Myanmar, Papua New Guinea, the Philippines, Thailand, Vietnam, Laos, Timor-Leste] (GP/2016/093)

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Vietnam

Budgeted funding

A$5.2
million

ACIAR-supported projects

31

Multilateral & co-investment programs

2

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)

Agriculture continues to play a major role in the Vietnam economy. On average, the sector annually contributes about 15% of the GDP, and absorbs an estimated 40% of the total workforce.

In 2018, the agricultural sector achieved the highest GDP expansion and production value of the past seven years. Export revenue reached more than US$40 billion, of which five items gained a revenue of more than US$3 billion—wood and wood products, shrimp, vegetable and fruit, coffee and cashew nuts. This was a result of the efforts toward prosperous agriculture, rich farmers and improved environment in rural areas through the 'agricultural restructuring' and 'new rural development' programs of the Vietnamese Government.

Despite these positive results, the Vietnam agriculture sector faces significant challenges, including:

- difficulties among the large numbers of smallholder growers and producers to meet market requirements
- impacts of climate change affecting crop productivity and rural livelihood security
- limited capital and technological capacity to compete on global markets.

The top three priorities for Vietnam's agriculture sector in 2019 are all areas where ACIAR has provided long-term support, and are included in the ACIAR Vietnam 2017–2027 research strategy. They are to:

- improve the quantity and quality of the sustainable forestry industry in Vietnam, and ensure compliance with international obligations
- improve sustainability of Vietnam's fisheries sector, including better reporting and action against illegal, unreported and unregulated fishing
- continue to implement the agricultural restructuring program, including uptake of high-tech agriculture and ensuring climate change resilience.

Country priorities

The ACIAR strategy for research collaboration with Vietnam (2017–2027) 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 create 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, for 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 the 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 the 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, to 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, to produce more food with fewer resources
- implement practices and inform policymakers to manage climate change impacts on agriculture.

The strategy focuses on:

- food safety
- climate change
- soil fertility and efficiency of crop–livestock systems
- market knowledge, access to markets and skills for better policy analyses
- increasing value from forests
- increasing value from aquaculture.

The research themes are focused on the Mekong Delta, Central Highlands and North West. While the Mekong Delta and Central Highlands have capacity for exporting agricultural products, they face climate change challenges, and share challenges for development. These include sloping land conservation, generating better livelihoods for ethnic minorities and economically empowering women.

2019–20 research program

ACIAR supports 32 projects and programs in Vietnam, 11 of which are specific to this country, and the remainder are part of regional projects. The projects address our high-level objectives, as outlined in the 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and partner organisations.

The following sections briefly describe individual ACIAR-supported projects and anticipated outputs in Vietnam, grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

Agribusiness

Foodborne illness is a major public health issue across South-East Asia, and particularly in Vietnam. With rapid intensification of animal food production systems and urbanisation, food safety risks are likely to increase. A project, led by Dr Elizabeth Petersen of the University of Western Australia, will conclude with prepared strategies and activities that will develop policy analysis capacity in key stakeholders and policymakers, to improve food safety in Vietnam's local and international markets.[1]

Mango production makes a significant contribution to Vietnam's economy, and nearly half of the crop is produced in the Mekong Delta region. A project, led by Dr Robin Roberts of Griffith University, aims to identify new opportunities in the fresh and processed mango value chain in southern Vietnam, to improve net income and livelihoods of smallholder mango growers. The research will also focus on roles and opportunities for women in the industry. In 2019–20, the project will continue to evaluate options to overcome barriers to competitiveness, and improve capacity, industry stakeholder linkages and knowledge sharing.[2]

Cassava is an increasingly important crop in terms of both rural livelihoods and regional economic development, and it remains an important food-security crop in specific subregions. The market outlook for cassava, and the prospects for smallholder producers are strongly linked to supply and demand in global starch, grain, and energy markets. A project in Indonesia and Vietnam, led by Dr Dominic Smith of the University of Queensland, aims to make smallholder cassava production more profitable and sustainable, by linking value-chain actors to increase the adoption of improved technologies. In its final year, the project will develop policy recommendations and support learning alliances through better agribusiness arrangements.[3]

Improving the agricultural value chain and developing trade models is a means of improving the livelihoods of farmers across many industries. In Myanmar and Vietnam, a project, led by Dr Gordon Rogers of Applied Horticultural Research, aims to develop an understanding of vegetable markets and value chains, and identify opportunities for safe and off-season vegetable production for urban, wholesale and retail markets. In 2019–20, the project will recommend a suitable governance model for a sustainable and inclusive smallholder farmer group. A scalable model for production, marketing and supply of high-quality vegetables in Myanmar will be documented and published. It is anticipated that Vietnam will be an important market for Myanmar producers.[4]

Smallholder farmers in South-East Asia often cannot access credit to invest in new crops or technologies, deal with risks and shocks, and safely carry wealth from harvest to planting. To help smallholders reach their production potential, a project, led by Dr Alan de Brauw of the International Food Policy Research Institute, will review and research financing models for agricultural value chains, and evaluate specific interventions in Indonesia, Myanmar and Vietnam. In 2019–20, a rigorous impact evaluation of agricultural value-chain financing models will be designed, for implementation by project partners.[5]

Beef markets and trade in China and South-East Asia are growing and changing rapidly. While per capita beef production has increased in the region, it has been outstripped by per capita consumption. These rapid changes have implications for up to 20 million households who participate in the industry, including better cattle prices for smallholders and employment opportunities for other chain participants. But increasing commercialisation and imports also have the potential to crowd out individual chain actors, such as household producers, traders and butchers. A project, led by Dr Dominic Smith of the University of Queensland, aims to generate relevant and timely information to support policymakers to develop inclusive trade and industry policy for the beef sector in the region.[6]

A small research activity, led by Dr Chris Chilcott of CSIRO Land and Water, will evaluate opportunities to reduce logistics costs to small-scale farmers, and contribute to more informed policy on infrastructure that promotes development and access to markets in Indonesia and Vietnam. The project will further develop an adapted logistics model to better understand links, stakeholders and requirements to operate the model in the two countries.[7]

Also focused on Indonesia and Vietnam, another small research activity, led by Dr Wendy Umberger of the University of Adelaide, will review, update and develop innovative new content, learning resources and delivery models for the *Making value chains work better for the poor* toolkit and the ACIAR *Agribusiness Masterclass*. The activity aims to develop innovative agribusiness research learning resources and delivery models for the Asia–Pacific region, which mainstream contemporary gender equity, social inclusion and women's economic empowerment principles and approaches.[8]

Cassava harvest, Vietnam

The most important constraint for the development of a temperate fruit industry in northern Vietnam is the lack of coordination between stakeholders in the private sector (seedling producers, growers, traders and retailers), and between the private sector and local government. A short research activity in 2019, led by Mr Oleg Nicetic of the University of Queensland, will strengthen leadership, coordination and economic development of the industry, by forming and developing a professional and inclusive multi-stakeholder industry association.[9]

A new project in Cambodia, Laos, Myanmar and Vietnam aims to improve the resilience of cassava production systems and value chains, by addressing rapidly evolving disease constraints, cassava witches broom disease and the Sri Lanka cassava mosaic virus. The project, led by Dr Jonathan Newby of the International Center for Tropical Agriculture, will develop technically viable and economically and socially sustainable solutions, including resistant varieties and the production of virus free planting material. It will test and evaluate methods for slowing the spread of the diseases through planting material, explore scaling solutions, strengthen capacity and regional networks to address new pest and disease incursions, and investigate opportunities for public–private funding models to support a resilient cassava industry.[10]

Vietnam is world's top producer (by volume) of robusta coffee and black pepper. Production areas are concentrated in the Central Highlands, and both crops are often grown on the same farm and plots. A new short research activity, led by Dr Philippe Vaast of the World Agroforestry Centre, aims to collect baseline information and analyse the agribusiness contexts for the two crops, to identify opportunities and bottlenecks affecting the value chains, and recommend further possible research and development work to define and introduce long-term whole-of-chain improvement.[11]

Fisheries

Groupers form the basis of the live reef food-fish trade in South-East Asia. The giant grouper (*Epinephelus lanceolatus*) is a high-value fast-growing grouper species with significant aquaculture potential. A five-year project has successfully established a sustainable aquaculture industry for giant grouper in Vietnam and the Philippines, by developing captive breeding and larval-rearing technologies. The project, led by Professor Abigail Elizur of the University of the Sunshine Coast, will conclude in 2019, delivering molecular methods to advance sexual maturation, and induce spawning and sex reversal, and implementing a genetic program for selection of improved giant grouper.[12]

Dried sea cucumbers are highly valued in China and South-East Asian markets, but overfishing throughout the Asia–Pacific region, and poor fisheries management have resulted in severe declines in sea cucumber stocks and even fishery closures, reducing income-generating opportunities for coastal communities.

Building on previous ACIAR-supported projects, a project, led by Professor Paul Southgate of the University of the Sunshine Coast, will develop technical skills to improve the reliability of culture methods. This will support increased production capacity and further expansion of community-based sea cucumber farming in Vietnam and the Philippines.[13]

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, a project, led by Professor Paul Southgate of the University of the Sunshine Coast, 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.[14]

Forestry

Vietnam has about two million hectares of Australian eucalyptus and acacia plantations, which supply major processing industries and export markets, generating substantial income for smallholder plantation owners and the people working in forest industries. The impacts of Australian-origin insects on eucalypt plantations is a rapidly increasing problem globally. In the Mekong region, scientists and forest managers are collaborating to control and manage these pests. A research project, led by Dr Simon Lawson of the University of the Sunshine Coast, aims to develop appropriate biological controls for gall wasp by importing and testing natural enemies of the pest from Australia. The project concludes in 2019–20, with follow-up release and monitoring of biological control agents.[15]

A project, led by Dr La Nguyen of the World Agroforestry Centre, will continue research on the development and adoption of locally appropriate market-based agroforestry systems and rehabilitation of degraded forests in Northwest Vietnam. Working closely with the Department of Agricultural and Rural Development offices in Son La, Yen Bai and Dien Bien provinces, the project will 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.[16]

Regional collaboration in South-East Asia is urgently needed to reduce the risk of pest and disease incursion and the impacts of established pests and diseases. A new project in 2019–20, with activities based in Indonesia, Vietnam and Laos, aims to implement best-practice forest biosecurity and pest management for sustainable productivity. With government and industry partners, the project, led by Dr Caroline Mohammed of the University of Tasmania, will establish pilot forest surveillance networks, co-develop essential pest risk analyses and biosecurity plans, continue taxa screening and tree breeding that started in previous research projects for pest and disease tolerance and resistance, and examine silvicultural practices to reduce pest and disease spread and impact.[17]

Livestock Systems

Market demand for beef is increasing rapidly in Vietnam, but cannot be met by current levels of domestic production. A project, led by Dr Stephen Ives of the University of Tasmania, is investigating and implementing whole-farm solutions for smallholder cattle producers in the highlands of Northwest Vietnam. This will help smallholder farmers shift from extensive to more intensive production systems, so that they can meet market specifications, increase market linkages and improve profitability.[18]

Asia is a major global producer of pork, with South-East Asia and southern China currently providing the majority of regional production. Food safety is a significant and growing concern in Vietnam, and is a barrier to smallholder farmers wishing to sell product in high-value domestic and export markets. Through market-based approaches the Safe Pork project, led by Dr Fred Unger of the International Livestock Research Institute, aims to reduce the burden of foodborne disease across various markets in Vietnam.[19]

A new project, led by Dr Amanda Ash of Murdoch University, aims to identify and recommend interventions to mitigate disease risk from foodborne parasites in pigs, adding value to cross-border pig trade between Laos and Vietnam. Laos is a comparatively smaller producer of pork compared with Vietnam and China, but pork production has grown significantly in recent years, including a growing cross-border trade. The potential of this growing market could be severely affected, unless current production chains, including food safety, are improved.[20]

Demand for goat meat in Vietnam is high, and the country's goat population has tripled over the past 10 years. Previous research identified models for goat production and marketing systems, to capitalise on strong opportunities, and create market linkages for smallholder farmers.

Following on from this research, a project, led by Dr Stephen Walkden-Brown of the University of New England, 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.[21]

The potential of forage production by smallholders is the focus of a new short research activity. Professor Rob Cramb of the University of Queensland will conduct a stocktake in Cambodia, Laos and Vietnam to analyse factors that contribute to, and constrain, forage development. If a clear demand for further forage development is shown, analysis of constraints and opportunities for more effective uptake and use of forages, and identification of potential business models for more demand driven development, will be done. Critical issues that can be addressed through research will be identified and used to guide future investment by ACIAR.[22]

As part of the Research for One Health Systems Strengthening program (page 81), a short research activity in Cambodia and Laos, led by Professor Barbara McPake of the Nossal Institute, will: gain a better understanding of the policy opportunities and challenges for human and animal disease promotion and surveillance; establish the extent of existing knowledge around policy development processes, socioeconomic factors and regulatory capacity of poultry production; host a stakeholder workshop to share results and experiences with decision-makers; and identify questions for future research. This will lead into a research project in early 2020, to investigate veterinary economics to advance One Health in Mekong Countries (Cambodia, Laos and Vietnam).[23]

Pig production, South-East Asia

Social Sciences

A small research activity will analyse gender transformative tools that are used with ethnic minorities in the Technologically Enhanced Agricultural Livelihoods (2018–2022) project operated by CARE International in the northern uplands of Vietnam. The project, led by Dr Rochelle Spencer of Murdoch University, will determine how the tools contribute to changing gender relations and empowering women, and to what extent. The project will also build capacity of in-country partners and of 10 social science researchers in the early stages of their careers, through training in mixed-method research, including participatory methods, and project-level Women's Empowerment in Agriculture Index.[24]

Soil and Land Management

The productivity and sustainability rice–shrimp farming systems in the Mekong Delta of Vietnam are threatened by increasing salinity caused by changing environmental conditions, and regulation of riverine and tidal flows. Shrimp production is also reduced by recurrent disease outbreaks, exacerbated by stocking of poor-quality post-larvae. In its final months, a project, led by Associate Professor Jesmond Sammut of the University of New South Wales, will report on investigations of a re-designed rice–shrimp farming system, and new varieties of salt-resistant rice. Results from research in this project on how farm management and institutional arrangements influence the productivity of new rice–shrimp farming systems will also be reported.[25]

Improving the productivity and sustainable management of low-fertility sands through better water and nutrient-use efficiency, and lower exploitation and contamination are common priorities for south-central coastal Vietnam and Western Australia. Concluding in 2019, a project, led by Professor Richard Bell of Murdoch University, will deliver groundwater modelling results, technologies to increase productivity through better water management and irrigation planning, and regulation and use of groundwater in the two countries.[26]

Increasing numbers of smallholder farmers in Laos and northern Vietnam are growing maize on sloping land to meet demand for livestock feeds by Chinese and South-East Asian poultry, pig and cattle industries. A project, led by Professor Michael Bell of the University of Queensland, is helping farmers adopt maize-based farming systems that supply livestock feed markets, reduce soil degradation and improve smallholder livelihoods and economic viability.[27]

Sea level rise and changes to seasonal rainfall patterns due to climate change result in decreased freshwater availability and higher saline intrusion of the Mekong River Delta during the dry season. Farmers and the Vietnamese Department of Agriculture and Rural Development staff are seeking better soil management techniques, and profitable alternative crops to grow in the dry season.

A new project, led by Dr Jason Condon of Charles Sturt University, plans to provide evidence-based options for profitable crop diversification in the rice production areas of the Mekong Delta. The project aims to increase production and profitability of saline-affected crop production systems, and to create a capacity legacy to enable these systems to adapt to ongoing climate change.[28]

Vietnam has achieved global dominance in coffee and pepper production, using intensive farming techniques, and investing significant amounts of capital and labour. But productivity of these systems is declining, due to unsustainable farming practices. A short project in 2019–20 aims to provide a clear understanding of the problems affecting coffee and black pepper production in the Central Highlands of Vietnam. The project, led by Dr Didier Lesueur of the International Center for Tropical Agriculture, aims to characterise coffee and black pepper-based farming systems, identify gaps in knowledge and research to restore soil fertility and plant health, and strengthen the scientific and technical capability of local research and development institutions.[29]

Water and Climate

A new project is assessing ways to reduce agricultural emissions in the Asia–Pacific region, as well as offset methods appropriate to developing countries (using Fiji and Vietnam as pilot examples). The project, led by Professor Peter Grace of Queensland University of Technology, 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 to enable user countries to identify, adopt and manage locally appropriate emission-reduction options. It will also provide a detailed analysis of potential co-benefits 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.[30]

Global Program

The Global Program manages several programs in the East and South-East Asia region addressing multidisciplinary challenges and/or opportunities, in partnership with international agricultural research-for-development agencies. The work of the Global Program is described in Chapter 2.

The Global Program project operational in Vietnam during 2019–20 is Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific—Agricultural Science and Technology Indicators (ASTI) program.[31]

Current and proposed projects

1. Policy analysis of food safety and trade in Vietnam (ADP/2016/140)
2. Improving smallholder farmer incomes through strategic market development in mango supply chains in southern Vietnam (AGB/2012/061)
3. Developing value-chain linkages to enhance the adoption of profitable and sustainable cassava production systems in Vietnam and Indonesia (AGB/2012/078)
4. Improving livelihoods in Myanmar and Vietnam through vegetable value chains (AGB/2014/035)
5. Inclusive agriculture value-chain financing [Indonesia, Myanmar, Vietnam] (AGB/2016/163)
6. Sustainable and inclusive development of the cattle and beef industry in Vietnam and trade relationships with other countries in the region (AGB/2016/196)
7. Enhancing smallholder linkages to markets by optimising transport and logistics infrastructure [Indonesia, Vietnam] (AGB/2017/036)
8. Revision and update of *Making value chains work better for the poor* toolkit and the ACIAR *Agribusiness Masterclass* [Indonesia, Vietnam] (AGB/2018/121)
9. Strengthening leadership, coordination and economic development of the temperate fruit industry in northern Vietnam (AGB/2018/171)
10. Establishing sustainable solutions to cassava diseases in mainland South-East Asia [Cambodia, Laos, Myanmar, Vietnam] (AGB/2018/172)
11. Enhancing the livelihoods of coffee and pepper smallholders in the Central Highlands of Vietnam through improving stakeholders' participation in agribusiness-led value chains (AGB/2018/208)
12. Developing technologies for giant grouper (*Epinephelus lanceolatus*) aquaculture in Vietnam, the Philippines and Australia (FIS/2012/101)
13. Increasing technical skills supporting community-based sea cucumber production in Vietnam and the Philippines (FIS/2016/122)
14. Half-pearl industry development in Tonga and Vietnam (FIS/2016/126)
15. Biological control of galling insect pests of eucalypt plantations in the Mekong region [Cambodia, Thailand, Vietnam, Laos] (FST/2012/091)
16. Developing and promoting market-based agroforestry and forest rehabilitation options for Northwest Vietnam (FST/2016/152)
17. Reducing forest biosecurity threats in South-East Asia [Indonesia, Laos, Vietnam] (FST/2018/179)
18. Intensification of beef cattle production in upland cropping systems in Northwest Vietnam (LPS/2015/037)
19. Safe Pork: market-based approaches to improving the safety of pork in Vietnam (LS/2016/143)
20. Interventions to mitigate disease risk and add value to cross-border pig trade between Laos and Vietnam (LS/2014/055)
21. Goat production systems and marketing in Laos and Vietnam (LS/2017/034)
22. Forages—taking stock and identifying research needs [Cambodia, Laos, Vietnam] (LS/2018/186)
23. Veterinary economics in Mekong countries: advancing One Health [Cambodia, Laos, Vietnam] (LS/2019/118)
24. Analysing gender transformative approaches to agricultural development with ethnic minority communities in Vietnam (SSS/2018/139)
25. Improving the sustainability of rice–shrimp farming systems in the Mekong River Delta, Vietnam (SMCN/2010/083)
26. Integrated water, soil and nutrient management for sustainable farming systems in South Central Coast of Vietnam and Australia (SMCN/2012/069)
27. Improving maize-based farming systems on sloping lands in Vietnam and Laos (SMCN/2014/049)
28. Farmer options for crops under saline conditions (FOCUS) in the Mekong Delta, Vietnam (SLAM/2018/144)
29. Identifying entry points for black pepper (*Piper* sp.) production and value-chain development in the Central Highlands in Vietnam (SLAM/2018/209)
30. Agriculture-based emission-reduction options to support nationally determined contributions in Vietnam and Fiji (LWR/2017/029)
31. Monitoring agricultural research investments, capacity and impact in South-East Asia and the Pacific—Agricultural Science and Technology Indicators (ASTI) program [Cambodia, Indonesia, Malaysia, Myanmar, Papua New Guinea, the Philippines, Thailand, Vietnam, Laos, Timor-Leste] (GP/2016/093)

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5.3 South Asia

Farmers in a wheat crop, Bihar, India. ACIAR-project: Enhancing farm-household management decision making for increased productivity in the Eastern Gangetic Plain (CSE/2012/108). Credit: ACIAR/Conor Ashleigh (2019)

South Asia

Regional summary

The ACIAR program in the South Asia region is strongly focused on regional research collaboration with five Indian Ocean Rim countries:

- Bangladesh
- India
- Nepal
- Pakistan
- Sri Lanka.

While there are common challenges and opportunities in agriculture in the countries of South Asia, there are also fundamental differences between and within these countries in terms of the broad characteristics that influence the nature and success of agriculture.

Population ranges from 21 million in Sri Lanka to 1.2 billion in India, and area ranges from 6.6 million hectares in Sri Lanka to 329 million hectares in India. The northern hilly region of Bangladesh is geographically distinct from the southern coastal areas. India is divided in 15 distinct agroecological zones. Nepal has three distinct topographical zones of the mountainous Himalayan region of the north, the Hill region, and the low-lying land of the Terai region in the south. Pakistan's Indus plains are in sharp contrast to the arid regions of Sindh or hilly and semi-arid areas of the north-west. Sri Lanka's landscape is clearly defined by its dry and wet zones. These regional variations must be taken into account when designing a meaningful program for regional research collaboration, to accommodate regional distinctions and varying degrees of vulnerability of the local population.

South Asia has 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 marginally above the poverty line, but 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. Although the share of agriculture in rural employment remains high, growth of the rural non-farm sector is speeding up, and now provides a sizeable share of rural income and employment, primarily in services. The rural non-farm sector has grown more quickly than agricultural employment in recent years, and now generates about 60% of rural income in India and Nepal, and 57% in Pakistan and Bangladesh.

Despite many challenges, South Asia remained the fastest growing region in the world in 2018, as economic growth continued to strengthen. But growth rates varied greatly across the region—exceeding 7.0% in Bangladesh, India, and Nepal, and reaching 5.8% in Pakistan. Growth in most South Asian nations was driven primarily by domestic consumption, with limited contributions from exports and investments.

Drivers of regional collaboration

Rice and wheat are the region's major staple crops, accounting for about two-thirds of total dietary energy. But food consumption patterns have changed in the region over the past few decades, and the changes are most apparent in rural areas—consumption of cereals is declining while consumption of animal-sourced foods, fruit, vegetables and processed foods is increasing. Pressure to expand food production to meet growing demand is putting stress on natural resources.

The resulting expansion and intensification of agriculture are leading to land degradation, deterioration of soil quality, and loss of biodiversity. This could potentially jeopardise the region's capacity to meet future food demand. Agricultural growth also poses risks for water resources. Facing the world's lowest per capita renewable freshwater resources, millions of people living in rural areas have benefited from the growing use of groundwater. But aquifers are being depleted, and the watertable is falling, particularly in India. Water quality is also deteriorating throughout the region, due to nutrient overloads and industrial pollution, raising concerns about food safety and drinking water quality.

Large areas in several countries in South Asia are prone to disaster. Bangladesh and coastal parts of India are often threatened by cyclones and floods, while recurring droughts are common in the arid and semi-arid parts of India and Pakistan. Incidence of natural calamities is most severe on food insecure households. Respective governments must allocate and provide significant resources to cope with frequent natural disasters.

Climate variability, competing and increasing demands from agriculture and industry (including energy production) and population growth are creating very severe demands on water availability. Regional cooperation is increasingly essential to manage these shared resources. There are also significant opportunities in regional cooperation 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.

ACIAR program in the region

Australian agricultural and resource management expertise is highly regarded in the South Asia region, and ACIAR has a long history of research collaboration in improving crop productivity, forestry, water use efficiency and policy reforms. The South Asia regional program of the Australian Government seeks to underpin Australia's economic engagement in the region, by addressing some of the key region-wide barriers to sustainable economic growth and connectivity, through the Sustainable Development Investment Portfolio (SDIP) and South Asia Regional Trade Facilitation Program. Gender equality is a focus in all investments under the regional program.

The ACIAR 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, Nepal and Sri Lanka.

Research in these areas looks to identify appropriate reform policy, increase adoption of technology (including post-harvest management), improve productivity and livelihoods in marginalised communities and improve productivity of crop, livestock, forestry and fisheries systems.

The major pathways of development in the region are modernisation of agrifood systems, technology support, strengthening service providers, developing rural non-farm sector and local governance at district or state level. Overproduction in some areas and unequal distribution due to poorly developed management of supply chains are the major issue in India, which could play a major role in achieving food and nutrition security and stability in the region.

The medium- to long-term strategy in the region focuses on creating regional collaborations that:

- sustainably intensify and diversify cropping systems, using conservation agriculture/zero tillage, farm mechanisation, saline land management and adaptation to climate change
- eradicate extreme poverty through improved productivity of food-grain crops (especially wheat and pulses), livestock (in Pakistan), agroforestry (in Nepal) and fisheries (in Sri Lanka)
- better manage agricultural water, including rainfed areas in the Eastern Gangetic Plains and coastal zone
- influence policy about agricultural and farmer's livelihoods and climate change
- increase the emphasis on meaningful gender inclusion and empowerment.

During 2019–20, 36 ACIAR-supported projects will be active in the South Asia region (Table 5.3).

Sustainable Development Investment Portfolio

The SDIP is an Australian Government initiative that brings together partners in Australia and South Asia to improve the integrated management of water, energy and food in three major Himalayan river basins—the Indus, Ganges and Brahmaputra. The initiative includes eastern Afghanistan, Pakistan, northern India, Bangladesh, Nepal and Bhutan. It draws on Australia's expertise and technologies in the water, food and energy sectors.

The component of SDIP focused on food and agriculture is funded by DFAT, and supported and coordinated by ACIAR. It aims to improve the integrated management of food, energy and water in the Eastern Gangetic Plains, which lie in the Ganges and Brahmaputra Basins.

ACIAR supports 10 projects within the portfolio, in Bangladesh, India and Nepal. These projects are managed by two ACIAR programs: Crops and Water and Climate.

SDIP projects in Bangladesh, India and Nepal

- Sustainable and resilient farming system intensification (SRSFI) (CSE/2011/077)
- Identifying Eastern Gangetic Plains soil constraints (CROP/2018/210)
- Institutions to support intensification, integrated decision-making and inclusiveness in agriculture in the East Gangetic Plain (LWR/2018/104)
- Foresight for sustainable food systems in the Eastern Gangetic Plains (WAC/2018/168)
- Quantifying crop yield gaps across the Indo–Gangetic Plains from new perspectives: production, farmer profit and sustainability of water use (WAC/2018/169)
- The regional hydrological impact of farm-scale water saving measures in the Eastern Gangetic Plains (WAC/2019/104)

SDIP project in India and Nepal

- The implications of sustainable intensification on weed dynamics in the Eastern Gangetic Plains (WAC/2018/211)

SDIP project in India

- Aquifer characterisation, artificial recharge and reuse of suddenly available water in South Bihar, India (WAC/2018/211)

SDIP project in Nepal

- Building provincial capacity for sustainable agricultural mechanisation in Nepal (WAC/2018/220)

SDIP project in Bangladesh

- Pilot project on commercialisation of smallholder conservation-based planters in Bangladesh (LWR/2018/111)

Table 5.3 **Current and proposed projects in the South Asia region, 2019–20**

Project title	Country	Project code
Agribusiness		
Policy and institutional reforms to improve horticultural markets in Pakistan	Pakistan, China	ADP/2014/043
Developing competitive and inclusive value chains of pulses in Pakistan	Pakistan	ADP/2017/004
Understanding the drivers of successful and inclusive rural regional transformation: sharing experiences and policy advice in Bangladesh, China, Indonesia and Pakistan	Bangladesh, China, Indonesia, Pakistan	ADP/2017/024
Crops		
Incorporating salt-tolerant wheat and pulses into smallholder farming systems in southern Bangladesh	Bangladesh	CIM/2014/076
Establishing the International Mungbean Improvement Network	Bangladesh, India, Myanmar	CIM/2014/079
Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa	India, Nepal, Pakistan, Ethiopia	CIM/2014/081
Increasing productivity and profitability of pulse production in cereal-based cropping systems in Pakistan	Pakistan	CIM/2015/041
Insect-tolerant chickpea for Bangladesh	Bangladesh	CIM/2016/039
Improved mungbean harvesting and seed production systems for Bangladesh, Myanmar and Pakistan	Bangladesh, Myanmar, Pakistan	CIM/2016/174
Identification of sources of resistance to wheat blast and their deployment in wheat varieties adapted to Bangladesh	Bangladesh	CIM/2016/219
Identifying Eastern Gangetic Plains soil constraints (SDIP)	Bangladesh, India, Nepal	CROP/2018/210
Extension of the International Mungbean Improvement Network project	Bangladesh, India, Kenya, Myanmar, Tanzania, Uganda	CROP/2018/133
Sustainable and resilient farming system intensification (SDIP)	Bangladesh, India, Nepal	CSE/2011/077
Enhancing farm household management decision-making for increased productivity in the Eastern Gangetic Plains	Bangladesh, India, Nepal	CSE/2012/108
Fisheries		
Improved productivity and efficiency of the culture-based fishery for giant freshwater prawn in Sri Lankan reservoirs	Sri Lanka	FIS/2018/157
Forestry		
Enhancing livelihoods through improved forest management in Nepal	Nepal	FST/2017/037
Horticulture		
Strengthening vegetable value chains in Pakistan for greater community livelihood benefits	Pakistan	HORT/2016/012
Livestock Systems		
Improving smallholder dairy and beef profitability by enhancing farm production and value-chain management in Pakistan	Pakistan	LPS/2016/011
Enhancing small ruminant production to benefit farming families in Sindh and Punjab, Pakistan	Pakistan	LS/2018/105
Water and Climate		
Efficient participatory irrigation institution to support productive and sustainable agriculture in South Asia	India, Pakistan	ADP/2014/045
Promoting socially inclusive and sustainable agricultural intensification in West Bengal (India) and Bangladesh	Bangladesh, India	LWR/2014/072
Cropping system intensification in the salt-affected coastal zones of Bangladesh and West Bengal, India	Bangladesh, India	LWR/2014/073
Developing approaches to enhance farmer water management skills in Balochistan, Punjab and Sindh, Pakistan	Pakistan	LWR/2014/074

Project title	Country	Project code
Improving groundwater management to enhance agriculture and farming livelihoods in Pakistan	Pakistan	LWR/2015/036
Nutrient management for diversified cropping in Bangladesh	Bangladesh	LWR/2016/136
Salinity Pakistan	Pakistan	LWR/2017/027
Institutions to support intensification, integrated decision-making and inclusiveness in agriculture in the East Gangetic Plain	Bangladesh, India, Nepal	LWR/2018/104
Pilot project on commercialisation of smallholder conservation-based planters in Bangladesh	Bangladesh	LWR/2018/111
Improving livelihood of marginal communities, by out-scaling irrigation and agricultural practices, through collectives, in the Eastern Gangetic Plains	Bangladesh, India, Nepal	WAC/2018/163
Water management for smallholder farmers: out-scaling ACIAR research in Andhra Pradesh drought mitigation program	India	WAC/2018/164
Foresight for sustainable food systems in the Eastern Gangetic Plains (SDIP)	Bangladesh, India, Nepal	WAC/2018/168
Quantifying crop yield gaps across the Indo–Gangetic Plains from new perspectives: production, farmer profit and sustainability of water use (SDIP)	Bangladesh, India, Nepal	WAC/2018/169
Aquifer characterisation, artificial recharge and reuse of suddenly available water in South Bihar, India (SDIP)	India	WAC/2018/211
Building provincial capacity for sustainable agricultural mechanisation in Nepal (SDIP)	Nepal	WAC/2018/220
The implications of sustainable intensification on weed dynamics in the Eastern Gangetic Plains (SDIP)	India, Nepal	WAC/2018/221
The regional hydrological impact of farm-scale water saving measures in the Eastern Gangetic Plains (SDIP)	Bangladesh, India, Nepal	WAC/2019/104

Note: More details (including project leader, commissioned organisation and partner organisations) are provided in the appendixes.

Bangladesh

Budgeted funding

A$3.5
million

ACIAR-supported projects

19

Multilateral & co-investment program

1

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 is investment and opportunities created by 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)

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

A key development challenge for Bangladesh 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. Pro-poor agricultural growth has stimulated the non-farm economy in Bangladesh, with the World Bank estimating that each 10% rise in farm incomes delivers a 6% rise in non-farm incomes.

Climate change is the most pressing issue, with different vulnerabilities and impacts across the country:

- Coastal areas are prone to salinity intrusion and tropical cyclones.
- The floodplains in the central areas are prone to floods.
- The north-western region is prone to drought.
- The north-eastern region is prone to flash floods.
- The hilly regions are prone to erosion and landslides.

Bangladesh is an active participant in the global effort to combat climate change, and needs to develop adequate adaptive capacity to protect its people and economy against the impacts of climate change. In view of the substantial long-term challenges presented by climate change, the Government has developed a long-term Bangladesh Delta Plan 2100, focusing on approaches to sustainably manage water, environment and land resources.

The long-term plan comprises a series of five-year plans. The seventh five-year plan (2016–2020) focuses on:

- promoting the use of agricultural technology with supportive policies, institutions, reforms, regulations and incentive in place for raising productivity and profitability
- increasing diversification of production, in line with consumption diversification, to promote nutrition
- increasing private sector participation in the agriculture and improving agro-processing value chain
- reducing instability of production
- increasing resource use efficiency
- reducing loss of arable land
- minimising yield gap
- maintaining food security, safety and quality
- expanding irrigation and farm mechanisation through appropriate technology
- developing resilience to climate change impacts.

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

Country priorities

Bangladesh has been an ACIAR partner country since the mid-1990s. ACIAR-supported programs in Bangladesh are focused in the hill regions of the north and north-west, and the coastal region, which is the poorest and most vulnerable region in the country. Concerns about Bangladesh's ability to maintain food security in light of the country's high vulnerability to the impacts of climate change underpin the priorities for ACIAR support.

Given the common agricultural production challenges of many countries in South Asia, ACIAR plays a role in strengthening research linkages between Bangladesh and other countries, particularly India (Bihar and West Bengal states) and Nepal (eastern Terai region).

The key research areas of ACIAR supported-projects in Bangladesh during 2019–20 are:

- crop improvement—focused on wheat, maize and pulses
- improved farming systems—focused on cropping systems and diversification
- managing water—focused on quantity (scarcity, groundwater and waterlogging) and quality (salinity)
- soil fertility and soil management
- innovative institutions and value-chain research
- cross-sectoral areas—climate change, policy support and gender.

The Krishi Gobeshona Foundation is a strategic partner of ACIAR in Bangladesh. It is an agricultural research funding organisation that has made major investments in funding research and building capacity in ACIAR-supported projects.

2019–20 research program

ACIAR supports 19 projects in Bangladesh, five of which are specific to this country, and the remainder are part of regional projects. The projects address our high-level objectives, as outlined in the 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and partner organisations.

The following sections briefly describe individual ACIAR-supported projects and anticipated outputs in Bangladesh, grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

Agribusiness

As development proceeds throughout the Indo-Pacific region, countries will undergo rural transformation. A new project in China, Bangladesh, Indonesia and Pakistan, led by Dr Chunlai Chen of the Australian National University, endeavours to understand the nature and drivers of rural transformation, to provide better policy advice that will underpin the success of transformation. In 2019–20, the project will review literature, collect data and conduct interviews and workshops to explain and describe rural transformation, and form the basis for future research.[1]

Wheat blast research plots, Bangladesh. ACIAR project: Identification of sources of resistance to wheat blast and their deployment in wheat varieties adapted to Bangladesh (CIM/2016/219).

Crops

The Sustainable and Resilient Farming Systems Intensification project is a large collaborative venture between ACIAR, 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 its final year, the project, led by Dr Thakur P Tiwari of CIMMYT, will support widespread adoption of sustainable, resilient and more profitable farming systems, through capacity development, and credible pathways to scale-out conservation agriculture and sustainable intensification systems.[2] This project is part of the SDIP, a larger investment by the Australian Government in the region (see page 123).

To supplement the farming systems project, a short research activity, led by Dr Neal Menzies of the University of Queensland, aims to validate future research needs on soil health, focusing on: soil acidification in areas where nitrogen fertiliser use has increased; the potential for zinc fertiliser to increase rice yields; changes in soil structure under conservation tillage practice; and understanding system sustainability through partial nutrient budgets.[3]

Various farming system innovations to increase productivity and resilience to climate change are being developed, but, outside of immediate project areas, the uptake and impact of these innovations is highly variable. A project, led by Dr Fay Rola-Rubzen of the University of Western Australia, will continue its research on understanding decision-making behaviour of farm households, so it can design and test interventions that will encourage smallholder farmers to take up innovations, particularly conservation agriculture and sustainable intensification technologies.[4]

Coastal Bangladesh has large areas of flood-prone land with variable levels of salinity and low agricultural production. Agriculture centres on the annual cropping of rice in the monsoon season and other crops in the dry (rabi) season, which is economic, but limited by land topography, soil salinity and irrigation availability. Salinity varies spatially and temporally, so there are opportunities for more profitable dry-season cropping on fallow land between rice crops. A project, led by Professor William Erskine of the University of Western Australia, aims to lift agricultural productivity and profitability, and hence rural welfare in the region, by introducing salt-tolerant wheat and pulses and alternative dry-season fodder crops.[5]

In 2016, for the first time in Asia, wheat blast devastated some 15,000 hectares of crops in Bangladesh. After an immediate emergency response, a large, integrated multidisciplinary program was formed. As part of the program, an ACIAR project, led by Dr Pawan Singh at CIMMYT, aims to help reduce the effect of wheat blast in Bangladesh, by identifying new sources of genetic resistance, and deploying known sources, then using them in breeding programs to develop improved varieties. The project supports the operation of the Bangladesh Agricultural Research Institute research platform in Jessore, where wheat germplasm from all around the world can be tested for tolerance to wheat blast.[6]

Mungbean is an important food and cash crop of South and South-East Asia. Its short growing season, low input requirement and high global demand make mungbean an ideal rotation crop for smallholder farmers, particularly in rice-based farming systems. The establishment of the International Mungbean Improvement Network, through an ACIAR-supported project, led by Dr Ramakrishnan Nair of the World Vegetable Center, has helped realise the potential of mungbean to improve cropping system productivity and livelihoods. The centre continues to improve researchers' access to genetic material, and to coordinate and provide technical support to variety work in Bangladesh, India, Myanmar and Australia.[7] In 2019–20, the network will be extended to Kenya, Tanzania and Uganda, providing access to new genetic material, and improving cropping opportunities for smallholders in Africa.[8]

Another project, led by Dr Ramakrishnan Nair of The World Vegetable Center, continues to trial combine harvesting management and methods with progressive mungbean growers and contractors in Bangladesh and Myanmar, and to establish community-based agri-enterprise for harvesting services to smallholder farmers. Throughout 2019, the project will explore how women can engage in, and benefit from, the business models identified for mechanised harvesting services.[9]

The availability of chickpea lines resistant to the major insect pests—pod borer and bruchids—would reinvigorate and increase crop production in Bangladesh. This would reduce the use of chemical pesticides by smallholder farmers, protecting their environment. Chickpeas would also contribute to the sustainability of food production systems, by breaking disease cycles and fixing nitrogen in low input agricultural systems. Dr TJ Higgins of CSIRO Agriculture and Food leads an evaluation of the opportunities offered by gene technology, to develop lines of chickpea suited to conditions in Bangladesh, with higher yield potential than existing varieties and with resistance to major insect pests.[10]

Water and Climate

About 65% of people living in the coastal zones of Bangladesh and West Bengal in India live below the poverty line. Owners of marginal land, those without land, tribal people, women and those who rely on ecosystem services (such as fishing communities) are often disadvantaged by low levels of agricultural development. A project, led by Dr Christian Roth of CSIRO Agriculture and Food, is investigating ways to provide more equitable and less-risky development pathways for marginalised communities. The learnings from the project, which concludes in 2020, will be used to support the design and delivery of public and private programs that are more socially inclusive, enabling marginalised people and the poorest households to access the benefits of agricultural intensification.[11]

In the same region, another project, led by Dr Mohammed Mainuddin of CSIRO Land and Water, aims to sustainably increase cropping intensity and productivity, particularly in the dry season, through integrated soil, water and crop management. Field experiments and computer modelling have identified suitable and profitable cropping patterns. The researchers have also gained an understanding of the influence of soil management techniques and canal management, to retain freshwater for irrigation in the dry season. In its last year, results from four seasons will be synthesised, communicated and disseminated through meetings, workshops, and policy briefs to scientists from collaborating organisations, students from universities, non-government organisation staff, officials and farmers.[12]

Specifically focused on Bangladesh, a project, led by Professor Richard Bell of Murdoch University, 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.[13]

Resources for agriculture are relatively abundant in the Eastern Gangetic Plain, compared with neighbouring regions, and the benefits of intensification are well demonstrated. A project, led by Professor Lin Crase of the University of South Australia, aims to determine how institutions in the region, in their various forms and scales, can simultaneously and successfully promote intensification, integration and inclusiveness. In its final year, the project will foster collaboration with and within state, district and national authorities, by developing an agreed evidence-based framework for shaping institutions. Institutional field sites will also be created, where the benefits of institutional change can be showcased and monitored beyond the life of the project.[14]

A project, led by Professor Richard Bell of Murdoch University, will identify gaps in policy and capacity, as well as roadblocks to the adoption of conservation agriculture-based farm mechanisation on small farms in Bangladesh. The project builds on previous project outputs, especially the development of the versatile multicrop planter, and evaluates 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 completed.[15]

Another project, led by Mr Erik Schmidt of the University of Southern Queensland, will engage farmer collectives established in a previous ACIAR project, and will support field activities. These will help determine the most effective way to extend and scale-out climate-smart irrigation and agricultural practices for marginal communities of the Eastern Gangetic Plains into government and agency implementation programs and initiatives. The project will also investigate the institutional structures, policy frameworks and value-chain interventions required to support the long-term sustainability of farmer collectives at a village level.[16]

Three small research activities, will operate during 2019–20 on the Eastern Gangetic Plains in Bangladesh, India and Nepal, with a common theme of optimising management of natural resources, and adopting new practices to increase productivity and sustainability, and ultimately improve the livelihoods of the many and varied communities of the plains. These projects are part of the SDIP, a larger investment by the Australian Government in the region (see page 123).

Food systems in the Eastern Gangetic Plains face major challenges, while at the same time, rapid economic growth and technological progress in the South Asia economy is generating new opportunities for agriculture. A project, led by Dr Avinash Kishore of the International Food Policy Research Institute, aims to prepare an open, scientifically informed and participatory ‘foresight for food’ exercise in the Eastern Gangetic Plains region. The exercise will be carried out by regional scientists and other stakeholders.[17]

The traditional concept of a physiological crop yield gap is considered useful in national food security planning. But across the Indo–Gangetic Plains, socioeconomic constraints often limit yield, while overexploitation of regional water resources also causes problems. A project, led by Dr Donald Gaydon of CSIRO Agriculture and Food, aims to quantify current yield gaps (physiological, economic and water use sustainability) for major food crops at sentinel sites across the plains. The project will make a preliminary assessment of the effects of conservation agriculture and sustainable intensification, future climate scenarios, and some economic variables.[18]

Groundwater levels are falling in some areas of the Eastern Gangetic Plains, particularly in north-west Bangladesh. To address the situation, farm-scale water saving measures, innovative irrigation practices and soil conservation practices are proposed and actively promoted. But it is likely that on-farm measures have no impact on the sustainability of groundwater, and could be counterproductive, by reducing recharge to the aquifer. A project, led by Dr Mohammed Mainuddin of CSIRO Land and Water, aims to better understand the impact of farm-scale water management on regional hydrology, to provide options for sustainable groundwater management for irrigated crop production.[19]

Regional Manager, South Asia
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See page 200 for contact details

Sustainable intensification of crops such as maize is being investigated through a program of projects that are part of the Sustainable Development Investment Portfolio (page 123). Credit: ACIAR/Conor Ashleigh (2019)

Current and proposed projects

1. Understanding the drivers of successful and inclusive rural regional transformation: sharing experiences and policy advice in Bangladesh, China, Indonesia and Pakistan (ADP/2017/024)
2. Sustainable and resilient farming system intensification (SDIP) [Bangladesh, India, Nepal] (CSE/2011/077)
3. Identifying Eastern Gangetic Plains soil constraints (SDIP) (CROP/2018/210)
4. Enhancing farm household management decision-making for increased productivity in the Eastern Gangetic Plains [Bangladesh, India, Nepal] (CSE/2012/108)
5. Incorporating salt-tolerant wheat and pulses into smallholder farming systems in southern Bangladesh (CIM/2014/076)
6. Identification of sources of resistance to wheat blast and their deployment in wheat varieties adapted to Bangladesh (CIM/2016/219)
7. Establishing the International Mungbean Improvement Network [Bangladesh, India, Myanmar] (CIM/2014/079)
8. Extension of the International Mungbean Improvement Network project [Bangladesh, India, Kenya, Myanmar, Tanzania, Uganda] (CROP/2018/133)
9. Improved mungbean harvesting and seed production systems for Bangladesh, Myanmar and Pakistan (CIM/2016/174)
10. Insect tolerant chickpea for Bangladesh (CIM/2016/039)
11. Promoting socially inclusive and sustainable agricultural intensification in West Bengal (India) and Bangladesh (LWR/2014/072)
12. Cropping system intensification in the salt-affected coastal zones of Bangladesh and West Bengal (India) (LWR/2014/073)
13. Nutrient management for diversified cropping in Bangladesh (LWR/2016/136)
14. Institutions to support intensification, integrated decision-making and inclusiveness in agriculture in the East Gangetic Plain [Bangladesh, India, Nepal] (LWR/2018/104)
15. Pilot project on commercialisation of smallholder conservation-based planters in Bangladesh (LWR/2018/111)
16. Improving livelihood of marginal communities, by out-scaling irrigation and agricultural practices, through collectives, in the Eastern Gangetic Plains [Bangladesh, India, Nepal] (WAC/2018/163)
17. Foresight for sustainable food systems in the Eastern Gangetic Plains (SDIP) [Bangladesh, India, Nepal] (WAC/2018/168)
18. Quantifying crop yield gaps across the Indo-Gangetic Plains from new perspectives: production, farmer profit and sustainability of water use (SDIP) [Bangladesh, India, Nepal] (WAC/2018/169)
19. The regional hydrological impact of farm-scale water saving measures in the Eastern Gangetic Plains (SDIP) [Bangladesh, India, Nepal] (WAC/2019/104)

India

Budgeted funding

A$2.4
million

ACIAR-supported projects

17

Multilateral & co-investment program

1

Australia does not have a bilateral development cooperation program with India, however we do provide support through our global and regional aid investments and technical assistance activities. ACIAR works with partners in India and the South Asia region to address Objective 1 of the South Asia Regional Aid Program—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). The program seeks to underpin Australia's economic engagement in the region by addressing key region-wide barriers to sustainable economic growth. The Australian Government's overseas aid program advances Australia's national interest by assisting developing countries to reduce poverty and achieve economic development.

Australian High Commission, New Delhi, 2019

India is the seventh largest country in the world by land area. With more than 1.3 billion people, it is the second most populous country after China, and accounts for 18% of the world's population.

The level of urbanisation in India has increased from 28% to 31% over the past decade, but two-thirds of the population still lives in rural areas. Agricultural land is very scarce, with just 0.15 hectares per capita. The proportion of the population that is undernourished has declined significantly, from about 24% in 1990–92 to 15% in 2014–16. The country has also emerged as a major agricultural exporter of several key commodities, and is currently the largest exporter of rice globally and the second largest of cotton.

The contribution of the agricultural sector to India's GDP has declined over the past two decades—from 29% in 1990 to 17% in 2016— but agriculture remains a major source of employment, accounting for about 47% of the total national workforce. At the same time, production has been increasing, by an average of 3.6% per year since 2011, due to improved access to inputs such as fertilisers and seeds, irrigation and credit facilities. The sector has also diversified from grains to pulses, fruit, vegetables and livestock products, largely driven by evolving demographics, urbanisation and changing consumer demand patterns. However, the country is still plagued with issues of low market prices, distorted subsidies, lack of storage infrastructure, inefficient use of natural resources, and susceptibility to climate change and extreme weather.

The focus of the Indian Government on agriculture has shifted from increasing productivity to increasing the income of farmers—with a target of doubling incomes by 2022–23. An inter-ministerial committee, set up in April 2016, identified seven major sources of growth in the agriculture sector. They are:

- improvement in crop productivity
- improvement in livestock productivity
- resource use efficiency or saving in cost of production
- increase in cropping intensity
- diversification towards high-value crops
- improvement in real prices received by farmers
- shift from farm to non-farm occupations.

The India Economic Survey 2017–18 highlighted that women farmers are predominant at all levels of farming production, pre-harvest, post-harvest processing, packaging, and marketing of the agricultural value chain. To transform agriculture and allied sectors in the country, an 'inclusive transformative agricultural policy' is essential, and should aim at gender-specific interventions, to raise productivity of small farm holdings, integrate women as active agents in rural transformation, and engage men and women in extension services with gender expertise. This requires that women farmers have better access to resources like land, water, credit, technology and training. The Indian Government has been implementing various schemes to address these challenges, but there is still a huge knowledge gap and limited resources to implement gender-inclusive agricultural development strategies.

Country priorities

The ACIAR research activities with India are delivered totally through a regional collaborative approach involving neighbouring countries with shared issues and opportunities. Australia's analysis—An India Economic Strategy to 2035—identified agribusiness development as one of the lead sectors of focus for collaboration. Substantial co-investment from India will become a prerequisite to maintain an ongoing program of collaboration in future.

The geographic focus will remain on the eastern regions, with a focus on:

- managing agricultural water, including rainfed areas in the Eastern Gangetic Plains and coastal zone
- sustainably intensify and diversify cropping systems, with support of conservation agriculture/ zero tillage
- breeding improved varieties of wheat and mungbean
- helping to develop policies for farmers' livelihoods and climate change.

2019–20 research program

ACIAR supports 17 projects in India, two of which are specific to this country, and the remainder are part of regional projects. The projects address our high-level objectives, as outlined in the 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and partner organisations.

The following sections briefly describe individual ACIAR-supported projects and anticipated outputs in India, grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

Crops

The Sustainable and Resilient Farming Systems Intensification project is a large collaborative venture between ACIAR, 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 its final year, the project, led by Dr Thakur P Tiwari of CIMMYT, will support widespread adoption of sustainable, resilient and more profitable farming systems, through capacity development, and credible pathways to scale-out conservation agriculture and sustainable intensification systems.[1] This project is part of the SDIP, a larger investment by the Australian Government in the region (see page 123).

To supplement the farming systems project, a short research activity, led by Dr Neal Menzies of the University of Queensland, aims to validate future research needs on soil health, focusing on: soil acidification in areas where nitrogen fertiliser use has increased; the potential for zinc fertiliser to increase rice yields; changes in soil structure under conservation tillage practice; and understanding system sustainability through partial nutrient budgets.[2]

Various farming system innovations to increase productivity and resilience to climate change are being developed, but, outside of immediate project areas, the uptake and impact of these innovations is highly variable. A project, led by Dr Fay Rola-Rubzen of the University of Western Australia, will continue its research on understanding decision-making behaviour of farm households, so it can design and test interventions that will encourage smallholder farmers to take up innovations, particularly conservation agriculture and sustainable intensification technologies.[3]

Mungbean is an important food and cash crop of South and South-East Asia. Its short growing season, low input requirement and high global demand make mungbean an ideal rotation crop for smallholder farmers, particularly in rice-based farming systems. The establishment of the International Mungbean Improvement Network, through an ACIAR-supported project, led by Dr Ramakrishnan Nair of the World Vegetable Center, has helped realise the potential of mungbean to improve cropping system productivity and livelihoods. The centre continues to improve researchers' access to genetic material, and to coordinate and provide technical support to variety work in Bangladesh, India, Myanmar and Australia.[4] In 2019–20, the network will extend to Kenya, Tanzania and Uganda, providing access to new genetic material, and improving cropping opportunities for smallholders in Africa.[5]

Of three rust pathogens that significantly affect global wheat production, stripe rust (also called yellow rust) has been the most damaging worldwide for at least the past 40 years. In-crop control of the rust can be achieved by applying fungicide, but genetic resistance is economically and environmentally more sound. A project, led by Professor Robert Park of the University of Sydney, aims to reduce the vulnerability of wheat to stripe rust in South Asia and eastern Africa, by establishing, equipping and mobilising a collaborative network of key cereal improvement centres. The knowledge base that has been built will enable ongoing research and development. Significant benefits are expected to spill over to Australia, through identified markers linked to effective resistance genes, which can be used in pre-emptive breeding and to develop rapid diagnostic tests to profile pathogen isolates.[6]

Water and Climate

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 policymakers and irrigation officials, and to devolve decision-making to farmers. The project, led by Professor Lin Crase of the University of South Australia, concludes in 2019. Final activities will be to engage with policymakers about the usefulness of different forms of participatory irrigation management/irrigation management transfer, at different scales and in specific locations.[7]

About 65% of people living in the coastal zones of Bangladesh and West Bengal in India live below the poverty line. Owners of marginal land, those without land, tribal people, women and those who rely on ecosystem services (such as fishing communities) are often disadvantaged by low levels of agricultural development. A project, led by Dr Christian Roth of CSIRO Agriculture and Food, is investigating ways to provide more equitable and less-risky development pathways for marginalised communities. The learnings from the project, which concludes in 2020, will be used to support the design and delivery of public and private programs that are more socially inclusive, enabling marginalised people and the poorest households to access the benefits of agricultural intensification.[8]

Direct sowing of crops is being investigated in West Bengal, India. The project is part of the Australian Government's Sustainable Development Investment Portfolio (page 123) and led by CIMMYT, in partnership with Uttar Banga Krishi Viswavidyalaya.
Credit: ACIAR/Conor Ashleigh (2019)

Integrated soil and water management, particularly in the dry season, facilitates more intensive crop production, West Bengal, India. The project is part of the Australian Government's Sustainable Development Investment Portfolio (page 123) and led by CIMMYT, in partnership with Uttar Banga Krishi Viswavidyalaya. Credit: ACIAR/Conor Ashleigh (2019)

In the same region, another project, led by Dr Mohammed Mainuddin of CSIRO Land and Water, aims to sustainably increase cropping intensity and productivity, particularly in the dry season, through integrated soil, water and crop management. Field experiments and computer modelling have identified suitable and profitable cropping patterns. The researchers have also gained an understanding of the influence of soil management techniques and canal management, to retain freshwater for irrigation in the dry season. In its final year, results from four seasons will be synthesised, communicated and disseminated through meetings, workshops, and policy briefs to scientists from collaborating organisations, students from universities, non-government organisation staff, officials and farmers.[9]

Resources for agriculture are relatively abundant in the Eastern Gangetic Plain, compared with neighbouring regions, and the benefits of intensification are well demonstrated. A project, led by Professor Lin Crase of the University of South Australia, aims to determine how institutions in the region, in their various forms and scales, can simultaneously and successfully promote intensification, integration and inclusiveness. In its final year, the project will foster collaboration with and within state, district and national authorities, by developing an agreed evidence-based framework for shaping institutions. Institutional field sites will also be created, where the benefits of institutional change can be showcased and monitored beyond the life of the project.[10]

Another project, led by Mr Erik Schmidt of the University of Southern Queensland, will engage farmer collectives established in a previous ACIAR project, and will support field activities. These will help determine the most effective way to extend and scale-out climate-smart irrigation and agricultural practices, for marginal communities of the Eastern Gangetic Plains into government and agency implementation programs and initiatives. The project will also investigate the institutional structures, policy frameworks and value-chain interventions required to support the long-term sustainability of farmer collectives at a village level.[11]

Previous ACIAR-supported research on participative management of climate risk, groundwater and irrigation will be integrated into the Andhra Pradesh Drought Mitigation Program. A project team, led by Dr Uday Nidumolu of CSIRO Agriculture and Food, will work with Indian counterparts to integrate the research, support out-scaling of the ACIAR research and then co-learn about out-scaling. The objective of the project is to strengthen the adaptive capacity and productivity of agriculture in rainfed areas of five districts in southern Andhra Pradesh.[12]

Food systems in the Eastern Gangetic Plains face major challenges, while at the same time, rapid economic growth and technological progress in the South Asia economy are generating new opportunities for agriculture. A project, led by Dr Avinash Kishore of the International Food Policy Research Institute, aims to prepare an open, scientifically informed and participatory 'foresight for food' exercise in the Eastern Gangetic Plains region. The exercise will be carried out by regional scientists and other stakeholders.[13]

Three small research activities, will operate during 2019–20 on the Eastern Gangetic Plains in Bangladesh, India and Nepal, with a common theme of optimising management of natural resources, and adopting new practices to increase productivity and sustainability, and ultimately improve the livelihoods of the many and varied communities of the plains. These projects are part of the SDIP, a larger investment by the Australian Government in the region (see page 123).

The traditional concept of a physiological crop yield gap is considered useful in national food security planning. But across the Indo–Gangetic Plains, socioeconomic constraints often limit yield, while overexploitation of regional water resources also causes problems. A project, led by Dr Donald Gaydon of CSIRO Agriculture and Food, aims to quantify current yield gaps (physiological, economic and water use sustainability) for major food crops at sentinel sites across the plains. The project will make a preliminary assessment of the effects of conservation agriculture and sustainable intensification, future climate scenarios, and some economic variables.[14]

Groundwater levels are falling in some areas of the Eastern Gangetic Plains, particularly in north-west Bangladesh. To address the situation, farm-scale water saving measures, innovative irrigation practices and soil conservation practices are proposed and actively promoted. But it is likely that on-farm measures have no impact on the sustainability of groundwater, and could be counterproductive, by reducing recharge to the aquifer. A project, led by Dr Mohammed Mainuddin of CSIRO Land and Water, aims to better understand the impact of farm-scale water management on regional hydrology, to provide options for sustainable groundwater management for irrigated crop production.[15]

Aquifer storage and recovery could be effective for storing large volumes of water at relatively low cost, without the need to build large surface reservoirs. A project, led by Dr Prabhakar Sharma of Nalanda University, will investigate the technical viability of such systems, by installing an indigenously developed system at several sites in South Bihar. The project will study aquifer characteristics, produce a hydro-geological map, and initiate long-term monitoring of recharged water for continuous risk assessment. The project will also prepare an operating manual, assess benefits, and identify key social factors that help adoption by smallholder farmers.[16]

While there are proven benefits in conservation agriculture-based sustainable intensification systems in the Eastern Gangetic Plains, there are also potential trade-offs. Weed control is one of the biggest challenges when these systems are implemented. A project, led by Dr Brendan Brown of CIMMYT, will document farmers' knowledge, attitude and practices around weed management under conservation agriculture and sustainable intensification systems, and to analyse its gendered implications for equitable and sustainable intensification in the Eastern Gangetic Plains of South Asia.[17]

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See page 200 for contact details

Current and proposed projects

1. Sustainable and resilient farming system intensification (SDIP) [Bangladesh, India, Nepal] (CSE/2011/077)
2. Identifying Eastern Gangetic Plains soil constraints (SDIP) [Bangladesh, India, Nepal] (CROP/2018/210)
3. Enhancing farm household management decision-making for increased productivity in the Eastern Gangetic Plains [Bangladesh, India, Nepal] (CSE/2012/108)
4. Establishing the International Mungbean Improvement Network [Bangladesh, India, Myanmar] (CIM/2014/079)
5. Extension of the International Mungbean Improvement Network project [Bangladesh, India, Kenya, Myanmar, Tanzania, Uganda] (CROP/2018/133)
6. Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa [Ethiopia, India, Nepal, Pakistan] (CIM/2014/081)
7. Efficient participatory irrigation institution to support productive and sustainable agriculture in South Asia [India, Pakistan] (ADP/2014/045)
8. Promoting socially inclusive and sustainable agricultural intensification in West Bengal (India) and Bangladesh (LWR/2014/072)
9. Cropping system intensification in the salt-affected coastal zones of Bangladesh and West Bengal (India) (LWR/2014/073)
10. Institutions to support intensification, integrated decision-making and inclusiveness in agriculture in the East Gangetic Plain [Bangladesh, India, Nepal] (LWR/2018/104)
11. Improving livelihood of marginal communities, by out-scaling irrigation and agricultural practices, through collectives, in the Eastern Gangetic Plains [Bangladesh, India, Nepal] (WAC/2018/163)
12. Water management for smallholder farmers: out-scaling ACIAR research in Andhra Pradesh drought mitigation program [India] (WAC/2018/164)
13. Foresight for sustainable food systems in the Eastern Gangetic Plains (SDIP) [Bangladesh, India, Nepal] (WAC/2018/168)
14. Quantifying crop yield gaps across the Indo–Gangetic Plains from new perspectives: production, farmer profit and sustainability of water use (SDIP) [Bangladesh, India, Nepal] (WAC/2018/169)
15. Aquifer characterisation, artificial recharge and reuse of suddenly available water in South Bihar, India (SDIP) (WAC/2018/211)
16. The regional hydrological impact of farm-scale water saving measures in the Eastern Gangetic Plains (SDIP) [Bangladesh, India, Nepal] (WAC/2019/104)
17. The implications of sustainable intensification on weed dynamics in the Eastern Gangetic Plains (SDIP) [India, Nepal] (WAC/2018/221)

Nepal

Budgeted funding

A$1.3
million

ACIAR-supported projects

12

Multilateral & co-investment program

1

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)

Nepal emerged from 10 years of civil conflict in 2006, and, in December 2017, elections were successfully held at the federal, state, and local tier, marking the final phase in the country's long political transition. A new government was formed in February 2018.

Nepal is among the least developed countries in the world, with about one-quarter of its population living below the poverty line. It is heavily dependent on remittances, which amount to as much as 30% of GDP. 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 2018. In 2015, Nepal was hit by its worst earthquake in 80 years. Reconstruction after the earthquake continues to have a negative impact on the growth of the economy.

Agriculture provides livelihoods for 66% of Nepal's population, and accounts for 36% of the GDP. Farming is subsistence in nature, and cropping is mostly integrated with livestock production. Agriculture is the largest sector of Nepal's economy, and faces numerous interdependent challenges associated with:

- degrading resources
- underdeveloped agricultural institutions and policies
- declining availability of labour
- lack of productive technologies and mechanisation, which limits the improvement of farm household livelihoods.

The challenges facing agriculture 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.

Nepal's Agriculture Development Strategy 2015–2035 outlines a 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. It conceptualises transformation of Nepal from a society primarily based on agriculture to one that derives most of its income from services and industry. The 20-year strategy aims to halve poverty in less than 10 years, through an agriculture-led economy that achieves improved governance, higher productivity, profitable commercialisation and increased competitiveness.

The strategy also guides policies that include women, and states that all agricultural programs will be designed to benefit women. It contains specific programs for women's organisations and agro-enterprises led by women, and recommends equal wages for women labourers. 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.

Country priorities

Australia and Nepal have a longstanding relationship, which 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 SDIP, a regional multi-agency program in which ACIAR is a partner, 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.

Priorities for ACIAR collaboration have been identified through consultations with ACIAR senior research staff and stakeholders in Nepal. Increased farm and forest productivity is a core approach to better food and nutrition security and 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.

2019–20 research program

ACIAR supports 12 projects in Nepal, two of which are specific to this country, and the remainder are part of regional projects. The projects address our high-level objectives, as outlined in the 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and partner organisations.

The following sections briefly describe individual ACIAR-supported projects and anticipated outputs in Nepal, grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

Crops

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To supplement the farming systems project, a short research activity, led by Dr Neal Menzies of the University of Queensland, aims to validate future research needs on soil health, focusing on: soil acidification in areas where nitrogen fertiliser use has increased; the potential for zinc fertiliser to increase rice yields; changes in soil structure under conservation tillage practice; and understanding system sustainability through partial nutrient budgets.[2]

Various farming system innovations to increase productivity and resilience to climate change are being developed, but, outside of immediate project areas, the uptake and impact of these innovations is highly variable. A project, led by Dr Fay Rola-Rubzen of the University of Western Australia, will continue its research on understanding decision-making behaviour of farm households, so it can design and test interventions that will encourage smallholder farmers to take up innovations, particularly conservation agriculture and sustainable intensification technologies.[3]

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Forestry

The Middle Hills of Nepal are home to 44% of the country's population, and most 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 suboptimal, with only very limited timber being harvested. A five-year project is building 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. The project, led by Dr Ian Nuberg of the University of Adelaide, 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 impacts. In each district, the project will work with 15 community forest user groups. 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.[5]

Water and Climate

Resources for agriculture are relatively abundant in the Eastern Gangetic Plain, compared with neighbouring regions, and the benefits of intensification are well demonstrated. A project, led by Professor Lin Crase of the University of South Australia, aims to determine how institutions in the region, in their various forms and scales, can simultaneously and successfully promote intensification, integration and inclusiveness. In its final year, the project will foster collaboration with and within state, district and national authorities, by developing an agreed evidence-based framework for shaping institutions. Institutional field sites will also be created, where the benefits of institutional change can be showcased and monitored beyond the life of the project.[6]

Another project, led by Mr Erik Schmidt of the University of Southern Queensland, will engage farmer collectives established in a previous ACIAR project, and will support field activities. These activities will help determine the most effective way to extend and scale-out climate-smart irrigation and agricultural practices, for marginal communities of the Eastern Gangetic Plains into government and agency implementation programs and initiatives. The project will also investigate the institutional structures, policy frameworks and value-chain interventions required to support the long-term sustainability of farmer collectives at a village level.[7]

Three small research activities, will operate during 2019–20 on the Eastern Gangetic Plains in Bangladesh, India and Nepal, with a common theme of optimising management of natural resources and adopting new practices to increase productivity and sustainability, and ultimately improve the livelihoods of the many and varied communities of the plains. These projects are part of the SDIP, a larger investment by the Australian Government in the region (see page 123).

Food systems in the Eastern Gangetic Plains face major challenges, while at the same time, rapid economic growth and technological progress in the South Asia economy is generating new opportunities for agriculture. A project, led by Dr Avinash Kishore of the International Food Policy Research Institute, aims to prepare an open, scientifically informed and participatory 'foresight for food' exercise in the Eastern Gangetic Plains region. The exercise will be carried out by regional scientists and other stakeholders.[8]

The traditional concept of a physiological crop yield gap is considered useful in national food security planning. But across the Indo–Gangetic Plains, socioeconomic constraints often limit yield, while overexploitation of regional water resources also causes problems. A project, led by Dr Donald Gaydon of CSIRO Agriculture and Food, aims to quantify current yield gaps (physiological, economic and water use sustainability) for major food crops at sentinel sites across the plains. The project will make a preliminary assessment of the effects of conservation agriculture and sustainable intensification, future climate scenarios, and some economic variables.[9]

Groundwater levels are falling in some areas of the Eastern Gangetic Plains, particularly in north-west Bangladesh. To address the situation, farm-scale water saving measures, innovative irrigation practices and soil conservation practices are proposed and actively promoted. But it is likely that on-farm measures have no impact on the sustainability of groundwater, and could be counterproductive, by reducing recharge to the aquifer. A project, led by Dr Mohammed Mainuddin of CSIRO Land and Water, aims to better understand the impact of farm-scale water management on regional hydrology, to provide options for sustainable groundwater management for irrigated crop production.[10]

SDIP activities have highlighted how conservation agriculture-based sustainable intensification practices can improve the livelihoods of those in rural areas of the Eastern Gangetic Plains. A short research activity, led by Dr Brendan Brown of CIMMYT, aims to build capacity for conservation agriculture-based sustainable intensification to be mechanised. The project will formally map and understand the institutional landscape for mechanisation at provincial level; facilitate the development of multi-stakeholder platforms; and support the development of a road map to help roll out mechanisation.[11]

While there are proven benefits in conservation agriculture and sustainable intensification systems in the Eastern Gangetic Plains, there are also potential trade-offs. Weed control is one of the biggest challenges when these systems are implemented. A project, led by Dr Brendan Brown of CIMMYT, will document farmers' knowledge, attitude and practices around weed management under conservation agriculture and sustainable intensification systems, and to analyse its gendered implications for equitable and sustainable intensification in the Eastern Gangetic Plains of South Asia.[12]

Current and proposed projects

1. Sustainable and resilient farming system intensification (SDIP) [Bangladesh, India, Nepal] (CSE/2011/077)
2. Identifying Eastern Gangetic Plains soil constraints (SDIP) [Bangladesh, India, Nepal] (CROP/2018/210)
3. Enhancing farm household management decision-making for increased productivity in the Eastern Gangetic Plains [Bangladesh, India, Nepal] (CSE/2012/108)
4. Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa [Ethiopia, India, Nepal, Pakistan] (CIM/2014/081)
5. Enhancing livelihoods through improved forest management in Nepal (FST/2017/037)
6. Institutions to support intensification, integrated decision-making and inclusiveness in agriculture in the East Gangetic Plain [Bangladesh, India, Nepal] (LWR/2018/104)
7. Improving livelihood of marginal communities, by out-scaling irrigation and agricultural practices, through collectives, in the Eastern Gangetic Plains [Bangladesh, India, Nepal] (WAC/2018/163)
8. Foresight for sustainable food systems in the Eastern Gangetic Plains (SDIP) [Bangladesh, India, Nepal] (WAC/2018/168)
9. Quantifying crop yield gaps across the Indo–Gangetic Plains from new perspectives: production, farmer profit and sustainability of water use (SDIP) [Bangladesh, India, Nepal] (WAC/2018/169)
10. The regional hydrological impact of farm-scale water saving measures in the Eastern Gangetic Plains (SDIP) [Bangladesh, India, Nepal] (WAC/2019/104)
11. Building provincial capacity for sustainable agricultural mechanisation in Nepal (SDIP) (WAC/2018/220)
12. The implications of sustainable intensification on weed dynamics in the Eastern Gangetic Plains (SDIP) [India, Nepal] (WAC/2018/221)

Regional Manager, South Asia
Dr Pratibha Singh

Research Program Managers
Crops—Dr Eric Huttner
Forestry—Dr Nora Devoe
Water and Climate—Dr Robyn Johnston

See page 200 for contact details

Pakistan

Budgeted funding

A$4.5
million

ACIAR-supported projects

13

Pakistan is at the heart of a regional market with a large population, diverse resources and untapped potential for trade. However, Pakistan faces several 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

Pakistan's economic performance remained robust during 2018 as growth continued to accelerate, reaching its highest level in the past decade, while inflation stayed well below target—Pakistan achieved GDP growth of 5.5%.

Pakistan's economy relies on agriculture, which accounts for nearly 21% of total GDP, generates employment for 44% of the total labour force and provides 78% of the country's export income (primarily textile, agricultural commodities and products, animal-sourced foods and livestock by-products). The sector faces many challenges, including low cereal/legume and livestock productivity, low crop and livestock diversification, inefficient management practices, climate change and excessive pressure on water resources.

The Government of Pakistan recently launched a Food Security Policy, which recognises the importance of reactivation of the agriculture sector. The policy provides guidelines to address stagnant growth and inequity that typifies much of Pakistan's agriculture sector. It focuses on:

- building an innovation-based sustainable agricultural sector
- using public investment to improve the profitability of agriculture
- ensuring food security and freedom from hunger.

The current ACIAR investments are well aligned with this policy through ongoing policy discussions at the national and provincial levels.

Diminishing water availability requires effective management at farm and national scales. Agricultural intensification and competing demands for urban and industrial uses are exerting pressure on availability of surface and groundwater water resources. This pressure, as well as low agricultural productivity, increasing waterlogging and salinity, faulty irrigation management practices with poor drainage, and soil management are the key issues in this sector. Climate changes is further exacerbating these challenges.

The Chinese investment in the China–Pakistan Economic Corridor is helping to improve infrastructure, lift energy capacity and underpin economic growth in Pakistan. This has entered into a new phase, focusing on technology transfer and skill development. With a new government in Pakistan, there has been significant foreign investment from Saudi Arabia and Malaysia, with agriculture being main driver of all these initiatives.

ACIAR works closely with DFAT, Australian institutions, the Pakistan Federal Government, provincial departments, non-government organisations, academia and the Pakistani private sector, along with other donor partners, to provide research and development and technical capacity building. Technical support and carefully targeted research and development interventions underpin development programs in Pakistan.

Country priorities

The Pakistan Government has recently identified market-led development as a key approach to addressing food insecurity and poverty of rural areas. The dairy and small ruminant sectors, in particular, have been given a high priority, as these provide a safety net and self-employment opportunities for more than 12 million rural families, and are often the only option for these families to generate an income. Ongoing ACIAR work in dairy beef value chains, along with a new project in the small ruminant sector, is well positioned to support the Pakistan Government's priorities.

As the road links between China and Pakistan have improved, Pakistan has negotiated access for its fruit and vegetables into the China market. This will create prospects of further investment in the horticulture sector. Given increased interest from China in supporting agricultural research and development in Pakistan, there are possibilities for trilateral collaboration. Our long-term support to the horticulture sector is now fully integrated into a large horticultural development program in Punjab, with CABI leading both ACIAR research and the Punjab development projects.

Uncoordinated use of groundwater is increasing soil salinity in Pakistan, and both national and provincial irrigation policies have identified this as major threat. ACIAR is scoping opportunities for a program of research collaboration with Pakistan on salinity-tolerant agricultural systems.

Rapid rural transformation has led to a quick decline of poverty in many countries, but success varies between countries, and between regions within countries. Rapid rural transformation in China has been responsible for millions of people being assisted out of poverty. ACIAR is supporting research collaboration involving China to better understand rural transformation processes and policies relevant for Pakistan.

The National Planning Commission of Pakistan has recently expressed interest in developing a partnership arrangement with ACIAR, involving co-investment in longer-term agricultural research-for-development projects. ACIAR will pursue this in 2019–20.

2019–20 research program

ACIAR supports 13 projects in Pakistan, nine of which are specific to this country, and the remainder are part of regional projects. The projects address our high-level objectives, as outlined in the 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and partner organisations.

The following sections briefly describe individual ACIAR-supported projects and anticipated outputs in Pakistan, grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

Agribusiness

Pakistan is home to one of the largest horticulture industries of the world, with great potential domestically and globally. A detailed study of horticultural markets in China will be conducted as part of a broader project to design practical horticulture marketing policy reforms in Pakistan. This will help improve producer and consumer welfare, with particular attention to gender and poverty dimensions. China's experience in agricultural market reform is valuable to the project, and the China–Pakistan Economic Corridor will provide Pakistan with preferential access to the world's fastest growing horticulture market. The project, led by Dr Thilak Mallawaarachchi of the University of Queensland, aims to increase growth, employment and productivity for Pakistan's agricultural markets. In the concluding stages of the project, the assessment of markets in China will support the development of commodity market models, and provide an analysis of domestic and export market potential.[1]

Pulses, mainly chickpeas, lentils and mungbeans, are well suited to smallholder farming by both men and women, and are important in the agrifood systems of Pakistan. A project, led by Dr Rajendra Adhikari of the University of Tasmania, will develop socially inclusive and competitive value chains for pulses in Punjab and Sindh, with spillover benefits expected for the Khyber Pakhtunkhwa region. The three regions are characterised by gender inequalities within the industry and in society generally. The project will develop production and market knowledge, increase capacity of farmers and stakeholders, and support industry development.[2]

As development proceeds throughout the Indo-Pacific region, countries will undergo rural transformation. A new project in China, Bangladesh, Indonesia and Pakistan, led by Dr Chunlai Chen of the Australian National University, endeavours to understand the nature and drivers of rural transformation, to provide better policy advice that will underpin the success of transformation. In 2019–20, the project will review literature, collect data and conduct interviews and workshops to explain and describe rural transformation, and form the basis for future research.[3]

Crops

Of three rust pathogens that significantly affect global wheat production, stripe rust (also called yellow rust) has been the most damaging worldwide for at least the past 40 years. In-crop control of the rust can be achieved by applying fungicide, but genetic resistance is economically and environmentally more sound. A project, led by Professor Robert Park of the University of Sydney, aims to reduce the vulnerability of wheat to stripe rust in South Asia and eastern Africa, by establishing, equipping and mobilising a collaborative network of key cereal improvement centres. The knowledge base that has been built will enable ongoing research and development. Significant benefits are expected to spill over to Australia, through identified markers linked to effective resistance genes, which can be used in pre-emptive breeding and to develop rapid diagnostic tests to profile pathogen isolates.[4]

The demand for pulses in Pakistan has been increasing, while production is decreasing. Despite relatively high prices, pulses, especially chickpea and lentils, have been progressively pushed out to the most marginal lands, with labour shortages being a major production constraint. Reintroducing legumes in cropping systems would have nutritional, economic and environmental benefits, and has been identified as a priority for agriculture development by the Pakistan Government. A project, led by Dr Ata-ur Rehman of Charles Sturt University, aims to increase the production and profitability of pulses in the existing cropping systems in Pakistan, through farmer-led research and demonstrations of improved varieties, agronomic practices and seed production.[5]

A project led by Dr Ramakrishnan Nair of The World Vegetable Center, continues to trial combine harvesting management and methods with progressive farmers and contractors in Pakistan, Bangladesh and Myanmar, and establish community based agri-enterprise for harvesting services to smallholder farmers. Throughout 2019, the project will explore how women can engage in, and benefit from, the business models identified for mechanised harvesting services.[6]

Horticulture

The horticulture sector in Pakistan is significant, both domestically and for export production. 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. A project, led by Dr Babar Bajwa of the Centre for Agriculture and Bioscience International, will strengthen selected horticultural value chains in Punjab and Sindh provinces, as part of the Agriculture Value Chain Collaborative Research Program. The project focuses on potatoes, chillies, tomatoes and onions, and strives to build capacity of farming families, traders and intermediaries.[7]

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 the 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, led by Dr David McGill of the University of Melbourne, is taking 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.[8]

Previous research found that poor supply (quantity, quality and consistency) of small ruminants from farms into local markets is the major restriction in many value chains. Further, extension and other services for small ruminant farmers are very limited. A project, led by Dr Rebecca Doyle of the University of Melbourne, focuses on including women in goat (and sheep) production systems and the value chain in the Pakistani provinces of Punjab and Sindh. The project will develop strategies for higher and more sustainable production and value-chain engagement, to improve the livelihoods and wellbeing of small ruminant farming families.[9]

Water and Climate

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 policymakers and irrigation officials, and to devolve decision-making to farmers. The project, led by Professor Lin Crase of the University of South Australia, concludes in 2019. Final activities will be to engage with policymakers about the usefulness of different forms of participatory irrigation management/irrigation management transfer, at different scales and in specific locations.[10]

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. A project, led by Dr Sandra Heaney-Mustafa of the University of Canberra, is working with farmers to test simple irrigation management tools, measuring soil moisture and nutrients, to extend information and support farmer-to-farmer learning. In the final year of the project, successful modes of extension will be used to increase the irrigation management skills of farmers. Scale-out models and plans will be developed for extension services for ongoing transfer of the tools and technologies beyond the project area.[11]

Processing of forage for more efficient livestock production, Pakistan. ACIAR project: Improving smallholder dairy and beef profitability by enhancing farm production and value-chain management in Pakistan (LPS/2016/011). Credit: ACIAR/Conor Ashleigh (2017)

Groundwater use is extensive in Pakistan, with some areas (Balochistan) being completely reliant on groundwater, 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, led by Dr Jehangir Punthakey of Charles Sturt University, has identified approaches for farmers, communities, and managers and policy-makers to manage both groundwater quantity and quality, while increasing agricultural productivity. In its final year, the project will test identified approaches with the economic and hydrogeological models developed or customised. The skills of farmers and stakeholders will be improved, and institutional arrangements identified for post-project adoption of tools and options.[12]

Salinisation and sodification of surface soils and waterlogging threaten agricultural production and livelihoods, resulting in higher rates of impoverishment for communities living in areas affected by salinity in the Indus Basin. A new project, led by Dr Michael Mitchell of Charles Sturt University, aims to build the adaptive capacity of farming and coastal communities in salinity-affected areas to maintain and improve their livelihoods. In the first year of the project, a set of case studies will be identified on which to focus subsequent project work. The research team will work with a broad network of local partners to develop adaptation options for living with salinity.[13]

Country Manager, Pakistan
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Research Program Managers
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Horticulture—Ms Irene Kernot
Livestock Systems—Dr Anna Okello
Water and Climate—Dr Robyn Johnston

See page 200 for contact details

Current and proposed projects

1. Policy and institutional reforms to improve horticultural markets in Pakistan [China, Pakistan] (ADP/2014/043)
2. Developing competitive and inclusive value chains of pulses in Pakistan (ADP/2017/004)
3. Understanding the drivers of successful and inclusive rural regional transformation: sharing experiences and policy advice in Bangladesh, China, Indonesia and Pakistan (ADP/2017/024)
4. Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa [Ethiopia, India, Nepal, Pakistan] (CIM/2014/081)
5. Increasing productivity and profitability of pulse production in cereal-based cropping systems in Pakistan (CIM/2015/041)
6. Improved mungbean harvesting and seed production systems for Bangladesh, Myanmar and Pakistan (CIM/2016/174)
7. Strengthening vegetable value chains in Pakistan for greater community livelihood benefits (HORT/2016/012)
8. Improving smallholder dairy and beef profitability by enhancing farm production and value-chain management in Pakistan (LPS/2016/011)
9. Enhancing small ruminant production to benefit farming families in Sindh and Punjab, Pakistan (LS/2018/105)
10. Efficient participatory irrigation institution to support productive and sustainable agriculture in South Asia [India, Pakistan] (ADP/2014/045)
11. Developing approaches to enhance farmer water management skills in Balochistan, Punjab and Sindh in Pakistan (LWR/2014/074)
12. Improving groundwater management to enhance agriculture and farming livelihoods in Pakistan (LWR/2015/036)
13. Salinity Pakistan (LWR/2017/027)

Sri Lanka

Budgeted funding

A$0.1
million

ACIAR-supported project

1

The Australian Government is providing an estimated $27.1 million in total official development assistance to Sri Lanka in 2019–20. That includes an estimated $19.9 million in bilateral funding managed by DFAT. Sri Lanka has experienced strong economic growth for more than a decade, reducing its rate of extreme poverty from 28.8% of the population in 1995 to 6.7% in 2013. However, poverty and economic marginalisation remain in many rural areas particularly in districts directly affected by the civil conflict that ended in 2009. As the Sri Lankan economy continues to grow, opportunities for greater two-way trade and investment will increase.

Aid Investment Plan, Sri Lanka, 2019–2020 (DFAT)

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 United Nations' Millennium Development Goals, and has achieved middle-income 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, but the program gradually reduced until the last fisheries project ended in 2005. However, Australia has a strong interest in ensuring Sri Lanka continues its development as a secure, stable and prosperous partner in the Indian Ocean region, underpinned by an effective post-conflict reconciliation process.

Instigated by a request by Australia's Commission for International Agricultural Research, ACIAR undertook a scoping study and concluded there was a conducive environment to re-establish a collaborative research program with Sri Lanka. Given Sri Lanka's middle-income status, this re-engagement is incumbent on significant co-investment from Sri Lanka.

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 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 that the growth and competitiveness of the Sri Lanka economy, particularly small and medium enterprises, are constrained by issues such as lack of access to finance, markets, market linkages, technology, skills gaps in the workforce and lack of effectively coordinated and inclusive policy reform.

2019–20 research program

ACIAR supports one project in Sri Lanka, which addresses our high-level objectives, as outlined in the 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and partner organisations. ACIAR provides funding of A$0.1 million to the project.

Fisheries

Sri Lanka has a well-developed and sustainable inland reservoir fishery that makes up about 12%–15% of 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 freshwater prawn (*Macrobrachium rosenbergii*) in inland reservoirs, but development has been ad hoc, with productivity and returns relatively low. An ACIAR-supported project, led by Dr Clive Jones of James Cook University, is investigating stocking, monitoring and harvesting practices to optimise fish and prawn productivity and quality. The project also aims to better understand the market chains, to enable further improvements in the value of the fishery, and benefit both men and women fishers and traders.[1]

Current project

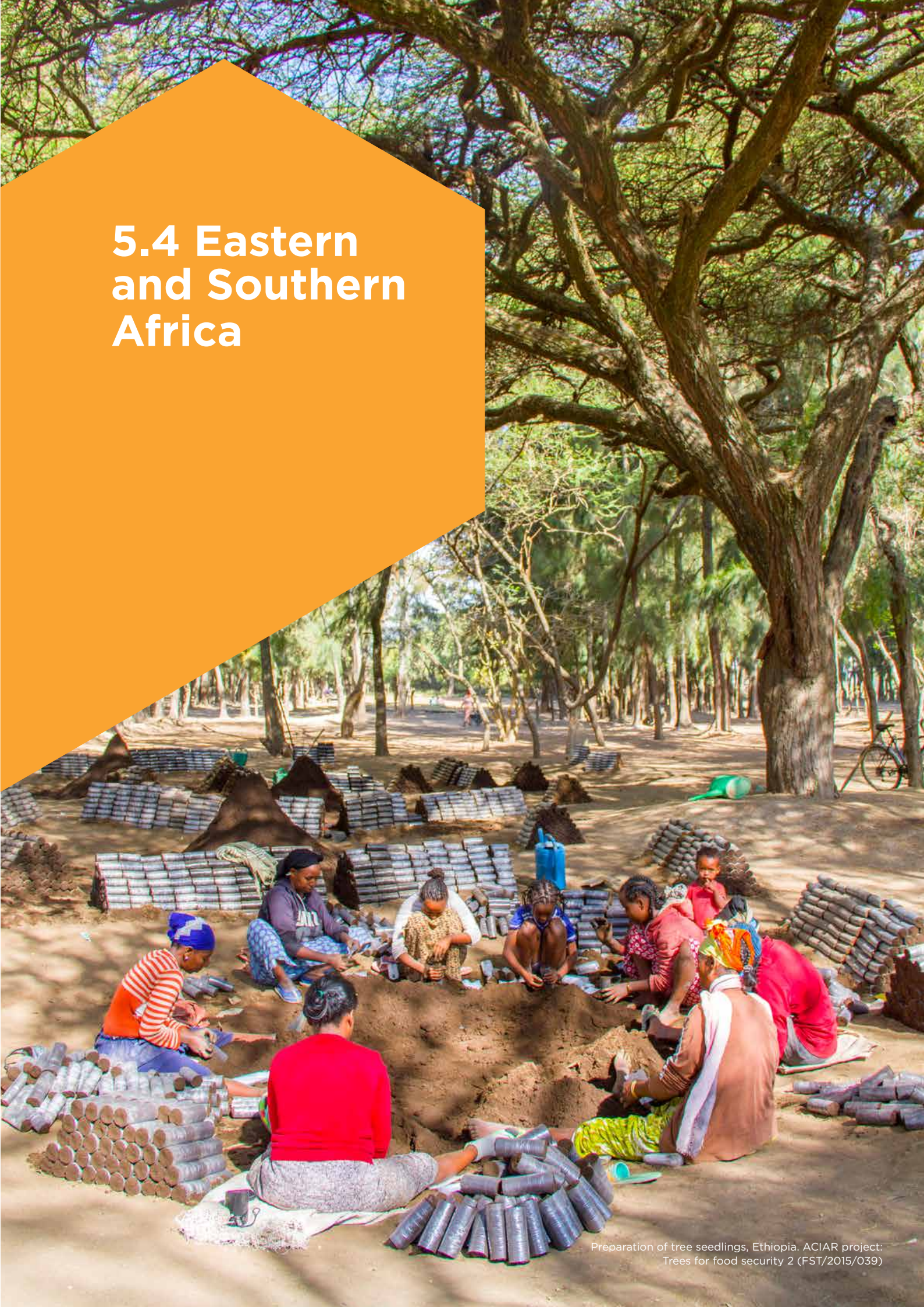
1. Improved productivity and efficiency of the culture-based fishery for giant freshwater prawn in Sri Lankan reservoirs (FIS/2018/157)

Regional Manager, South Asia
Dr Pratibha Singh

Research Program Managers
Fisheries—Dr Ann Fleming

See page 200 for contact details

5.4 Eastern and Southern Africa



Preparation of tree seedlings, Ethiopia. ACIAR project: Trees for food security 2 (FST/2015/039)

Eastern and Southern Africa

Regional summary

Africa's economic performance continues to grow, reaching an estimated 3.5% in 2018, up 1.4% 2016. In 2018, Eastern Africa had an estimated GDP growth of 5.7%, central Africa of 2.2%, and southern Africa of 1.2%. In the medium term, growth is predicted to speed up to 4.0% in 2019, and 4.1% in 2020. Africa's economic performance is projected to be higher than that of other emerging and developing countries, apart from China and India (African Economic Outlook 2019).

While incredibly diverse, at a macro level, the region has a greater proportion of poor people on average than any other, and is characterised by high levels of food insecurity and very low Human Development Index rankings.

The United Nations projects that, by 2050, the urban population of Africa will reach 56% of the total. Africa's demand for food is projected to more than double by that time, driven by population growth, rising incomes, rapid urbanisation, changes in national diets towards greater consumption of higher-value fresh and processed foods, and more open intra-regional trade policies. All of these are helping create new opportunities for Africa's smallholder farmers, driving many farmers to a more commercial way of operation. But, with that, comes new challenges to agricultural systems.

While agriculture remains a key driver of the economic growth required to deliver economic transformation for the rural poor, growth in productivity and production have broadly stagnated in the past decade. Unlocking the potential of Africa's agricultural and food systems requires substantial investment in the agriculture sector, as well as in the research to provide the knowledge that underpins growth in agricultural productivity, especially for commercialising smallholder farming.

Drivers of regional collaboration

The Comprehensive Africa Agriculture Development Programme (CAADP) process and subregional organisations have made concerted efforts to promote regional collaboration. The program has put priority-setting firmly in the hands of governments of member countries and their stakeholders. This is 'an agriculture-led integrated framework of development priorities aimed at reducing poverty and increasing food security on the continent'.

Under the program, African leaders agreed to spend a minimum of 10% of their total expenditure on agriculture, and to pursue a target of 6% annual growth rate in agriculture. This commitment was renewed in 2014 with the adoption of the Malabo Declaration on Accelerated African Agricultural Growth and Transformation for Shared Prosperity and Improved Livelihood. In 2017, the African Union introduced the annual Africa Agriculture Status Report that tracks and reports the status of the progress made by member states in implementing the Malabo Declaration.

The ACIAR program with Africa is aligned with the principles and values of CAADP. In particular, our program continues to liaise with:

- Forum for Agricultural Research in Africa (FARA)
- New Partnership for Africa's Development (NEPAD)
- subregional coordination bodies, especially:
  - Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA)
  - Centre for Coordination of Agricultural Research and Development for Southern Africa (CCARDESA)
  - Common Market for Eastern and Southern Africa (COMESA).

Table 5.4: Current and proposed projects in the Eastern and Southern Africa region, 2019–20

Project title	Country	Project code
Crops		
Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa	Ethiopia, India, Nepal, Pakistan	CIM/2014/081
Faba bean in Ethiopia: mitigating disease constraints to improve productivity and sustainability	Ethiopia	CIM/2017/030
Protection of stored grains against insect pests	Tanzania	CIM/2017/031
Rapid breeding for reduced cooking time and enhanced nutritional quality in common bean (*Phaseolus vulgaris*)	Burundi, Ethiopia, Kenya, Rwanda, Tanzania, Uganda	CROP/2018/132
Extension of the International Mungbean Improvement Network project	Bangladesh, India, Kenya, Myanmar, Tanzania and Uganda	CROP/2018/133
Forestry		
Developing value-chain innovation platforms to improve food security in eastern and southern Africa	Uganda, Zambia	FST/2014/093
Developing integrated options and accelerating scaling-up of agroforestry for improved food security and resilient livelihoods in eastern Africa—Trees for Food Security 2	Ethiopia, Rwanda, Uganda	FST/2015/039
Livestock Systems		
High-quality markets and value chains for small-scale and emerging beef cattle farmers in South Africa (stage 2)	South Africa	LS/2016/276
Integrating approaches for estimating greenhouse gas emissions from forests and livestock in Kenya	Kenya	LS/2018/202
Scoping livestock research opportunities in Africa	Ethiopia	LS/2018/205
Social Sciences		
The potential of International Landcare	Fiji, Indonesia, the Philippines, South Africa, Uganda	ASEM/2018/117
Water and Climate		
Transforming smallholder irrigation into profitable and self-sustaining systems in southern Africa	Malawi, Mozambique, South Africa, Tanzania, Zimbabwe	LWR/2016/137
Virtual irrigation academy, Phase 2	Malawi, Mozambique, South Africa, Tanzania, Zimbabwe	WAC/2018/162
Global Program		
Cultivate Africa's Future, Phase 2 (CultiAF2)	A program of nine projects, described in Chapter 2	C2016/367
Demand-led plant variety design for emerging markets in Sub-Saharan Africa	Ghana, Kenya, South Africa, Tanzania	FSC/2013/019

Note: More details (including project leader, commissioned organisation and partner organisations) are provided in the appendixes.

Eastern and Southern Africa

Budgeted funding

A$7.7
million

ACIAR-supported projects

15

Multilateral & co-investment programs

2

Australia's aid program in Sub-Saharan Africa supports the Foreign Policy White Paper aim of broadening our international influence in support of stability, prosperity and cooperation to address global challenges. Sub-Saharan Africa is a diverse region: the development context and challenges faced differ dramatically between the 49 countries. Australia's support to the agricultural sector in Sub-Saharan Africa aims to enhance agricultural productivity and food security to promote growth and improve livelihoods. Australia invests in the research and adoption of new technologies that address food availability, access and nutrition-related challenges for poor rural farmers. Our investments focus on areas where Australia has comparative technical, research and agribusiness expertise.

Overview of Australia's aid program in Sub-Saharan Africa (DFAT 2019)

The agricultural environments of eastern and southern Africa and of Australia have much in common—the wet tropics of Rwanda with northern Queensland, the semi-arid tropics of eastern Africa with central Queensland, and the arid rangelands of Ethiopia and southern Africa with the Northern Territory.

So, Australian agricultural science has expertise that is directly relevant in the African context. For more than three decades ACIAR-supported projects have mobilised this expertise to deliver sustainable development outcomes in the region. The free-market orientation and effective architecture of agricultural research in Australia are also relevant to African agricultural transformation.

Currently, ACIAR invests 12% of its annual budget in Africa, and directly funds projects in partnership with 12 African countries. But our footprint is much broader if we consider our contribution to the CGIAR, which has four of its centres located in Africa, and until recently spent half of its total budget in Africa.

ACIAR also has a substantial program in Africa, Cultivate Africa's Future Fund (CultiAF), which leverages co-investment with development partner, the Canadian International Development Research Centre. The CulitAF program has entered a second phase, and supports nine projects across seven countries. It harnesses the complementary interests and skill sets of both organisations, to deliver novel projects such as:

- Harnessing dietary nutrients of underutilised fish and fish-based products in Uganda
- Scaling-up supply and utilization of precooked beans
- Gender inclusive financing for scaling up improved fish processing technologies in Malawi.

CultiAF is discussed in more detail in Chapter 2 'Global partnerships'.

Our ongoing portfolio of projects covers a diverse variety of priorities, including:

- improving sustainable productivity in farming systems, including water and natural resource management, food crops, livestock production and disease management
- assessing the role of trees in farming systems, and what constraints are preventing agroforestry from being reintroduced
- improving human nutrition to lower risks to human health
- improving social inclusion and building the empowerment of women and girls in academic and rural settings
- fostering more inclusive agrifood and forestry market chains, engaging the private sector where possible
- building scientific and policy capability.

The core of our portfolio is delivered through bilateral country research partnerships (linked to regional impact pathways) and regional collaborations coordinated with subregional organisations.

During 2019–20, 15 ACIAR-supported projects and programs will be active in the Eastern and Southern Africa region (Table 5.4). The projects address our high-level objectives, as outlined in the 10-Year Strategy 2018–2027, as well as specific issues and opportunities identified by ACIAR and partner organisations.

The following sections briefly describe individual ACIAR-supported projects and anticipated outputs in Eastern and Southern Africa, grouped according to research program. Each project description is referenced in a list at the end of this section, which provides the project title and code.

Crops

Of three rust pathogens that significantly affect global wheat production, stripe rust (also called yellow rust) has been the most damaging worldwide for at least the past 40 years. In-crop control of the rust can be achieved by applying fungicide, but genetic resistance is economically and environmentally more sound. A project, led by Professor Robert Park of the University of Sydney, aims to reduce the vulnerability of wheat to stripe rust in South Asia and eastern Africa, by establishing, equipping and mobilising a collaborative network of key cereal improvement centres. The knowledge base that has been built will enable ongoing research and development. Significant benefits are expected to spill over to Australia, through identified markers linked to effective resistance genes, which can be used in pre-emptive breeding and to develop rapid diagnostic tests to profile pathogen isolates.[1]

Faba bean is the most important legume crop in Ethiopia. A newly established disease, faba bean gall, threatens the ongoing cultivation, viability and existence of the crop in highland areas. Little is known about the disease, and its management is a government priority. A project, led by Professor Martin Barbetti of the University of Western Australia, will define the conditions and practices driving the spread and impact of faba bean gall, and initiate a search for sources of genetic resistance. In its second year, research continues to help design and evaluate integrated pest management packages, and develop resistant varieties. The project also is investigating the presence and relevance of other diseases in faba bean.[2]

A new project aims to deliver new genotypes of the common bean that have 30% shorter cooking time and higher zinc and iron content than current varieties, as well as better resistance to *Bruchid* and *Pythium* root rot, and stronger agronomic traits. The five-year project will train plant breeders in the Pan-Africa Bean Research Alliance, coordinated by the International Center for Tropical Agriculture, in a new rapid method of plant breeding, based on optimal mating designs. The method takes advantage of recent developments in genetic data collection and analysis, to speed up breeding, while maintaining genetic diversity in the lines under selection. The project, led by Professor Wallace Cowling of the University of Western Australia, will distribute seed for parent lines to project partners, which will be subsequently evaluated, along with progeny of the parent lines in a first cycle of selection during 2019–20.[3]

In Tanzania, damage by insect pests poses a critical risk to on-farm storage of grains. The economic significance of most pests under farmers' production conditions is not adequately understood. The effectiveness of inert dusts for grain protection generally is limited, due to product characteristics and environmental factors.

Building on previous ACIAR research, a small research activity, led by Dr David Eagling from Davren Global, and co-funded by Davren Global and ACIAR, will investigate the new technology of synthetic amorphous silica. The project starts with a laboratory study to understand the various insect pests controlled by the silica and the design of equipment to apply the silica, suitable for smallholders in Tanzania.[4]

Mungbean has a short growing season, low input requirement and high global demand, making it an ideal rotation crop for smallholder farmers. The establishment of the International Mungbean Improvement Network, through an ACIAR-supported project, led by Dr Ramakrishnan Nair of the World Vegetable Center, has helped realise the potential of mungbean to improve cropping system productivity and livelihoods. The centre continues to improve researchers' access to genetic material, and to coordinate and provide technical support to crop variety work in Bangladesh, India, Myanmar and Australia. In 2019–20, the network will be extended to Kenya, Tanzania and Uganda, providing access to new genetic material, and improving cropping opportunities for smallholders in Africa.[5]

Forestry

Many products of agroforestry systems can be used directly by farmers to substantially improve their 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, led by Dr Clement Okia of the World Agroforestry Centre, worked with coalitions of stakeholders to establish effective innovation platforms that support greater collective action and increase farmer access to markets. The four-year project concludes in 2019, with the delivery of guidelines to help government and non-government organisations scale-up innovation platforms. It has demonstrated economic, social and environmental benefits for smallholder farmers and communities.[6]

Locally-appropriate agroforestry systems can lift crop yields, and 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, led by Dr Catherine Muthuri of World Agroforestry Centre, 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. This will enable farmers to choose the best agroforestry system for their circumstances. The project is also working to increase adoption of these systems, by establishing cross-sector communities of practice and developing capacity in a network of tertiary educational institutions.[7]

Livestock

Livestock management is an important source of farm-level diversification for smallholder farmers in eastern and southern Africa. Projects in the Livestock 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, led by Dr Heather Burrow of the University of New England, is establishing commercially viable value chains, and improving the competitiveness of small-scale beef cattle farmers in South Africa.[8]

A new short research project aims to design and test options for linking an operational livestock model to an existing integrated system to estimate greenhouse gas emissions from forests and agriculture.

Led by Dr Robert Waterworth of the Mullion Group, the researchers will expand the operational capacity of the System for Land-based Emissions Estimation for Kenya program to incorporate full AFOLU accounting (agriculture, forestry and other land use), and to share this knowledge and tools with others. The benefits of this work support Kenya, and provide a generic framework and operational example that can be applied to other countries.[9]

Ethiopia is addressing climate change through its Climate Resilient Green Economy Strategy, with livestock management being one of seven priority areas in terms of adaptation, resilience building and greenhouse mitigation. The Climate Change and Food Security Programme of the CGIAR, together with international company UNIQUE Forestry and Land Use, is implementing a three-year project to strengthen capacities for the measurement, reporting and verification of targeted livestock interventions livestock in Ethiopia and Kenya. Within this program, a small research project, led by Dr Dawit Solomon of the International Livestock Research Institute, will foster improvements in availability and quality of administrative data on livestock production and performance.[10]

Social Sciences

Landcare is a grassroots community-led approach to sustainable land management. Dr Mary Johnson of RMIT University will study Landcare in five countries in the Indo-Pacific region, and analyse how sustainable agricultural land management mobilised through Landcare has contributed to development outcomes, including the ACIAR high-level objectives. The findings of the study will produce an evidence base for ACIAR to assess the role of Landcare for future agricultural research-for-development, and more broadly as an extension model in sustainable agriculture and natural resource management.[11]

Water and Climate

Irrigation has significant potential to contribute to food security in Sub-Saharan African countries, but investment in irrigation infrastructure and distribution faces major impediments to generating adequate returns. Previous ACIAR-supported research showed that agricultural innovation platforms, combined with soil moisture and solute measuring and monitoring, substantially increased the productivity and incomes of farmers, and made irrigation schemes more self-sustaining. A follow-on project aims to improve farmer livelihoods, and the equity and community management of smallholder irrigation schemes in southern Africa. It will work with at least 38 irrigation schemes, supporting more than 15,000 farmers, to determine the best methods of disseminating successful technologies identified by previous research. In 2019–20, the research team, led by Professor Jamie Pittock of the Australian National University, will continue to assess the effectiveness of water management tools, and identify factors leading to inequity among farmers in water supply and financial benefit from irrigation schemes.[12]

While there is ample knowledge about the design and construction of irrigation infrastructure, irrigation management skills are needed to capitalise on this infrastructure. The Virtual Irrigation Academy project in Malawi, South Africa and Tanzania developed a system of continual social and institutional learning to improve the profitability and sustainability of irrigated farming. A second phase of the project, led by Dr Richard Stirzaker of CSIRO Land and Water, starts in 2019–20. This phase will develop the system from its current function of monitoring water and solutes, to a water learning and governance platform that can support the needs of smallholder farmers, and address the information deficits at scheme to national levels. In this phase, the location of activities will be extended to include Mozambique and Zimbabwe.[13]

Global Program

The Global Program manages several programs in the Eastern and Southern Africa region addressing multidisciplinary challenges and/or opportunities, in partnership with international agricultural research-for-development agencies. The work of the Global Program is described in Chapter 2.

Global Program projects operational in Africa during 2019–20 are:

- Cultivate Africa's Future Fund (CultiAF), Phase 2[14]
- Demand-led plant variety design for emerging markets in Sub-Saharan Africa.[15]

Current and proposed projects

1. Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa [Ethiopia, India, Nepal, Pakistan] (CIM/2014/081)
2. Faba bean in Ethiopia: mitigating disease constraints to improve productivity and sustainability (CIM/2017/030)
3. Rapid breeding for reduced cooking time and enhanced nutritional quality in common bean (*Phaseolus vulgaris*) [Burundi, Ethiopia, Kenya, Rwanda, Tanzania, Uganda] (CROP/2018/132)
4. Protection of stored grains against insect pests [Tanzania] (CIM/2017/031)
5. Extension of the International Mungbean Improvement Network project [Bangladesh, India, Kenya, Myanmar, Tanzania, Uganda] (CROP/2018/133)
6. Developing value-chain innovation platforms to improve food security in eastern and southern Africa [Uganda, Zambia] (FST/2014/093)
7. Developing integrated options and accelerating scaling-up of agroforestry for improved food security and resilient livelihoods in eastern Africa—Trees for Food Security 2 [Ethiopia, Rwanda, Uganda] (FST/2015/039)
8. High-quality markets and value chains for small-scale and emerging beef cattle farmers in South Africa (stage 2) (LS/2016/276)
9. Integrating approaches for estimating greenhouse gas emissions from forests and livestock in Kenya (LS/2018/202)
10. Scoping livestock research opportunities in Africa [Ethiopia] (LS/2018/205)
11. The potential of International Landcare [Fiji, Indonesia, the Philippines, South Africa, Sri Lanka, Uganda] (ASEM/2018/117)
12. Transforming smallholder irrigation into profitable and self-sustaining systems in southern Africa [Malawi, Mozambique, South Africa, Tanzania, Zimbabwe] (LWR/2016/137)
13. Virtual Irrigation Academy, Phase 2 [Malawi, Mozambique, South Africa, Tanzania, Zimbabwe] (WAC/2018/162)
14. Cultivate Africa's Future Fund, Phase 2 [Ethiopia, Kenya, Uganda, Malawi, Mozambique, Zambia, Zimbabwe] (CultiAF2) (C2016/367)
15. Demand-led plant variety design for emerging markets in Sub-Saharan Africa [Ghana, Kenya, South Africa, Tanzania] FSC/2013/019

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Researchers at the Department of Agricultural Research, Myanmar.
Credit: ACIAR/Conor Ashleigh (2018)

6

Building capability

Building capability

The Capacity Building Program works to boost capacity of individuals and institutions involved in agricultural research-for-development. We facilitate programs in scientific research, leadership, management, policy and governance with our partners in the Indo-Pacific region.

In 2019–20, the program continues its focus on leadership and career development, while maintaining an ongoing commitment to support postgraduate study. A key activity will be the launch of a new leadership program for women in agricultural research and the roll-out of the first two cohorts of an executive leadership program for John Allwright Fellows.

At the same time, ACIAR is building a stronger alumni program, working closely with past fellows in their home countries, to support ongoing collaborative capacity building that meets their self-identified needs. Alumni engagements highlight the diverse achievements, knowledge and influence of all alumni, and seek to create a network of professionals who support excellence in agricultural research.

Australian researchers are also being targeted through various initiatives designed to ensure the current and next generation of international agricultural researchers are exposed to the work of ACIAR, and that future expertise is nurtured and developed.

A new Monitoring and Evaluation Framework has been developed for the Capacity Building Program. The framework will ensure all programs are contributing to the goals of the ACIAR 10-Year Strategy 2018–2027. It will also support the program to work towards common aims, support effective monitoring and management, and enable lessons to be captured, shared and used to improve future work.

John Allwright Fellowship and Executive Leadership Program

In 2019–20, John Allwright Fellowships will continue to be provided to agricultural researchers for PhD and masters scholarships administered through the Australia Awards system.

In 2019–20, about 75 John Allwright Fellows will be studying at 12 universities across Australia. Applicants for the fellowship are invited annually, and must be connected with an ACIAR project through current or recent work.

In January 2019, the first annual cohort of John Allwright Fellows started the new Executive Leadership Program within the John Allwright Fellowship, which is delivered by the University of New England. The cohort of 24 completed a 10-day intensive camp, and started a 15-month program of online learning, which will be completed during 2019–20. The online learning takes about 6 hours per month, and is completed alongside the fellows' postgraduate studies. The program concludes with a four-day camp.

Gender is mainstreamed and integrated into every aspect of the program, which includes leadership and communication skills, and people, finance, and project management.

On completion of the Executive Leadership Program, participants achieve half of a certificate qualification.

A second cohort of John Allwright Fellows will start the Executive Leadership Program in November 2019.

John Dillon Fellowship

The John Dillon Fellowship is a six-week program that runs twice a year for 15 mid-career agricultural researchers connected to ACIAR projects. The program is delivered in Australia by the University of the Sunshine Coast. Fellows participate in workshops, field-trips and networking events, and undertake a short institutional placement.

An annual round of the John Dillon Fellowship specifically for institutions in the Pacific region began in May 2019. Starting with a group of fellows from Papua New Guinean institutions, this iteration of the program will engage with senior management in host institutions, develop specific institutional strengthening projects, and deploy mentoring and coaching alongside the formal training of the fellowship. The institutional focus has the potential to amplify the outcomes of the training program by garnering widespread buy-in of approaches, and delivering a tailored package of training to suit the identified needs of our partner organisations.

A second round of the traditional John Dillon Fellowship, made up of researchers from the Indo-Pacific and two Australian researchers, will be delivered in early 2020.

New women's leadership program

In recognition of gendered inequalities in access to agricultural education and leadership positions, a new fellowship program for women agricultural researchers in the Indo-Pacific will open for applications early in 2019–20. The program delivers on our commitment in the Gender Equity Policy and Strategy to develop a leadership program for women in agricultural science.

Open to women with a bachelor qualification and above, the program will focus on leadership and high-level science skills. It also includes workshops for key people within the fellows' workplace and in-country mentors, recognising the importance of fostering institutional support for women's leadership.

The first cohort of the fellowship will start in early 2020 with workshops in Australia and an internship of up to three months. The program will run over 15 months. Before the program begins, a baseline study of the status of women's leadership in agriculture-for-development will be done. This will enable a benchmark to be established on which to measure progress over time.

Table 6.1: **Five-year history of participants in John Allwright and John Dillon fellowships**

	2015–16 (actual)	2016–17 (actual)	2017–18 (actual)	2018–19 (actual)	2019–20 (estimated)
John Allwright Fellows: total active in year	130	140	97	85	75
John Allwright Fellowships awarded in year	24	22	7	12	10
John Dillon Fellows: total active and awarded in year	10	10	10	28	28

South Pacific capacity building program

In 2019–20, ACIAR will develop and implement a capacity-building strategy tailored to more effectively address the needs of the agricultural innovation system in the Pacific. The strategy will seek to strengthen relationships, increase talent, and work with institutions to help researchers and decision-makers in the Pacific address emerging agricultural challenges and opportunities.

The strategy will build on existing initiatives, such as the University of the South Pacific Scholarship Program, and develop new approaches, including academic exchanges, institutional support (such as the Pacific-focused John Dillon Fellowship) and an alumni network. The strategy is a whole-of-agency approach, that will improve coordination between research projects and capacity-building approaches.

Other training activities

The ACIAR Launch Fund provides financial assistance to organisations or individuals wishing to conduct or attend events or training that directly benefits international agricultural research. Activities supported by the fund will develop skills and knowledge, and develop and maintain research partnerships, to improve international agricultural research.

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.

Leontine Baje, John Allwright Fellow, Papua New Guinea

Australian researcher activities

In addition to including two Australian researchers in the John Dillon Fellowship cohort each year, the ACIAR Capacity Building Program will continue to provide financial support for the Researchers in Agriculture for International Development network through The Crawford Fund. Researchers in Agriculture for International Development is an active network of early career researchers who share knowledge and opportunities related to agricultural research-for-international-development.

An internship program primarily focusing on placing Master of Business Administration students in agribusiness projects will also continue. Building on a pilot program of two internships in 2017, and a further seven in 2018–19, the program supports Australian masters students to work in-country alongside ACIAR projects on a specific task for three to six months. The program aims to address skills gaps within ACIAR projects, and offers real-world work experience opportunities for postgraduate students. In 2019–20, eight internships will be offered for masters students studying business and social sciences. The program will also be offered to PhD candidates.

Alumni program

All participants in ACIAR capacity-building programs are considered alumni. The Alumni Program is driven through our country and regional offices, with support from the Capacity Building Program. In-country alumni are being consulted about the type of network they would like to create and activities they feel would benefit them. These range from workshops to improve their science communication skills, field trips to ACIAR projects, and presentations from experts.

In 2019–20, alumni activities will continue to be delivered in partner countries. A key event will be held in conjunction with Pacific Week of Agriculture, where a group of ACIAR Pacific alumni will participate in a week-long leadership training and networking program.

Monitoring, evaluation and learning framework

In 2019–20, the capacity-building program will start using the newly developed monitoring, evaluation and learning framework. The framework aims to provide a structured approach to the collection, analysis and use of data about the progress, performance and results of activities within the Capacity Building Program. It clarifies the processes and resources applied to this work, and underpins well-informed and evidence-based program planning and management.

The framework will provide the information needed by the ACIAR Capacity Building Program and by service providers implementing subprograms to make sound day-to-day and strategic management decisions, based on timely and reliable information. It also supports strong accountability to ACIAR senior management, including the Training Committee, about the use of Capacity Building Program resources, supports achievement of positive outcomes, and enables deeper learning from program activities.

Farmers Without Borders

In 2019–20, a pilot of the Farmers Without Borders program will continue to place Australian farmers in the Pacific, Myanmar and Kenya. This follows two placements in Kenya and Timor-Leste in the second half of 2018–19.

The farmer placed in Samoa will work with an organisation that supports local women in agriculture, strengthening the group's agricultural extension approaches. In Myanmar, a group of Australian farmers will be deployed to work with local cropping groups on topics such as improved cropping practices and fertiliser handling. In Kenya, the farmer will work with local smallholder famers on applying zero-till farming practices.

The pilot will be reviewed during 2019–20, and recommendations considered for the future of the program.

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See page 200 for contact details

Cattle feeding on freshly cut forage, Cambodia. ACIAR project: Forages - taking stock and identifying research needs (LS/2018/186)

7

Increasing influence and impact

Increasing influence and impact

Reflecting the ACIAR 10-Year Strategy and its six strategic objectives, the Outreach Program is designed to communicate the work of ACIAR to a wide variety of audiences, both in Australia and overseas.

The objectives of the ACIAR Outreach Program are to:

- communicate the value and impact of our work, and increase our reputation as a trusted and valued partner
- build closer, more effective working relationships with our partners and other stakeholders
- support the communication needs of our country offices, with an emphasis on detailing research results and outcomes achieved at a regional and country level.

In 2019–20, comprehensive and coordinated strategies and plans, programs and projects will be developed and/or implemented to achieve these objectives. The work of the Outreach Program team will include:

- further development of the ACIAR website and social media channels
- partnering with domestic and international media organisations to raise our profile with a wide audience
- refining the publications program to deliver scientific publications to our scientific and research partners
- identifying opportunities to engage with stakeholders
- consolidating our In-Country Communication Officer Network, so we can communicate more actively and effectively in-country and in our regions.

Website development

With a continued focus on digital communication, the Outreach team will further develop the ACIAR website during 2019–20, to increase usability, provide richer content and improve reach to our audiences. New video and photographic content will continue to be produced to tell our stories in various creative formats.

At the same time, functionality and layout of the website is being reviewed, to ensure it meets with the latest design principles and addresses issues such as search functionality.

A new-look landing page will be launched for each current research project. The project landing page will include content about the project and links to relevant information, including publications and reports, blog stories and videos.

A rolling content plan for ensuring a dynamic homepage and news section will be developed and implemented. Corporate content will continue to be reviewed and updated.

Social media

Our social media channels are a key communication tool. Over the past two years, the combined following across Facebook, Twitter, Instagram and LinkedIn has increased by more than 1000%. In 2019–20, we will continue to shape our social media voice, and grow the number of followers and audience engagement, by creating more engaging and dynamic digital storytelling that provides target audiences with relevant and interesting information.

Digital content production will continue, with an emphasis on video, photography and infographics. A network of digital influencers will be developed, to increase reach and engagement with our digital content. Special events will also be supported, with live social media video-streaming and posting to extend reach.

Media partnerships

Outreach will continue to partner with media organisations, both domestically and internationally, to raise the profile of our work with a wide audience. In 2019–20, we will continue the program of supporting journalists to visit ACIAR projects, to capture different stories and angles that will interest the general public in Australia. ACIAR will also work closely with the Crawford Fund to generate positive media coverage, especially in regional media in Australia.

Stakeholder engagement

Work will continue on developing a comprehensive stakeholder engagement strategy, to ensure we take a strategic approach to improving awareness and detailed understanding of ACIAR among specific stakeholder groups. Domestically, our engagement program will build and maintain support for our research work in developing countries. Internationally, it will aim to ensure ACIAR remains well recognised and respected.

As a key part of this strategy, ACIAR will continue to participate in key sector events and conferences, as sponsors, speakers and exhibitors. For example, in 2019–20 ACIAR will support the:

- Annual Crawford Fund Conference, Canberra, Australia
- Pacific Week of Agriculture, Samoa
- 5th Global Science Conference on Climate Smart Agriculture, Indonesia
- 7th International Symposium on Soil Organic Matter, Adelaide, Australia
- International Tropical Agriculture Conference: TropAg 2019, Brisbane, Australia
- Extending Horizons: Asia Pacific Extension Network 2019 Conference, Darwin, Australia
- Australasian Aid Conference, Canberra, Australia

These events provide important opportunities to share the results of ACIAR research, and interact with a highly engaged audience.

We will also continue to create opportunities to host public events involving keynote speakers from partner organisations and agencies.

Publications

Publications, including annual corporate reports, are an essential part of our outreach and communication work. Publications contribute to ensuring more diverse audiences in Australia, and in our partner countries, can access and use research findings.

The Scientific Publications Committee will ensure the quality and relevance of ACIAR scientific publications, so that our scientific and research partners are better served with improved review processes and more timely production of research publications.

During 2019–20, we will work to continuously improve our Publications Production and Distribution Program, strengthening internal production support systems and processes to manage the timely production, distribution and promotion of ACIAR publications.

Corporate publications will be published according to statutory and legislative requirements, and these will be available both online and, in limited numbers, as hard copy. Two additional corporate reports will be produced for stakeholders.

The production of our flagship publication, *Partners in research for development*, continues on a quarterly basis, with ongoing review of content, audiences and delivery modes.

In-country communication

A major activity in 2019–20 is the scale-out of a network of communication professionals to our country offices. Following a pilot of this program over the past two years, the In-Country Communication Officer Network will deliver communication activities more actively tailored to the needs of the country or region, and better aligned with our strategic outreach objectives and themes. These activities will target opinion leaders, decision-makers and local media to share research results from projects in the area.

Currently, there are communication officers in five country offices—Fiji, Papua New Guinea, Vietnam, the Philippines and Kenya. Communication plans and activities will be devised and delivered on a country or regional basis, to help ACIAR country offices with communications expertise, ensuring more proactive content is being produced and increasing engagement with our partners and stakeholders.

Communication campaigns

Targeted and themed communication campaigns will be delivered during 2019–20. These include a campaign delivered in partnership with The Crawford Fund, targeting the next generation of Australian international agricultural researchers. The Next Gen campaign will focus on undergraduates and students and teachers in agricultural high schools, to profile careers in the agricultural research-for-development sector, and highlight opportunities to become involved. Another campaign targets professional communicators, including media, in the Pacific, to build capacity in reporting on agricultural science and research, particularly where it can relate to improved nutrition. A competition will be held, and short-listed entrants will be invited to participate in a communications masterclass during the Pacific Week of Agriculture.

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See page 200 for contact details

Crop irrigation, Kiribati. Credit: ACIAR/Conor Ashleigh (2014)

Appendixes

Appendix 1

Details of current and proposed projects and short research activities, 2019–20

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
Agribusiness Research Program						
Policy and institutional reforms to improve horticultural markets in Pakistan [China, Pakistan]	ADP/2014/043	1/01/2016	15/12/2019	Dr Thilak Mallawaarachchi	The University of Queensland	Arid Agriculture University Rawalpindi, Center for Chinese Agricultural Policy, Karachi School of Business and Leadership, La Trobe University, Macquarie University, Pakistan Agricultural Coalition, Pakistan Agricultural Research Council, Peking University, Quaid-e-Azam University, Sindh Agricultural University, University of Agriculture Faisalabad
Agricultural policy research to support natural resource management in Indonesia's upland landscapes	ADP/2015/043	21/03/2018	31/12/2021	Prof Randy Stringer	The University of Adelaide	Australian National University, Indonesian Centre for Agriculture Socio Economic and Policy Studies, University of New England, World Agroforestry Centre, World Wild Fund for Nature - Indonesia
Policy analysis of food safety and trade in Vietnam	ADP/2016/140	1/10/2018	31/08/2020	Dr Elizabeth Petersen	The University of Western Australia	Australian Bureau for Agricultural and Resource Economics and Sciences, Australian National University, Central Institute for Economic Management, Fruit and Vegetable Research Institute, Institute of Policy and Strategy for Agriculture and Rural Development, Ministry of Planning and Investment, Vietnam National University of Agriculture
Developing competitive and inclusive value chains of pulses in Pakistan	ADP/2017/004	1/09/2018	30/06/2021	Dr Rajendra Adhikari	University of Tasmania	Australian National University, COMSATS Institute of Information Technology, National Agricultural Research Centre, Sindh Agricultural University, University of Agriculture Faisalabad
Understanding the drivers of successful and inclusive rural regional transformation: sharing experiences and policy advice in Bangladesh, China, Indonesia and Pakistan	ADP/2017/024	1/07/2019	30/06/2021	Dr Chunlai Chen	Australian National University	University of Western Australia, Peking University, Bangladesh Agricultural University, Bangladesh Academy for Rural Development, Pakistan Institute of Development Economics, Planning Commission of Pakistan, (ICASEPS), Ministry of Agriculture Indonesia, Bogor Agricultural University
Policy drivers for public-private partnerships in Pacific organics: improving extension policy through an evidence-based approach [Fiji, Vanuatu]	ADP/2018/131	26/06/2018	28/02/2021	Assoc Prof Katherine Warner	The University of the Sunshine Coast	C-King Community, University of Adelaide, SPC (Fiji)
Evaluating smallholder livelihoods and sustainability in Indonesian coffee and cocoa value chains	AGB/2010/099	1/03/2014	31/12/2019	Dr Jeff Neilson	The University of Sydney	Committee on Sustainability Assessment, Indonesian Coffee and Cocoa Research Institute, Indonesian Research Institute for Industrial and Beverage Crops, University of Hassanudin, University of Lampung
Improving smallholder farmer incomes through strategic market development in mango supply chains in southern Vietnam	AGB/2012/061	25/06/2018	30/06/2021	Dr Robin Roberts	Griffith University	Centre international pour la recherche agronomique pour le développement, Northern Territory Department of Primary Industry and Fisheries, Southern Center of Agriculture Rural Policy and Strategy, Southern Horticultural Research Institute, Southern Sub-Institute of Agricultural Engineering and post-harvest Technology, The University of Adelaide

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
Developing value-chain linkages to enhance the adoption of profitable and sustainable cassava production systems in Vietnam and Indonesia	AGB/2012/078	1/01/2016	31/12/2019	Dr Dominic Smith	The University of Queensland	Brawijaya University, Indonesian Legume and Tuber Crops Research Institute, International Center for Tropical Agriculture, Northern Mountainous Agriculture and Forestry Science Institute, Tay Nguyen University
Improving milk supply, competitiveness and livelihoods in smallholder dairy chains in Indonesia	AGB/2012/099	13/06/2016	31/05/2020	Dr Wendy Umberger	The University of Adelaide	Australasian Dairy Corporation, Bogor Agricultural University, Department of Economic Development, Jobs, Transport and Resources, Indonesia Centre for Animal Research and Development, Indonesian Centre for Agriculture Socio Economic and Policy Studies
Improving livelihoods in Myanmar and Vietnam through vegetable value chains	AGB/2014/035	13/03/2017	28/02/2021	Dr Gordon Rogers	Applied Horticultural Research	Centre international pour la recherche agronomique pour le developpement, Department of Agriculture, Fresh Studio Innovations (Asia), Northern Mountainous Agriculture and Forestry Science Institute, The University of Queensland, The University of Sydney, Yezin Agricultural University
Pacific agribusiness research in development initiative - phase 2 (PARDI 2) [Fiji, Tonga, Vanuatu]	AGB/2014/057	12/06/2017	31/05/2021	Dr Lex Thomson	The University of the Sunshine Coast	Pacific Community FiJi, Pacific Island Farmers Organisation Network, Pacific Islands Development Forum, Pacific Islands Private Sector Organization, Southern Cross University, The University of Adelaide, University of the South Pacific
Innovative and inclusive agriculture value chain financing [Indonesia, Myanmar, Vietnam]	AGB/2016/163	25/06/2018	31/05/2022	Dr Alan de Brauw	International Food Policy Research Institute	Indonesian Centre for Agriculture Socio Economic and Policy Studies, Institute of Policy and Strategy for Agriculture and Rural Development, Myanmar Economics Association, The University of Sydney
Sustainable and inclusive development of the cattle and beef industry in Vietnam and trade relationships with other countries in the region	AGB/2016/196	28/02/2019	30/09/2022	Dr Dominic Smith	The University of Queensland	Center for Informatics and Statistics, Centre for Rural Economy Development, Institute of Policy and Strategy for Agriculture and Rural Development, International Food Policy Research Institute, International Livestock Research Institute
Enhancing smallholder linkages to markets by optimising transport and logistics infrastructure [Indonesia, Vietnam]	AGB/2017/036	28/02/2019	30/06/2020	Dr Chris Chilcott	CSIRO Land and Water	—
Developing vegetable and fruit value chains and integrating them with community development in the southern Philippines	AGB/2017/039	1/07/2018	30/06/2020	Dr Gomathy Palaniappan	The University of Queensland	Visayas State University
Revision and update of *Making value chains work better for the poor toolkit and the ACIAR AgribusinessMasterclass* [Indonesia, Vietnam]	AGB/2018/121	22/06/2018	30/11/2019	Dr Wendy Umberger	The University of Adelaide	—
Strengthening leadership, coordination and economic development of the temperate fruit industry in northern Vietnam	AGB/2018/171	6/03/2019	31/12/2019	Mr Oleg Nicetic	The University of Queensland	Fruit & Vegetable Research Institute (Vietnam)

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
Establishing sustainable solutions to cassava diseases in mainland South-East Asia [Cambodia, Laos, Myanmar, Vietnam]	AGB/2018/172	1/07/2019	30/06/2023	Dr Jonathan Newby	International Center for Tropical Agriculture	The University of Queensland, Vietnam: Hung Loc Research Agricultural Research Center, Plant Protection Research Institute, Agricultural Genetic Institute; Laos: National Agriculture and Forestry Research Institute, Plant Protection Centre; Cambodia: General Directorate of Agriculture, Thailand: Thai Tapioca Development Institute, Kasetsart University; The Chinese Academy of Tropical Agricultural Sciences
Enhancing the livelihoods of coffee and pepper smallholders in the Central Highlands of Vietnam through improving stakeholders' participation in agribusiness-led value chains	AGB/2018/208	1/01/2019	1/07/2020	Dr Philippe Vaast	World Agroforestry Centre	University of Sydney, Western Highlands Agriculture and Forestry Science Institute
A Theory of Change for inclusive value chains in the Philippines	AGB/2019/100	15/06/2019	30/06/2020	Dr Oleg Nicetic	The University of Queensland	CSIRO, Foodlink Advocacy Cooperative
Agribusiness Masterclass - The Philippines	AGB/2019/101	16/06/2019	30/06/2020	Dr Lilly Lim-Camacho	CSIRO Agriculture and Food	The University of Queensland, DOST - PCAARRD, Foodlink Advocacy Cooperative, Climate Smart Solutions, FocusGroupGo, consultants
Crops Research Program						
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	15/07/2014	30/06/2021	Assoc Prof Ian Godwin	The University of Queensland	Guadalcanal Plains Palm Oil Limited, Ministry of Agriculture and Livestock, PNG Oil Palm Research Association Inc
Incorporating salt-tolerant wheat and pulses into smallholder farming systems in southern Bangladesh	CIM/2014/076	1/03/2017	28/02/2021	Prof William Erskine	The University of Western Australia	Bangladesh Agricultural Research Institute, Bangladesh Agricultural University, CSIRO Agriculture Flagship, Department of Agricultural Extension, The University of Western Australia
Establishing the International Mungbean Improvement Network [Bangladesh, India, Myanmar]	CIM/2014/079	1/01/2016	31/12/2019	Dr Ramakrishnan Nair	The World Vegetable Center	Bangladesh Agricultural Research Institute, Department of Agricultural Research, Indian Institute of Pulses Research
Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa [Ethiopia, India, Nepal, Pakistan]	CIM/2014/081	1/08/2016	30/06/2020	Prof Robert Park	The University of Sydney	Directorate of Wheat Research, Ethiopian Institute of Agricultural Research, Indian Institute for Wheat and Barley Research, National Agricultural Research Council, NSW Department of Primary Industries, Pakistan Agricultural Research Council
Agricultural innovations for communities for intensified and sustainable farming systems in Timor-Leste (AI-Com)	CIM/2014/082	1/10/2016	30/09/2021	Prof William Erskine	The University of Western Australia	Ministry of Agriculture and Fisheries, National University of Timor Lorosa e, The University of the Sunshine Coast, World Vision
Increasing productivity and profitability of pulse production in cereal based cropping systems in Pakistan	CIM/2015/041	1/11/2016	30/06/2021	Dr Ata Rehman	Charles Sturt University	Muhammad Nawaz Sharif University of Agriculture, Multan, Punjab, Pakistan Agricultural Research Council, Sindh Agriculture University, University of Arid Agricultural Rawalpindi
Insect tolerant chickpea for Bangladesh	CIM/2016/039	1/03/2017	31/12/2019	Dr TJ Higgins	CSIRO Agriculture and Food	Bangladesh Agricultural Research Institute, DBT-Assam Agricultural University

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Improved mungbean harvesting and seed production systems for Bangladesh, Myanmar and Pakistan	CIM/2016/174	14/07/2017	30/06/2021	Dr Ramakrishnan Nair	The World Vegetable Center	Bangladesh Agricultural Research Institute, Department of Agricultural Research, Pakistan Agricultural Research Council
Identification of sources of resistance to wheat blast and their deployment in wheat varieties adapted to Bangladesh	CIM/2016/219	1/07/2017	30/06/2021	Dr Pawan Kumar Singh	International Maize and Wheat Improvement Center	Bangladesh Agricultural Research Institute, National Institute of Agricultural and Forestry Innovation
Faba bean in Ethiopia – mitigating disease constraints to improve productivity and sustainability	CIM/2017/030	1/12/2018	30/06/2023	Prof Martin Barbetti	The University of Western Australia	Debre Berhan Agricultural Research Centre, Ethiopian Institute of Agricultural Research, International Center for Agricultural Research in the Dry Areas, NSW Department of Primary Industries
Protecting stored grains against pests using a new silica technology – understanding distribution and extension pathways [Tanzania]	CIM/2017/031	1/07/2019	18/12/2020	Dr David Eagling	Davren Global	Tanzania: Tropical Pesticides Research Institute, Ministry of Agriculture Food Security Cooperative
Understanding drill seeding of rice techniques and business models [Laos]	CIM/2018/113	1/06/2018	31/12/2019	Dr Leigh Vial	Deakin University	Provincial Agriculture and Forestry Office (Laos)
Rapid breeding for reduced cooking time and enhanced nutritional quality in common bean (*Phaseolus vulgaris*) [Burundi, Ethiopia, Kenya, Rwanda, Tanzania, Uganda]	CROP/2018/132	1/08/2019	30/06/2024	Prof Wallace Cowling	The University of Western Australia	International Center for Tropical Agriculture, National Crops Resources Research Institute (Uganda), Kenya Agricultural and Livestock Research Organisation, Maruku Agricultural Research Institute (Tanzania), Rwanda Agriculture and Animal Resources Development Board, Institut des Sciences Agronomiques du Burundi, Ethiopian Institute of Agricultural Research
Extension of International Mungbean Improvement Network extension project [Bangladesh, India, Kenya, Myanmar, Tanzania and Uganda]	CROP/2018/133	1/01/2020	30/06/2020	Dr Ramakrishnan Nair	The World Vegetable Center	Bangladesh Agricultural Research Institute, Department of Agricultural Research, Pakistan Agricultural Research Council
Identifying Eastern Gangetic Plains soil constraints (SDIP) [Bangladesh, India, Nepal]	CROP/2018/210	1/12/2018	30/06/2020	Dr Neal Menzies	The University of Queensland	Uttar Banga Krishi Viswavidyalaya (India), Bangladesh Agricultural Research Institute, Nepal Agricultural Research Council
Plant health – a major challenge to achieving sustainable 'green' agriculture in Myanmar	CROP/2019/103	10/04/2019	1/09/2020	Dr Sivapragasam Annamalai	CABI International	Myanmar Agricultural Service
Sustainable and resilient farming system intensification (SDIP) [Bangladesh, India, Nepal]	CSE/2011/077	12/05/2014	30/06/2020	Dr Thakur Prasad Tiwari	International Maize and Wheat Improvement Center	Bangladesh Agricultural Research Council, Bangladesh Agricultural Research Institute, Bihar Agricultural University, CSIRO Ecosystem Sciences, Curtin University of Technology, Department of Agricultural Extension, iDE, Indian Council of Agricultural Research, International Food Policy Research Institute, International Rice Research Institute, International Water Management Institute, JEEViKA, Nepal Agricultural Research Council, Nepal Department of Agriculture, Rangpur Dinajpur Rural Service, Sakhi, University of New England, University of Queensland, Uttar Banga Krishi Vishwavidyalaya

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Enhancing farm household management decision-making for increased productivity in the Eastern Gangetic Plains [Bangladesh, India, Nepal]	CSE/2012/108	1/07/2018	31/10/2021	Dr Fay Rola-Rubzen	The University of Western Australia	Bihar Agricultural University, Nepal Agricultural Research Council, Rajshahi University, Rangpur Dinajpur Rural Service, University of New England, Uttar Banga Krishi Vishwavidyalaya
Sustainable intensification and diversification in the lowland rice system in north-west Cambodia	CSE/2015/044	24/02/2017	30/10/2021	Assoc Prof Daniel Tan	The University of Sydney	Cambodia Agricultural Research and Development Institute, Mean Chey University, Provincial Department of Agriculture - Banteay Meanchey, Provincial Department of Agriculture - Battambang, Provincial Department of Agriculture - Pursat
Fisheries Research Program						
Improving the design of irrigation infrastructure to increase fisheries production in floodplain wetlands of the Lower Mekong and Murray-Darling basins [Laos]	FIS/2012/100	1/04/2014	30/09/2019	Dr Craig Boys	Department of Primary Industries (NSW)	Living Aquatic Resources Research Centre, National University of Laos, NSW Department of Primary Industries
Developing technologies for giant grouper (*Epinephelus lanceolatus*) aquaculture in Vietnam, the Philippines and Australia	FIS/2012/101	1/01/2014	30/09/2019	Prof Abigail Elizur	The University of the Sunshine Coast	Queensland Dept of Agriculture & Fisheries, Research Institute for Aquaculture No. 1, Research Institute for Aquaculture No. 3, Southeast Asian Fisheries Development Centre
Quantifying biophysical and community impacts of improved fish passage in Laos and Myanmar	FIS/2014/041	1/01/2016	31/12/2020	Dr Lee Baumgartner	Charles Sturt University	La Trobe University, Living Aquatic Resources Research Centre, National University of Laos, University of South Australia
Expanding spiny lobster aquaculture in Indonesia	FIS/2014/059	1/07/2015	31/12/2019	Dr Clive Jones	James Cook University	Agency for Research and Human Resources Development Marine and Fisheries, Indonesia, BBAP Ujung Batee Aceh, Bogor Agricultural University, CSIRO Food Futures Flagship, Institute for Mariculture Research and Development Gondol, Marine Fisheries and Aquaculture Development Centre of Lombok, University of Western Australia
Developing pearl industry-based livelihoods in the western Pacific [Fiji, Papua New Guinea, Tonga]	FIS/2014/060	1/09/2015	31/08/2020	Prof Paul Southgate	The University of the Sunshine Coast	James Cook University, Ministry of Agriculture and Food, Forests and Fisheries, Ministry of Fisheries and Forests, National Fisheries Authority
Improving technical and institutional capacity to support development of mariculture based livelihoods and industry in New Ireland, Papua New Guinea	FIS/2014/061	1/03/2016	28/02/2020	Prof Paul Southgate	The University of the Sunshine Coast	James Cook University, National Fisheries Authority, SPC
Improving technologies for cost-effective fish feeding strategies, husbandry and fingerling production for inland aquaculture in Papua New Guinea	FIS/2014/062	13/05/2015	30/04/2020	Assoc Prof Jesmond Sammut	University of New South Wales	Australian Nuclear Science and Technology Organisation, National Fisheries Authority, University of Technology
Restoring damaged coral reefs using mass coral larval reseeding [The Philippines]	FIS/2014/063	1/07/2015	30/06/2020	Dr Peter Harrison	Southern Cross University	Australian National University, University of the Philippines
Improving seaweed production and processing opportunities in Indonesia	FIS/2015/038	1/08/2016	31/07/2020	Assoc Prof Nicholas Paul	The University of the Sunshine Coast	Centre for Seaweed Culture Research and Development, Hasanuddin University, James Cook University

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Improving fishery management in support of better governance of Myanmar's inland and delta fisheries	FIS/2015/046	1/01/2017	31/12/2020	Mr Micheael Akester	WorldFish Center	Ministry of Agriculture, Livestock and Irrigation
Harvest strategies for Indonesian tropical tuna fisheries to increase sustainable benefits	FIS/2016/116	26/02/2018	31/12/2021	Dr Campbell Davies	CSIRO Oceans and Atmosphere	Centre for Fisheries and Human Resources
Increasing technical skills supporting community-based sea cucumber production in Vietnam and the Philippines	FIS/2016/122	1/10/2018	31/08/2023	Prof Paul Southgate	The University of the Sunshine Coast	Guiuan Development Foundation Incorporated, Marine Science Institute - University of the Philippines, Mindanao State University at Naawan, Southeast Asian Fisheries Development Centre
Half-pearl industry development in Tonga and Vietnam	FIS/2016/126	1/09/2017	30/06/2021	Prof Paul Southgate	The University of the Sunshine Coast	Ministry of Agriculture and Food, Forests and Fisheries, Ministry of Agriculture and Rural Development
Accelerating the development of finfish mariculture in Cambodia through south-south research cooperation with Indonesia	FIS/2016/130	13/12/2017	30/06/2021	Assoc Prof Nicholas Paul and Dr Mike Rimmer	The University of the Sunshine Coast	Fisheries Administration, Institute for Mariculture Research and Development Gondol, NSW Department of Primary Industries, Research Institute for Coastal Aquaculture
Development of rice-fish systems in the Ayeyarwady Delta, Myanmar	FIS/2016/135	1/07/2017	31/12/2021	Dr Michael Phillips	WorldFish Center	Department of Agricultural, Department of Agricultural Research, Department of Fisheries, International Rice Research Institute
Strengthening and scaling community-based approaches to Pacific coastal fisheries management in support of the New Song	FIS/2016/300	6/09/2017	30/06/2021	Prof Neil Andrew	University of Wollongong	Fisheries Department, Ministry of Fisheries and Marine Resources, Ministry of Fisheries and Marine Resources Development, Secretariat of the Pacific Community, University of Wollongong, Worldfish Center
Assessing fisheries mitigation measures at Xayaburi Dam in Laos	FIS/2017/016	19/02/2018	31/12/2019	Dr Lee Baumgartner	Charles Sturt University	Department of Foreign Affairs and Trade, KarlTek Pty Ltd, Living Aquatic Resources Research Centre, National University of Laos, Xayaburi Power
Assessing fisheries mitigation measures at Xayaburi Dam in Laos	FIS/2017/017	1/07/2019	30/06/2022	Dr Lee Baumgartner	Charles Sturt University	KarlTek Pty Ltd, Living Aquatic Resources Research Center (Laos), National University of Laos, Xayaburi Power Company Limited, Department of Foreign Affairs and Trade (Aust)
A nutrition-sensitive approach to coastal fisheries management and development in Timor-Leste and Nusa Tenggara Timur Province, Indonesia	FIS/2017/032	1/07/2019	30/06/2023	Dr David Mills	WorldFish Center	Directorate General of Fisheries, Ministry of Agriculture and Fisheries (Timor-Leste), Research Centre for Marine and Fisheries Socio-economics (Indonesia), CSIRO
Evaluating processes and outcomes in south-south research collaboration – finfish mariculture development in Cambodia through co-operation with Indonesia	FIS/2018/115	20/06/2018	30/06/2021	Prof Janelle Allison	University of Tasmania	Fisheries Administration (Cambodia), Research Institute for Coastal Aquaculture (Indonesia)
Baseline monitoring and evaluation of long-term impacts on fish stocks from coral restoration [The Philippines]	FIS/2018/128	25/06/2018	30/06/2021	Dr Peter Harrison	Southern Cross University	James Cook University, University of the Philippines
Monitoring and evaluation of socio-economic impacts of pearl-based livelihood development	FIS/2018/129	20/06/2018	30/06/2020	Assoc Prof Katja Mikhailovich	Sustineo Pty Ltd	University of the Sunshine Coast

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Institutional strengthening in Papua New Guinea: translating fisheries research into policy and management	FIS/2018/151	1/07/2019	30/06/2024	Assoc Prof Jesmond Sammut	University of New South Wales	National Fisheries Authority (PNG), James Cook University, CSIRO, The University of Tasmania, The University of Papua New Guinea, Australian Nuclear Science and Technology Organisation
Translating fish passage research outcomes into policy and legislation across South-East Asia [Cambodia, Indonesia, Laos]	FIS/2018/153	1/01/2020	31/12/2023	Dr Lee Baumgartner	Charles Sturt University	Ministry of Agriculture, Livestock and Irrigation (Myanmar); IHE Delft Institute for Water Education; Australasian Fish Passage Services (Cambodia); National University of Laos; Ministry of Marine Affairs and Fisheries (Indonesia); National University of Laos; Inland Fisheries Research and Development Institute (Cambodia)
Improving livelihoods and human nutrition through inland aquaculture in Papua New Guinea	FIS/2018/154	1/01/2020	31/12/2024	Assoc Prof Jesmond Sammut	University of New South Wales	—
Agriculture for improved nutrition: integrated agri-food systems for the Pacific region [Kiribati, Solomon Islands, South Pacific general, Vanuatu]	FIS/2018/155	1/07/2019	30/06/2022	Prof Neil Andrew	University of Wollongong	CSIRO, Pacific Community Fiji, The University of Sydney, University of Wollongong, WorldFish Center
Improved productivity and efficiency of the culture based fishery for giant freshwater prawn in Sri Lankan reservoirs	FIS/2018/157	1/01/2020	31/12/2023	Dr Clive Jones	James Cook University	University of Kelaniya, Deakin University, University of Western Australia, University of Sri Lanka, University of Ruhuna, Wayamba University, Sabaragamuwa University
Forestry Research Program						
Biological control of galling insect pests of eucalypt plantations in the Mekong region [Cambodia, Thailand, Vietnam, Laos]	FST/2012/091	1/02/2014	31/12/2019	Dr Simon Lawson	University of the Sunshine Coast	Department of Agriculture, Fisheries and Forestry (Qld), National Agriculture and Forestry Research Institute (Laos), Birla Lao Pulp and Plantation Company, Stora Enso (Laos), Sun Paper Holdings Lao Co., Burapha Agroforestry Co. (Laos), Vietnamese Academy of Forest Sciences, Royal Forest Department (Thailand), Forestry Administration (Cambodia)
Improving returns from community teak plantings in Solomon Islands	FST/2014/066	1/07/2015	31/12/2019	Dr Tim Blumfield	Griffith University	Ministry of Forest and Research, Queensland Dept of Agriculture & Fisheries, SPE Consulting, The University of Adelaide
Enhancing value-added products and environmental benefits from agroforestry systems in Papua New Guinea and the Pacific [Fiji, Papua New Guinea, Solomon Islands, Vanuatu]	FST/2014/067	1/10/2015	31/07/2019	Prof Helen Wallace	The University of the Sunshine Coast	Ministry of Commerce, Industry, Labour and Immigration, Ministry of Trade, Commerce, Industry and Tourism, National Agricultural Research Institute, Secretariat of the Pacific Community, Southern Cross University, The University of Adelaide
Improvement and management of teak and sandalwood in Papua New Guinea and Australia	FST/2014/069	15/07/2015	31/01/2020	Dr Tony Page	University of the Sunshine Coast	Sylva Systems (Victoria), University of Western Sydney, PNG: Forest Authority, Forest Research Institute, Organisation for Industrial, Spiritual and Cultural Advancement, University of Natural Resources and Environment, Pacific Island Projects
Developing value chain innovation platforms to improve food security in east and southern Africa [Uganda, Zambia]	FST/2014/093	1/06/2015	30/11/2019	Dr Clement Okia	World Agroforestry Centre	Copperbelt University (Zambia), Kapchorwa District Landcare Chapter, Makerere University (Uganda), National Forestry Resources Research Institute, Zambia Agricultural Research Institute

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Developing integrated options and accelerating scaling-up of agroforestry for improved food security and resilient livelihoods in eastern Africa - Trees for food security 2 [Ethiopia, Rwanda, Uganda]	FST/2015/039	1/01/2017	31/12/2020	Dr Philip Smethurst	CSIRO Land and Water	African Network for Agriculture, Agroforestry and Natural Resources Education, Ethiopian Environment and Forest Research Institute, Makerere University Uganda, Mbale Coalition Against Poverty, Mekelle University, National Forestry Resources Research Institute, Oromiya Agricultural Research Institute, Rwanda Agriculture Board, Rwanda Farmers Federation IMBARAGA, University of Rwanda, World Agroforestry Centre, World Vision
Enhancing community-based commercial forestry in Indonesia	FST/2015/040	7/04/2016	31/12/2020	Dr Digby Race	The University of the Sunshine Coast	Australian Agroforestry Foundation, Forestry Research, Development and Innovation Agency, Gadjah Mada University, Trees 4 Trees, University of Mataram
Building research capacity among ACIAR's sandalwood-focused projects through a regional sandalwood workshop and publication [Indonesia, Vanuatu, Fiji, Papua New Guinea, Timor-Leste, Australia]	FST/2016/024	15/05/2017	30/06/2020	Dr Tony Page	The University of the Sunshine Coast	Center for Forest Biotechnology and Tree Improvement, Vanuatu Department of Forests
Developing and promoting market-based agroforestry options and integrated landscape management for smallholder forestry in Indonesia (Kanoppi 2)	FST/2016/141	1/04/2017	30/09/2021	Mr Aulia Perdana	World Agroforestry Centre	Center for International Forestry Research, Department of Employment, Economic Development and Innovation, Farm Forestry Consortium, Threads of Life: Indonesia Textile Arts Centre, University of Mataram, The University of Western Australia, World Wild Fund for Nature - Indonesia
Improving community fire management and peatland restoration in Indonesia	FST/2016/144	1/12/2017	31/12/2021	Dr Daniel Mendham	CSIRO Land and Water	Indonesia: Centre for Socio-economic, Policy and Climate Change Research and Development (P3SEKPI), Forestry and Environment Research and Development Agency, Ministry of Environment and Forestry, (FOERDIA), Borneo Orangutan Survival Foundation, University of Palangka Raya; Australia: University of the Sunshine Coast, La Trobe University, Australian National University
Improving agroforestry policy for sloping land in Fiji	FST/2016/147	14/12/2018	30/09/2021	Dr Tyron Venn	The University of Queensland	Australian National University, Ministry of Agriculture, Ministry of Fisheries and Forests, Queensland University of Technology, University of the South Pacific
Advancing enhanced wood manufacturing industries in Laos and Australia	FST/2016/151	1/04/2017	30/09/2021	Assoc Prof Barbara Ozarska	The University of Melbourne	Australian National University, Luang Prabang Teak Program, National University of Laos, Queensland Dept of Agriculture & Fisheries
Developing and promoting market-based agroforestry and forest rehabilitation options for north-west Vietnam	FST/2016/152	1/04/2017	30/08/2021	Dr La Nguyen	World Agroforestry Centre	Department of Agriculture and Rural Development, Dien Bien, Department of Agriculture and Rural Development, Son La, Department of Agriculture and Rural Development, Yen Bai, Northern Mountainous Agriculture and Forestry Science Institute, Soil and Fertilizer Research Institute, Southern Cross University, Vietnam Academy of Forest Sciences

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Enabling community forestry in Papua New Guinea	FST/2016/153	1/10/2017	30/09/2021	Mr Grahame Applegate	University of the Sunshine Coast	Papua New Guinea Forest Authority, Papua New Guinea Forest Authority Goroka Office, PNG Forest Research Institute, Ramu Agri-Industries Ltd, Timber and Forestry Training College of the PNG University of Technology
Enhancing returns from high-value agroforestry species in Vanuatu	FST/2016/154	1/06/2017	30/06/2021	Dr Tony Page	The University of the Sunshine Coast	Department of Forests, Department of Industry, Southern Cross University
Domestication and breeding of sandalwood in Fiji and Tonga	FST/2016/158	26/06/2017	30/06/2020	Mr David Bush	CSIRO National Research Collections	Department of Forestry, Ministry of Agriculture and Food, Forests and Fisheries, Pacific Australia Reforestation Co Ltd, Secretariat of the Pacific Community
Enhancing livelihoods through improved forest management in Nepal	FST/2017/037	1/07/2018	30/06/2023	Dr Ian Nuberg	The University of Adelaide	Department of Forest Research and Survey Nepal, Department of Forests, ForestAction Nepal, Nepal Agroforestry Foundation, University of New South Wales
Enhancing private sector-led development of the canarium industry in Papua New Guinea - phase 2	FST/2017/038	1/03/2019	31/12/2021	Prof Helen Wallace	The University of the Sunshine Coast	National Agricultural Research Institute, The University of Adelaide
Promoting smallholder teak and sandalwood plantations in Papua New Guinea and Australia	FST/2018/178	1/01/2020	31/12/2023	Dr Tony Page	The University of the Sunshine Coast	PNG Forest Authority, PNG Forest Research Institute, Organisation for Industrial, Spiritual and Cultural Advancement (OISCA), Sylva Systems,
Reducing forest biosecurity threats in South-East Asia [Indonesia, Laos, Vietnam]	FST/2018/179	1/07/2019	30/06/2023	Dr Caroline Mohammed	University of Tasmania	Centre for Forest Biotechnology and Tree Improvement, FOERDIA (Indonesia), National Agriculture and Forestry Research Institute (Laos), Department of Agriculture Plant Quarantine Division (Laos), Vietnamese Academy of Forest Sciences, University of the Sunshine Coast, New South Wales Department of Primary Industries
Enhanced adoption of agroforestry systems in Laos	FST/2018/180	1/07/2019	30/06/2023	Dr Mark Dieters	The University of Queensland	National Agriculture and Forestry Research Institute, Northern Agriculture and Forestry College, District Agriculture and Forestry Offices (Laos), Souphanouvong University
Horticulture Research Program						
Bogia coconut syndrome in Papua New Guinea: developing biological knowledge and a risk management strategy	HORT/2012/087	23/06/2014	30/11/2019	Dr Geoff Gurr	Charles Sturt University	Kokonat Indastri Koporasen, National Agricultural Research Institute, National Agriculture Quarantine and Inspection Authority, New Britain Oil Palm, PNG Oil Palm Research Association Inc, University of Southern Queensland
Integrated management of *Fusarium* wilt of bananas in the Philippines and Australia	HORT/2012/097	20/06/2014	31/12/2019	Mr Anthony Pattison	Department of Agriculture and Fisheries (Qld)	Australian Banana Growers Council, Bioversity International, MegaManila Pest Management Specialists Inc., Provincial Agricultural Office-Rigion XI, Davao Del Norte, The University of Queensland, University of Southeastern Philippines
Improved post-harvest management of fruit and vegetables in the southern Philippines and Australia	HORT/2012/098	20/12/2013	31/08/2019	Dr Jenny Ekman	Applied Horticultural Research	The University of Queensland, University of the Philippines, Mindanao, Visayas State University
Enhanced fruit production and post-harvest handling systems for Fiji, Samoa and Tonga	HORT/2014/077	1/01/2016	30/12/2019	Prof Steven Underhill	The University of the Sunshine Coast	Fiji National University, Ministry of Agriculture and Food, Forests and Fisheries, Scientific Research Organisation of Samoa, Secretariat of the Pacific Community, Sigatoka Research Station, The University of Queensland

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Aligning genetic resources, production and post-harvest systems to market opportunities for Pacific island and Australian cocoa [Fiji, Samoa, Solomon Islands, Vanuatu]	HORT/2014/078	12/04/2017	30/07/2021	Mr Yan Diczbalis	Department of Agriculture and Fisheries (Qld)	Alternative Communities Trade in Vanuatu, Ministry of Agriculture, Ministry of Agriculture and Fisheries, Ministry of Agriculture and Livestock, Ministry of Agriculture, Livestock, Forestry, Fisheries and Biosecurity, Secretariat of the Pacific Community, The University of Adelaide
Integrating protected cropping systems into high-value vegetable value chains in the Pacific and Australia [Fiji, Samoa, Tonga]	HORT/2014/080	1/04/2017	31/12/2020	Prof Phil Brown	Central Queensland University	Ministry of Agriculture and Food, Forests and Fisheries, Queensland Dept of Agriculture & Fisheries, Secretariat of the Pacific Community, Soil Health Pacific Ltd, The University of the Sunshine Coast
Developing improved crop protection options in support of intensification of sweetpotato production in Papua New Guinea	HORT/2014/083	28/11/2016	31/08/2021	Dr Geoff Gurr	Charles Sturt University	Charles Sturt University, Fresh Produce Development Agency Ltd, National Agricultural Research Institute, Papua New Guinea University of Technology, University of Southern Queensland
Developing the cocoa value chain in Bougainville	HORT/2014/094	1/02/2016	31/12/2021	Prof David Guest	The University of Sydney	Autonomous Region of Bougainville Dept of Primary Industries and Marine Resources, Cocoa Coconut Institute of Papua New Guinea, Mars Australia, University of Natural Resources and Environment
Enterprise-driven transformation of family cocoa production in East Sepik, Madang, New Ireland and Chimbu Provinces of Papua New Guinea	HORT/2014/096	25/03/2016	28/02/2021	Dr Phil Keane	La Trobe University	Cocoa Coconut Institute of Papua New Guinea, Curtin University, University of Natural Resources and Environment
Supporting commercial sweetpotato production and marketing in the Papua New Guinea highlands	HORT/2014/097	1/03/2016	28/02/2021	Prof Phil Brown	Central Queensland University	Australian National University, Fresh Produce Development Agency Ltd, National Agricultural Research Institute, Queensland Dept of Agriculture & Fisheries
Development of area-wide management approaches for fruit flies in mango for Indonesia, Philippines, Australia and the Asia-Pacific region	HORT/2015/042	1/11/2018	30/06/2023	Mr Stefano De Faveri	Department of Agriculture and Fisheries (Qld)	Eastern Mennonite University, Indonesian Centre for Agriculture Socio Economic and Policy Studies, Indonesian Centre for Horticulture Research and Development, Provincial Agriculturist Office, University of Gadjah Mada, University of the Philippines at Los Banos, University of the Philippines, Mindanao
Strengthening vegetable value chains in Pakistan for greater community livelihood benefits	HORT/2016/012	21/02/2018	31/12/2021	Dr Babar Bajwa	Centre for Agriculture and Bioscience International	Agriculture Research Institute, Pakistan, Department of Agriculture Extension Punjab, Mojaz Foundation, National Agricultural Research Centre, Sindh Agricultural University, Sindh Department of Agriculture Extension, University of Agriculture Faisalabad, The University of Queensland, Women Agriculture Development Organisation
Responding to emerging pest and disease threats to horticulture in the Pacific islands [Fiji, Papua New Guinea, Samoa, Solomon Islands, Tonga]	HORT/2016/185	1/04/2018	30/09/2023	Dr Michael Furlong	The University of Queensland	Ministry of Agriculture, Ministry of Agriculture and Fisheries, Ministry of Agriculture and Food, Forests and Fisheries, Ministry of Agriculture and Livestock, National Agricultural Research Institute, PACIFIC COMMUNITY FIJI, Solomon Islands National University, University of Goroka
Developing vegetable value chains to meet evolving market expectations in the Philippines	HORT/2016/188	1/02/2019	31/12/2023	Dr Gordon Rogers	Applied Horticultural Research	Department of Agriculture Philippines, East West Seed Company Inc, Landcare Foundation of the Philippines Inc, NSW Department of Primary Industries, Visayas State University

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
Integrated crop management for mango in Cambodia and the Philippines to meet market quality standards	HORT/2016/190	1/07/2019	30/06/2024	Dr Cameron McConchie	Department of Primary Industry and Fisheries (NT)	Cambodian Agricultural Research and Development Institute, General Directorate of Agriculture (Cambodia), Royal University of Agriculture (Cambodia), Davao del Norte Provincial Agriculturist Office (Philippines), University of the Philippines
Coconuts for Pacific livelihoods [Fiji, Papua New Guinea, Samoa, Solomon Islands, Vanuatu]	HORT/2017/025	1/01/2019	31/12/2023	Mrs Logotonu Waqainabete	Secretariat of the Pacific Community	The University of Queensland, Ministry of Agriculture (Fiji), Ministry of Agriculture and Fisheries (Samoa), Ministry of Agriculture and Livestock (Solomon Islands), Ministry of Agriculture, Forestry, Fisheries, Livestock and Biosecurity (Vanuatu), Kokonas Indastri Koporesen (PNG)
Effective management of cocoa pod borer [Papua New Guinea]	HORT/2018/114	28/06/2018	31/08/2019	Dr Leigh Pilkington	Department of Primary Industries (NSW)	—
An integrated management response to the spread of *Fusarium* wilt of banana in South-East Asia [Indonesia, Laos, Philippines]	HORT/2018/192	1/01/2020	30/06/2024	Mr Anthony Pattison	Department of Agriculture and Fisheries (Qld)	—
Protecting the coffee industry from coffee berry borer in Papua New Guinea and Australia	HORT/2018/194	1/07/2019	30/06/2024	Dr Ian Newton	Department of Agriculture and Fisheries (Qld)	PNG Coffee Industry Corporation, University of the Sunshine Coast
Developing and deploying the diversity of root crops for greater climate resilience in the Pacific island countries [Fiji, Samoa, Solomon Islands, Tonga, Vanuatu]	HORT/2018/195	1/03/2020	30/10/2024	Mr Michael Hughes	Department of Agriculture and Fisheries (Qld)	—
Impact Assessment Program						
Development of mixed method approaches to impact assessments of Philippines research projects	IAP/2017/010	11/04/2018	30/12/2019	Ms Alison Laing	CSIRO Agriculture and Food	Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development
Livestock Systems Research Program						
Strengthening incentives for improved grassland management in China and Mongolia	ADP/2012/107	1/09/2015	31/12/2019	Dr Colin Brown	The University of Queensland	Australian National University, Charles Sturt University, Chinese Academy of Agricultural Sciences, CSIRO Ecosystem Sciences, Inner Mongolia Agricultural University, Ministry of Food and Agriculture of Mongolia, Ministry of Science and Technology, Mongolia University of Life Sciences
Enhancing transboundary livestock disease risk management in Laos	AH/2012/067	1/02/2015	31/07/2019	Dr Russell Bush	The University of Sydney	Department of Livestock and Fisheries, Ministry of Agriculture and Forestry, National Agriculture and Forestry Research Institute, National University of Laos
Development of a market-driven biosecure beef production system in Laos	AH/2012/068	1/02/2015	31/07/2019	Dr Russell Bush	The University of Sydney	Department of Livestock and Fisheries, Ministry of Agriculture and Forestry, National Agriculture and Forestry Research Institute, National University of Laos, Savannakhet University
Integrating herbaceous forage legumes into crop and livestock systems in East Nusa Tenggara, Indonesia	LPS/2012/064	1/12/2014	30/11/2019	Dr Lindsay Bell	CSIRO Agriculture and Food	Assessment Institute for Agricultural Technology, NTT, Queensland Dept of Agriculture & Fisheries

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Profitable feeding strategies for smallholder cattle in Indonesia	LPS/2013/021	1/01/2017	31/12/2020	Dr Karen Harper	The University of Queensland	Assessment Institute for Agricultural Technology, NTB, Balai Pengkajian Teknologi Pertanian (BPTP) Central Sulawesi, Balai Pengkajian Teknologi Pertanian (BPTP) NTB, Balai Pengkajian Teknologi Pertanian (BPTP). Malang East Java, Balai Pengkajian Teknologi Pertanian Yogyakarta, Department of Primary Industry and Fisheries, Northern Territory, University of Brawijaya, University of Gadjah Mada, University of Jember, University of Mataram, University of Tadulako
Developing profitable dairy and sheep meat production systems in the central Tibet Autonomous Region, China	LPS/2014/036	1/04/2016	30/06/2021	Dr Dianne Mayberry	CSIRO Agriculture and Food	CSIRO Sustainable Agriculture Flagship, Lanzhou University, NSW Department of Primary Industries, Tibet Academy of Agricultural and Animal Sciences, The University of Queensland
Increasing the productivity and market options of smallholder beef cattle farmers in Vanuatu	LPS/2014/037	1/10/2015	30/09/2019	Dr Simon Quigley	The University of Queensland	Ministry of Agriculture, Livestock, Forestry, Fisheries and Biosecurity, Ministry of Trade, Commerce, Industry and Tourism, Queensland Dept of Agriculture & Fisheries, Southern Cross University, Vanuatu Agricultural Research and Training Centre, Vanuatu Agriculture College
Smallholder cattle enterprise development in Timor-Leste	LPS/2014/038	1/02/2016	31/12/2020	Dr Geoffry Fordyce	The University of Queensland	Ministry of Agriculture and Fisheries, National University of Timor Lorosa e, University of Mataram
Intensification of beef cattle production in upland cropping systems in Northwest Vietnam	LPS/2015/037	1/01/2017	30/06/2022	Dr Stephen Ives	University of Tasmania	Centre de Cooperation Internationale en Recherche Agronomique pour le Developpement, Department of Agriculture and Rural Development, Dien Bien, Hanoi Agricultural University, National Institute of Animal Sciences, Swinburne University of Technology, Tay Bac University, Thai Nguyen University, The University of Queensland, Vietnam National University of Agriculture
Improving smallholder dairy and beef profitability by enhancing farm production and value chain management in Pakistan	LPS/2016/011	1/04/2017	30/09/2021	Dr David McGill	The University of Melbourne	Charles Sturt University, Sindh Agriculture University, University of Animal and Veterinary Sciences, Lahore
Pig disease investigation in Timor-Leste	LS/2012/065	1/07/2019	31/12/2021	Dr Jenny-Ann Toribio	The University of Sydney	Assessment Institute for Agricultural Technology, NTT, Department of Livestock, NTT, DGLAHS, Ministry of Agriculture and Fisheries, National University of Timor Lorosa e, NSW Department of Primary Industries, University of Mataram, University of New England, The University of Queensland
Increasing the productivity and profitability of smallholder beekeeping enterprises in Papua New Guinea and Fiji	LS/2014/042	1/07/2019	30/06/2023	Dr David Lloyd	Southern Cross University	Biosecurity Authority of Fiji, Coffee Industry Corporation, Department of Agriculture and Livestock, Fiji Beekeepers Association, Ministry of Agriculture
Interventions to mitigate disease risk and add value to cross-border pig trade between Laos and Vietnam	LS/2014/055	1/01/2020	31/12/2023	Dr Amanda Ash	Murdoch University	—

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Improving farmer livelihoods by developing market-oriented small ruminant production systems in Myanmar	LS/2014/056	1/03/2019	31/12/2022	Dr Angus Campbell	The University of Melbourne	Livestock Breeding and Veterinary Department, University of Veterinary Science, Yezin Agricultural University
Improving smallholder beef value chains in rainfed cropping systems in Indonesia	LS/2015/047	1/10/2018	30/06/2021	Dr Heather Burrow	University of New England	Assessment Institute for Agricultural Technology, NTB, Balai Pengkajian Teknologi Pertanian (BPTP) Kalimantan Selatan, Indonesia Centre for Animal Research and Development, Loka Penelitian Sapi Potong, University of Lambung Mangkurat (ULM), University of Mataram, University of New England
Improving smallholder beef supply and livelihoods through cattle-palm system integration in Indonesia	LS/2015/048	1/05/2018	30/06/2021	Dr John Ackerman	University of New England	Balai Pengkajian Teknologi Pertanian (BPTP) Kalimantan Selatan, Balai Pengkajian Teknologi Pertanian Kalimantan Timur, Balai Pengkajian Teknologi Pertanian Riau, Indonesia Centre for Animal Research and Development, Northern Territory Department of Primary Industry and Fisheries
Improving cattle production in the Central Dry Zone of Myanmar through improved animal nutrition, health and management	LS/2016/132	1/11/2018	31/10/2022	Dr Dianne Mayberry	CSIRO Agriculture and Food	Livestock Breeding and Veterinary Department, The University of Melbourne, University of Veterinary Science, Yezin Agricultural University
Safe Pork: market-based approaches to improving the safety of pork in Vietnam	LS/2016/143	1/10/2017	30/06/2022	Dr Fred Unger	International Livestock Research Institute	Hanoi University of Public Health, National Institute of Animal Sciences, The University of Sydney, Vietnam National University of Agriculture
High quality markets and value chains for small-scale and emerging beef cattle farmers in South Africa (stage 2)	LS/2016/276	1/01/2018	31/12/2021	Dr Heather Burrow	University of New England	Agricultural Research Council - Animal Products Institute, Department of Agriculture, Forestry and Fisheries, National Agricultural Marketing Council
Improving small ruminant production and supply in Fiji and Samoa	LS/2017/033	1/07/2019	31/03/2023	Dr Frances Cowley	University of New England	Charles Sturt University, Fiji National University, Ministry of Agriculture, Ministry of Agriculture and Fisheries, The University of the South Pacific
Goat production systems and marketing in Laos and Vietnam	LS/2017/034	1/07/2019	30/06/2023	Dr Stephen Walkden-Brown	University of New England	Charles Sturt University, National Agriculture and Forestry Research Institute, National Animal Health Laboratory
Trilateral support to smallholder cattle systems research in Timor-Leste	LS/2017/035	1/01/2019	31/12/2020	Dr Dominic Smith	The University of Queensland	Ministry of Agriculture and Fisheries (Timor-Leste)
Enhancing small ruminant production to benefit farming families in Sindh and Punjab, Pakistan	LS/2018/105	1/11/2018	30/06/2021	Dr Rebecca Doyle	The University of Melbourne	National Rural Support Programme, Sindh Agricultural University, Sindh Livestock and Dairy Development Department, University of Animal and Veterinary Sciences, Lahore
Smallholder livestock futures in South-East Asia [Indonesia]	LS/2018/107	8/04/2019	30/09/2020	Dr Mario Herrero	CSIRO Agriculture and Food	University of Agriculture and Forestry (Vietnam), Royal University of Agriculture (Cambodia)
Establishing the linkages between foodborne bacterial enteropathies and malnutrition in Timor-Leste	LS/2018/184	14/01/2019	30/06/2020	Dr Ben Polkinghorne	Australian National University	Menzies School of Health Research (Northern Territory), Hospital Nacional Guido Valadares (Timor-Leste)

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Promoting business development pathways for more productive and profitable smallholder cattle systems in Vanuatu	LS/2018/185	1/10/2019	30/09/2023	Dr Simon Quigley	The University of Queensland	Department of Industry, Department of Livestock, Vanuatu Agricultural Research and Technical Centre
Forages – taking stock and identifying research needs [Cambodia, Laos, Vietnam]	LS/2018/186	1/07/2019	31/12/2020	Dr Lava Yadav	The University of Queensland	Warrawilla Pty Ltd
Impact assessment of *Taenia solium* control in Phongsali province, Laos and development of future opportunities for the control of zoonotic parasitic infections	LS/2018/201	3/10/2018	31/12/2019	Dr Amanda Ash	Murdoch University	CSIRO Australian Animal Health Laboratory, Ministry of Agriculture (Laos)
Integrating approaches for estimating greenhouse gas emissions from forests and livestock in Kenya	LS/2018/202	14/01/2019	30/06/2020	Dr Robert Waterworth	The Mullion Group Pty Ltd	The University of Melbourne, Ministry of Environment and Forestry (Kenya), Ministry of Agriculture, Livestock, Fisheries and Irrigation (Kenya), International Livestock Research Institute, New Zealand Agricultural Greenhouse Gas Research Centre
Scoping livestock research opportunities in Africa	LS/2018/205	1/01/2019	30/06/2020	Dr Dawit Solomon	International Livestock Research Institute	University of New England, Ministry of Agriculture (Ethiopia), Ethiopian Institute for Agricultural Research, UNIQUE forestry and land use
Assessing the potential of point of care diagnostic tools for developing countries [Cambodia, Laos]	LS/2018/203	14/01/2019	30/06/2020	Dr John Allen	CSIRO Australian Animal Health Laboratory	La Trobe University, National Institute of Animal Health (Thailand)
Supporting Fijian health and agricultural authorities implement the national antimicrobial resistance action plan (One Health)	LS/2018/212	20/02/2019	31/01/2020	Dr Paul Debarro	CSIRO Health and Biosecurity	University of Technology Sydney, Fiji National Coordinator on AMR
A One Health approach to establish surveillance strategies for Japanese encephalitis and zoonotic arboviruses in Papua New Guinea (One Health)	LS/2018/213	21/02/2019	31/01/2020	Dr John Allen	CSIRO Australian Animal Health Laboratory	Burnet Institute (Victoria), James Cook University, Papua New Guinea Institute of Medical Research, National Agriculture Quarantine and Inspection Authority (PNG), Divine Word University (PNG), Central Public Health Laboratory (PNG)
Zoonotic malaria in Indonesia (One Health)	LS/2018/214	18/03/2019	28/02/2020	Prof Nicholas Anstey	Menzies School of Health Research	University of Sumatera Utara (Indonesia), Eijkman Institute for Molecular Biology (Indonesia)
Developing and testing processes and tools to generate connected and live health security knowledge in Mekong communities (One Health) [Cambodia, Laos]	LS/2018/215	28/02/2019	31/01/2020	Prof Osborne Richard	Swinburne University of Technology	Ministry of Health National Centre for Health Promotion (Cambodia), Independent Consultant (Vietnam)
Incentives for early declaration and effective prevention of avian influenza in the Mekong (One Health) [Cambodia, Laos]	LS/2018/216	22/02/2019	31/01/2020	Prof Barbara McPake	Nossal Institute Limited (The University of Melbourne)	Peter Doherty Institute for Infection and Immunity (Victoria), Health Strategy and Policy Institute (Vietnam), Pasteur Institute (Vietnam, Laos), Hanoi University of Public Health, National Institute of Public Health (Cambodia), Institut Pasteur du Cambodge (Cambodia), Lao Tropical and Public Health Institute

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Drug sensitive and resistant tuberculosis and zoonotic infections as causes of lymphadenitis in two provinces in Papua New Guinea (One Health)	LS/2018/217	5/04/2019	31/01/2020	Dr Philipp Du Cros	Burnet Institute	University of Melbourne, Institute of Medical Research (PNG), National Department of Health (PNG), Central Public Health Laboratory (PNG)
Evaluating zoonotic malaria transmission and agricultural land use in Indonesia	LS/2019/116	1/01/2020	30/06/2022	Dr Matthew Grigg	Menzies School of Health Research	University of Sumatera Utara (Indonesia), Eijkman Institute for Molecular Biology (Indonesia), Eijkman Institute for Molecular Biology (Indonesia), James Cook University
Veterinary Economics in Mekong Countries – advancing One Health [Cambodia, Laos, Vietnam]	LS/2019/118	1/01/2020	30/06/2022	Professor Barbara McPake	Nossal Institute Limited (The University of Melbourne)	Ministry of Agriculture (Cambodia), National Institute for Public Health (Cambodia)
Enhancing the management of antimicrobial resistance in Fiji (One Health)	LS/2019/119	1/01/2020	30/06/2022	Dr Paul DeBarro	CSIRO Health and Biosecurity	University of Technology Sydney, University of South Australia, Ministry of Health and Medical Services (Fiji), Fiji National University
Soil and Land Management Research Program						
Land management of diverse rubber-based systems in southern Philippines	SLAM/2017/040	1/01/2019	31/12/2023	Prof Chengrong Chen	Griffith University	Bureau of Soil and Water Management, Caraga State University, Provincial Government of Agusan del Sur (PGAS), University of Southern Mindanao
Mainstreaming research in Myanmar's agricultural and veterinary universities	SLAM/2017/041	1/01/2019	31/12/2023	Prof Kaye Basford	The University of Queensland	The University of Melbourne, University of Veterinary Science, Yezin Agricultural University
Synthesis of learnings on sustainable intensification of agriculture in Cambodia from ACIAR research investments to inform the future and support impact.	SLAM/2018/127	8/06/2018	31/12/2019	Dr Davina Boyd	Murdoch University	—
Farmer options for crops under saline conditions (FOCUS) in the Mekong Delta, Vietnam	SLAM/2018/144	1/07/2019	30/06/2024	Dr Jason Condon	Charles Sturt University	Can Tho University (Vietnam), NSW Department of Primary Industries, University of New England
Crop health and nutrient management of shallot-chilli-rice cropping systems in coastal Indonesia	SLAM/2018/145	1/07/2019	30/06/2023	Dr Stephen Harper	The University of Queensland	Balai Pengkajian Teknologi Pertanian (BPTP) Central Sulawesi, Bogor Agricultural University, Indonesian Soil Research Institute, Indonesian Vegetable Research Institute, University of Gadjah Mada
Soil-based challenges for cropping in Shan State, Myanmar (nutrient acquisition)	SLAM/2018/190	1/07/2019	30/06/2021	Dr Terry Rose	Southern Cross University	—
Farmer participatory crop benchmarking in the Central Dry Zone of Myanmar	SLAM/2018/206	10/12/2018	31/12/2019	Prof David Herridge	University of New England	—
Identifying entry points for black pepper (*Piper* sp) production and value chain development in the Central Highlands in Vietnam	SLAM/2018/209	3/06/2019	30/06/2020	Dr Didier Lesueur	Deakin University	International Center for Tropical Agriculture, Department of Agriculture and Fisheries (Queensland), Western Highlands Agriculture and Forestry Science Institute (Vietnam)

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Improving the sustainability of rice-shrimp farming systems in the Mekong River Delta, Vietnam	SMCN/2010/083	1/06/2013	31/10/2019	Assoc Prof Jesmond Sammut	University of New South Wales	Can Tho University (Vietnam), Charles Sturt University, Cuu Long Rice Research Institute, Griffith University, Research Institute for Aquaculture No. 2
Integrated water, soil and nutrient management for sustainable farming systems in South Central Coast of Vietnam and Australia	SMCN/2012/069	1/06/2014	31/12/2019	Prof Richard Bell	Murdoch University	Agricultural Science Institute for Southern Central Coast of Vietnam, Central Vietnam Division of Water Resources Planning and Investigation, Department of Agriculture and Rural Development, Binh Dinh, Department of Agriculture and Rural Development, Ninh Thuan, Department of Natural Resources and Environment - Binh Dinh, Flinders University, Hue University, Hue University of Agriculture and Forestry, Institute of Agricultural Sciences of Southern Vietnam, International Water Management Institute, Nong Lam University
Management practices for profitable crop livestock systems for Cambodia and Laos	SMCN/2012/075	22/03/2016	31/07/2020	Dr Matthew Denton	The University of Adelaide	Cambodia Agricultural Research and Development Institute, Department of Agricultural Land Management, Murdoch University, National Agriculture and Forestry Research Institute, Provincial Agriculture and Forestry Office, Royal University of Agriculture
Sustaining soil fertility in support of intensification of sweetpotato cropping systems [Papua New Guinea]	SMCN/2012/105	15/02/2016	31/12/2019	Prof Neal Menzies	The University of Queensland	National Agricultural Research Institute
Management of nutrients for improved profitability and sustainability of crop production in central Myanmar	SMCN/2014/044	19/01/2016	30/06/2020	Prof Deli Chen	The University of Melbourne	Department of Agriculture, Yezin Agricultural University
Optimising soil management and health in Papua New Guinea integrated cocoa farming systems	SMCN/2014/048	3/10/2016	31/07/2020	Assoc Prof Damien Field	The University of Sydney	Cocoa Coconut Institute of Papua New Guinea
Improving maize-based farming systems on sloping lands in Vietnam and Laos	SMCN/2014/049	1/02/2017	30/06/2021	Prof Michael Bell	The University of Queensland	Centre international pour la recherche agronomique pour le développement, Department of Agricultural Land Management, International Center for Tropical Agriculture, Northern Mountainous Agriculture and Forestry Science Institute, Queensland Dept of Agriculture & Fisheries, Soil and Fertilizer Research Institute
Land resource evaluation for productive and resilient landscapes in the Central Dry Zone of Myanmar	SMCN/2014/075	1/04/2016	30/06/2020	Dr Anthony Ringrose-Voase	CSIRO Agriculture and Food	CSIRO Agriculture Flagship, Department of Agricultural Research, Department of Agriculture, Dry Zone Greening, Dry Zone Greening Department, Farm Business Development Technical Group, Land Use Division, Department of Agriculture, Yezin Agricultural University
Integrated resource management for vegetable production in Laos and Cambodia	SMCN/2014/088	1/12/2015	30/06/2020	Dr Alice Melland	University of Southern Queensland	Cambodia Agricultural Research and Development Institute, Clean Agriculture Development Centre, National Agriculture and Forestry Research Institute, National University of Laos, University of Tasmania

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Soil management in Pacific Islands: investigating nutrient cycling and development of the Soils Portal [Fiji, Kiribati, Samoa, Tonga, Tuvalu]	SMCN/2016/111	1/10/2017	30/09/2021	Dr Ben Macdonald	CSIRO Agriculture and Food	Department of Agriculture, Landcare Research, Ministry of Agriculture, Ministry of Agriculture and Food, Forests and Fisheries, Ministry of Environment, Lands & Agriculture Development, Scientific Research Organisation of Samoa, Secretariat of the Pacific Community
Land suitability assessment and site specific soil management for Cambodian uplands	SMCN/2016/237	10/11/2017	30/09/2021	Dr Wendy Vance	Murdoch University	Cambodia Agricultural Research and Development Institute
Improving soil health, agricultural productivity and food security on atolls [Kiribati, Tuvalu]	SMCN/2014/089	1/10/2015	31/4/2019	Dr Siosiua Halavatau	Secretariat of the Pacific Community	Centre international pour la recherche agronomique pour le développement, Department of Agricultural Land Management, International Center for Tropical Agriculture, Northern Mountainous Agriculture and Forestry Science Institute, Queensland Dept of Agriculture & Fisheries, Soil and Fertilizer Research Institute
Social Sciences Research Program						
Improving the methods and impacts of agricultural extension in Western Mindanao, Philippines	ASEM/2012/063	1/10/2013	31/12/2020	Dr Mary Johnson	RMIT University	—
Improving food security in the northern uplands of Laos: identifying drivers and overcoming barriers	ASEM/2012/073	1/09/2014	30/09/2020	Dr Paulo Santos	Monash University	James Cook University, National University of Laos, The University of Sydney
Improving market engagement, post-harvest management and productivity of the Cambodian and Laos vegetable industries	ASEM/2012/081	1/08/2014	31/12/2019	Mr Jeremy Badgery-Parker	University of Adelaide	Charles Sturt University, NSW Department of Primary Industries; Cambodia: General Directorate of Agriculture, Cambodian Agricultural Research and Development Institute, Royal University of Agriculture,International Development Enterprises, SNV – Netherlands Development Organisation; Laos: Horticultural Research Centre, NAFRI, National University of Laos
Uptake of agricultural technologies amongst farmers in Battambang and Pailin provinces, Cambodia	ASEM/2013/003	1/04/2017	31/12/2020	Dr Brian Cook	The University of Melbourne	Australian National University, Center for Development Oriented Research in Agriculture and Livelihood Systems, Partners for Rural Development, Prek Leap National School of Agricullture, RMIT University
Action-ready climate knowledge to improve disaster risk management for small holder farmers in the Philippines	ASEM/2014/051	10/08/2015	30/06/2020	Dr Peter Hayman	South Australian Research and Development Institute	Charles Sturt University, Department of Agriculture, Philippine Atomospheric, Geophysical and Astronomical Services Administration, Philippine Institute for Development Studies, University of the Philippines at Los Banos
Smallholder farmer decision-making and technology adoption in southern Laos: opportunities and constraints	ASEM/2014/052	1/01/2016	31/12/2019	Dr Kim Alexander	James Cook University	Department of Agriculture Extension and Cooperatives, National Agriculture and Forestry Research Institute, National University of Laos
Developing cassava production and marketing systems to enhance smallholder livelihoods in Cambodia and Laos	ASEM/2014/053	1/10/2015	31/12/2019	Dr Dominic Smith	The University of Queensland	Cambodia Agricultural Research and Development Institute, Department of Agricultural Research, International Center for Tropical Agriculture, National Agriculture and Forestry Research Institute, Yezin Agricultural University

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Identifying opportunities and constraints for rural women's engagement in small-scale agricultural enterprises in Papua New Guinea	ASEM/2014/054	1/10/2016	30/06/2020	Dr Gina Koczberski	Curtin University of Technology	CARE International, Curtin University, Papua New Guinea Cocoa and Coconut Institute Ltd., Papua New Guinea University of Technology, PNG Coffee Industry Corporation, PNG Oil Palm Research Association Inc
Improving livelihoods of smallholder coffee communities in Papua New Guinea	ASEM/2016/100	1/10/2017	31/12/2021	Prof George Curry	Curtin University	CSIRO Land and Water, PNG Coffee Industry Corporation
Climate-smart landscapes for promoting sustainability of Pacific island agricultural systems [Fiji, Tonga]	ASEM/2016/101	1/01/2018	31/12/2021	Dr Eloise Biggs	The University of Western Australia	Ministry of Agriculture and Food, Forests and Fisheries, Secretariat of the Pacific Community, Stockholm Environment Institute - Asia, The University of Auckland, The University of Sydney, University of the South Pacific
Enhancing livelihoods through forest and landscape restoration [The Philippines]	ASEM/2016/103	15/12/2017	30/06/2022	Dr John Herbohn	The University of the Sunshine Coast	Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development, Queensland University of Technology, Southern Cross University, The University of Queensland, Visca Foundation for Agricultural and Rural Development, Incorporated
Climate-smart agriculture opportunities for enhanced food production in Papua New Guinea	ASEM/2017/026	18/03/2019	31/12/2023	Mr Steven Crimp	Australian National University	Climate Change and Development Authority, CSIRO Agriculture and Food, Department of Agriculture and Livestock, Fresh Produce Development Agency Ltd, National Agricultural Research Institute, Phloem 3 Pty Ltd, PNG National Weather Service, Sustineo Pty Ltd, University of Goroka
The potential of International Landcare [Fiji, Indonesia, Philippines, South Africa, Uganda]	ASEM/2018/117	4/06/2018	4/12/2019	Dr Mary Johnson	RMIT University	RM Consulting Group Pty Ltd
Building institutions for the sustainable management of artesian groundwater in Myanmar	SSS/2018/135	1/01/2020	31/06/2022	Dr Sonali Senaratna-Sellamuttu	International Water Management Institute	Ministry of Agriculture, Livestock and Irrigation (Myanmar), Aqua Rock Konsultants, CSIRO Land and Water, Myanmar Institute for Integrated Development
Improving agricultural development opportunities for female smallholders in rural Solomon Islands	SSS/2018/136	1/01/2020	31/12/2024	Dr Deborah Hill	University of Canberra	Solomon Islands: Live and Learn, Kastom Gaden Association, Longgu District Mother's Union
Gender equitable agricultural extension through institutions and youth engagement in Papua New Guinea	SSS/2018/137	1/10/2019	31/03/2023	Dr Josephine Caffery	University of Canberra	Pacific Adventist University
Analysing gender transformative approaches to agricultural development with ethnic minority communities in Vietnam	SSS/2018/139	1/10/2018	21/03/2020	Dr Rochelle Spencer	Murdoch University	CARE Vietnam
Water and Climate Research Program						
Efficient participatory irrigation institution to support productive and sustainable agriculture in South Asia [India, Pakistan]	ADP/2014/045	1/09/2016	31/10/2019	Prof Lin Crase	University of South Australia,	Indian Institute of Management, Council on Energy, Environment and Water (India), Pakistan Agricultural Research Council, University of Karachi, Mehran University of Engineering and Technology, University of Agriculture Faisalabad, Pakistan Institute of Development Economics, Punjab Irrigation and Drainage Authority, Sindh Irrigation and Drainage Authority

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Promoting socially inclusive and sustainable agricultural intensification in West Bengal (India) and Bangladesh	LWR/2014/072	1/03/2016	29/02/2020	Dr Christian Roth	CSIRO Agriculture and Food	Australian National University, Bangladesh Agricultural University, Centre for the Development of Human Initiatives (India), Edith Cowan University (Western Australia), Indian Institute of Technology, Livelihoods and Natural Resource Management Institute (India), Professional Assistance for Development Action (India), Shushilan (Bangladesh), YesBank (India)
Cropping system intensification in the salt-affected coastal zones of Bangladesh and West Bengal (India)	LWR/2014/073	1/11/2015	31/10/2020	Dr Mohammed Mainuddin	CSIRO Land and Water	Bangladesh Agricultural Research Institute, Bangladesh Rice Research Institute, Bidhan Chandra Krishi Viswavidyalaya University, Central Soil Salinity Research Institute, CSIRO Agriculture Flagship, Gajah Mada University, Institute of Water Modelling, Khulna University, Krishni Gobeshona Foundation, Murdoch University, Tagore Society for Rural Development
Developing approaches to enhance farmer water management skills in Balochistan, Punjab and Sindh in Pakistan	LWR/2014/074	1/10/2016	30/09/2020	Dr Sandra Heaney-Mustafa	University of Canberra	CSIRO Agriculture and Food, CSIRO Land and Water, National Agricultural Research Centre, Pakistan Council for Research on Water Resources, Society of Facilitators and Trainers
Improving groundwater management to enhance agriculture and farming livelihoods in Pakistan	LWR/2015/036	1/10/2016	30/09/2020	Dr Jehangir Punthakey	Charles Sturt University	Balochistan Irrigation and Power Department, Balochistan University of Information Technology, Engineering and Management Sciences, International Center for Agricultural Research in the Dry Areas, Mehran University of Engineering and Technology, NED University of Engineering and Technology, Pakistan Council for Research on Water Resources, PMAS Arid Agriculture University, Punjab Irrigation Department, Sindh Agricultural University, Sindh Irrigation Department, University for Arid Agriculture, University of Agriculture, University of Agriculture Faisalabad, Water and Power Development Authority
Nutrient management for diversified cropping in Bangladesh	LWR/2016/136	1/08/2017	31/07/2021	Prof Richard Bell	Murdoch University	Bangladesh Agricultural Research Council, Bangladesh Agricultural Research Institute, Bangladesh Agricultural University, Bangladesh Rice Research Institute, Conservation Agriculture Service Providers Association, Khulna University, Patuakhali Science and Technology University, Soil Resource Development Institute
Transforming smallholder irrigation into profitable and self-sustaining systems in southern Africa [Malawi, Mozambique, South Africa, Tanzania, Zimbabwe]	LWR/2016/137	16/06/2017	15/06/2021	Prof Jamie Pittock	Australian National University	Ardhi University, CSIRO Agriculture and Food, CSIRO Land and Water, Food, Agriculture and Natural Resources Policy Analysis Network, International Crops Research Institute for the Semi Arid Tropics, National Institute of Irrigation, University of South Australia
Salinity Pakistan	LWR/2017/027	1/07/2019	31/12/2022	Dr Michael Mitchell	Charles Sturt University	Murdoch University, Paksitan: Mehran University of Engineering and Technology, Muhammad Nawaz Shareef University of Agriculture Multan, International Union for Conservation of Nature, National Agricultural Research Centre
Agriculture based emission-reduction options to support nationally determined contributions in Vietnam and Fiji	LWR/2017/029	1/11/2018	30/06/2020	Prof Peter Grace	Queensland University of Technology	Australian National University, Ministry of Agriculture, Ministry of Agriculture and Rural Development, The University of Melbourne

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
Institutions to support intensification, integrated decision making and inclusiveness in agriculture in the East Gangetic Plain [Bangladesh, India, Nepal]	LWR/2018/104	1/11/2018	30/06/2020	Prof Lin Crase	University of South Australia	Bangladesh Agricultural University, FAO, Institute for Integrated Development Studies (IIDS), International Food Policy Research Institute, The University of Western Australia
Pilot project on commercialisation of smallholder conservation-based planters in Bangladesh	LWR/2018/111	10/08/2018	15/01/2020	Prof Richard Bell	Murdoch University	Bangladesh: Hoque Corporation, Bangladesh Agricultural University, National Bank, Conservation Agriculture Service Providers Association
Virtual irrigation academy - phase 2 [Malawi, Mozambique, South Africa, Tanzania, Zimbabwe]	WAC/2018/162	1/07/2019	30/06/2023	Dr Richard Stirzaker	CSIRO Land and Water	ASARECA, Department of Agricultural Research Services, Department of Irrigation, National Institute of Irrigation
Improving livelihood of marginal communities, by out scaling irrigation and agricultural practices, through collectives, in the Eastern Gangetic Plains [Bangladesh, India, Nepal]	WAC/2018/163	1/07/2019	30/06/2020	Mr Erik Schmidt	University of Southern Queensland	Birmingham University (UK), University of Agricultural Sciences (Sweden), International Water Management Institute (Nepal), Uttar Banga Krishi Viswavidyalaya (India), Centre for the Development of Human Initiatives (India)Sakhi Bihar (India), International Development Enterprise (Nepal)
Water management for smallholder farmers - out-scaling ACIAR research in Andhra Pradesh drought mitigation program [India]	WAC/2018/164	1/10/2019	30/09/2022	Dr Uday Nidumolu	CSIRO Agriculture and Food	Western Sydney University, South Australian Research and Development Institute, Watershed Support Services Activities Network (India)
Expanding opportunities to use groundwater for poverty alleviation and climate change adaption in Laos	WAC/2018/167	1/06/2019	30/06/2020	Dr Paul Pavelic	International Water Management Institute	Flinders University (South Australia)
Foresight for sustainable food systems in the Eastern Gangetic Plains (SDIP) [Bangladesh, India, Nepal]	WAC/2018/168	17/09/2018	31/07/2019	Dr Avinash Kishore	International Food Policy Research Institute	Bangladesh Agricultural University
Quantifying crop yield gaps across the Indo-Gangetic Plains from new perspectives – production, farmer profit and sustainability of water use (SDIP) [Bangladesh, India, Nepal]	WAC/2018/169	11/02/2019	31/12/2019	Dr Donald Gaydon	CSIRO Agriculture and Food	International Maize and Wheat Improvement Center (CIMMYT)
Aquifer characterisation, artificial recharge and reuse of suddenly available water in South Bihar, India (SDIP)	WAC/2018/211	4/02/2019	30/06/2020	Dr Prabhakar Sharma	Nalanda University	—
Building provincial capacity for sustainable agricultural mechanisation in Nepal (SDIP)	WAC/2018/220	11/02/2019	30/06/2020	Dr Brendan Brown	International Maize and Wheat Improvement Center	Department of Agriculture (Nepal), Socioeconomics and Agricultural Research Policy Division (Nepal)
The implications of sustainable intensification on weed dynamics in the Eastern Gangetic Plains [India, Nepal]	WAC/2018/221	1/04/2019	30/06/2020	Dr Brendan Brown	International Maize and Wheat Improvement Center	—

Project title	Project code	Start	End	Project leader	Commissioned organisation	Collaborating institutions
The regional hydrological impact of farm-scale water saving measures in the Eastern Gangetic Plains (SDIP) [Bangladesh, India, Nepal]	WAC/2019/104	1/07/2019	30/06/2020	Dr Mohammed Mainuddin	CSIRO Land and Water	—
Global Program						
ACIAR-IDRC co-investment – Cultivate Africa's Future, Phase 2 (CultiAF2) [Ethiopia, Kenya, Uganda, Malawi, Mozambique, Zambia, and Zimbabwe]	C2016/367	2019	2023	—	—	International Development Research Centre (Canada)
Demand-led plant variety design for emerging markets in Africa [Ghana, Kenya, South Africa, Tanzania]	FSC/2013/019	26/06/2014	31/12/2021	Prof Gabrielle Persley	The University of Queensland	African Centre for Crop Improvement, Alliance for a Green Revolution in Africa, Association for Strengthening Agricultural Research in Eastern and Central Africa, Biosciences eastern and central Africa, Crawford Fund, Forum for Agricultural Research in Africa, International Livestock Research Institute, Pan Africa Bean Research Alliance, Regional Universities Forum for Capacity Building in Agriculture, Syngenta Foundation for Sustainable Agriculture, University of Nairobi, West Africa Centre for Crop Improvement, University of Ghana, West and Central African Council for Agricultural Research and Development
Improving plant biosecurity in the Pacific islands [Fiji, Kiribati, Papua New Guinea, Samoa, Solomon Islands, Timor-Leste, Tonga, Tuvalu, Vanuatu]	GP/2018/109	23/11/2018	30/06/2020	Mr Rob Duthie	Kalang Consultancy Services	Magee Consultancy Services
Reinvigorating the Coconut Genetic Resources Network (COGENT) [Fiji, Indonesia, Papua New Guinea, Samoa]	GP/2018/193	1/07/2019	30/06/2021	Mr Uron Salum	International Coconut Community	Bioversity International
ACIAR-IDRC co-investment – Future of food program [Global]	GP/2018/218	31/01/2019	30/06/2021	Mr John Greisberger	XPRIZE Foundation Inc.	International Development Research Centre (Canada)
Agricultural Science and Technology Indicators (ASTI), Monitoring agricultural research investments, capacity and impact in Southeast Asia and the Pacific	GP/2016/093	13/11/2017	31/03/2020	Gert-Jan Stads	APAARI and IFPRI	Asia Pacific Association of Agricultural Research Institutions (APAARI); National Agricultural Research Institutes (NARIs) in South-East Asia

Note: Details in this appendix may differ slightly to those reported in the main text due to changing project arrangements during the time of compiling this document

Appendix 2

Location (Australian state or country) of commissioned organisations for current and proposed projects, 2019–20

Project title	Project code	Commissioned organisation
Australian Capital Territory		
Understanding the drivers of successful and inclusive rural regional transformation: sharing experiences and policy advice in Bangladesh, China, Indonesia and Pakistan	ADP/2017/024	Australian National University
Policy drivers for public-private partnerships in Pacific organics: improving extension policy through an evidence-based approach [Fiji, Vanuatu]	ADP/2018/131	The University of the Sunshine Coast
Insect tolerant chickpea for Bangladesh	CIM/2016/039	CSIRO Agriculture and Food
Protecting stored grains against pests using a new silica technology – understanding distribution and extension pathways [Tanzania]	CIM/2017/031	Davren Global
Monitoring and evaluation of socio-economic impacts of pearl-based livelihood development	FIS/2018/129	Sustineo Pty Ltd
Domestication and breeding of sandalwood in Fiji and Tonga	FST/2016/158	CSIRO National Research Collections
Development of mixed method approaches to impact assessments of Philippines research projects	IAP/2017/010	CSIRO Agriculture and Food
Supporting Fijian health and agricultural authorities implement the national antimicrobial resistance action plan (One Health)	LS/2018/212	CSIRO Health and Biosecurity
Integrating approaches for estimating greenhouse gas emissions from forests and livestock in Kenya	LS/2018/202	The Mullion Group Pty Ltd
Establishing the linkages between foodborne bacterial enteropathies and malnutrition in Timor-Leste	LS/2018/184	Australian National University
Enhancing the management of antimicrobial resistance in Fiji (One Health)	LS/2019/119	CSIRO Health and Biosecurity
Soil management in Pacific Islands: investigating nutrient cycling and development of the Soils Portal [Fiji, Kiribati, Samoa, Tonga, Tuvalu]	SMCN/2016/111	CSIRO Agriculture and Food
Land resource evaluation for productive and resilient landscapes in the Central Dry Zone of Myanmar	SMCN/2014/075	CSIRO Agriculture and Food
Climate-smart agriculture opportunities for enhanced food production in Papua New Guinea	ASEM/2017/026	Australian National University
Gender equitable agricultural extension through institutions and youth engagement in Papua New Guinea	SSS/2018/137	University of Canberra
Improving agricultural development opportunities for female smallholders in rural Solomon Islands	SSS/2018/136	University of Canberra
Cropping system intensification in the salt-affected coastal zones of Bangladesh and West Bengal (India)	LWR/2014/073	CSIRO Land and Water
Transforming smallholder irrigation into profitable and self-sustaining systems in southern Africa [Malawi, Mozambique, South Africa, Tanzania, Zimbabwe]	LWR/2016/137	Australian National University
Virtual irrigation academy - phase 2 [Malawi, Mozambique, South Africa, Tanzania, Zimbabwe]	WAC/2018/162	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
The regional hydrological impact of farm-scale water saving measures in the Eastern Gangetic Plains (SDIP) [Bangladesh, India, Nepal]	WAC/2019/104	CSIRO Land and Water
New South Wales		
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

Project title	Project code	Commissioned organisation
Sustainable intensification and diversification in the lowland rice system in north-west Cambodia	CSE/2015/044	The University of Sydney
Mitigating the effects of stripe rust on wheat production in South Asia and eastern Africa [Ethiopia, India, Nepal, Pakistan]	CIM/2014/081	The University of Sydney
Understanding drill seeding of rice techniques and business models [Laos]	CIM/2018/113	Deakin University
Increasing productivity and profitability of pulse production in cereal based cropping systems in Pakistan	CIM/2015/041	Charles Sturt University
Translating fish passage research outcomes into policy and legislation across South-East Asia [Cambodia, Indonesia, Laos]	FIS/2018/153	Charles Sturt University
Agriculture for improved nutrition: integrated agri-food systems for the Pacific region [Kiribati, Solomon Islands, South Pacific general, Vanuatu]	FIS/2018/155	University of Wollongong
Strengthening and scaling community-based approaches to Pacific coastal fisheries management in support of the New Song	FIS/2016/300	University of Wollongong
Improving the design of irrigation infrastructure to increase fisheries production in floodplain wetlands of the Lower Mekong and Murray-Darling basins [Laos]	FIS/2012/100	Department of Primary Industries (NSW)
Assessing fisheries mitigation measures at Xayaburi Dam in Laos	FIS/2017/016	Charles Sturt University
Assessing fisheries mitigation measures at Xayaburi Dam in Laos	FIS/2017/017	Charles Sturt University
Quantifying biophysical and community impacts of improved fish passage in Laos and Myanmar	FIS/2014/041	Charles Sturt University
Institutional strengthening in Papua New Guinea: translating fisheries research into policy and management	FIS/2018/151	University of New South Wales
Improving livelihoods and human nutrition through inland aquaculture in Papua New Guinea	FIS/2018/154	University of New South Wales
Restoring damaged coral reefs using mass coral larval reseeding [The Philippines]	FIS/2014/063	Southern Cross University
Baseline monitoring and evaluation of long-term impacts on fish stocks from coral restoration [The Philippines]	FIS/2018/128	Southern Cross University
Improving technologies for cost-effective fish feeding strategies, husbandry and fingerling production for inland aquaculture in Papua New Guinea	FIS/2014/062	University of New South Wales
Improving plant biosecurity in the Pacific islands [Fiji, Kiribati, Papua New Guinea, Samoa, Solomon Islands, Timor-Leste, Tonga, Tuvalu, Vanuatu]	GP/2018/109	Kalang Consultancy Services
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
Improved post-harvest management of fruit and vegetables in the southern Philippines and Australia	HORT/2012/098	Applied Horticultural Research
Developing vegetable value chains to meet evolving market expectations in the Philippines	HORT/2016/188	Applied Horticultural Research
Bogia coconut syndrome in Papua New Guinea: developing biological knowledge and a risk management strategy	HORT/2012/087	Charles Sturt University
Effective management of cocoa pod borer [Papua New Guinea]	HORT/2018/114	Department of Primary Industries (NSW)
Increasing the productivity and profitability of smallholder beekeeping enterprises in Papua New Guinea and Fiji	LS/2014/042	Southern Cross University
Improving small ruminant production and supply in Fiji and Samoa	LS/2017/033	University of New England
Improving smallholder beef value chains in rainfed 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
Enhancing transboundary livestock disease risk management in Laos	AH/2012/067	The University of Sydney

Project title	Project code	Commissioned organisation
Development of a market-driven biosecure beef production system in Laos	AH/2012/068	The University of Sydney
Goat production systems and marketing in Laos and Vietnam	LS/2017/034	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
Pig disease investigation in Timor-Leste	LS/2012/065	The University of Sydney
Soil-based challenges for cropping in Shan State, Myanmar (nutrient acquisition)	SLAM/2018/190	Southern Cross University
Optimising soil management and health in Papua New Guinea integrated cocoa farming systems	SMCN/2014/048	The University of Sydney
Farmer options for crops under saline conditions (FOCUS) in the Mekong Delta, Vietnam	SLAM/2018/144	Charles Sturt University
Improving the sustainability of rice-shrimp farming systems in the Mekong River Delta, Vietnam	SMCN/2010/083	University of New South Wales
Farmer participatory crop benchmarking in the Central Dry Zone of Myanmar	SLAM/2018/206	University of New England
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
Enhancing smallholder linkages to markets by optimising transport and logistics infrastructure [Indonesia, Vietnam]	AGB/2017/036	CSIRO Land and Water
Northern Territory		
Integrated crop management for mango in Cambodia and the Philippines to meet market quality standards	HORT/2016/190	Department of Primary Industry and Fisheries (NT)
Zoonotic malaria in Indonesia (One Health)	LS/2018/214	Menzies School of Health Research
Evaluating zoonotic malaria transmission and agricultural land use in Indonesia	LS/2019/116	Menzies School of Health Research
Queensland		
Policy and institutional reforms to improve horticultural markets in Pakistan [China, Pakistan]	ADP/2014/043	The University of Queensland
Pacific agribusiness research in development initiative - phase 2 (PARDI 2) [Fiji, Tonga, Vanuatu]	AGB/2014/057	The University of the Sunshine Coast
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/2017/039	The University of Queensland
Improving smallholder farmer incomes through strategic market development in mango supply chains in southern Vietnam	AGB/2012/061	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
Strengthening leadership, coordination and economic development of the temperate fruit industry in northern Vietnam	AGB/2018/171	The University of Queensland
A Theory of Change for inclusive value chains in the Philippines	AGB/2019/100	The University of Queensland
Agribusiness Masterclass - The Philippines	AGB/2019/101	CSIRO Agriculture and Food
Identifying Eastern Gangetic Plains soil constraints (SDIP) [Bangladesh, India, Nepal]	CROP/2018/210	The University of Queensland
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
Accelerating the development of finfish mariculture in Cambodia through south-south research cooperation with Indonesia	FIS/2016/130	The University of the Sunshine Coast
Developing pearl industry-based livelihoods in the western Pacific [Fiji, Papua New Guinea, Tonga]	FIS/2014/060	The University of the Sunshine Coast

Project title	Project code	Commissioned organisation
Improving seaweed production and processing opportunities in Indonesia	FIS/2015/038	The University of the Sunshine Coast
Improving technical and institutional capacity to support development of mariculture-based livelihoods and industry in New Ireland, Papua New Guinea	FIS/2014/061	The University of the Sunshine Coast
Developing technologies for giant grouper (*Epinephelus lanceolatus*) aquaculture in Vietnam, the Philippines and Australia	FIS/2012/101	The University of the Sunshine Coast
Increasing technical skills supporting community-based sea cucumber production in Vietnam and the Philippines	FIS/2016/122	The University of the Sunshine Coast
Improved productivity and efficiency of the culture-based fishery for giant freshwater prawn in Sri Lankan reservoirs	FIS/2018/157	James Cook University
Half-pearl industry development in Tonga and Vietnam	FIS/2016/126	The University of the Sunshine Coast
Expanding spiny lobster aquaculture in Indonesia	FIS/2014/059	James Cook University
Improving agroforestry policy for sloping land in Fiji	FST/2016/147	The University of Queensland
Enhancing value-added products and environmental benefits from agroforestry systems in Papua New Guinea and the Pacific [Fiji, Papua New Guinea, Solomon Islands, Vanuatu]	FST/2014/067	The University of the Sunshine Coast
Enhancing community-based commercial forestry in Indonesia	FST/2015/040	The University of the Sunshine Coast
Enhanced adoption of agroforestry systems in Laos	FST/2018/180	The University of Queensland
Enabling community forestry in Papua New Guinea	FST/2016/153	University of the Sunshine Coast
Enhancing private sector-led development of the canarium industry in Papua New Guinea - phase 2	FST/2017/038	The University of the Sunshine Coast
Promoting smallholder teak and sandalwood plantations in Papua New Guinea and Australia	FST/2018/178	The University of the Sunshine Coast
Improving returns from community teak plantings in Solomon Islands	FST/2014/066	Griffith University
Enhancing returns from high-value agroforestry species in Vanuatu	FST/2016/154	The University of the Sunshine Coast
Biological control of galling insect pests of eucalypt plantations in the Mekong region [Cambodia, Thailand, Vietnam, Laos]	FST/2012/091	University of the Sunshine Coast
Building research capacity among ACIAR's sandalwood-focused projects through a regional sandalwood workshop and publication [Indonesia, Vanuatu, Fiji, Papua New Guinea, Timor-Leste, Australia]	FST/2016/024	The 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
Demand-led plant variety design for emerging markets in Africa [Ghana, Kenya, South Africa, Tanzania]	FSC/2013/019	The University of Queensland
Responding to emerging pest and disease threats to horticulture in the Pacific islands [Fiji, Papua New Guinea, Samoa, Solomon Islands, Tonga]	HORT/2016/185	The University of Queensland
Developing and deploying the diversity of root crops for greater climate resilience in the Pacific island countries [Fiji, Samoa, Solomon Islands, Tonga, Vanuatu]	HORT/2018/195	Department of Agriculture and Fisheries (Qld)
Aligning genetic resources, production and post-harvest systems to market opportunities for Pacific island and Australian cocoa [Fiji, Samoa, Solomon Islands, Vanuatu]	HORT/2014/078	Department of Agriculture and Fisheries (Qld)
Enhanced fruit production and post-harvest handling systems for Fiji, Samoa and Tonga	HORT/2014/077	The University of the Sunshine Coast
Integrating protected cropping systems into high-value vegetable value chains in the Pacific and Australia [Fiji, Samoa, Tonga]	HORT/2014/080	Central Queensland University
An integrated management response to the spread of *Fusarium* wilt of banana in South-East Asia [Indonesia, Laos, Philippines]	HORT/2018/192	Department of Agriculture and Fisheries (Qld)
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)

Project title	Project code	Commissioned organisation
Supporting commercial sweetpotato production and marketing in the Papua New Guinea highlands	HORT/2014/097	Central Queensland University
Protecting the coffee industry from coffee berry borer in Papua New Guinea and Australia	HORT/2018/194	Department of Agriculture and Fisheries (Qld)
Integrated management of *Fusarium* wilt of bananas in the Philippines and Australia	HORT/2012/097	Department of Agriculture and Fisheries (Qld)
Forages – taking stock and identifying research needs [Cambodia, Laos, Vietnam]	LS/2018/186	The University of Queensland
Developing profitable dairy and sheep meat production systems in the central Tibet Autonomous Region, China	LPS/2014/036	CSIRO Agriculture and Food
Strengthening incentives for improved grassland management in China and Mongolia	ADP/2012/107	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
Smallholder livestock futures in South-East Asia [Indonesia]	LS/2018/107	CSIRO Agriculture and Food
Improving cattle production in the Central Dry Zone of Myanmar through improved animal nutrition, health and management	LS/2016/132	CSIRO Agriculture and Food
Smallholder cattle enterprise development in Timor-Leste	LPS/2014/038	The University of Queensland
Trilateral support to smallholder cattle systems research in Timor-Leste	LS/2017/035	The University of Queensland
Increasing the productivity and market options of smallholder beef cattle farmers in Vanuatu	LPS/2014/037	The University of Queensland
Promoting business development pathways for more productive and profitable smallholder cattle systems in Vanuatu	LS/2018/185	The University of Queensland
Integrated resource management for vegetable production in Laos and Cambodia	SMCN/2014/088	University of Southern Queensland
Crop health and nutrient management of shallot-chilli-rice cropping systems in coastal Indonesia	SLAM/2018/145	The University of Queensland
Improving maize-based farming systems on sloping lands in Vietnam and Laos	SMCN/2014/049	The University of Queensland
Mainstreaming research in Myanmar's agricultural and veterinary universities	SLAM/2017/041	The University of Queensland
Sustaining soil fertility in support of intensification of sweetpotato cropping systems [Papua New Guinea]	SMCN/2012/105	The University of Queensland
Land management of diverse rubber-based systems in southern Philippines	SLAM/2017/040	Griffith University
Developing cassava production and marketing systems to enhance smallholder livelihoods in Cambodia and Laos	ASEM/2014/053	The University of Queensland
Smallholder farmer decision-making and technology adoption in southern Laos: opportunities and constraints	ASEM/2014/052	James Cook University
Enhancing livelihoods through forest and landscape restoration [The Philippines]	ASEM/2016/103	The University of the Sunshine Coast
Promoting socially inclusive and sustainable agricultural intensification in West Bengal (India) and Bangladesh	LWR/2014/072	CSIRO Agriculture and Food
Improving livelihood of marginal communities, by out scaling irrigation and agricultural practices, through collectives, in the Eastern Gangetic Plains [Bangladesh, India, Nepal]	WAC/2018/163	University of Southern Queensland
Agriculture based emission-reduction options to support nationally determined contributions in Vietnam and Fiji	LWR/2017/029	Queensland University of Technology
Quantifying crop yield gaps across the Indo-Gangetic Plains from new perspectives – production, farmer profit and sustainability of water use (SDIP) [Bangladesh, India, Nepal]	WAC/2018/169	CSIRO Agriculture and Food

Project title	Project code	Commissioned organisation
South Australia		
Agricultural policy research to support natural resource management in Indonesia's upland landscapes	ADP/2015/043	The University of Adelaide
Improving milk supply, competitiveness and livelihoods in smallholder dairy chains in Indonesia	AGB/2012/099	The University of Adelaide
Revision and update of *Making value chains work better for the poor toolkit* and the ACIAR *Agribusiness Masterclass* [Indonesia, Vietnam]	AGB/2018/121	The University of Adelaide
Enhancing livelihoods through improved forest management in Nepal	FST/2017/037	The University of Adelaide
Management practices for profitable crop livestock systems for Cambodia and Laos	SMCN/2012/075	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
Improving market engagement, post-harvest management and productivity of the Cambodian and Laos vegetable industries	ASEM/2012/081	University of Adelaide
Institutions to support intensification, integrated decision making and inclusiveness in agriculture in the East Gangetic Plain [Bangladesh, India, Nepal]	LWR/2018/104	University of South Australia
Water management for smallholder farmers - out-scaling ACIAR research in Andhra Pradesh drought mitigation program [India]	WAC/2018/164	CSIRO Agriculture and Food
Efficient participatory irrigation institution to support productive and sustainable agriculture in South Asia [India, Pakistan]	ADP/2014/045	University of South Australia
Tasmania		
Developing competitive and inclusive value chains of pulses in Pakistan	ADP/2017/004	University of Tasmania
Evaluating processes and outcomes in south-south research collaboration – finfish mariculture development in Cambodia through co-operation with Indonesia	FIS/2018/115	University of Tasmania
Harvest strategies for Indonesian tropical tuna fisheries to increase sustainable benefits	FIS/2016/116	CSIRO Oceans and Atmosphere
Developing integrated options and accelerating scaling-up of agroforestry for improved food security and resilient livelihoods in eastern Africa - Trees for food security 2 [Ethiopia, Rwanda, Uganda]	FST/2015/039	CSIRO Land and Water
Improving community fire management and peatland restoration in Indonesia	FST/2016/144	CSIRO Land and Water
Reducing forest biosecurity threats in South-East Asia [Indonesia, Laos, Vietnam]	FST/2018/179	University of Tasmania
Intensification of beef cattle production in upland cropping systems in Northwest Vietnam	LPS/2015/037	University of Tasmania
Victoria		
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
Assessing the potential of point of care diagnostic tools for developing countries [Cambodia, Laos]	LS/2018/203	CSIRO Australian Animal Health Laboratory
Developing and testing processes and tools to generate connected and live health security knowledge in Mekong communities (One Health) [Cambodia, Laos]	LS/2018/215	Swinburne University of Technology
Incentives for early declaration and effective prevention of avian influenza in the Mekong (One Health) [Cambodia, Laos]	LS/2018/216	Nossal Institute Limited (The University of Melbourne)
Improving farmer livelihoods by developing market-oriented small ruminant production systems in Myanmar	LS/2014/056	The University of Melbourne
Improving smallholder dairy and beef profitability by enhancing farm production and value chain management in Pakistan	LPS/2016/011	The University of Melbourne

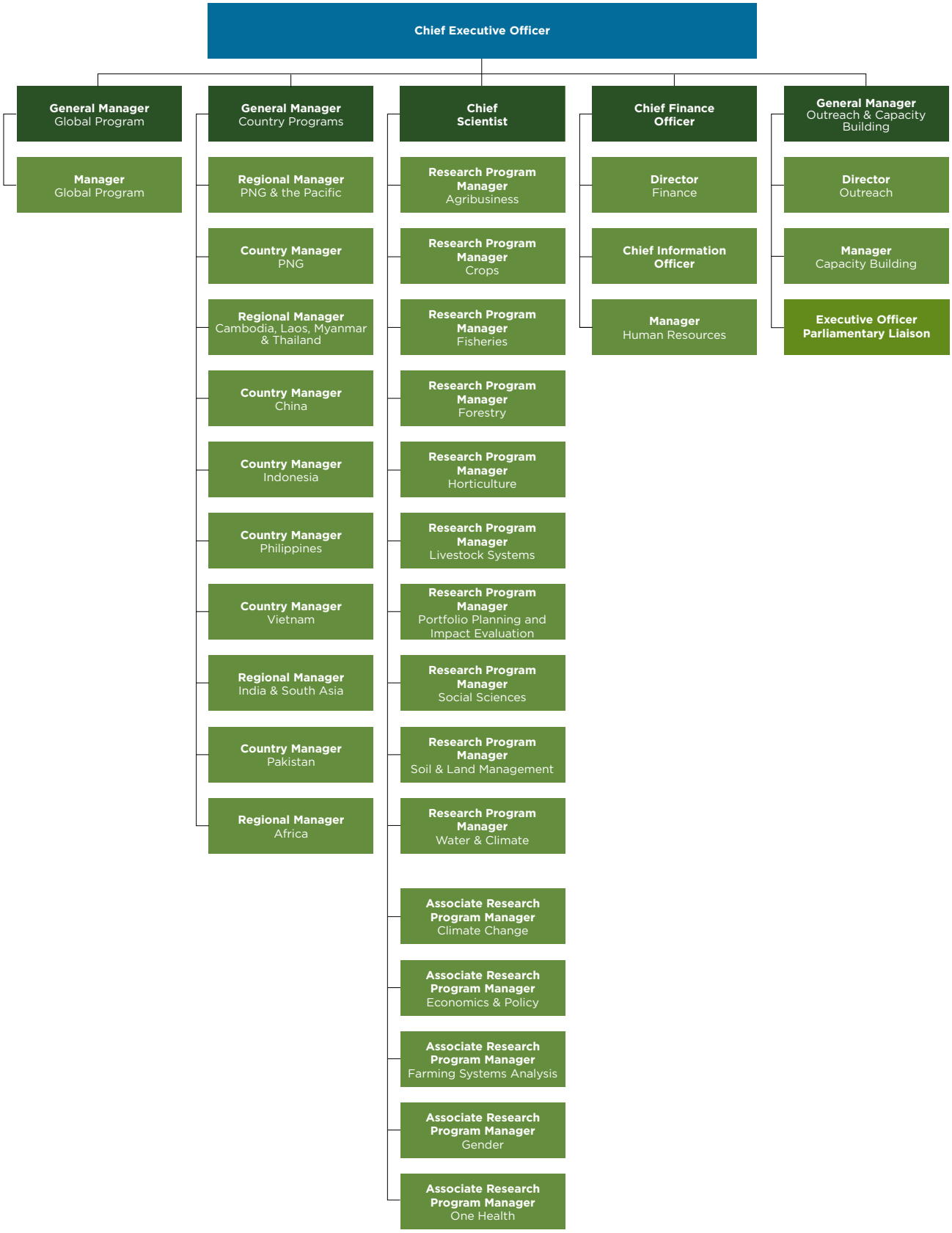
Project title	Project code	Commissioned organisation
Enhancing small ruminant production to benefit farming families in Sindh and Punjab, Pakistan	LS/2018/105	The University of Melbourne
A One Health approach to establish surveillance strategies for Japanese encephalitis and zoonotic arboviruses in Papua New Guinea (One Health)	LS/2018/213	CSIRO Australian Animal Health Laboratory
Veterinary Economics in Mekong Countries – advancing One Health [Cambodia, Laos, Vietnam]	LS/2019/118	Nossal Institute Limited (The University of Melbourne)
Drug sensitive and resistant tuberculosis and zoonotic infections as causes of lymphadenitis in two provinces in Papua New Guinea (One Health)	LS/2018/217	Burnet Institute
Management of nutrients for improved profitability and sustainability of crop production in central Myanmar	SMCN/2014/044	The University of Melbourne
Identifying entry points for black pepper (*Piper* sp) production and value chain development in the Central Highlands in Vietnam	SLAM/2018/209	Deakin 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 [Fiji, Indonesia, Philippines, South Africa, Uganda]	ASEM/2018/117	RMIT University
Improving food security in the northern uplands of Laos: identifying drivers and overcoming barriers	ASEM/2012/073	Monash University
Improving the methods and impacts of agricultural extension in Western Mindanao, Philippines	ASEM/2012/063	RMIT University
Western Australia		
Policy analysis of food safety and trade in Vietnam	ADP/2016/140	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
Enhancing farm household management decision-making for increased productivity in the Eastern Gangetic Plains [Bangladesh, India, Nepal]	CSE/2012/108	The University of Western Australia
Rapid breeding for reduced cooking time and enhanced nutritional quality in common bean (*Phaseolus vulgaris*) [Burundi, Ethiopia, Kenya, Rwanda, Tanzania, Uganda]	CROP/2018/132	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
Agricultural innovations for communities for intensified and sustainable farming systems in Timor-Leste (AI-Com)	CIM/2014/082	The University of Western Australia
Impact assessment of *Taenia solium* control in Phongsali province, Laos and development of future opportunities for the control of zoonotic parasitic infections	LS/2018/201	Murdoch University
Interventions to mitigate disease risk and add value to cross-border pig trade between Laos and Vietnam	LS/2014/055	Murdoch University
Synthesis of learnings on sustainable intensification of agriculture in Cambodia from ACIAR research investments to inform the future and support impact.	SLAM/2018/127	Murdoch University
Land suitability assessment and site specific soil management for Cambodian uplands	SMCN/2016/237	Murdoch University
Integrated water, soil and nutrient management for sustainable farming systems in South Central Coast of Vietnam and Australia	SMCN/2012/069	Murdoch University
Climate-smart landscapes for promoting sustainability of Pacific island agricultural systems [Fiji, Tonga]	ASEM/2016/101	The University of Western Australia
Identifying opportunities and constraints for rural women's engagement in small-scale agricultural enterprises in Papua New Guinea	ASEM/2014/054	Curtin University of Technology
Improving livelihoods of smallholder coffee communities in Papua New Guinea	ASEM/2016/100	Curtin University

Project title	Project code	Commissioned organisation
Analysing gender transformative approaches to agricultural development with ethnic minority communities in Vietnam	SSS/2018/139	Murdoch University
Nutrient management for diversified cropping in Bangladesh	LWR/2016/136	Murdoch University
Pilot project on commercialisation of smallholder conservation-based planters in Bangladesh	LWR/2018/111	Murdoch University
International		
Enhancing the livelihoods of coffee and pepper smallholders in the Central Highlands of Vietnam through improving stakeholders' participation in agribusiness-led value chains	AGB/2018/208	World Agroforestry Centre
Establishing sustainable solutions to cassava diseases in mainland South-East Asia [Cambodia, Laos, Myanmar, Vietnam]	AGB/2018/172	International Center for Tropical Agriculture
Innovative and inclusive agriculture value chain financing [Indonesia, Myanmar, Vietnam]	AGB/2016/163	International Food Policy Research Institute
Plant health – a major challenge to achieving sustainable 'green' agriculture in Myanmar	CROP/2019/103	CABI International
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 system intensification (SDIP) [Bangladesh, India, Nepal]	CSE/2011/077	International Maize and Wheat Improvement Center
Establishing the International Mungbean Improvement Network [Bangladesh, India, Myanmar]	CIM/2014/079	The World Vegetable Center
Improved mungbean harvesting and seed production systems for Bangladesh, Myanmar and Pakistan	CIM/2016/174	The World Vegetable Center
Extension of International Mungbean Improvement Network extension project [Bangladesh, India, Kenya, Myanmar, Tanzania and Uganda]	CROP/2018/133	The World Vegetable 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
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 Ayeyarwady Delta, Myanmar	FIS/2016/135	WorldFish Center
Developing and promoting market-based agroforestry options and integrated landscape management for smallholder forestry in Indonesia (Kanoppi 2)	FST/2016/141	World Agroforestry Centre
Developing value chain innovation platforms to improve food security in east and southern Africa [Uganda, Zambia]	FST/2014/093	World Agroforestry Centre
Developing and promoting market-based agroforestry and forest rehabilitation options for Northwest Vietnam	FST/2016/152	World Agroforestry Centre
Supporting an international initiative to maintain the coconut genetic resources network (COGENT) [Fiji, Indonesia, Papua New Guinea, Samoa]	GP/2018/193	International Coconut Community
ACIAR-IDRC Future of food program [Global]	GP/2018/218	XPRIZE Foundation Inc.
Agricultural Science and Technology Indicators (ASTI), Monitoring agricultural research investments, capacity and impact in Southeast Asia and the Pacific	GP/2016/093	APAARI and IFPRI
ACIAR-IDRC co-investment – Cultivate Africa's Future, Phase 2 (CultiAF2) [Ethiopia, Kenya, Uganda, Malawi, Mozambique, Zambia, and Zimbabwe]	C2016/367	—
Coconuts for Pacific livelihoods [Fiji, Papua New Guinea, Samoa, Solomon Islands, Vanuatu]	HORT/2017/025	Secretariat of the Pacific Community
Strengthening vegetable value chains in Pakistan for greater community livelihood benefits	HORT/2016/012	Centre for Agriculture and Bioscience International
Safe Pork: market-based approaches to improving the safety of pork in Vietnam	LS/2016/143	International Livestock Research Institute
Scoping livestock research opportunities in Africa	LS/2018/205	International Livestock Research Institute

Project title	Project code	Commissioned organisation
Improving soil health, agricultural productivity and food security on atolls [Kiribati, Tuvalu]	SMCN/2014/089	Secretariat of the Pacific Community
Building institutions for the sustainable management of artesian groundwater in Myanmar	SSS/2018/135	International Water Management Institute
Foresight for sustainable food systems in the Eastern Gangetic Plains (SDIP) [Bangladesh, India, Nepal]	WAC/2018/168	International Food Policy Research Institute
Aquifer characterisation, artificial recharge and reuse of suddenly available water in South Bihar, India (SDIP)	WAC/2018/211	Nalanda University
Expanding opportunities to use groundwater for poverty alleviation and climate change adaption in Laos	WAC/2018/167	International Water Management Institute
The implications of sustainable intensification on weed dynamics in the Eastern Gangetic Plains [India, Nepal]	WAC/2018/221	International Maize and Wheat Improvement Center
Building provincial capacity for sustainable agricultural mechanisation in Nepal (SDIP)	WAC/2018/220	International Maize and Wheat Improvement Center

Note: Details in this appendix may differ slightly to those reported in the main text due to changing project arrangements during the time of compiling this document

Appendix 3 Organisational structure



Current at 1 July 2019

Reference material

Tomato production in Fiji.
Credit: ACIAR/Conor Ashleigh

Abbreviations and acronyms

AAUN	Australia Africa Universities Network
ACIAR	Australian Centre for International Agricultural Research
AFOLU	agriculture, forestry and other land use
APAARI	Asia–Pacific Association of Agricultural Research Institutions
ASEAN	Association of Southeast Asian Nations
ASTI	Agricultural Science and Technology Indicators
CAADP	Comprehensive Africa Agriculture Development Programm
CABI	Centre for Agricultural Biosciences International
CEO	Chief Executive Officer
COGENT	Coconut Genetic Resources Network
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CultiAF	Cultivate Africa's Future
DFAT	Australian Government Department of Foreign Affairs and Trade
GDP	gross domestic product
IDRC	Canadian International Development Research Centre
Lao PDR	Lao People's Democratic Republic
MoU	memorandum of understanding
OECD	Organisation for Economic Co-operation and Development
PARDI	Pacific Agribusiness Research and Development Initiative
PCAARRD	Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development
SDIP	Sustainable Development Investment Portfolio
SPC	The Pacific Community
UN	United Nations
US	United States of America
WorldVeg	World Vegetable Center

List of tables

List of figures

Map

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